



Glocal Ecosystems and Expanded Knowledge for
green skills and capability in the Food Sector

D5.1

Report on specific/technical and
transversal skills courses for
mentors



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|------------------------------------|--|
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1. Executive summary

Deliverable D5.1. reports the activities on the design of training modules for trainers developed within T5.1. It outlines the methodology employed, beginning with the task descriptions as laid out in the project work plan.

The training focused on the **GEEK4Food approach** discussed and co-developed during our in-person meetings. Two train-the-trainer sessions were organised to ensure that the strategies for syllabus and content development, the active training methodologies, including a discussion on how to deliver harmonized content across Europe, within regional contexts were carried out (Cluj-Napoca, Aarhus) with the aim to widen the impact of the project to a wider community.

In the Annexes, the **content mapping files, syllabi, and module content** for three specific modules—"Eco-design of food packaging," "Optimized fermentation," and "Food waste valorization in food product design"—are included to illustrate the project's curriculum in more detail.

2. Introduction

One of the project's core goals is to design educational and training modules that help both graduates and experienced professionals develop the green skills they need to drive sustainability in the food sector. It does so by anticipating future needs, designing forward-looking curricula, and ensuring these modules bridge gaps across industries to foster a more sustainable, circular and ecofriendly food system. The project likely aims to support the creation of a workforce capable of contributing to the green economy, specifically in the context of food production and processing.

Green skills are those competences that help individuals contribute to the sustainability of the environment, and may involve technical knowledge, but also practices that lead to reduce environmental impact. The GEEK4Food project aims to enhance these skills, meaning it wants to not only teach the basics but also improve existing knowledge, making it more relevant and effective in addressing real-world environmental and sustainability challenges.

The design's forward-looking planning refers to creating training programs that are proactive and anticipate future needs, rather than merely reacting to current needs. In this context, it means designing training that will equip graduates and professionals with skills that will be relevant as food industry moves toward sustainability.

3. Methodology

3.1 Task description as presented in the project work plan

According to the task 5.1 (Training for Trainers) and its deliverable 5.1 (Report on specific/technical and transversal skills courses for mentors), educators will need to acquire green skills and competences by adapting or renewing their knowledge portfolio and responding to the job-market demand of professional profiles with future technical and transversal skills, as identified in WP2.

This will require training for teachers in green skills and competences. To achieve this, mentors providing the training will be selected within the partners' network. Specific/technical modules (such as innovative methods and emerging technologies), and transversal modules (e.g. entrepreneurial skills, system thinking), designed in WP4, will be delivered as training for final learners in WP5. The training will involve synchronous and asynchronous between on-site, online, and blended learning. The learning outcomes of the training will be specified to increase the teacher literacy on the agri-food sector sustainability. The platform developed in WP3 will allow the assessment of the learning outcomes post-training of the acquired skills/competencies in the agri-food system (circular economy, sustainable agriculture, food waste and valorization, etc). It will also be evaluated the ability to develop training aiming at entrepreneurial skills considering design-thinking, co-creation of training to solve agri-food system challenges, and the ability to support social impact for SDG achievement. The training for trainers will target educators in the agri-food sector at all levels and enable the trainers to prepare, deliver and assess education to all categories of learners and to provide upskilling and/or reskilling of the agri-food workforce.

3.2 Training for trainers

Task 5.1 “Training for Trainers” plays a pivotal role in the GEEK4Food project’s mission to build a sustainable, forward-looking education and training system for the agri-food sector. Grounded in the green and entrepreneurial skills identified in WP2 and built upon the innovative modular approach of WP4, this task supports the upskilling and reskilling of educators and trainers, enabling them to prepare future-proof learning pathways for students and professionals.

To equip educators with the ability to deliver courses focused on sustainability, circularity, and innovation, this task aimed to strengthen their pedagogical and content capacities through a dedicated training programme. The objective was to familiarise trainers with GEEK4Food’s modular, challenge-based, and learner-centred methodology, and to empower them to implement the project’s pilot modules in their local contexts.

Two dedicated Train-the-Trainer events were organised to pilot and disseminate this approach:

- **Cluj-Napoca Training – 20 June 2024** “*Training for the Future: Innovative Design Methods to Advance Agri-Food Education*” (hosted by USAMV Cluj-Napoca)
This session emphasised co-design and course prototyping based on the WP4 module structure. Activities included flipped classroom simulation, peer design work, and mentoring support.
- **Aarhus Training – 14 January 2025** “*Addressing Green Skills Needs in the Agri-Food Sector: Identifying and Delivering Emerging Green Skills*” (hosted by Aarhus University)
This session focused on future skills identification, policy and industry foresight, and competence mapping. It included input from external stakeholders such as SkyHive (AI-based skills analytics) and 4CF (Futures Literacy specialists).

Together, these sessions laid the groundwork for a transnational training framework aligned with the GEEK4Food model, enabling harmonisation and contextualisation of green skills education across Europe.

3.3 Methodology

The methodology of Task 5.1 is deeply rooted in the GEEK4Food pedagogical framework developed in WP4 and operationalised through the modular pilot courses. The approach combines challenge-based learning, modular course architecture, blended delivery, and competency-driven assessment.

3.3.1 Training in Cluj: Design innovation and pedagogical prototyping

The Cluj training focused on hands-on pedagogical design and application of the modular methodology. The agenda featured:

- **Introduction to GEEK4Food and WP4 module development**
- **Flipped classroom simulation** based on food waste valorisation
- **Collaborative course co-creation workshop:** Trainers worked in teams to adapt module templates to local educational contexts
- **Mentoring and feedback rounds** to refine proposed course structures

Participants actively engaged in prototyping new course ideas using the WP4 module templates and discussed how to localise challenges while maintaining pedagogical consistency across institutions.

The session highlighted the value of storytelling, active learning, and portfolio-based assessment in green skills training.

3.3.2 Training in Aarhus: Future skills, systems thinking, and platform integration

The Aarhus training provided a broader strategic view on **skills anticipation** and **training design**, with a focus on aligning course content with future labor market demands. Key components included:

- **Keynote on GEEK4Food's green skills ecosystem** (Paola Pittia-UNITE, Mario Roccaro-EITFood)
- **Industry foresight using AI** (SkyHive): Leveraging skills data to tailor course development
- **Futures Literacy workshop** (4CF): Using scenario planning to anticipate evolving sustainability challenges
- **Introduction to the GEEK4Food learning platform** (MilCoop, SkyHive): Emphasis on learning outcome tracking and personalised feedback

Participants engaged in:

- **Plenary sharing on learning objectives and course design**
- **Group design work**: Contextualising WP4 modules using foresight and circular economy principles
- **Session on "From Local to Glocal"**: Translating region-specific skills into transferable training models

This session underlined the importance of system thinking, anticipatory education, and digital support tools in developing resilient, future-oriented teaching pathways.

3.3.3 Competency mapping and GreenComp integration

Both training sessions were aligned with the **European GreenComp framework**, ensuring that educators could:

- Define and apply learning outcomes using Bloom's taxonomy;
- Assess technical (e.g., fermentation, packaging) and transversal (e.g., problem-solving, critical thinking) skills;
- Evaluate learning progress using rubrics and formative techniques;
- Integrate **entrepreneurship, co-creation, and design-thinking** into course planning.

Participants were introduced to the content mapping files from WP4 and trained in aligning course components with defined learning outcomes. The assessment model included:

- Group case study results
- Reflection activities
- Multiple-choice quizzes and peer evaluation

3.3.4. Digital integration via WP3 platform

Participants were introduced to the WP3 platform which supports:

- Upload and customisation of training materials
- Learning outcome monitoring
- Competency self-assessment
- Certification and feedback loops

The platform enables trainers to **trace skill acquisition**, evaluate course impact, and adapt learning paths dynamically to meet evolving needs.

3.3.5. Evaluation and certification

At the end of each session:

- Trainers presented their **prototype course designs**
- Engaged in **peer review and feedback**
- Completed **training evaluations**

All participants received a **Certificate of Participation**, and post-training follow-ups are planned to support implementation and to collect evidence of training replication and adaptation.

4. Training programme overview

4.1 Cluj-Napoca Training – 20 June 2024 *“Training for the Future: Innovative Design Methods to Advance Agri-Food Education”*

Date and time: 20/06/2024 09:30 am to 17:30 pm EEST

Location: USAMV-Cluj-Napoca (RO) Library building, Room 47
Calea Manastur 3-5, Cluj-Napoca

1. **Annexe 1: Group Picture**
2. **Annexe 2: Event brochure**
3. **Annexe 3: Training lectures and presentations**

Train the Trainers Event summary (See Agenda, Fig 1)

On **20 June 2024**, the GEEK4Food project hosted a full-day “Training for the Future” event at the University of Agricultural Sciences and Veterinary Medicine (USAMV) in Cluj-Napoca, Romania. This train-the-trainer event was a **side session of the CASEE 2024 conference** and brought together 35 participants such as university lecturers, PhD candidates, postdoctoral fellows, and professional trainers in the agri-food sector. The theme of the day – *“Innovative Design Methods to Advance Agri-Food Education”* – reflected the overall objective of equipping educators with new pedagogical tools to address emerging green and digital challenges in food systems. In line with GEEK4Food’s mission, the workshop aimed to impart innovative methods for designing effective courses, prepare educators for the agri-food sector’s green and digital transition, foster a systems approach to One-Health challenges, and promote collaborative learning and the use of sustainable competency frameworks. The atmosphere was professional and collaborative, setting the stage for a series of interactive lectures and activities focused on modernizing agri-food education.

Gender, country, scientific/technological expertise, sector and role are reported in **Figure 2 and 3**.

Training for the future: innovative design methods to advance agri-food education

University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca, Romania

THURSDAY 20 JUNE 2024 | 9:30 - 17:30

| | |
|---------------|--|
| 09:30 - 10:00 | Training registration |
| 10:15 - 11:15 | Inspirational lectures "A systems approach to addressing ONE-HEALTH challenges in the agri-food sector" Prof. Paola Pittia, G4F Coordinator, University of Teramo (IT) "Biotechnological applications in molecular gastronomy" Prof. Dan Vodnar, USAVM Cluj-Napoca (RO) |
| 11:15-11:30 | Coffee break |
| 11:30-12:00 | Sustainable competency frameworks for upskilling and reskilling in the agri-food sector Dr. Mario Roccaro, G4F Co-coordinator, EIT Food (BE) |
| 12:00-12:40 | Methods and tools for designing advanced training courses: from learning outcomes to evaluation Prof. Milena Corredig & Konstantina Ntrallou, Aarhus University (DK) |
| 12:40 - 13:10 | Presenting the GEEK4Food's AI-powered skill-based platform Mohan Reddy, SkyHive (US) |
| 13:10-14:10 | Lunch break |
| 14:10 - 14:25 | Introduction to afternoon activities and teams formation Konstantina Ntrallou, Aarhus University (DK) & Mario Roccaro, EIT Food (BE) |
| 14:25-15:25 | Let's design part 1 |
| 15:25-15:40 | Coffee break |
| 15:40-16:50 | Let's design part 2 |
| 16:50-17:30 | Plenary reporting of the courses designed by each team |
| 17:30 | Conclusion and end of activities |

Registration link: <https://www.eventbrite.com/e/858793663967?aff=oddtcreator>

Visit the CASEE 2024 Conference website: <https://casee.usamvcluj.ro>

Fig. 1: Agenda of the training, USAVM-Cluj Napoca, June 2024

Welcome and Introduction (10:00–10:15).

After a brief registration period, the event formally opened with welcome remarks from **Prof. Paola Pittia (University of Teramo, Italy)**, GEEK4Food Project Coordinator, and **Prof. Dan C. Vodnar (USAMV Cluj-Napoca, Romania)**, the local host. They greeted the participants and outlined the workshop's goals in the context of the GEEK4Food initiative. Prof. Pittia emphasized the importance of building a community of practice around green skills development, while Prof. Vodnar highlighted the university's commitment to educational

innovation in agriculture and food sciences. Together they set a forward-looking tone for the day, underscoring the need for skill-based, sustainable education in the fast-changing agri-food sector.

Inspirational Lectures (10:15–11:15).

The morning continued with two back-to-back inspirational presentations designed to spark new ideas. First, **Prof. Paola Pittia** delivered a talk titled “*A systems approach to addressing the ONE-HEALTH challenges in the agri-food sector.*” Drawing on a One-Health perspective, she discussed how human, animal, and environmental health are interconnected in food systems, and argued for a holistic, system-level approach to education and problem-solving. Her presentation underscored the value of interdisciplinary thinking in tackling agri-food challenges, illustrating how educators can integrate concepts of food safety, nutrition, and sustainable farming into curricula to address health and sustainability in unison. The second lecture, “*Biotechnological applications in molecular gastronomy,*” was presented by **Prof. Dan Cristian Vodnar** of USAMV Cluj. In this talk, Prof. Vodnar showcased cutting-edge examples of molecular gastronomy and food biotechnology, linking scientific innovation to teaching practice. He demonstrated how novel biotechnological techniques in cuisine and food product development – for example, fermentations and texture innovations – can be used as engaging educational content. This session highlighted how blending science with gastronomy can inspire students and illustrate key principles of food science. Both inspirational lectures provided forward-thinking context and concrete examples, setting an innovative mindset for the participants as they prepared to design new learning experiences.

A short **coffee break (11:15–11:30)** gave participants a chance to network and reflect on the insights from the morning talks. Following the break, the program shifted focus from big-picture inspiration to the practical tools and frameworks for course design.

“Sustainable competency frameworks for upskilling and reskilling in the agri-food sector” (11:30–12:00).

In this session, **Dr. Mario Roccaro (EIT Food, Belgium)** – GEEK4Food’s co-coordinator – introduced participants to emerging competency frameworks that support sustainable skill development. He presented European-wide tools, notably the new **Green Competence Framework and the EIT Food Competence Framework**, explaining how these frameworks identify the knowledge, skills, and attitudes needed for sustainability in food systems. Dr. Roccaro discussed how educators can adopt such frameworks to structure curricula that address current industry needs and future challenges. By aligning courses with these competency models, universities can ensure their programs foster the green skills and mindsets required for the sector’s transition to sustainability. This presentation gave the audience a clear view of *what* to teach – the target competencies for sustainable agri-food careers – and how to embed those into training programs. It reinforced one of the event’s core objectives: adopting sustainable competency frameworks in education.

“Methods and tools for designing advanced training courses: from learning outcomes to evaluation” (12:00–13:10).

The next session was an interactive lecture led by dr **Konstantina Ntrallou (Aarhus University, Denmark)**, an education specialist on the GEEK4Food team. This segment delved into **instructional design methodologies and pedagogical techniques** for modern classrooms. Ms. Ntrallou introduced the classic *ADDIE model* – outlining the stages of Analysis, Design, Development, Implementation, and Evaluation – as a guiding framework for course creation. She emphasized starting with clear **learning outcomes** and showed how Bloom’s Taxonomy can help formulate specific, measurable objectives for student learning. From there, the session explored designing learning activities that are active and student-centered. Participants learned about innovative methods such as **game-based learning, experiential learning exercises, and flipped classroom approaches**, which can make training more engaging and practical. Ms. Ntrallou also presented the **ABC Learning Design** method, a toolkit for rapid course development that encourages educators to map out learning sequences in a visual and collaborative way. Throughout the talk, she connected these tools back to evaluation strategies, stressing the importance of aligning assessments with the intended outcomes to ensure training effectiveness. This rich toolkit of methods and design principles gave attendees actionable strategies for **how** to teach – complementing the *what* to teach from the previous talk. By the end of the morning sessions, the educators were equipped with both the content frameworks and the pedagogical techniques to start crafting their own innovative course plans. A lively discussion followed, as participants posed questions and shared experiences on applying these models in their home institutions.

After a networking **lunch break (13:10–14:10)**, the workshop shifted from theory into practice. The afternoon was dedicated to hands-on group activities under the banner “**Let’s design**” – an interactive design exercise unfolding in two parts.

Let’s Design – Part 1 (14:10–15:10).

Kicking off the practical sessions, Dr. Mario Roccaro and dr Konstantina Ntrallou introduced the format of the design challenge and helped form working teams. Participants were organized into small multidisciplinary groups, each tasked with developing a blueprint for a new agri-food educational course or training module. In Part 1 of this activity, teams concentrated on the initial phases of course design. Guided by the **ADDIE framework** introduced earlier, they began with the **Analysis** and **Design** steps: identifying their target learners and learning needs, defining clear learning objectives, and sketching out a course structure. Using the competency frameworks presented in the morning, groups chose which green skills or sustainability competencies their course would address. They then brainstormed innovative teaching methods to deliver this content – for example, integrating game-based exercises or laboratory demonstrations – drawing inspiration from the pedagogical tools discussed by Ms. Ntrallou. The format was highly collaborative and creative: flipcharts, sticky notes, and templates were provided so that each team could visually map out their course plan. GEEK4Food facilitators (including Prof. Pittia and Prof. Vodnar) circulated among the groups to offer guidance and provoke reflection. By the end of Part 1, each team had outlined a basic course concept with goals, key topics and activities, ready to be refined in the next session. The exercise’s objective was to let participants directly apply the concepts from the morning, thereby reinforcing their learning through practice.

After **coffee break (15:10–15:25)**, the teams reconvened to deepen and finalize their course designs in Part 2.

Let's Design – Part 2 (15:25–16:45).

In the second phase of the workshop exercise, teams moved into the **Development** and **Implementation** planning stages of their courses, and considered how to **Evaluate** learning – completing the ADDIE cycle. Building on the foundations from Part 1, each group fleshed out the details of their proposed course. This included selecting specific content modules, developing interactive assignments or case studies, and incorporating appropriate digital tools or laboratory components as needed. Participants paid particular attention to sequencing the learning activities (using principles from the ABC Learning Design method) to ensure a logical flow from introduction of concepts to hands-on practice. They also drafted evaluation methods – for instance, designing a formative quiz or a practical project – to measure whether the learning outcomes would be achieved. Throughout Part 2, teamwork and peer learning were front and center: educators from different backgrounds exchanged ideas on what works in their teaching experience, and they adapted suggestions from the morning's lectures to fit their course topics. The **format** remained one of active co-creation, mirroring real-world curriculum design committees. This collaborative design sprint not only produced tangible course plans, but also gave the trainers practice in applying **systemic and innovative thinking to curriculum development**, fulfilling the workshop's aim of "*promoting collaborative learning and design*" in education. By 16:45, the groups had prepared concise presentations of their newly designed course outlines.

Plenary Reporting and Conclusion (16:45–17:30).

In the final plenary session, all teams came together to share the results of their work. One by one, each group **reported on the course concept** they had developed, describing its target audience, learning objectives, instructional methods, and how it addresses agri-food skills needs. This report-out allowed for cross-pollination of ideas – the participants learned from each other's approaches and discovered diverse ways to tackle the challenge of modernizing agri-food education. The workshop facilitators and peers offered supportive feedback and observations after each team's brief presentation. This plenary discussion underscored the creativity and commitment present in the room: although each team tackled a different subject, common themes emerged around sustainability, innovation, and student engagement.

Finally, **Prof. Paola Pittia** took the floor to deliver concluding remarks. She congratulated the participants on their collaborative efforts and recapped the key insights of the day. In her conclusion, Prof. Pittia highlighted how the workshop had successfully provided a "wealth of new skills, methods, and ideas" to the educators, empowering them to transform their teaching practices. She noted that by experimenting with frameworks and design tools, the attendees had demonstrated readiness to drive educational innovation in the agri-food domain.

The event's objectives had been met: the group had not only learned about novel approaches, but actively practiced designing **skill-based, sustainable learning experiences** for the future. As a token of completion, each participant received a **certificate of participation**, marking

their contribution to this capacity-building effort. The day closed on an optimistic note, with the GEEK4Food team encouraging participants to bring these new methodologies back to their home institutions and continue the collaboration. In the broader context of the project, this Cluj-Napoca workshop was just the beginning – a model to be replicated in other regions as GEEK4Food expands its community of practice. In summary, the “Training for the Future” event in Cluj was a richly interactive and forward-looking training experience, one that united educators around the shared goal of advancing agri-food education for a sustainable future.

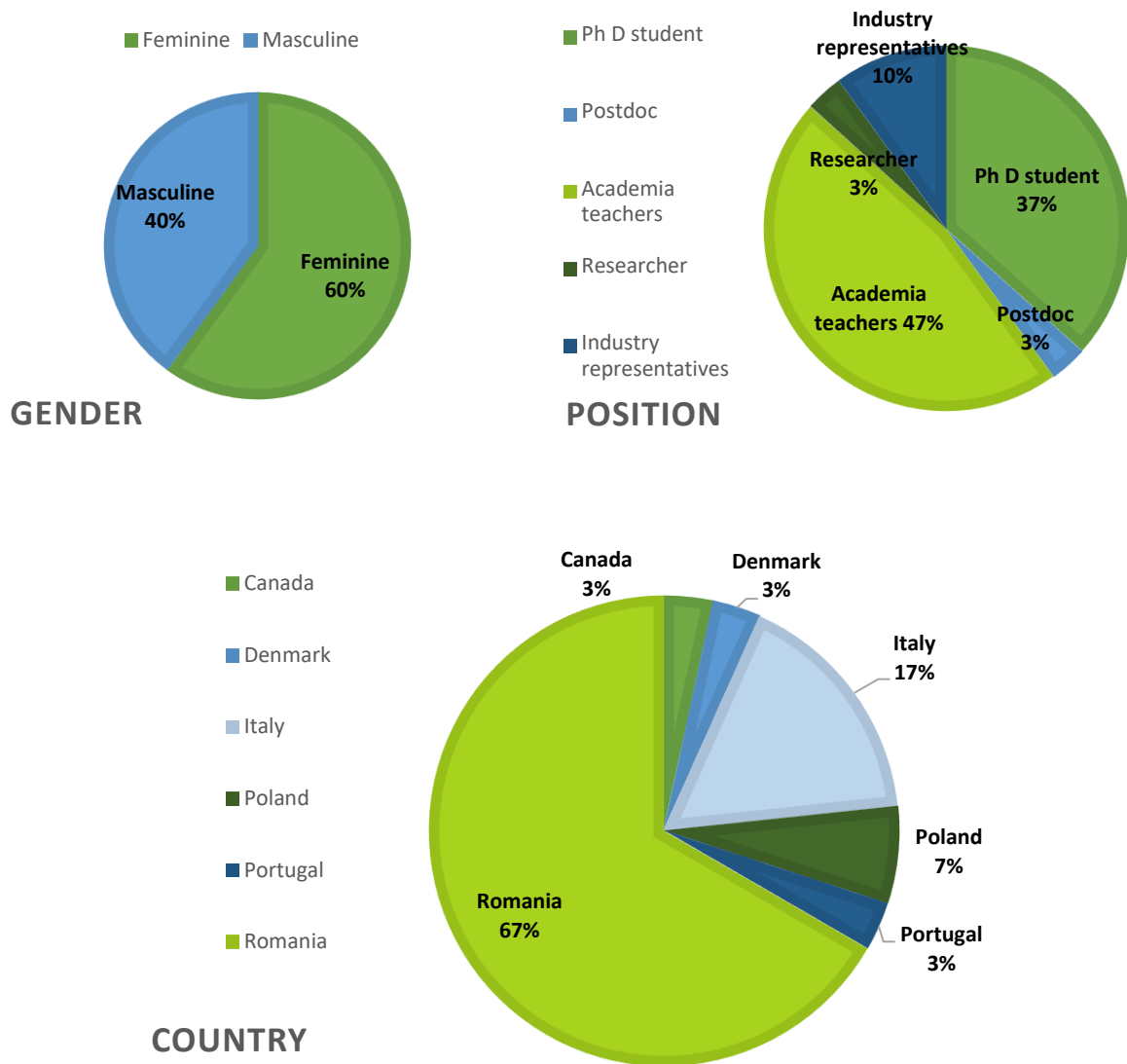
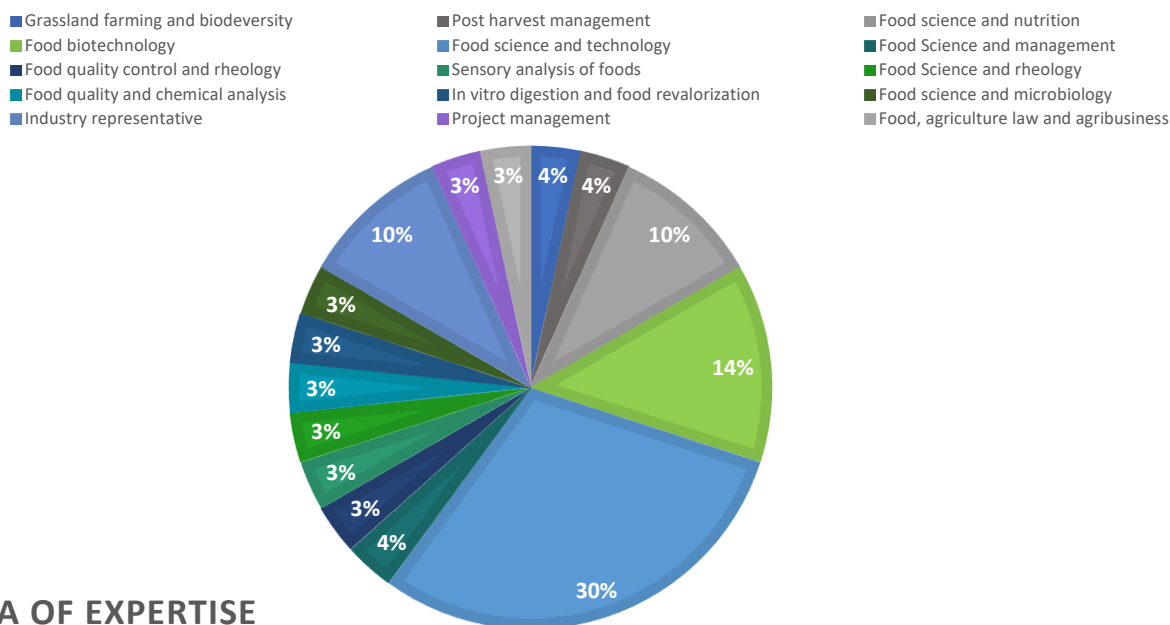


Figure 2: Gender, country, sector and role.



AREA OF EXPERTISE

Figure 3: Scientific/technological expertise of the participants

Outcome

During the “Training for the Future: Innovative Design Methods to Advance Agri-Food Education,” participants received lectures covering key sustainability methodologies, systems thinking approaches for sustainability challenges, and course design implementation. They were then split into teams and selected a subject from a provided list to develop their own course concept. Afterward, a representative from each team presented the group’s proposed course design. Each team documented their ideas on sheets, integrating and organizing all concepts visually. Below are the photos showcasing the results of this collaborative teamwork.

Working Group 1 (Figure 4)

Course Title: From Laboratory to Business Ideas

Theme: Food waste valorization and new product design

Target Group:

- End-level bachelor students
- Elite course
- Focus on bioactive compounds

Learning objectives:

Participants will be able to:

1. **Competently define bioactive compounds** and their value from food waste and **develop food design competences**.
2. **Appraise and articulate emerging technologies** for the **valorization of food waste**.
3. **Identify and use relevant circular economy models**.
4. **Acquire entrepreneurial skills** and **develop critical thinking**.
5. **Understand the complexity of food waste**.

Teaching methodology:

- Format: **In-person**
- Duration: **2 weeks**
- Method: **Flipped classrooms** and **hands-on workshops**
- Pedagogical tools:
 - **Storytelling**
 - **Challenge-based approach**

Review process:

- **Small pilot**
- **Model design**

Evaluation:

- **Report** (criteria setting)
- **Pitching** sessions
- Involvement of **invited experts** and **SMEs** for evaluation

Additional Information:

- **Credits:** 2 ECTS
- **Mentoring** support provided throughout the course

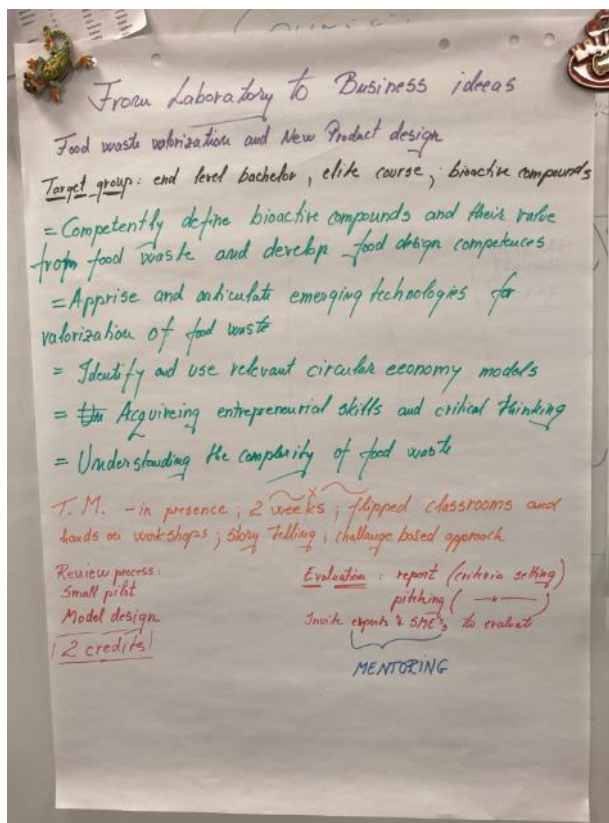


Figure 4: poster of the summary of the course designed by WP1

Working Group 2 (Figure 5)

Course Title: Elective course on food loss and waste

Format: Summer School

Target Group:

- Students from **Life Sciences programmes**
- **20–25 participants**
- Bachelor and Master level students
- **Gender balanced**

Duration:

- **One week**
- Conducted from **Monday to Friday**
- Includes **weekend activities** (Saturday–Sunday)

Learning activities & objectives (LO):

1. **Evaluate** the importance and impact of awareness raising and communication strategies.
2. **Implement** various actions depending on student context and values.

3. **Understand/explain** the difference between **food loss** and **food waste**.
4. **Apply case-based solutions** for reducing food loss and waste.
5. **Understand the value** of planning and managing consumption, based on individual needs/preferences.

Pedagogical Methods:

- Hands-on workshops
- Guest lectures from nutritionists and professionals
- Group projects and team-based activities
- Portfolio development
- Case studies and real-world food loss scenarios
- Field visits and cooking sessions

Modules/Units Overview:

| Day | Activity |
|------------------|---|
| Monday | - Moderation: Introduction and motivation - Module: Discuss food loss case studies (2 hrs) |
| Tuesday | - Module 1: Introduction to circular economy, food loss, and food waste (2 hrs) - Food design session - Workshop with chefs (1.5 hrs) |
| Wednesday | - Visit to an industry/research lab - Reflection on professional practices |
| Thursday | - Debate/discussion: What solutions for what context? - Group activities: Design your own solution - Presentation of professional solutions |
| Friday | - Motivational wrap-up: From awareness to business solution - Peer evaluation |
| Saturday | - Cooking session with food loss ingredients (with NGO) - Nutritionist session: food needs and preferences |
| Sunday | - Visit to a green food festival - Portfolio finalization and submission (2 items + feedback) |

Evaluation:

- Portfolio to be submitted at the end of the course (2 items)
- Peer feedback integrated
- Participation in discussions and practical activities

Creativity and applicability of proposed solutions

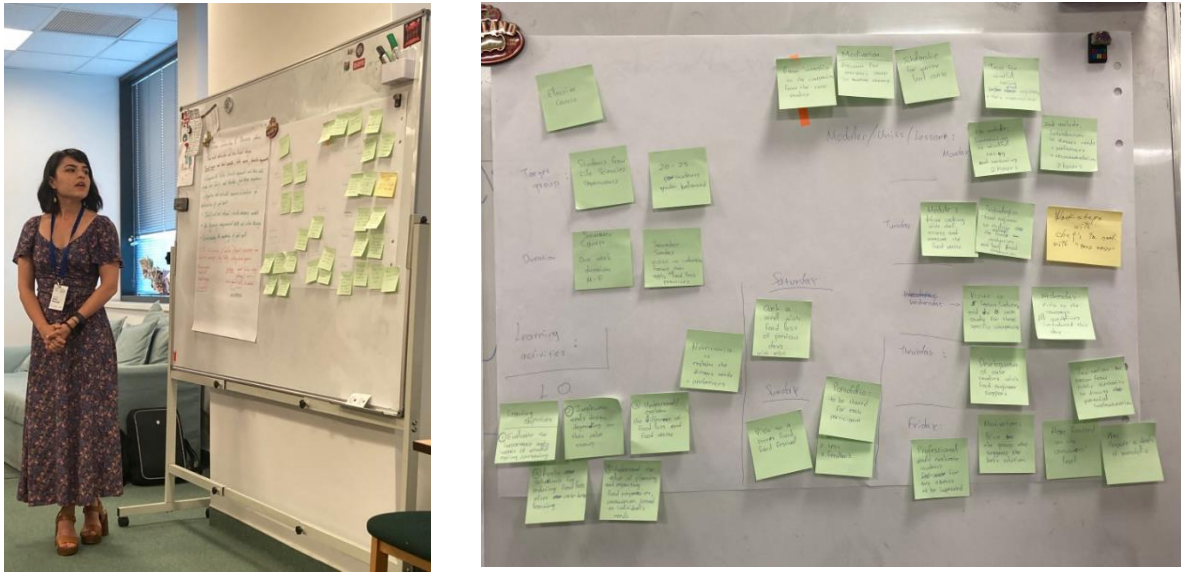


Figure 5: Reporting and working session Working group 2

4.2 Aarhus Training – 14 January 2025 “Addressing green skills needs in the Agri-food sector: identifying and delivering emerging green skills”

Date and time: 14/01/2025 08:30 am to 16:00 pm CET

Location: University’s Conference Center, [Fredrik Nielsens Vej 2-4, 8000 Aarhus C](#), room Richard Mortensen Stuen, building 1422/122, Aarhus, Denmark

1. **Annexe 4:** Group Picture
2. **Annexe 5:** Event poster
3. **Annexe 6:** Training lectures and presentations

Train the Trainers Event summary

On Tuesday, January 14, the GEEK4Food “Train the Trainers” event took place at the University’s Conference Center in Aarhus, Denmark. This full-day workshop (8:30–16:00) was dedicated to the theme of “**Addressing green skills needs in the agri-food sector**” and the goal of “**identifying and delivering emerging green skills**”. The event aimed to build capacity among **trainers (42 registered participants and 26 effectively attending participants)** to meet new sustainability skill requirements in the agri-food industry. The program featured a chronological series of expert presentations and interactive sessions, guiding participants through community-building, technological tools, futures literacy, and curriculum development approaches in the context of green skills.

After a networking breakfast and registration period, the event officially started at 9:00 with an opening session titled **“GEEK4Food: Building a community for green skills development,”** delivered by Paola Pittia (GEEK4Food Coordinator, Teramo University) and Mario Roccaro (GEEK4Food co-coordinator, EIT Food). In this introduction, the coordinators welcomed participants and outlined the objectives of the GEEK4Food initiative, emphasizing the importance of building a collaborative community to foster green skills development in the agri-food sector. Their remarks set a constructive tone for the day, highlighting the need for collective effort in addressing green skill gaps.

Next, from 9:20 to 10:00, Mohan Reddy (SkyHive by Cornerstone OnDemand) delivered a presentation titled **“The role of AI in identifying and understanding skill needs and demands”**. Reddy discussed how artificial intelligence can be leveraged to analyze workforce data and identify emerging skill requirements, illustrating the potential of AI tools to help anticipate and address skill gaps in the agri-food sector. This session provided a technological perspective on skills development, complementing the community-building focus of the opening remarks. After this talk, attendees took a short coffee break to network and reflect on the morning’s insights.

At 10:15, the program continued with an extended workshop on **“Futures literacy: anticipating skills needs through future scenarios,”** led by Bartosz Frackowiak (4CF) The Futures Literacy Company. In this interactive session (lasting until 11:45), Frackowiak introduced the concept of futures literacy and guided participants through the exploration of future scenarios in the agri-food sector. The aim was to help trainers anticipate how emerging trends and uncertainties could shape tomorrow’s skill needs, thereby equipping them with foresight tools to proactively adapt their training strategies. Attendees engaged in forward-looking discussions and exercises, gaining insight into anticipating green skill requirements before they become urgent.

Afterward, from 11:45 to 12:45, all participants reconvened for a plenary session to share insights on the green skill needs identified during the morning. This interactive plenary discussion allowed attendees to collectively reflect on the key skill gaps and priorities highlighted by the earlier presentations and the futures literacy workshop. The group dialogue helped consolidate a shared understanding of which emerging green skills require attention, setting the stage for the afternoon sessions. A lunch break followed from 12:45 to 13:30, giving participants time to network.

Following lunch, the agenda resumed at 13:30 with Milena Corredig (Aarhus University) presenting the **“GEEK4Food framework for understanding and addressing learner needs”**. Corredig introduced a structured framework developed by the GEEK4Food project to analyze learner requirements and tailor training approaches for green skills. She explained how this framework helps trainers align educational content with the sustainability competencies demanded by the agri-food sector, ensuring that learning programs effectively address the identified skills gaps. The session underscored the importance of understanding learners’ contexts and needs when developing green skill curricula.

At 14:00, participants reconvened for a second plenary session focused on learning objectives. In this 20-minute discussion, attendees collaboratively discussed and refined the learning objectives derived from the GEEK4Food framework, ensuring these objectives were closely

aligned with the green skills needs identified earlier. This plenary exercise enabled the group to validate that their training goals would effectively target the desired competencies. Afterward, a brief coffee break took place from 14:20 to 14:45.

From 14:45 to 15:30, Milena Corredig delivered the final presentation of the day, titled **“From local to glocal: adaptable principles for education and training.”** In this closing address, she highlighted how educational principles and training methodologies can be adapted from local contexts to broader, “glocal” applications. Corredig shared best practices for designing flexible training programs that remain effective across different regions and communities, reinforcing a scalable approach to green skills education. At 15:30, the workshop concluded with closing reflections and the awarding of certificates to participants. During this closing segment, the organizers and attendees discussed the day’s key takeaways and celebrated the establishment of a growing community committed to advancing green skills in the agri-food sector.

In Figure 6, gender, country, scientific/technological expertise distribution of the participants are summarised.

Agenda



Glocal Ecosystems and Expanded Knowledge for green skills and capability in the Food Sector

Addressing green skills needs in the Agri-food sector

Identifying and delivering emerging green skills

University's Conference Center, Fredrik Nielsens Vej 2-4, 8000 Aarhus C, room Richard Mortensen Stuen, building 1422/122 (the venue can be reached by tram: Letbane L2)

Tuesday 14th JANUARY 8:30 – 16:00

| | |
|--------------------|--|
| 8:30-9:00 | Networking breakfast and registration |
| 9:00-9:20 | GEEK4Food: Building a community for green skills development Paola Pittia, GEEK4Food Coordinator, Teramo University Mario Roccaro, GEEK4Food co-coordinator, EIT Food |
| 9:20-10:00 | The role of AI in identifying and understanding skill needs and demands Mohan Reddy, SkyHive by Cornerstone OnDemand |
| 10:00-10:15 | Coffee break |
| 10:15-11:45 | Futures literacy: anticipating skills needs through future scenarios Bartosz Frackwokiak, 4CF The Futures Literacy Company |
| 11:45-12:45 | Plenary sharing of skill needs insights |
| 12:45-13:30 | Lunch break |
| 13:30-14:00 | GEEK4Food framework for understanding and addressing learner needs Milena Corredig, Aarhus University |
| 14:00-14:20 | Plenary sharing on learning objectives |
| 14:20-14:45 | Coffee break |
| 14:45-15:30 | From local to glocal: adaptable principles for education and training Milena Corredig, Aarhus University |
| 15:30-16:00 | Closing reflections and certificates |

Participants

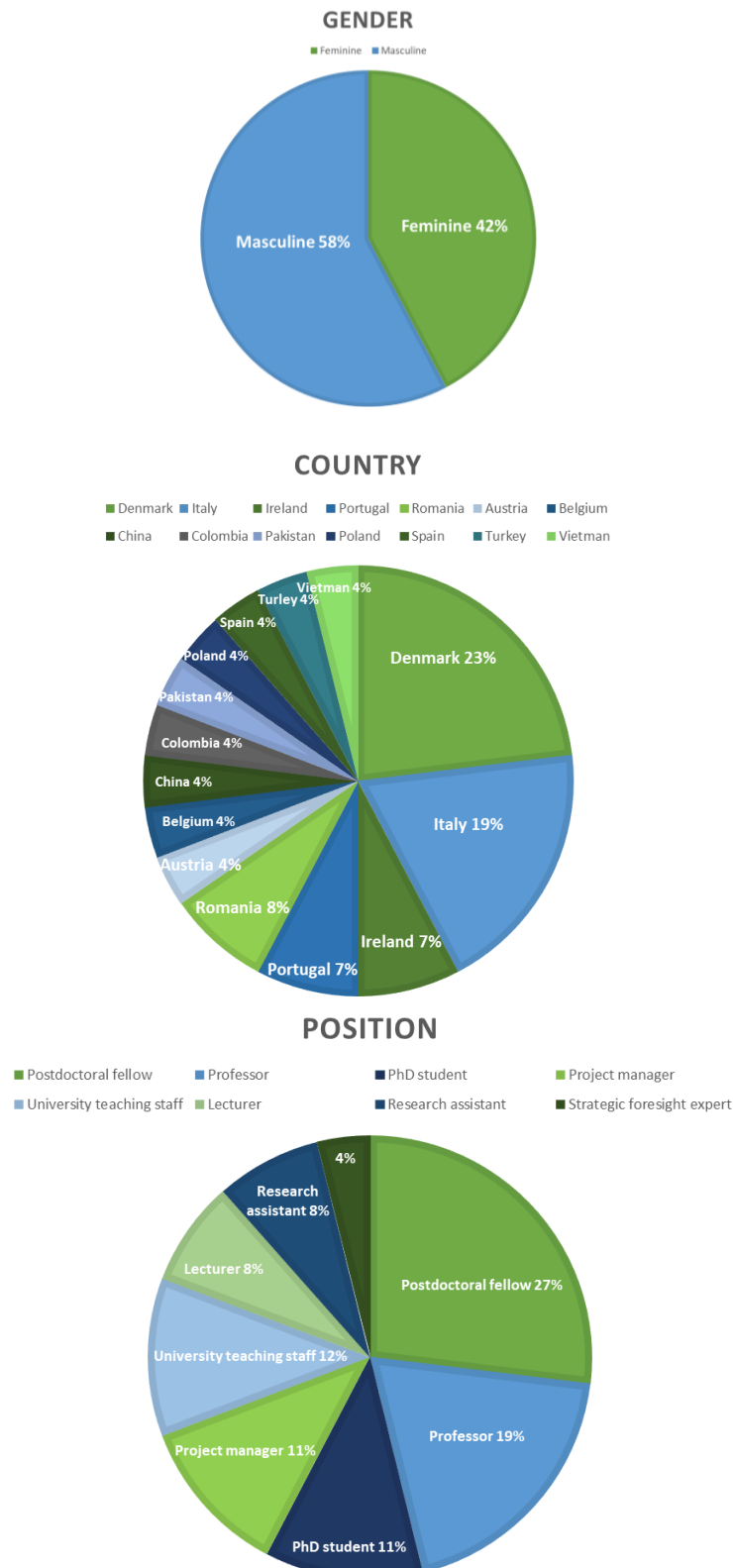


Figure 6: gender, country, scientific/techological expertise of the participants

Working groups

- ⇒ Within the presentation “*Future literacy: anticipating skills needs through future scenarios*”, **4 Futures Scenarios of Agrifood System through 2040 have been proposed** to work on as **groups**, as follows below:

Futures Scenarios of Agrifood System through 2040

Scenario 1: The Great Food System Paradox: Excellence Without Access

By 2040, the global food system has evolved into a state of stark contradictions. Despite developing world-class educational programs that produce highly competent agrifood professionals with advanced green and digital skills, widespread food insecurity has become the defining challenge of the era. The vast majority of the global population struggles with access to food, with only small enclaves of the wealthiest maintaining reliable food security. The healthcare crisis has deepened due to the inability to personalize diets to individual needs. Most of the population follows generic, one-size-fits-all nutritional guidelines, leading to a surge in obesity, malnutrition, and food-related diseases. This health crisis stands in sharp contrast to the sophisticated knowledge base developed within the sector.

A bright spot appears in urban agriculture, where both vertical farming has become common and most European households grow at least some fruits and vegetables for their own consumption. However, these local successes cannot compensate for the systemic failures in the broader food system.

The implementation of AI systems has introduced additional complications. Rather than solving distribution and access challenges, these systems have created new disruptions in the global food supply chain. The AI's reliance on statistical averages fails to account for local contexts, leading to misallocation of resources and deepening inequalities. This technological sophistication, paradoxically existing alongside widespread system failures, exemplifies the scenario's fundamental contradiction: excellence in knowledge and capability alongside systemic failure in execution and access.

Scenario 2: The Regulated Revolution

The food system of 2040 has been transformed through strict regulation and certification requirements. Every food retailer must now obtain the specialized "Food & Planet" certification to operate, fundamentally altering the retail landscape. This regulatory framework has enabled Alternative Food Networks (AFNs) to emerge as a large-scale alternative to conventional food supply chains, completely reshaping how food moves from producer to consumer.

A technological revolution has swept through the sector. The widespread adoption of emerging technologies - including 3D printing, laboratory food production, and non-thermal food processing - has radically changed food production methods. Perhaps the most visible manifestation of this change is the disappearance of traditional kitchens from homes, signaling a fundamental shift in how society approaches food preparation and consumption.

The European food industry, despite achieving net-zero emissions in food production - a remarkable technological and environmental achievement - struggles to maintain

international competitiveness and has become largely irrelevant in the global market. This economic challenge persists despite the industry's environmental successes.

In professional development, humans remain the primary drivers of knowledge transfer. The process of upskilling and reskilling food professionals takes place with minimal AI involvement, preserving the human element in professional education. This human-centric approach to professional development exists within a highly technologized production system, creating a unique balance between human knowledge and technological capability.

Scenario 3: AI-Mediated Food Transformation

By 2040, the global food system has undergone a dramatic transformation, driven by both technological advancement and shifting consumer preferences. The majority of the world's population has adopted a zero-carbon, primarily plant-based diet - a change that, coupled with sustained pressure on policymakers, has become the primary driver of the food system's transformation toward complete sustainability.

Alternative food sources have become mainstream, affordable, and widely accepted. Laboratory-grown meat, innovative plant-based products, and insect-based foods dominate the market. The industrial production of livestock meat has been outlawed, with traditional meat consumption relegated to a niche practice viewed as archaic and environmentally destructive.

The food safety standards have reached unprecedented levels, while personalized nutrition has become a common mainstream practice. This shift has effectively eliminated most food-related diseases, obesity, and malnutrition. However, this success comes with a significant privacy cost: AI systems collect extensive biophysiological and medical data on users, which corporations leverage to manipulate consumer behavior and eating habits for profit maximization.

Perhaps the most radical change has occurred in education and training. AI has completely replaced traditional academic training and vocational education for food professionals. The human element in professional development has been minimized, with AI systems handling everything from basic training to advanced specialization. Simultaneously, AI and automation have revolutionized food production, distribution, and supply chain management, dramatically increasing efficiency while reducing human labor requirements.

This scenario presents a future where AI dominates every aspect of the food system - from production to education, from dietary choices to consumer behavior. While this has solved many traditional challenges around food safety and nutrition, it has created new concerns about privacy, corporate control, and the diminishing role of human agency in the food system.

Scenario 4: The Security-Sustainability Dilemma

The 2040 food landscape presents a complex paradox. Universal food security has been achieved - every social group and class has reliable access to sufficient food resources. However, this unprecedented access comes at a significant environmental cost: the food system remains carbon-intensive and fundamentally unsustainable.

A robust framework of economic incentives and mechanisms has emerged to support sustainable food production, distribution, retail, and consumption. These measures have successfully encouraged widespread participation in local food production, with most European households maintaining some form of fruit and vegetable cultivation. However, these localized sustainable practices exist alongside energy-intensive industrial food production technologies that contribute to increased food waste.

The technological landscape reflects this contradiction. While AI and automation have successfully enhanced the efficiency of food production and supply chain management, reducing manual labor requirements, the prevalent use of high-energy technologies in food production continues to undermine broader sustainability goals.

This scenario illustrates the complex tensions between achieving immediate food security and long-term environmental sustainability. While economic incentives attempt to bridge this gap, the fundamental conflict between universal access and environmental impact remains unresolved. The widespread adoption of household food production suggests a growing awareness of sustainability needs but has not yet catalyzed systemic transformation.

Specific Questions for each scenario have been addressed to the working groups, as illustrated below:

Scenario 1: The Great Food System Paradox: Excellence Without Access

1. Production

- How can food production methods evolve to address systemic access disparities without sacrificing technological excellence?
- What role could decentralized, small-scale farming play in bridging the gap between high-tech systems and widespread food insecurity?

2. Processing

- How might processing innovations counteract the lack of localized dietary personalization while maintaining efficiency at scale?
- Could there be unintended health impacts from reliance on generalized processing techniques?

3. Distribution, Retail, and Access

- How might AI-driven disruptions in distribution chains be mitigated to ensure equitable access to food globally?
- What governance structures could ensure that urban farming benefits extend beyond affluent enclaves?

4. Consumption

- How might generic nutritional guidelines reshape cultural perceptions of food and eating habits?
- What are the risks of urban agriculture reinforcing existing dietary inequalities?

5. Sustainability, Waste, and Environment

- How could AI mismanagement exacerbate environmental degradation while failing to address systemic food waste?

- Could urban agriculture unintentionally introduce new environmental challenges in densely populated areas?
- 6. Society and Culture
 - How does the paradox of high-level food expertise alongside mass insecurity reshape cultural narratives around food?
 - Will societal trust in agrifood technologies decline in light of their inability to resolve access issues?
- 7. Food Safety
 - What new vulnerabilities might emerge in food safety from reliance on one-size-fits-all nutritional systems?
 - How can food safety systems adapt to disruptions caused by AI in the supply chain?
- 8. System Dynamics and Power Shifts
 - How might the growing gap between food system elites and marginalized populations destabilize existing power structures?
 - What unforeseen dependencies could arise from the simultaneous success and failure of AI in food systems?

Scenario 2: The Regulated Revolution

1. Production
 - How can regulation-driven production maintain innovation while avoiding stifling smaller, localized producers?
 - What tensions might arise between achieving net-zero emissions and maintaining global competitiveness?
2. Processing
 - How might regulatory frameworks encourage or hinder the development of decentralized processing technologies?
 - Could new technologies in processing inadvertently increase resource consumption despite sustainability goals?
3. Distribution, Retail, and Access
 - What challenges could arise from scaling AFNs while ensuring widespread accessibility?
 - How might strict certification systems widen inequalities in food access?
4. Consumption
 - How could the disappearance of traditional kitchens reshape individual and collective identities tied to food?
 - What potential backlash might arise against the homogenization of food preparation methods?
5. Sustainability, Waste, and Environment
 - Can localized AFNs coexist sustainably with high-energy food processing methods?
 - How will stricter waste management protocols interact with new forms of food production?

6. Society and Culture
 - What role will public trust play in fostering acceptance of AFNs and lab-grown food products?
 - Could traditional culinary practices become symbols of resistance to technological dominance?
7. Food Safety
 - How might certification protocols evolve to handle the rapid pace of technological change in food safety?
 - Will new risks emerge from the shift away from traditional food preparation?
8. System Dynamics and Power Shifts
 - How could certification systems consolidate power among large corporations at the expense of small producers?
 - What new alliances might form between technologists and policymakers in this heavily regulated system?

Scenario 3: AI-Mediated Food Transformation

1. Production
 - How could the outlawing of livestock production affect global rural economies and ecosystems?
 - What risks arise from the over-reliance on AI-driven precision agriculture?
2. Processing
 - How will food processing balance privacy concerns with the efficiencies gained from personalized nutrition?
 - Could the dominance of AI systems lead to homogenization in food quality and loss of regional diversity?
3. Distribution, Retail, and Access
 - What systems can prevent AI-controlled supply chains from reinforcing monopolies?
 - How might reliance on digital infrastructure compromise food access in less connected regions?
4. Consumption
 - How could consumer autonomy be safeguarded in an AI-driven market shaping eating habits?
 - Will plant-based and lab-grown diets create new social divides in dietary practices?
5. Sustainability, Waste, and Environment
 - Can AI effectively manage waste systems without perpetuating data privacy concerns?
 - How might the sustainability benefits of plant-based diets be offset by the environmental costs of data-driven agriculture?
6. Society and Culture
 - Will societal acceptance of AI-driven systems hinge on visible benefits, or could mistrust grow despite successes?

- How might AI-mediated dietary control affect cultural food rituals?
- 7. Food Safety
 - How could AI misinterpretation of biophysiological data create new food safety risks?
 - Could dependence on AI weaken human oversight in critical safety scenarios?
- 8. System Dynamics and Power Shifts
 - How might the centralization of power in AI-driven corporations challenge governmental regulatory capacities?
 - What ethical dilemmas arise from the commodification of personal health data?

Scenario 4: The Security-Sustainability Dilemma

1. Production
 - How can the food system balance immediate security needs with long-term sustainability goals?
 - Could high-energy production technologies undermine progress in localized farming practices?
2. Processing
 - How might sustainability goals influence the future of industrial food processing techniques?
 - Can decentralized processing models coexist with energy-intensive industrial systems?
3. Distribution, Retail, and Access
 - How might sustainability incentives reshape global food logistics networks?
 - Will food distribution systems prioritize equity over efficiency?
4. Consumption
 - Could universal food security lead to complacency in sustainable consumption habits?
 - How might changing access patterns redefine consumer attitudes toward waste?
5. Sustainability, Waste, and Environment
 - How will tensions between energy-intensive practices and sustainability initiatives shape waste management strategies?
 - Could localized food production inadvertently increase resource competition?
6. Society and Culture
 - How might universal food security shift societal attitudes toward environmental responsibility?
 - Will cultural narratives around abundance overshadow sustainability imperatives?
7. Food Safety
 - How could intensified industrial production introduce new safety risks?
 - Will achieving food security compromise stringent safety standards?
8. System Dynamics and Power Shifts

- How might the coexistence of universal security and environmental degradation shift global power dynamics?
- What governance models could effectively mediate between competing priorities of access and sustainability?

Attendees engaged in forward-looking discussions and exercises, gaining insight into anticipating green skill requirements before they become urgent.

Below, **we have selected Group Scenario 1** to further detail and expose the work done within this exercise.

Report Group Scenario 1 – TEAM: Konstantina, Lavinia, Dan, Abdul, Jesus, Busra

| Category | Scenario Questions | Skills Questions | Your thoughts and Insights |
|------------|--|---|--|
| Production | <p>How will food be produced? What technologies or methods will dominate food production? Will production be more localized or globalized?</p> <p>Who will be responsible for food production? How will the roles of farmers, technologists, corporations, and local communities evolve?</p> <p>How does this scenario impact the use and management of basic resources (soil, water, energy)?</p> <p>How does the scenario affect the balance between different types of food production?</p> | <p>What skills will be critical for future food producers in this scenario?</p> | <p>Scenario 1 Compulsory training in AI app using Regulatory skills to accept AI Technological AI proficiency Cross sector skills Vertical farming</p> |

| | | | |
|---|--|--|---|
| Processing | <p>How will food be processed?</p> <p>Will processing become more centralized or decentralized?</p> <p>What new technologies emerge in food processing, and how do they change traditional flows?</p> <p>How does the scenario affect quality control and food safety systems?</p> <p>What changes occur in packaging and food preservation methods?</p> <p>How will changes in packaging and preservation affect food safety?</p> | <p>What expertise will food processors need?</p> | <p>Scenario 1</p> <p>Skills to translate and implement technological knowledge</p> <p>Novel Processing technologies (nanotech, 3dp)</p> <p>Green and digital skills</p> <p>New foods, alternative foods, Critical thinking, communication skills</p> <p>Human agency</p> |
| Distribution, Retail, and Access | <p>How will food be delivered? What transportation and logistics systems will dominate? Will supply chains operate more locally or globally?</p> <p>Where and how will food be purchased?</p> <p>How do the realities of the scenario affect food accessibility and equity in distribution?</p> | <p>What skills will be essential for managing food distribution?</p> | <p>Scenario 1</p> <p>Logistic management</p> <p>Correct/ethical use of AI apps</p> <p>Adaptation to AI solutions</p> <p>Assessments of costs of AI solutions</p> <p>Access to information and data analysis</p> <p>Critical/ethical principles of food access</p> |

| | | | |
|--|--|--|---|
| <p>Consumption</p> | <p>How will food be consumed?</p> <p>Will culinary traditions and eating habits change significantly?</p> <p>Who will have access to which types of food? Will inequalities in food access decrease or intensify?</p> <p>What new forms of food consumption emerge?</p> | <p>What educational skills are necessary to inform consumers about conscious food choices?</p> | <p>Scenario 1 Education in food chain system Food influencers/story tellers Why choose food, scientific literacy Integration of information Practical skills to empower consumers</p> |
| <p>Sustainability, Waste, and Environment</p> | <p>How will food production and consumption affect the environment?</p> <p>How does the scenario balance environmental impact with system efficiency?</p> <p>How will the food system manage waste? Will there be more efficient systems for recycling and reusing food waste?</p> | <p>What competencies will support promoting sustainable practices throughout the food value chain?</p> | <p>Scenario 1 Reduction of waste and management of crop systems Farm management, Valorisation of waste Fermentation/Molecular gastronomy /Ecopackaging and technologies that add to diversity in food systems</p> |
| <p>Society and Culture</p> | <p>How will the role of food in culture change?</p> <p>How will society respond to new food technologies?</p> <p>Will there be greater acceptance of innovations?</p> | <p>What communication skills are essential to build public trust in new food technologies?</p> <p>What social competences will be key in engaging communities with food innovations?</p> | <p>Scenario 1 Critical thinking Social competences in engagement influences/storytellers. Skills in video editing/reels Integration of information Empathy, transparency and honesty</p> |

| | | | |
|---|---|--|--|
| <p>Food Safety</p> | <p>How will food be considered safe?</p> <p>What standards and practices will define food safety?</p> <p>What new challenges might arise?</p> | <p>What skills will be needed to manage risks and implement new food safety standards?</p> | <p>Personalized nutrition healthcare</p> <p>Ethical use of AI in Nutrition</p> |
| <p>System Dynamics and Power Shifts</p> | <p>Which elements of the food system gain or lose importance in this scenario?</p> <p>What new connections or relationships emerge between system elements?</p> <p>Where are the main points of tension or contradiction in the system?</p> <p>What new governance structures emerge?</p> <p>How does the scenario affect the balance of power between different actors?</p> <p>How does the system adapt to new challenges and opportunities?</p> <p>What unexpected consequences may emerge from system changes in the scenario</p> | <p>What analytical and strategic skills will be vital for understanding and shaping system dynamics?</p> | <p>Scenario 1</p> <p>Marketing/PR</p> <p>Policy making</p> <p>Social engagement</p> <p>Reward/punish processes</p> <p>Understanding Platform analytics with AI</p> <p>Adaptability/flexibility</p> <p>Understanding limits of AI</p> <p>Scenario Planning/Foresight</p> <p>Human Agency</p> |

Activity 1: Characterise the scenario 1

- There is a lack of farm input in relation to the food system
- Households and private farmers are not integrated
- There is an acceptance by farmers and consumers that the AI solutions are the best and they are not challenged.

- Farmers should validate AI outputs
- Scientists should act as a bridge between AI and the consumer
- Retail has a lack of diversity. One-size-fits-all approach

Activity 2 Skills needed in Scenario 1

Learn interaction between AI and/or challenges of AI

Translation of food science knowledge (CHOSEN)

Interaction with AI (Prompt and Ethics)

Activity 3: Curricular assessment for mobility

- Scientific literature Lexicon
- Tangible examples to the life of students
- Practical approach.
- Student needs to know why and need to contribute to the empowering of the consumer/society
- Communication skills and social media are needed to influence society

Activity 4 Persona

- Researcher Food Scientist
- Food Professional at the same level

Activity 5 Delivery in different context

Critical background

- Examples should be local (case studies)
- Science should be the same
- Terminology should be harmonised between languages
- Care to international audience and global perspective would contribute the relevance for the module
- Diversity needs to be considered (one delivery for all will not work).

⇒ The final presentation of the day, **“From local to glocal: adaptable principles for education and training,”** focused on identifying the core principles that enable educational modules to be effectively adapted across diverse cultural, geographical, and organisational contexts.

Drawing on group discussions and collaborative reflections, the session synthesised the elements that trainers must consider when translating learning content from a local setting into a “glocal” (globally informed yet locally relevant) educational framework.

A first principle highlighted was the **importance of cultural context**. Participants stressed that while scientific content should remain consistent across countries, the cultural framing of learning materials must be adapted to local realities. This includes acknowledging local norms, values, dietary habits, and communication preferences. The group agreed that culturally grounded examples enable learners to better relate to the material while still engaging with the wider global perspective promoted by GEEK4Food. Diversity

considerations, such as age, background, dietary practices, gender, or work roles, were also emphasised as crucial when designing learner personas and shaping the delivery of content. A second key theme was the **role of locally meaningful case studies**. While the scientific foundation of the training must remain the same, case studies should reflect local industries and practices to increase relevance. Participants noted that contextualisation is essential not only to enhance engagement but also to ensure that learners can directly apply insights to their own environments. This includes integrating region-specific industry scenarios, dietary considerations, and practical examples. At the same time, these locally adapted case studies should still contribute to a shared global vision—for instance, exploring what agri-food systems might look like in 2040, regardless of geographic location.

The discussion then turned to **logistical and management considerations**, which were recognised as central to ensuring fairness and accessibility. Decisions on whether training takes place online, onsite, or in hybrid formats can significantly influence participation. Similarly, language choice, whether English or the local language, must be carefully evaluated to guarantee equitable access to learning. Participants observed that these management decisions also carry economic implications, such as travel requirements, which can either support or hinder participation. Ensuring fairness from both a pedagogical and economic perspective was identified as a key pillar in designing glocal training activities. In conclusion, the session consolidated these reflections into a coherent set of guiding principles. To build adaptable, effective, and inclusive learning modules, trainers must (1) respect and integrate cultural differences, (2) maintain consistent scientific content while contextualising examples locally, (3) design case studies that reflect both local relevance and global foresight, (4) consider diversity in learner profiles, and (5) address practical aspects such as language and delivery format to ensure equitable access. Together, these principles provide a strong foundation for shaping education and training that is both locally meaningful and globally aligned—capturing the “glocal” vision central to the GEEK4Food initiative.

ANNEXE 1 – Training + Group pictures – Training Cluj



Annexe 2: Event brochure – Training Cluj



GEEK4FOOD  Co-funded by the European Union

Glocal Ecosystems and Expanded Knowledge for green skills and capabilities in the Food sector

Training for the Future: Innovative Design Methods to Advance Agri-Food Education

20 JUNE 2024 | 9:30AM-5:30PM

University of Agricultural Sciences and
Veterinary Medicine of Cluj-Napoca, Romania

www.geek4food.com
https://casee.usamvcluj.ro




OBJECTIVES

- Imparting skills and innovative methods for designing effective courses;
- Preparing educators to address the challenges and opportunities presented by the green and digital transition;
- Fostering a system approach to tackling agri-food sector challenges;
- Adopting sustainable competency frameworks;
- Promoting collaborative learning and design.

INFORMATION

Location: Library Building, Room 47

Meals: lunch and coffee breaks are included

Certificates: at the end of the training, participants will receive a certificate of participation

get your tickets! 

20 JUNE 2024 | 9:30AM-5:30PM
Training for the Future: Innovative Design Methods to Advance Agri-Food Education

WHO CAN PARTICIPATE

University teaching staff, PhD students and postdoctoral fellows;
Curricula designers and trainers at the higher education and professional levels

TRAINING PROGRAMME

| | |
|-------------|--|
| 9:30-10:00 | Registration |
| 10:00-10:15 | Welcome and Introduction Prof. Paola Pittia, G4F Coordinator, University of Teramo (IT) Prof. Dan Vodnar, USAVM-Cluj-Napoca (RO) |
| 10:15-11:15 | Inspirational lectures "A systems approach to addressing the ONE-HEALTH challenges in the agri-food sector" Prof. Paola Pittia, G4F Coordinator, University of Teramo (IT) "Biotechnological applications in molecular gastronomy" Prof. Dan Vodnar, USAVM-Cluj-Napoca (RO) |
| 11:15-11:30 | Coffee break |
| 11:30-12:00 | Sustainable competency frameworks for upskilling and reskilling in the agri-food sector Dr. Mario Roccaro, G4F Co-coordinator, EIT Food (BE) |
| 12:00-12:40 | Methods and tools for designing advanced training courses: from learning outcomes to evaluation Prof. Milena Corredig & Konstatina Ntrallou, Aarhus University (DK) |
| 12:40-13:10 | Presenting the GEEK4Food's AI-powered skill-based platform Mohan Reddy, SkyHive (US) |
| 13:10-14:10 | Lunch break |
| 14:10-14:25 | Introduction to afternoon activities and teams formation Konstantina Ntrallou, Aarhus University (DK) & Mario Roccaro, EIT Food (BE) |
| 14:25-15:25 | Let's design part 1 |
| 15:25-15:40 | Coffee break |
| 15:40-16:50 | Let's design part 2 |
| 16:50-17:30 | Plenary reporting of the courses designed by each team |
| 17:30 | Conclusions and end of activities |

D5.1 | Report on specific/technical and transvers skill courses for mentors

ANNEXE 3 – Training presentations and lectures - Training Cluj

Co-funded by the European Union


Training for the Future: Innovative Design Methods to Advance Agri-Food Education

20 JUNE 2024 | 9:30AM-5:30PM



Global Ecosystems and Expanded Knowledge for green skills and capability in the Food sector
GEEK4Food

20th June 2024
Cluj-Napoca (Romania)


GEEK4Food

Erasmus+ Forward Looking project 2023-2025

10 partners


- 5 academia
- 1 A.I. company
- 3 consulting/private companies
- 1 multiplier

Co-funded by the European Union



GEEK4FOOD

Development of a working, cross-sectorial framework to support the food system transition towards sustainable and green solutions by the implementation of disruptive tools able to boost a fluid upskilling and reskilling of the current workforce of the next generation of future professionals



GEEK4Food

SUSTAINABILITY vs. GREEN?

| Sustainability | Green |
|--|---|
| Use of «products and services that do not damage the resources of the future generation» | Use of «products, services «environment friendly» |

«GREEN» actions in agri-food processing

Natural resources, biodiversity, regenerative agriculture
Green Chemistry
Green «new» resources (e.g. reuse of waste)
Green technologies (mild, innovative)
Valorisation of underutilised natural resources

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Activities and main outcomes

- (1) Design and setting of an Artificial Intelligence (AI)-based tool (*Skills Intelligence*) to determine and forecast current and future green skills and capability needs (GEEK4Food Tool).
- (2) Design and exploit “forward-looking” planning in training design and implementation of HE and cross-sectoral trainings to enhance green skills.
- (3) Mainstreaming innovative teaching practices and providing paths to entrepreneurial education oriented on green skills.
- (4) Setting an interactive learner-centric virtual platform for green skill mapping to merge learners' needs with training offers and agri-food job opportunities (3P-GEEK4Food Hub).
- (5) Boosting consolidating evidence- and impact-based solutions of the GEEK4Food project to embed multi-level and multi-actor policy actions that can support skill-fluidity for the green transition of the food sector.



Activities & Workpackages

«Forward Looking», innovative aspects

- Skills intelligence applied to the agrifood sector (1° in the Erasmus/EU projects)
- Skill pass
- 3P-GEEK4Food Hub
- Development of Innovative Road map for curriculum design (based on the AI outcomes)
- Piloting innovative training modules (teachers, learners)
- Impact and Policy actions (based on AI support)
- Interdisciplinary and mutisector expertise



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Training for the Future: Innovative Design Methods to Advance Agri-Food Education

20 JUNE 2024 | 9:30AM-5:30PM



Systems approach to ONE-HEALTH in agri-food

Prof Paola Pittia

University of Teramo

Department of Bioscience and Technology for Food Agriculture and Environment

Teramo (Italy)





Alexa Pollock



Beth Jensen



Food is life



Alexa Pollock



Beth Jensen



How to guarantee food, safe food & food for all?



How to guarantee safe food, for all ?

| Issues |
|--|
| <ul style="list-style-type: none"> ▪ Vulnerability ▪ Intrinsic deperibility (senescence, putrefaction) ▪ Toxicity and safety <ul style="list-style-type: none"> ▪ Seasonality ▪ Extrinsic spoilage factors (biological/environmental) ▪ Attractiveness/acceptability <ul style="list-style-type: none"> ▪ Nutritional value |



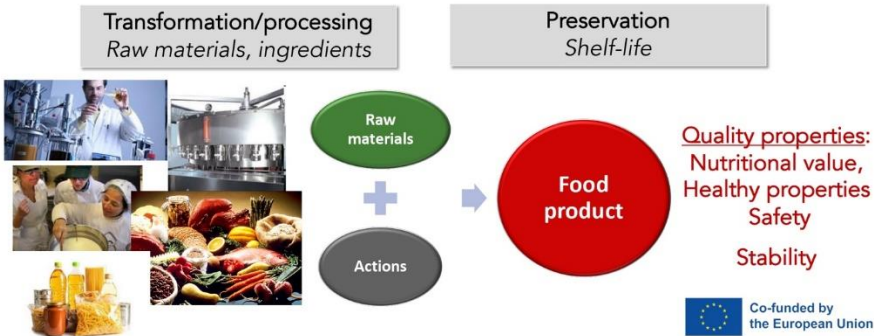
| Actions/Solutions needed |
|--|
| <ul style="list-style-type: none"> <input type="checkbox"/> Protection (environment) <input type="checkbox"/> To limit/to hinder reactions and processes causing spoilage <input type="checkbox"/> To remove the toxic and unsafe factors <ul style="list-style-type: none"> <input type="checkbox"/> To prolong the life <input type="checkbox"/> Improvement sensory properties <input type="checkbox"/> Enhancement of the bioavailability/biaccessibility <input type="checkbox"/> ... |





Food technology

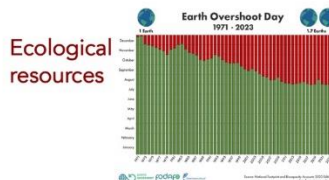
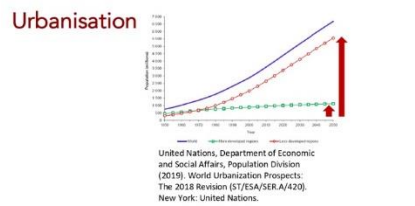
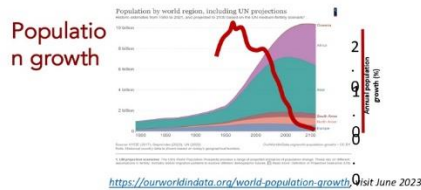
Application of food science to produce safe, high quality and stable foods to support nutritional needs of the humankind (i.e., the consumers)



The «Food technologies» role



New scenarios of the food production





New scenarios of the food production

Climate change & environmental impact

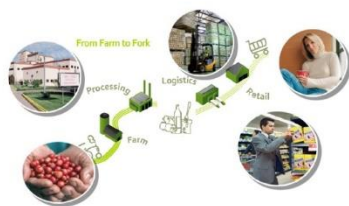
- Reduced yield, food resources
- Lower nutritional value
- Higher food losses
- Biodiversity loss and genetic erosion



- One-third of global Greenhouse Gas (GHG) emissions
- Consumption of large amounts of natural resources ("Carbon")
- Fresh water & Land consumption (farming: 70% water)
- Water pollution

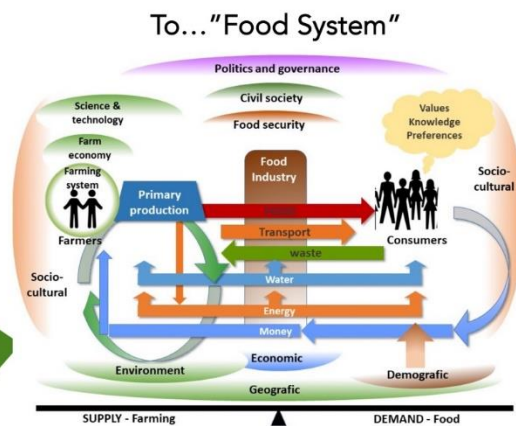


A paradigm shift: the «Food system» approach

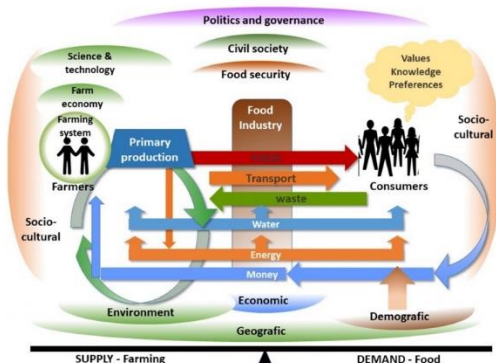


From ... "Food value chains"

- Causes:
- Socio-economic
 - Environmental
 - Needs
 - EU policies



The «Food system» (FS) approach



The Food Systems approach aims to comprehensively understand the interconnectedness of the processes (e.g. food production & processing, distribution, preparation, and consumption) within their socio-economic and environmental context

Main focus:

- socio-economic aspects
- food and nutrition security
- environmental impact.

Limited focus on health, mostly covering the nutritional aspects, not the safety ones (despite food processing aims to achieve the safety of the foods).

Policy actions, FS, sustainability



UN, Agenda 2030 (2015)



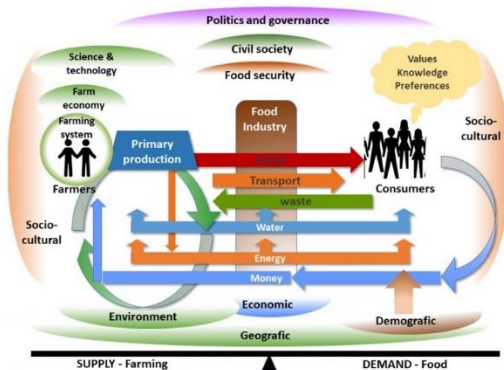
Food 2030 (EC, 2016)
Research and innovation policy to transform food systems and ensure everyone has enough affordable, nutritious food to lead a healthy life.



The Green Deal (EC, 2019)
Policy initiatives package to set the path to a green transition up to climate neutrality by 2050. It includes the "Farm to fork" strategy, aiming to make food systems fair, healthy and environmentally friendly.



The «Food system» approach



The food system in developed countries **Achieved**

- high levels of food security
- High level of food safety
- Wide consumer food and healthy food choices

Not achieved

- sustainability:
 - environmental,
 - economic
 - social



Food systems vs. sustainability

FS & its 'non-sustainability'

DIETS and NUTRITION

- Over-consumption, food-related illnesses
- "Quantity" over "quality"
- Unbalanced presence of nutrients
- Food distribution/security

TECHNOLOGIES

- Empirical approaches
- Resource-intensive
- High energy consumption
- Process-induced damage
- Wasted product

PROCESSED & FORMULATED FOODS

- High-impact food ingredients (meat)
- Low nutritional and health value
- Synthetic additives





Food systems vs. food safety

New challenges

Short-term shocks and/or long-term trends, may have direct impacts on human, animal and environmental health and, as a consequence on the food system

➤ short-term

e.g. covid-19
wars

➤ long-term trends

- innovations and disruptive, innovative technologies
- globalization
- climate change

...



Food systems vs. food safety

CRITICAL ASPECTS THREATENING FOOD SAFETY IN FOOD SYSTEMS

1. DECREASE OF THE PROCESS INTENSITY

1. Minimally processed foods (under processing, emerging microorganisms)
2. Innovative technologies

2. USE OF NEW FOOD SOURCES

1. «less-studied» plant based sources
2. Allergenicity/toxicity
3. Insects

3. BIOTECHNOLOGY-BASED and LAB/CULTURED FOODS

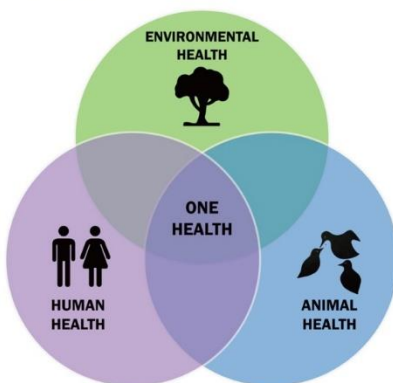
1. Unknown safety risks

4. ANTIBIOTIC RESISTANT MICROORGANISMS

5. DYSBIOSIS (ENVIRONMENT/SOIL-HUMANS)



«One Health»



One Health approach (OHA) is based on the following concepts:

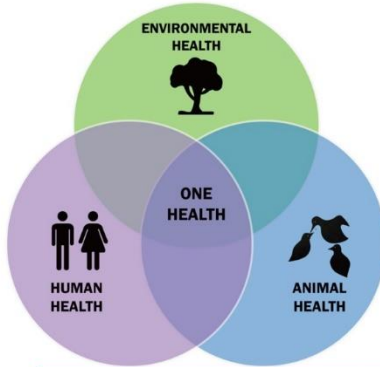
- recognition that human, animal, and ecosystem health are interconnected.
 - i.e. animal feed, human food, animal and human health, and environmental contamination are closely linked.
- sustainable balance of the human, animal, and ecosystem health

After COVID-19, the One-Health concept has moved from a human-centric to a planet-centric approach.





«One Health»



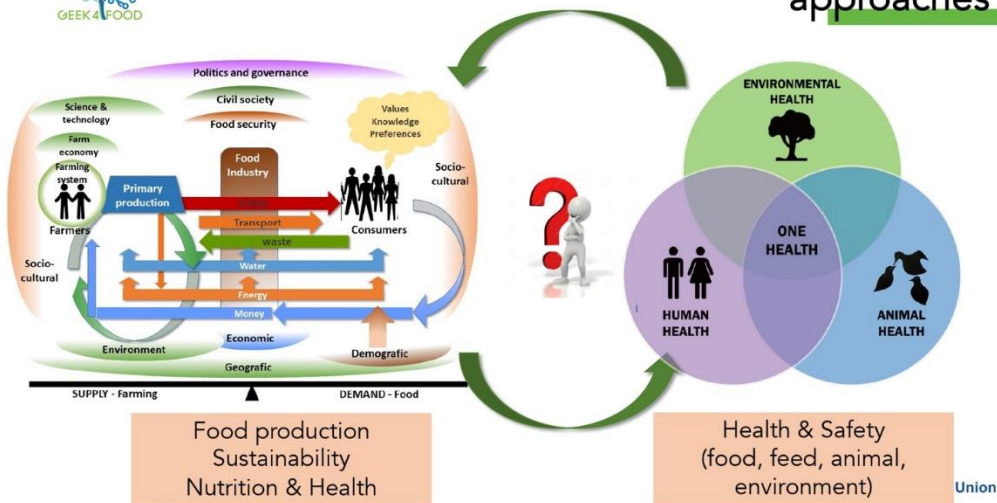
One Health approach applies to a range of issues, e.g.

- zoonotic diseases rabies and anthrax;
 - vector-borne diseases – (Lyme disease, dengue, chikungunya, and Chagas)
 - food safety and foodborne diseases (e.g. campylobacteriosis)
 - Foodborn zoonosys
 - antimicrobial resistance (AMR)
 - Emerging threats
- It requires a transdisciplinary
- Cooperation and integration of activities

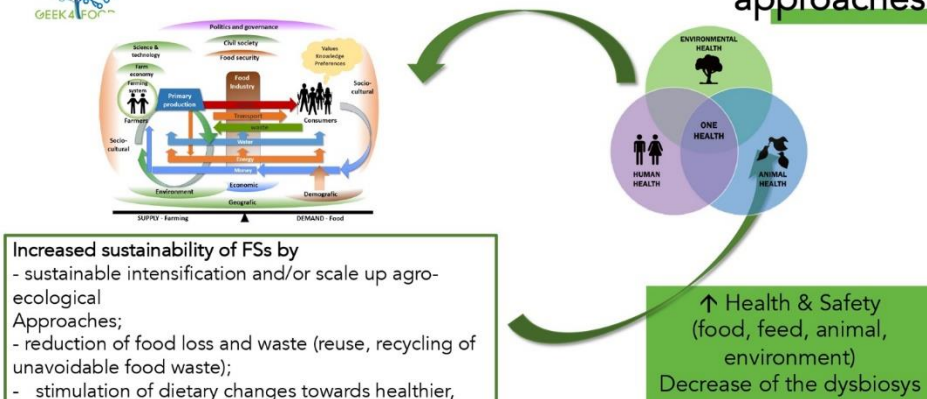
Limited contribution given by the agri-food sciences and technologies, despite their main role in destroying/inactivation/inhibition of microorganisms and pathogens

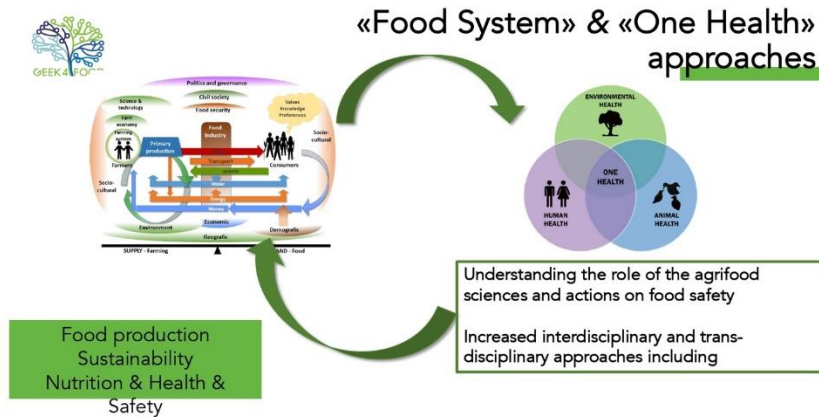


«Food System» vs. «One Health» approaches



«Food System» & «One Health» approaches





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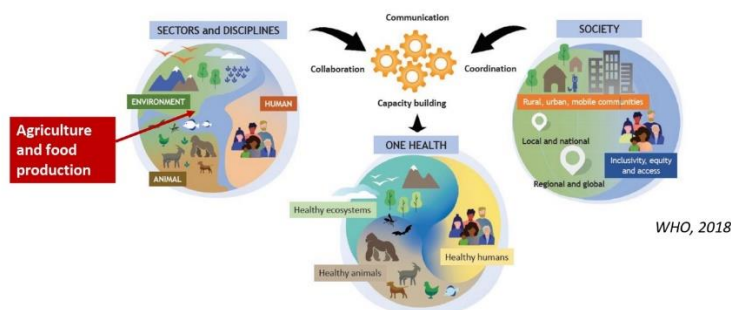
«Food System» & «One Health» approaches

- Beneficial interplay of the «Food system» & «One Health» approaches
- **New needs:**
 - Increased inter-disciplinarity
 - Transdisciplinarity
 - Mutual recognition of the role of food as «common good»
 - Joint collaborative research frameworks
 - participatory policy development and monitoring
 - training/education

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«Food System» & «One Health» approaches



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THANK YOU

Paola Pittia, University of Teramo, Project coordinator





Biotechnological applications in Molecular Gastronomy

Prof. Dan C. Vodnar



Fermentative bioconversion

- obtaining added-value compounds from industrial by-products (e.g. bio-vanillin, omega-3; succinic acid; citric acid; lactic acid; polyols;
- optimization of fermentation processes for the cultivation of probiotic bacteria

Psychobiotics - Microencapsulation

Specific probiotic bacteria

- selection, cultivation and production of probiotic bacteria in the form of food supplements
- application of microencapsulation technologies
- the specific use of probiotic bacteria in neurological diseases

Antimicrobial, antimutagenic activity of plant extracts

determination of the antimicrobial and antimutagenic activity of natural plant extracts and inorganic compounds

Molecular Gastronomy



Department of Food Science,
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University of Agricultural Sciences and Veterinary Medicine
Cluj-Napoca, Romania

Introduction in Molecular Gastronomy

❖ Molecular Gastronomy

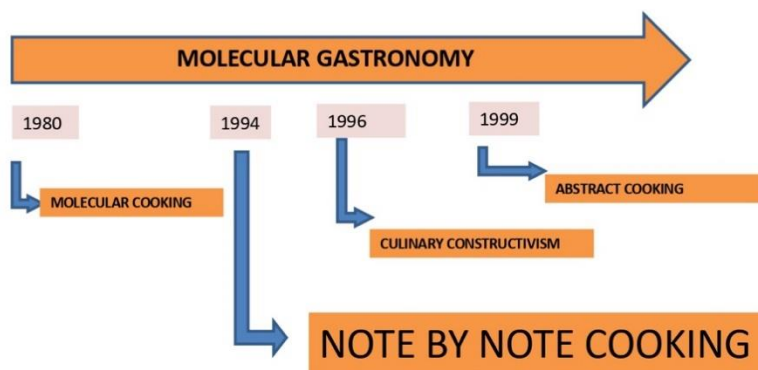


❖ Food for Tomorrow




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Concept evolution

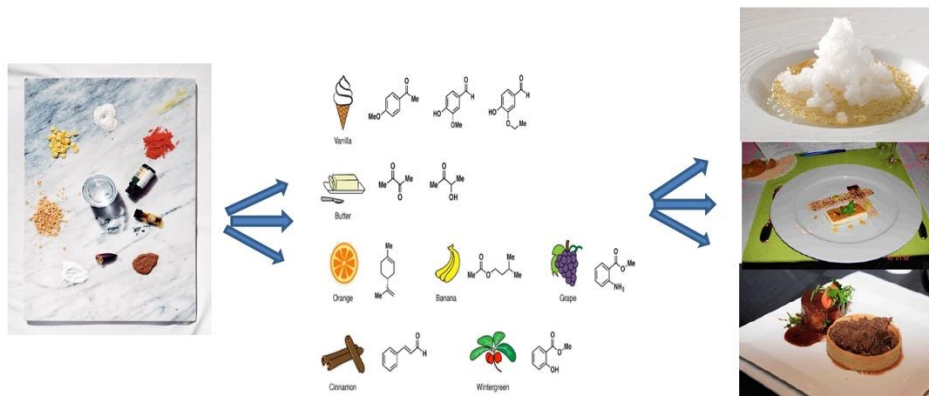




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Note by Note cooking

Note by Note cooking-" a painter who uses primary colors or a musician who composes electro-acoustic music, sound with sound, using a computer"- Hervé This



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Production of Valuable Organic Chemicals

468

D. C. Vodnar et al.

Dan C. Vodnar¹
Joachim Venus²
Roland Schneider²
Carmen Socaciu¹

Research Article

Lactic Acid Production by *Lactobacillus paracasei* 168 in Discontinuous Fermentation Using Lucerne Green Juice as Nutrient Substitute

¹ Department of Biochemistry and Biotechnology, University of Agricultural Sciences and Veterinary Medicine, Cluj-Napoca, Romania.

² Department of Bioengineering, Leibniz-Institute for Agricultural Engineering Potsdam-Bornim e.V.,

The aim of this study was the utilization of lucerne green juice (LGJ), obtained in 2005 and 2008, as nutrient substitute in lactic acid fermentation using *Lactobacillus paracasei* 168, in a discontinuous fermentation process with the addition of 55 g/L glucose and 15 g/L yeast extract. The LGJ after pressing fresh green mass

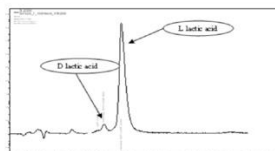
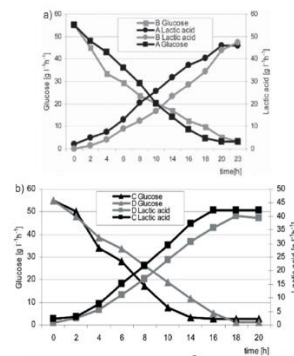


Figure 4. HPLC (Knauer) chromatogram to identify the optical isomers, L-(+) and D-(-), of lactic acid during the process. L-(+)-Lactic acid: $t_R = 6.25$ min; D-(-)-lactic acid: $t_R = 5.3$ min.

Table 4. Quantity of L-(+) and D-(-) lactic acid in all trials.

| Trial | L-(+)-Lactic acid | | D-(-)-Lactic acid | |
|----------------|-------------------|--------|-------------------|-------|
| | [g/L] | [%] | [g/L] | [%] |
| A | 42.07 | 91.520 | 3.9 | 8.480 |
| B | 46.09 | 97.605 | 1.13 | 2.595 |
| C | 38.12 | 90.189 | 4.14 | 9.811 |
| D | 43.48 | 91.873 | 3.84 | 8.127 |
| Control medium | 41.56 | 98.987 | 0.42 | 1.013 |



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CLUJ-NAPOCA - 2012

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Production of Valuable Organic Chemicals

L (+) lactic acid production on biodiesel crude glycerol

Vodnar et al. *Microbial Cell Factories* 2013, 12:92
http://www.microbialcellfactories.com/content/12/1/92



Vodnar et al. *Microbial Cell Factories* 2013, 12:92
http://www.microbialcellfactories.com/content/12/1/92

Page 1 of 9

RESEARCH Open Access

L (+)-lactic acid production by pellet-form *Rhizopus oryzae* NRRL 395 on biodiesel crude glycerol

Dan C. Vodnar¹, Francisc V. Dulău², Oana L. Pop¹ and Carmen Socaciulă^{1*}

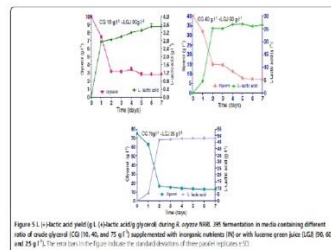
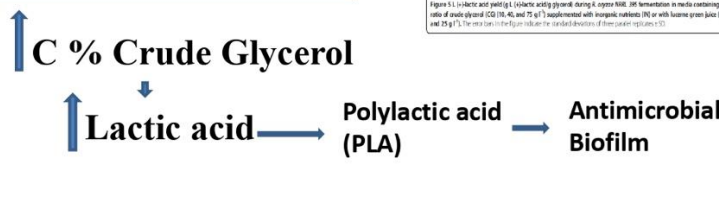


Figure 5: L(+)-lactic acid yield (g/L) (black circles) and glycerol (g/L) (red squares) during 60 days of fermentation in media containing different ratios of crude glycerol (CG) (10, 40, and 75 g/L) supplemented with inorganic nutrients (IN) or with lysine green juice (LGS) (50, 60, and 75 g/L). The error bars in the figure indicate the standard deviations of three parallel replicates (SD).



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Production of Valuable Organic Chemicals

2. Utilization of biodiesel derived-glycerol for 1,3 –Propanediol, Citric acid and Beta-carotene production

Mitreș et al. *Microb Cell Fact* (2017) 16:190
DOI 10.1186/s12934-017-0807-5

Microbial Cell Factories

REVIEW ARTICLES

REVIEW Open Access

Utilization of biodiesel derived-glycerol for 1,3-PD and citric acid production

Laura Mitreș¹, Monica Trif¹, Adriana-Florinela Cătoi² and Dan-Cristian Vodnar^{1*}



Isolated Microorganisms for Bioconversion of Biodiesel-Derived Glycerol Into 1,3-Propanediol

Laura MITREȘ¹, Larisa-Florina CĂLÎNȚIU¹, Gabriela FRECĂU¹, Maria BÎNDĂU¹, Bogdan RUSU¹, Monica TRIF¹, Bianca-Eugenia ȘTEFĂNESCU¹, Ioana-Olga POP^{1,3}, Dan-Cristian VODNAR^{1*}

¹ Department of Food Science, Life Science Institute, University of Agricultural Sciences and Veterinary Medicine, Cluj-Napoca, 3-5 Calea Mănăstir Street, Cluj-Napoca 400372, Romania.

² Department of Pharmaceutical Botany, Iuliu Haiegedeu University of Medicine and Pharmacy, 12.1 Creangă Street, Cluj-Napoca 400010, Romania.

³ Department of Exact Sciences, Horticulture Faculty, University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, 3-5 Calea Mănăstir Street, Cluj-Napoca 400372, Romania.

*Corresponding author; e-mail: dan.vodnar@usamv.ro

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Production of Valuable Organic Chemicals

Bindea et al. *Microb Cell Fact* (2018) 17:97
<https://doi.org/10.1186/s12934-018-0945-4>

Microbial Cell Factories

REVIEW **Open Access**
Valorification of crude glycerol for pure fractions of docosahexaenoic acid and β -carotene production by using *Schizochytrium limacinum* and *Blakeslea trispora*
Maria Bindea¹, Bogdan Rusu¹, Alexandru Rusu², Monica Trif¹, Loredana Florina Leopold¹, Francisc Dulci^{1*} and Dan Cristian Vodnar^{1,2*}

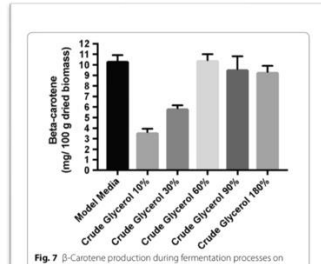


Fig. 7 β -Carotene production during fermentation processes on

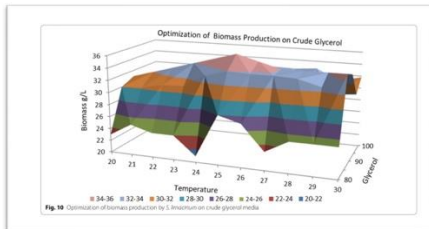


Fig. 19 Optimization of biomass production by *S. limacinum* on crude glycerol media

Table 2 Percentual assessment of β -carotene and lutein purification by TLC and SPE

| Carotenoids | Total β -carotene of TLC fraction (%) | Cis isomers % of TLC fraction (%) | Total lutein after SPE separation (%) | Cis isomers % of SPE fraction (%) |
|-------------------|---|-----------------------------------|---------------------------------------|-----------------------------------|
| β -Carotene | 99.9 | 38.83 | 99.9 | 31.53 |
| Lutein | 93.7 | 45.9 | 90 | 31 |

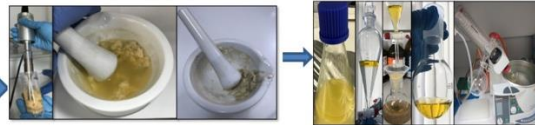


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Production of Valuable Organic Chemicals



Bioreactor fermentation of glycerol by microorganisms (*Blakeslea trispora*)



Sweet Burger



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Production of Valuable Organic Chemicals

4. Identification of bioactive compounds from agro-industrial by-products

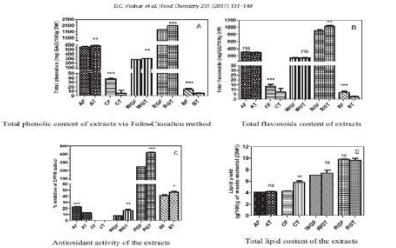
Food Chemistry 239 (2017) 151–160

Contents lists available at ScienceDirect
Food Chemistry
journal homepage: www.elsevier.com/locate/foodchem

Identification of the bioactive compounds and antioxidant, antimutagenic and antimicrobial activities of thermally processed agro-industrial waste

Dan Cristian Vodnar^{a,b}, Lavinia Florina Călinoiu^{a,b}, Francisc Vasile Dal^{a,c}, Bianca Eugenia Ștefănescu^{b,d}, Gianna Crișan^e, Carmen Socaci^b

^a Faculty of Food Science and Technology, University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Calea Mănăștur 3-5, 400122 Cluj-Napoca, Romania
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^c Faculty of Food Science and Technology, University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Calea Mănăștur 3-5, 400122 Cluj-Napoca, Romania
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Production of Valuable Organic Chemicals

4. Identification of bioactive compounds from agro-industrial by-products

Critical Reviews in Biotechnology
Volume 40, 2020 - Issue 5

812 Views
9 CrossRef citations to date
0 Altmetric

Review Articles
Recent advances in the biotechnological production of erythritol and mannitol
Gheorghe Adrian Martău^a, Vasile Coman^b & Dan Cristian Vodnar^{a, b, c}
Pages 608-622 | Received 10 May 2019; Accepted 27 Feb 2020; Published online 16 Apr 2020
Download citation | <https://doi.org/10.1080/07388551.2020.1751057>

Trends in Food Science & Technology
Volume 109, March 2021, Pages 579-592

Bio-vanillin: Towards a sustainable industrial production
Gheorghe Adrian Martău^{a, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100}, Lavinia-Florina Călinoiu^{a, b, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100}, Dan Cristian Vodnar^{a, b, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100}

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University of Agricultural Sciences and Veterinary Medicine
Cluj-Napoca, Romania

Microencapsulation

5. Microencapsulated probiotic bacteria and their survival after exposure to gastric and intestinal juice

Dynamics of microcapsule density with probiotic bacteria under simulated gastric and intestinal juice

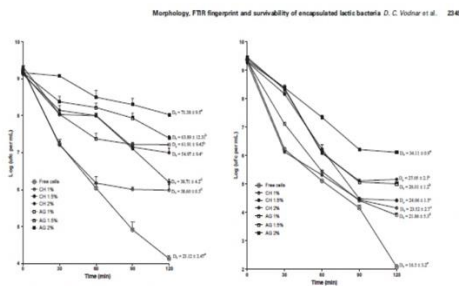


Figure 5 Dynamic of bacterial cell density ($\log \text{cfu mL}^{-1}$) at different periods (30, 60, 90, 120 min) after successive incubation of beads containing bacteria cells (AG or CH at 2%, 1.5% or 1%) in simulated gastric juice (pH 1.5). Values are expressed as average \pm standard error of triplicate ($n = 3$), comparatively with free cells. The decimal reduction time values (D_{10} , -min) are represented for each variant. D_{10} values that are significantly different ($P < 0.05$) are marked by different letters.



Original article
Morphology, FTIR fingerprint and survivability of encapsulated lactic bacteria (*Streptococcus thermophilus* and *Lactobacillus delbrueckii* subsp. *bulgaricus*) in simulated gastric juice and intestinal juice
Dan C. Vodnar,^{1,2*} Carmen Socaciu,¹ Ancuța M. Rotar² & Andreea Stănilă¹
Department of Chemistry and Biochemistry, University of Agricultural Sciences and Veterinary Medicine, Faculty of Agriculture, 1-5 Mîrlăncușilor str., 400712, Cluj-Napoca, Romania; Department of Food Microbiology, University of Agricultural Sciences and Veterinary Medicine, Faculty of Agriculture, 1-5 Mîrlăncușilor str., 400712, Cluj-Napoca, Romania
(Received 24 February 2018; Accepted & revised form 20 July 2018)



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Microencapsulation

International Journal of Food Science & Technology
International Journal of Food Science and Technology 2018, 48, 2345-2351

Original article Morphology, FTIR fingerprint and survivability of encapsulated lactic bacteria (*Streptococcus thermophilus* and *Lactobacillus delbrueckii* subsp. *bulgaricus*) in simulated gastric juice and intestinal juice

Dan C. Vodnar,^{1,2*} Carmen Socaciu,¹ Ancuța M. Rotar² & Andreea Stănilă¹
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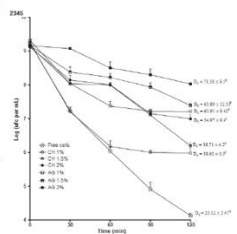
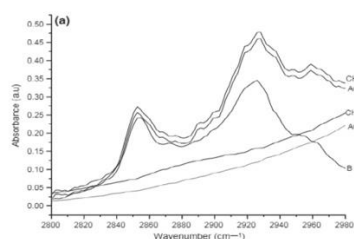


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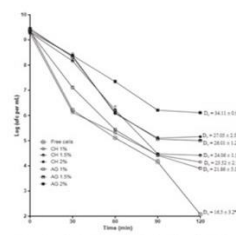


Figure 6 Dynamic of bacterial cell density ($\log \text{cfu mL}^{-1}$) at different periods (30, 60, 90, 120 min) after successive incubation of beads containing bacteria cells (AG or CH at 2%, 1.5% or 1%) in simulated gastric juice (pH 1.5) for 60 min and in simulated intestinal juice at 37 °C, for 2 h. Values are expressed as average \pm standard error of triplicate ($n = 3$), comparatively with free cells. The decimal reduction time values (D_{10} , -min) are represented for each variant. D_{10} values that are significantly different ($P < 0.05$) are marked by different letters.

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ROMÂNIA

Microencapsulation

LWT - Food Science and Technology 57 (2014) 406–411

Contents lists available at ScienceDirect

LWT - Food Science and Technology

journal homepage: www.elsevier.com/locate/lwt

Selenium enriched green tea increase stability of *Lactobacillus casei* and *Lactobacillus plantarum* in chitosan coated alginate microcapsules during exposure to simulated gastrointestinal and refrigerated conditions

Dan Cristian Vodnar^a, Carmen Socaciu^a

^aDepartment of Food Science and Technology, University of Agricultural Sciences and Veterinary Medicine, Faculty of Food Science and Technology, 3-5 Mădărarilor str., 400372 Cluj-Napoca, Romania

RESEARCH ARTICLE | OPEN ACCESS

Green tea increases the survival yield of Bifidobacteria in simulated gastrointestinal environment and during refrigerated conditions

Dan C. Vodnar and Carmen Socaciu

Chemistry Central Journal 2012, 6:61 | DOI: 10.1186/1752-1533-6-61 | © Vodnar and Socaciu et al.; licensee BioMed Central Ltd. 2012
Received: 11 May 2012 | Accepted: 22 June 2012 | Published: 22 June 2012

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Fig. 2 Survival of free and encapsulated *L. plantarum* (P) and *L. casei* (C) with and without addition of selenium green tea during exposure to simulated gastric juice at 37°C for 120min. The error bars indicate standard deviations from the mean values of three replicated experiments. Means with different letter in a column are significantly different ($P < 0.05$). Symbols: open square - Free *L. plantarum*, open circle - Free *L. casei*, open triangle - SGT10% - P, open diamond - SGT10% - C, open inverted triangle - SGT5% - P, open star - SGT5% - C.

Figure 3 Survival of free and encapsulated *B. infantis* (I) and *B. breve* (B) with and without addition of 5% and 10% green tea (GT) during exposure to simulated gastric juice at 37°C for 120 min. The error bars indicate standard deviations from the mean values of three replicated experiments. Means with different letter in a column are significantly different ($P < 0.05$). For abbreviations see Table 4.

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Prototypes





Prototypes



17



Prototypes



18



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BIOFILM WITH ANTIMICROBIAL ACTIVITY, FORMULATION PROCEDURE AND UTILISATION

Dr. Cristian VODNAR, Carmen SOCACIU
Paper No. 3/2018, Baza 10.12.2016

Faculty of Food Science and Technology, University of Agricultural Sciences and Veterinary Medicine,
Mădărar 3-4 400172 Cluj-Napoca, Romania
Email: dan.vodnar@usamv.ro

GOLD Medal at International Exhibition of Inventions GENEVA 2017

Fig. 1. Inhibitory effect of biofilms on the growth of *Lister monocytogenes* during refrigeration.

Fig. 2. FTIR fingerprint of the biofilm formation.

Fig. 3. Antimicrobial Biofilm Film with Delimitated

Fig. 3. Chromatographic fingerprint specific for the green tea extract (CH) and black (CHB) used in biofilm formation.

Fig. 4. Biofilm on ham steak meat product.

Patent No: 3/270/30.12.2016. ANTIMICROBIAL BIOFILM, FORMULATION PROCEDURE AND UTILISATION. Authors: Vodnar Dan Cristian, Carmen Socaciu

Project PH-IN-CI-2012-1-0372, 175 CI/2012. Food safety and security management system applied in the development of bioactive packaging with antimicrobial effect, type biofilm. Funding: UEFISCDI

45th International Exhibition of Inventions Geneva
29 March - 2 April 2017

Antimicrobial Biofilm

Research Article

Inhibition of *Listeria monocytogenes* ATCC 19115 on ham steak by tea bioactive compounds incorporated into chitosan-coated plastic films

Dan C. Vodnar*

Open Access

Chemistry Central Journal

Antimicrobial Efficiency of Edible Films in Food Industry

Dr. Cristian VODNAR*, Oana Lele POP, Florina VOILĂ, EMILIE CARCEN SOCACIU*

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ROMÂNIA

Edible Biofilm

Vodnar Chemistry Central Journal 2012, 6:74
<http://journal.chemistrycentral.com/content/6/1/74>

Chemistry Central Journal

RESEARCH ARTICLE Open Access

Inhibition of *Listeria monocytogenes* ATCC 19115 on ham steak by tea bioactive compounds incorporated into chitosan-coated plastic films

Dan C. Vodnar*

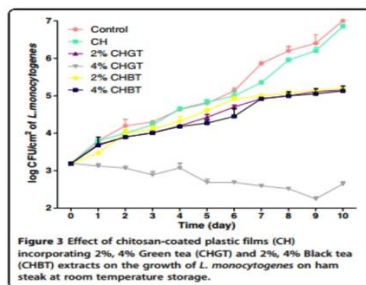


Figure 3 Effect of chitosan-coated plastic films (CH) incorporating 2%, 4% Green tea (CHGT) and 2%, 4% Black tea (CHBT) extracts on the growth of *L. monocytogenes* on ham steak at room temperature storage.

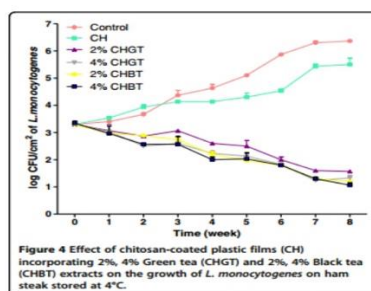


Figure 4 Effect of chitosan-coated plastic films (CH) incorporating 2%, 4% Green tea (CHGT) and 2%, 4% Black tea (CHBT) extracts on the growth of *L. monocytogenes* on ham steak stored at 4°C.

2016



Department of Food Science,
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Applications of Molecular Gastronomy

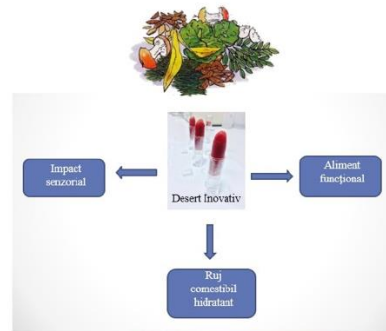
3D Printed Food – Bocusini Printer



Applications



Edible Molecular Lipstick



Department of Food Science,
Faculty of Food Science and Technology
University of Agricultural Sciences and Veterinary Medicine
Cluj-Napoca, Romania

Molecular Restructuring of CAPRESE Salad

Polydextrose → concentration 50 g / 100 ml
Egg white → microstructures → stable foam
→ oven 100 ° C / 2 h



Iota Carrageenan 0.5% concentration → hot dissolution → air incorporation → gel-foam structure



Siphon tube (N2O loading pressure) → Foam stabilization → **Microwave** 45 sec / 800W



Calcium > 3% in **Alginate bath** 0.5% for 3½ minutes → **microspheres - capsules**
Methods of injection: in the alginate bath and above the alginate bath





Molecular Gastronomy –Education at USAMV



Prototypes



25

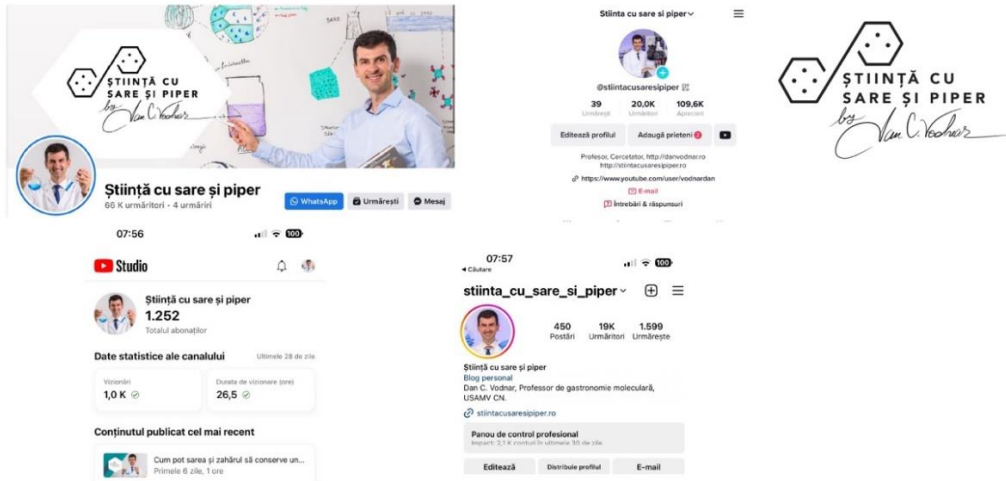


Molecular Gastronomy –Education

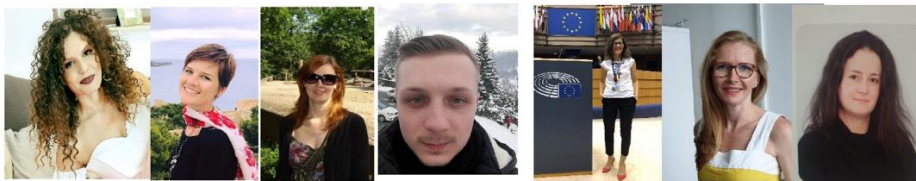




- Science communication
- Educating the population



Instead of conclusions...
Thank you!



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Training for the Future: Innovative Design Methods to Advance Agri-Food Education

*Sustainable competency frameworks for upskilling and
reskilling in the agri-food sector*

Dr. Mario Roccaro,
Programme Manager at EIT Food Education

info@geek4food.eu
www.geek4food.com

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Layout

- Green Competence Framework
- EIT Food Competence Framework

Frameworks are useful tools when we need to tackle policy, social, economic and educational issues and represent the underlying rationale to take actions leading to one or more objectives.

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www.geek4food.com

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Green Competence Framework



GreenComp (European Sustainability Competence Framework) responds to the growing need for people to improve and develop the knowledge, skills, and attitudes needed to live, work, and act sustainably.

Dr. Mario Roccaro,
Programme Manager at EIT Food Education

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www.geek4food.com

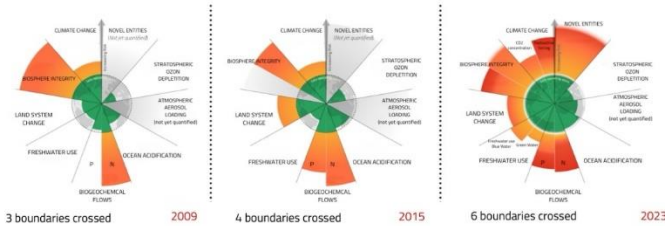
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Green Competence Framework

Learning for environmental sustainability

To nurture a sustainability mindset from childhood to adulthood with the understanding that humans are part of and depend on nature. Learners are equipped with knowledge, skills and attitudes that help them become agents of change and contribute individually and collectively to shaping futures within planetary boundaries.



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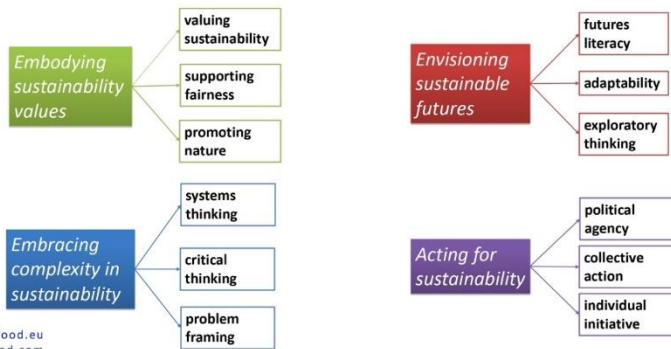
Credit: Azize for Stockholm Resilience Centre, Stockholm University

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Green Competence Framework

GreenComp consists of 12 competences organised into the four areas below:

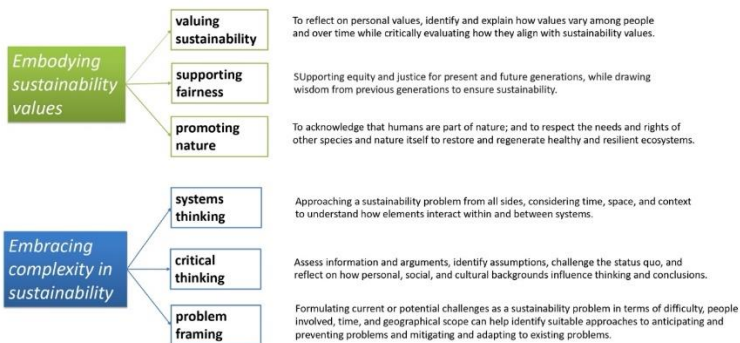


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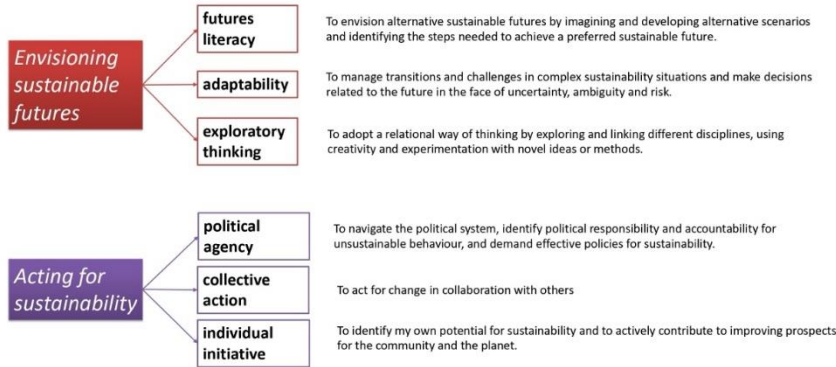


Green Competence Framework



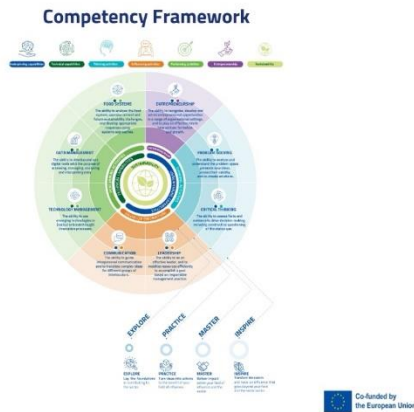
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Green Competence Framework



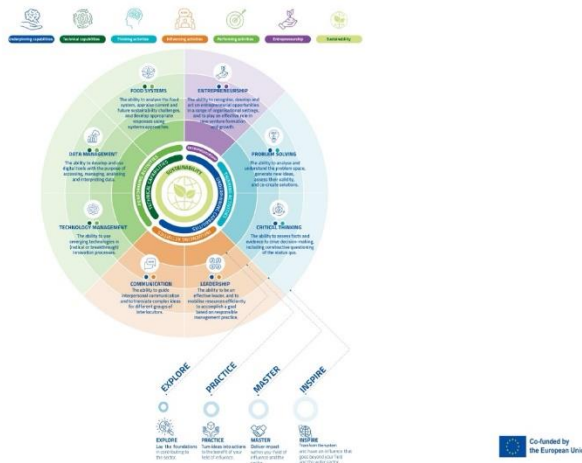
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EIT Food Competence Framework



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EIT Food Competence Framework



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EIT Food Competence Framework



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EIT Food Competence Framework



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Other relevant Frameworks

ENTRECOMP

<https://entrecomeurope.eu/wp-content/uploads/EntreComp-A-Practical-Guide-English.pdf>

DIGCOMPEDU

[European Framework for the Digital Competence of Educators: DigCompEdu](#)

SELFIEforTEACHERS

<https://entrecomeurope.eu/wp-content/uploads/EntreComp-Europe-Pocket-Book-for-Aspiring-Entrepreneurs.pdf>

[SELFIEforTEACHERS: Designing and developing a self-reflection tool for teachers' digital competence](#)

[SELFIEforTEACHERS Toolkit - Using SELFIEforTEACHERS](#)

[Adapting SELFIEforTEACHERS to Facilitate the Digital Competence of Early Childhood and Care Professionals](#)

[Building teachers' digital competence through a self-reflection process.](#)

<https://unevoc.unesco.org/home/Digital+Competence+Frameworks/lang=en/rd=2>





Methods and tools for designing advanced training courses: from learning outcomes to evaluation

Konstantina Ntrallou

Aarhus University
20/06/2024



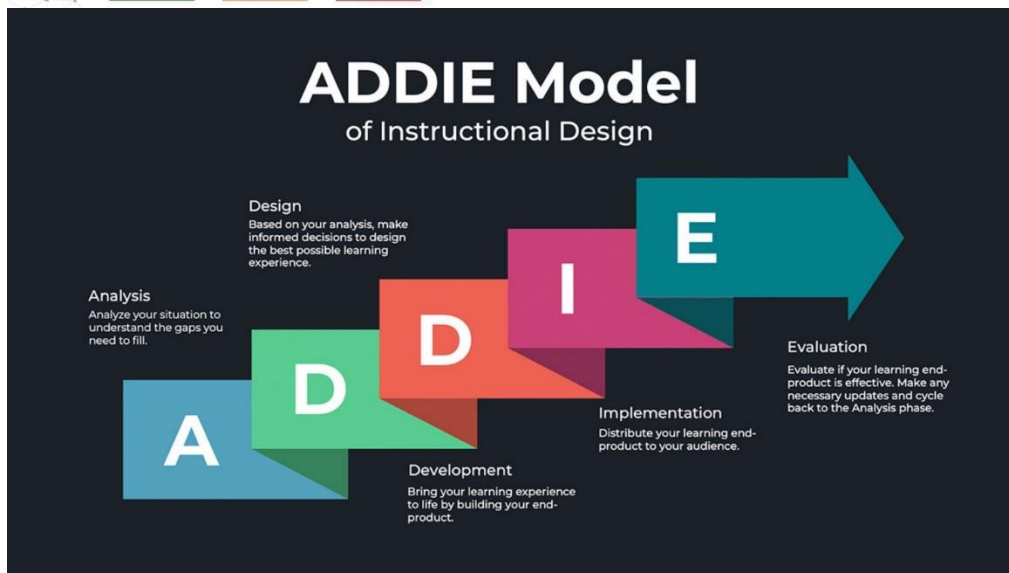
GEEK4FOOD



Agenda



1. Models for Learning Design



Aim of step: to identify all the variables that need to be considered when designing our course

Key questions:
 -Who are the learners?
 -What are their needs?
 -What resources are available?
 -What is the timeline?

Output: plan of the course and training needs



GEEK4FOOD

Aim of step: To identify the learning objectives and plan how materials will be designed and created

Key questions:

- What do we want the learners to learn?
- How will we support their learning?
- What resources, activities, content and tools will we use ?
- What mode of delivery will we use?

Output: course outline and overall design



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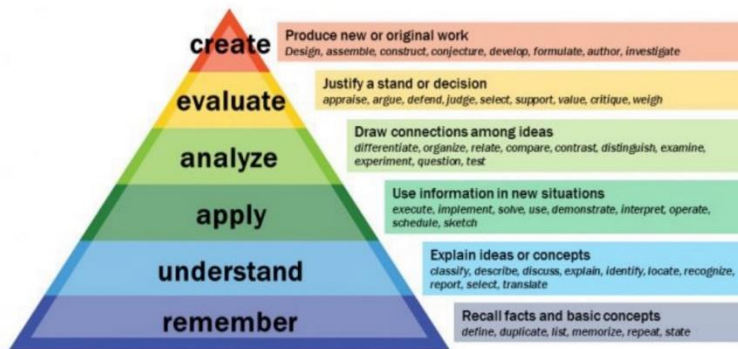


Bloom's taxonomy

Learning objectives: a measurable skill or knowledge that a learner is expected to have after being trained in a learning process.



GEEK4FOOD



Bloom's taxonomy verb and task design wheel



ABC Learning Design

| | | |
|---|---|--|
| <p>Acquisition</p> <p>Learning through acquisition is what learners are doing when they are listening to a lecture or podcast, reading from books or websites, and watching demos or videos</p> | <p>Collaboration</p> <p>Learning through collaboration embraces mainly discussion, practice, and production. Building on investigations and acquisition it is about taking part in the process of knowledge building itself</p> | <p>Discussion</p> <p>Learning through discussion requires the learner to articulate their ideas and questions, and to challenge and respond to the ideas and questions from the teacher, and/or from their peers</p> |
| <p>Investigation</p> <p>Learning through investigation guides the learner to explore, compare and critique the texts, documents and resources that reflect the concepts and ideas being taught</p> | <p>Practice</p> <p>Learning through practice enables the learner to adapt their actions to the task goal, and use the feedback to improve their next action. Feedback may come from self-reflection, from peers, from the teacher, or from the activity itself, if it shows them how to improve the result of their action in relation to the goal</p> | <p>Production</p> <p>Learning through production is the way the teacher motivates the learner to consolidate what they have learned by articulating their current conceptual understanding and how they used it in practice</p> |

Examples of activities

| <p>Learning type: Acquisition</p> <table border="1"> <tr> <th>Conventional method</th> <th>Digital technology</th> </tr> <tr> <td> <ul style="list-style-type: none"> reading books, papers listening to audio presentations face-to-face, lectures watching demonstrations, master classes </td> <td> <ul style="list-style-type: none"> reading multimedia, articles, digital documents and resources listening to podcasts, webcasts watching animations, videos </td> </tr> </table> | Conventional method | Digital technology | <ul style="list-style-type: none"> reading books, papers listening to audio presentations face-to-face, lectures watching demonstrations, master classes | <ul style="list-style-type: none"> reading multimedia, articles, digital documents and resources listening to podcasts, webcasts watching animations, videos | <p>Learning type: Collaboration</p> <table border="1"> <tr> <th>Conventional method</th> <th>Digital technology</th> </tr> <tr> <td> <ul style="list-style-type: none"> small group project discussing others' outputs building jobs output </td> <td> <ul style="list-style-type: none"> small group projects using online forums, chats, rooms, etc. for discussing others' outputs building a joint digital output </td> </tr> </table> | Conventional method | Digital technology | <ul style="list-style-type: none"> small group project discussing others' outputs building jobs output | <ul style="list-style-type: none"> small group projects using online forums, chats, rooms, etc. for discussing others' outputs building a joint digital output | <p>Learning type: Discussion</p> <table border="1"> <tr> <th>Conventional method</th> <th>Digital technology</th> </tr> <tr> <td> <ul style="list-style-type: none"> tutorials seminars discussion groups class discussions </td> <td> <ul style="list-style-type: none"> online tutorials seminars small discussions discussion groups discussion forums web conferencing tools videoconferencing and asynchronous </td> </tr> </table> | Conventional method | Digital technology | <ul style="list-style-type: none"> tutorials seminars discussion groups class discussions | <ul style="list-style-type: none"> online tutorials seminars small discussions discussion groups discussion forums web conferencing tools videoconferencing and asynchronous |
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| <ul style="list-style-type: none"> reading books, papers listening to audio presentations face-to-face, lectures watching demonstrations, master classes | <ul style="list-style-type: none"> reading multimedia, articles, digital documents and resources listening to podcasts, webcasts watching animations, videos | | | | | | | | | | | | | |
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| <p>Learning type: Investigation</p> <table border="1"> <tr> <th>Conventional method</th> <th>Digital technology</th> </tr> <tr> <td> <ul style="list-style-type: none"> using line-based study guides analyzing the ideas and information in a range of materials and resources using conventional methods to collect and analyze data comparing tests searching and evaluating information and ideas </td> <td> <ul style="list-style-type: none"> using online advice and guidance analyzing the ideas and information in a range of digital resources using digital tools to collect and analyze data comparing digital texts using digital tools for searching and evaluating information and ideas </td> </tr> </table> | Conventional method | Digital technology | <ul style="list-style-type: none"> using line-based study guides analyzing the ideas and information in a range of materials and resources using conventional methods to collect and analyze data comparing tests searching and evaluating information and ideas | <ul style="list-style-type: none"> using online advice and guidance analyzing the ideas and information in a range of digital resources using digital tools to collect and analyze data comparing digital texts using digital tools for searching and evaluating information and ideas | <p>Learning type: Practice</p> <table border="1"> <tr> <th>Conventional method</th> <th>Digital technology</th> </tr> <tr> <td> <ul style="list-style-type: none"> printing exercises doing practice-based projects labs field trips face-to-face role-play activities </td> <td> <ul style="list-style-type: none"> using models simulations microworlds virtual labs and field trips online role-play activities </td> </tr> </table> | Conventional method | Digital technology | <ul style="list-style-type: none"> printing exercises doing practice-based projects labs field trips face-to-face role-play activities | <ul style="list-style-type: none"> using models simulations microworlds virtual labs and field trips online role-play activities | <p>Learning type: Production</p> <table border="1"> <tr> <th>Conventional method</th> <th>Digital technology</th> </tr> <tr> <td> <ul style="list-style-type: none"> producing articulations using: statements essays accounts designs performances artefacts animations models videos </td> <td> <ul style="list-style-type: none"> producing and storing digital documents representations of designs performances, artefacts animations models podcasts photos blogs infographics </td> </tr> </table> | Conventional method | Digital technology | <ul style="list-style-type: none"> producing articulations using: statements essays accounts designs performances artefacts animations models videos | <ul style="list-style-type: none"> producing and storing digital documents representations of designs performances, artefacts animations models podcasts photos blogs infographics |
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Aim of step: To develop the course

Test and review process.

Output: have our entire course completed

3. Development

Bring your learning experience to life by building your end-product.



4. Implementation

Distribute your learning end-product to your audience.



Aim of step: ensuring the effectiveness of the training program and its continuous improvement

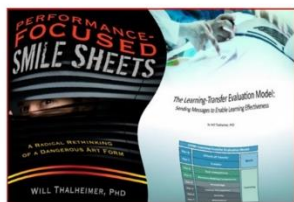
- Gather feedback from learners
- Assess the LO
- Identify areas for improvements



5. Evaluation

Evaluate if your learning end-product is effective and meeting its goals. Make any necessary updates and cycle back to the Analysis phase.

2. Learning evaluation models



Kirkpatrick's Levels of Evaluation:

- | | |
|---|---|
| REACTION The learner's emotional response to the course. | 1 |
| LEARNING How effectively the learner obtained information from the course. | 2 |
| BEHAVIOR Determining if the training makes an impact on day-to-day behavior. | 3 |
| RESULTS Calculating the business impact of the initiative, including ROI. | 4 |



GEEK4FOOD

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Kirkpatrick's Model of training evaluation

- Reaction → Did the learners enjoy the training?
- Learning → Did knowledge transfer occur?
- Behaviour → Did the learners behaviour change as a result of the training?
- Results/Benefits → Did the training have measurable impact on performance?



GEEK4FOOD

LTEM: Learning-Transfer Evaluation Model

Co-funded by the European Union

| | | | |
|-----------------|--------|----------------------------|----------|
| Task Competence | Tier 8 | Effects of Transfer | Work |
| | Tier 7 | Transfer | |
| Decision making | Tier 6 | Task Competence | Learning |
| | Tier 5 | Decision-Making Competence | |
| Knowledge | Tier 4 | Knowledge | |
| | Tier 3 | Learner Perceptions | |
| | Tier 2 | Activity | |
| | Tier 1 | Attendance | |



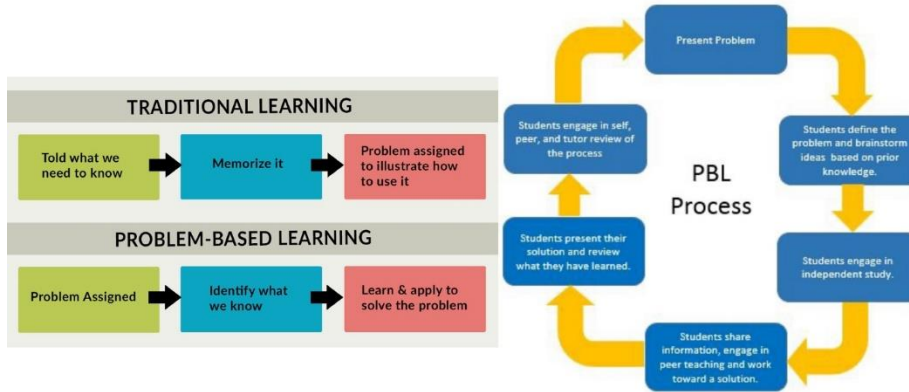
GEEK4FOOD

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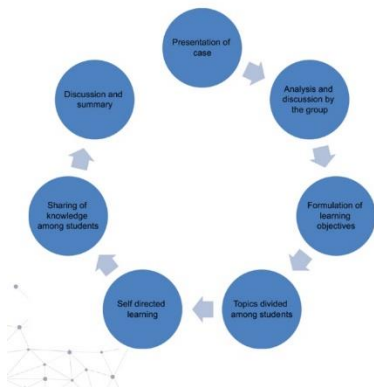


Innovative Teaching STRATEGIES

1. Problem-based learning (PBL)



2. Case based learning (CBL)



| Characteristic | Problem based learning | Case Based Learning |
|---------------------|--------------------------------------|---|
| Advance preparation | No advance prep | Advance prep |
| Activity | Problem based | Case based |
| Learning objectives | Identified during the session | Identified before the session |
| Organization | Small groups (4-8 students) | Small groups (4-8 students) |
| Learning method | Self-directed | Shared facilitator and self-directed |
| Role of faculty | Limited guidance | Active guidance |

3. Game based learning and gamification

GAMIFICATION VS GAME-BASED LEARNING

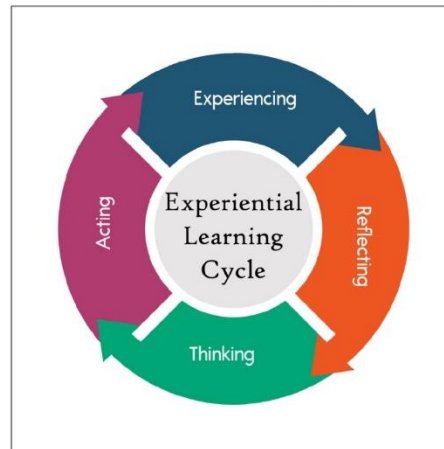
Gamification and game-based learning have become buzzwords in education. There are significant differences between the two when it comes to how they're used and how they affect students. But where does one stop and the other start? This handy infographic will help you out.

| GAMIFICATION | GAME-BASED LEARNING |
|---|--|
| Gamification is adding game elements to a non-game scenario. You reward certain behaviors with benefits or by "unlocking" new features or services. | Game-based learning (GBL) flips gamification on its head. Rather than implement game-like tropes into lessons, GBL uses actual games to teach. |
| Adding game-like elements (badges, experience points, etc.) to a lesson. | Using games (such as Minecraft) to teach specific learning objectives. |
| Motivation: Likely extrinsically rewarding. I.E. the reward is tied to grades. | Motivation: Games are designed to be intrinsically rewarding. May also be extrinsically rewarding. |
| Assessment is not within the "game". | Assessment is in-game . |
| Game-like aspects are adjusted to fit the lesson content. | Lesson content is adjusted to fit the game. |

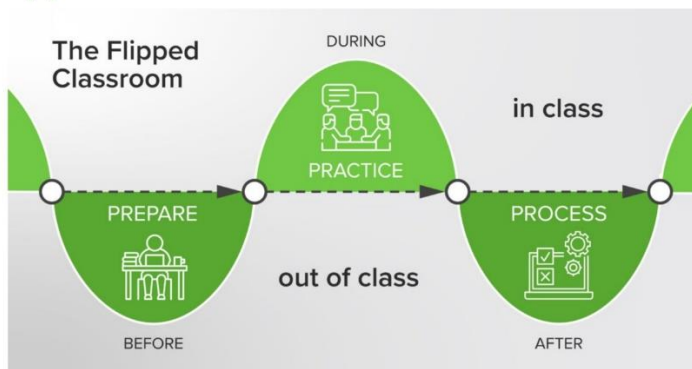
EdSurge

4. Experiential learning

- Emphasizes:
- hands-on experiences
 - experiments
 - field trips
 - simulations

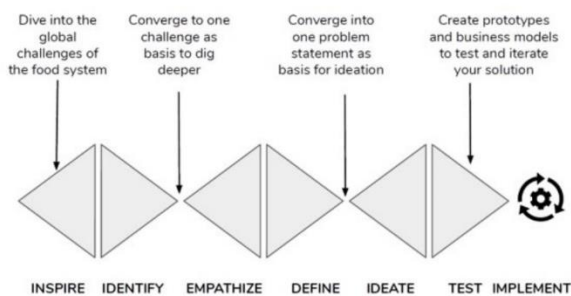


5. Flipped classroom



6. Design thinking

- 3 phases: Discover, Define, Develop
- Start from the challenge and dig deep / learn, and get engaged
- Define a problem to solve - case study. And go all the way to ideate, test and implement.



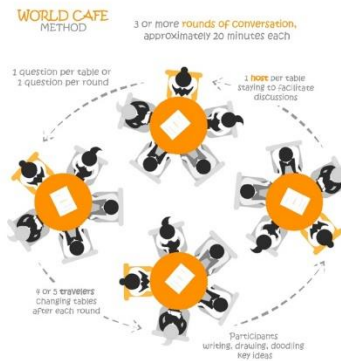
7. The world café

Desired outcome: Dialogue and/ or feedback in large groups.

Why it works: Open discussion in subgroups and building on each other's knowledge.

Method:

1. Form small groups.
2. Every group discusses around a table and notes or draws its points.
3. Part of the group rotates to the next table.
4. Discussion builds on previously discussed points.

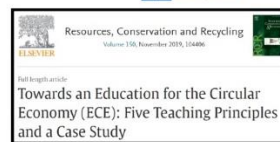


Co-funded by the European Union

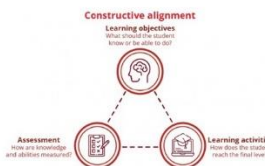
Inspiration to higher education strategies and methodologies

Course design based on 5 principles:

1. **Interactivity:** "...I do, and I understand"
2. **Non-dogmatism:** introducing both strengths and challenges
3. **Reciprocity:** continuous students' feedback
4. **Constructive alignment:** guarantee alignment between learning activities, intended Learning Outcomes and assessments.
5. **Problem "challenge" based-learning:**
 - continuous Feedback/work group
 - complex challenge/holistic approach



Co-funded by the European Union



Co-funded by the European Union

Introduction to the afternoon activities and teams' formation

Build a module WORKSHOP: develop a scheme on a model for teaching-challenge based new green skills.

Target group: end level bachelor, elective course

Prerequisites

Learning objectives

Teaching methodology/approach

Learning activities, tools, organise content into units, lessons

Testing and review process

Course duration

Assessment/Course evaluation criteria

Project n.: 101087203



Introduction to the afternoon activities and teams' formation

| TEAM 1 Konstantina Ntrallou | TEAM 2 Mario Roccaro | TEAM 3 Paola Pittia | TEAM 4 Antonio Vicente | TEAM 5 Laura Mitrea |
|--------------------------------|---------------------------------|------------------------------------|------------------------------------|-------------------------|
| Faisal Anggi Pradita (PhD) | Sutrisno Sutrisno (PhD) | Myriam Taghouti | Ramona Suharoschi (teaching staff) | Rehman Ullha (trainer) |
| Abid Ali (trainer) | Clauvette Ifany Obilo (trainer) | Clara Ewi (trainer) | Anda Elena Tanislav (PhD) | Anamaria Pop ? |
| Rotaru Mihail (teaching staff) | Cuibus Lucian (teaching staff) | Romina Alina Marc (teaching staff) | Laura Stan (teaching staff) | Raluca Borsa PhD |
| Eugen Radu | Rodica-Anita Varvara (PhD) | Teleky Bernadette-Emoke (postdoc) | Diana Plamada (PhD) | Ana Maria Dudau-Rai PhD |
| | | Amalia Nemes PhD | | Project n.: 101087203 |

Introduction to the afternoon activities and teams' formation

Suggested topics for course design:

1. Vertical farming.
2. Food waste valorization in food product design.
3. Precision fermentation.
4. Eco-design of food packaging.
5. Cellular agriculture.
6. Reducing food loss and waste.
7. Diversifying protein choices for food products.
8. Improving sustainable and resilient food production practices.
9. Growing the circular food economy through packaging and labelling.

Project n.: 101087203

GEEK4Food

AI powered Skills Platform

A skill-based model integrating AI and adaptive learning methods in higher education and vocational training for the green and digital transitions

Mohan Reddy
SkyHive

info@geek4food.eu
www.geek4food.com

About Me

- Co-Founded 8 Startups
- Associate Director, Stanford University Human Perception Lab
- Built products that scaled to approx. Billion users and systems that could handle trillions of transactions daily
- Bachelors in Biomedical Engineering (went to Med School and Engineering School)
- Masters in Electrical Engineering
- MBA in Computational Finance
- PhD dropout in Computational Neuroscience
- 28 Patents
- My interests
 - Deep Learning, Machine Learning, Symbolic Systems, Large Scale Systems, Optimization
 - Theory, Computer Vision
 - Computational Neuroscience + AI
 - Robotics
 - AR/VR
 - Reverse Engineering Human Brain

For the curious – What is Stanford University Human Perception Lab and what do I do there ?

Human Perception Lab
Creating the building blocks to fuel personalized AI and other human intelligent technologies

Our core approach is to reverse engineer the brain via the human senses, Perception, Intent, Action. We're not just an academic lab focused on advancing our own research. We're a lab that's building tools and technologies that can be used by everyone to advance the aim of achieving a human intelligent AI. It takes a community to make true change.

Our research is centered around three fundamental constructs of technology:

| | | |
|---|---|---|
| Integrated Understanding mind | Meaningful Interactions that matter | Self-aware Learning Deeper learning for challenging tasks |
| Composing intelligent capabilities Knowledge repositories | Trust and responsibility Human-Machine Interactions | Integrating continuous and symbolic representations Diversified learning modalities |




Capture 1
Human sensory signals
Product: SKCAPM



Action 4
Human AI response
Product: Human Int

Perceive 2
Brainwide Signals (HR, Behavior)
Product: Behavior, Touchless
Component: Perception
Interface: HR, Performance, Talent



Intent|Decision 3
Contextual|Behavioral
Product: Knowledge Base | Graphs



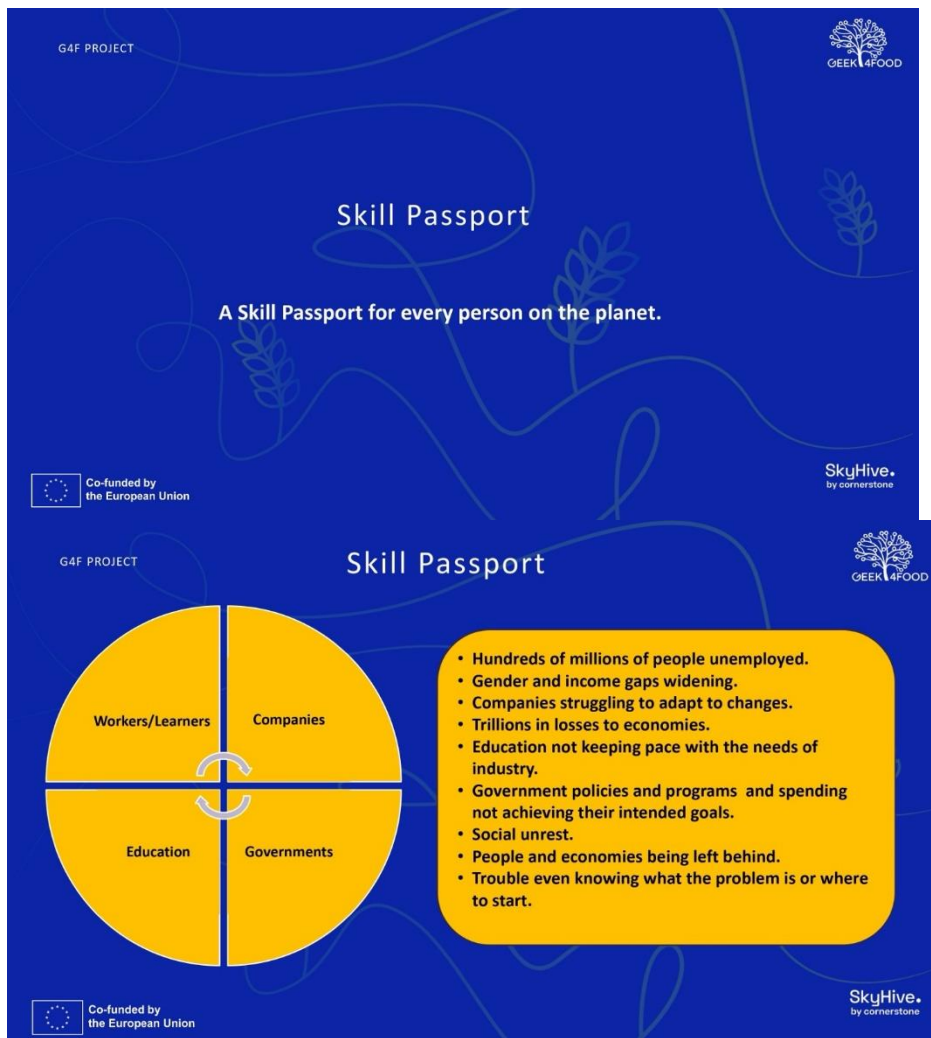
GEEK4Food

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A skill-based model integrating AI and adaptive learning methods in higher education and vocational training for the green and digital transitions

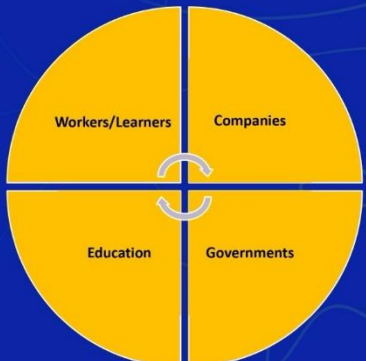
Mohan Reddy
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Skill Passport
A Skill Passport for every person on the planet.

Skill Passport



- Hundreds of millions of people unemployed.
- Gender and income gaps widening.
- Companies struggling to adapt to changes.
- Trillions in losses to economies.
- Education not keeping pace with the needs of industry.
- Government policies and programs and spending not achieving their intended goals.
- Social unrest.
- People and economies being left behind.
- Trouble even knowing what the problem is or where to start.

G4F PROJECT

What is Skill Passport



SkyHive's Skill Passport is pioneering the transition to an intelligent labor economy powered by one of the most advanced AI technologies in the world. It is the first and only technology to seamlessly combine all four sides of a labor market into one real-time and fluid system.

The Skill Passport revolutionizes how workforces work, learn, evolve and function. It drastically optimizes all aspects of workforce development for government, companies, educators and workers/learners.

It is the culmination of many years of research and development working with the largest companies and governments in the world.






G4F PROJECT

How can Skill Passport help you ?



Workers/Learners

- Have a complete picture of your skills and how your skills fit into any job or career.
- Find highly relevant jobs faster than ever before.
- Earn more income as you take control of the skills you are learning and the opportunities you are pursuing.
- Be matched with training that is hyper-personalized to any career pathway.
- Be fully prepared for the jobs of the near and long-term future.
- Build a highly specific professional network of friends, colleagues, peers and advisors.

Companies

- Find exceptional talent faster than ever before.
- Monitor real-time competitive intelligence.
- Upskill/reskill your employees at a fraction of the time and cost.
- Future-proof your company with real-time signals of workforce trends impacting your business.

Education

- Acquire more learners for your learning programs.
- Monitor the quality and relevancy of your programming in relation to the changing needs of industry, in real-time.
- Monitor real-time signals and data that will help you build relevant courses now into the future.

Governments

- Monitor the impact that an intelligent labor economy is having on your micro and macro economic performance, in real-time.
- Future-proof your community with real-time signals of workforce trends impacting your community.
- Monitor, to the dollar, the impact your policies, programs and investments are having on your economy.
- Help your citizens find jobs.
- Help your employers grow.
- Help your educational institutions remain relevant.

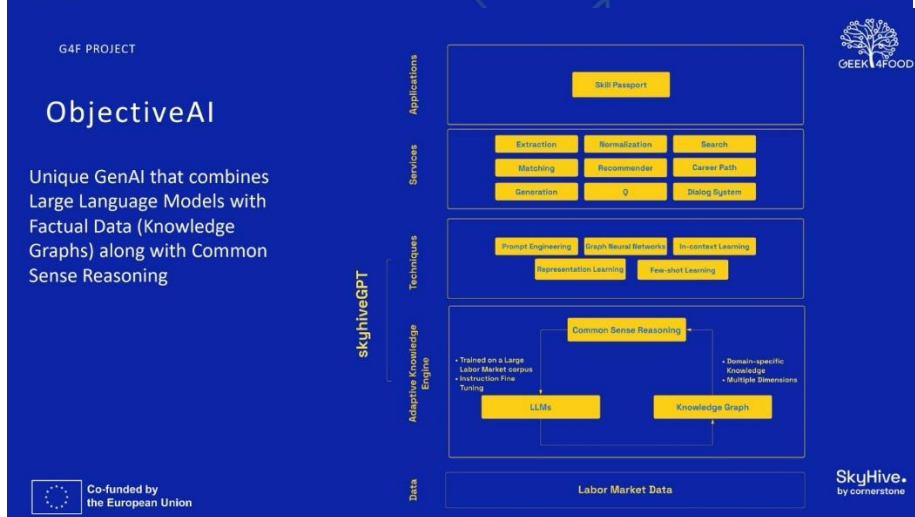
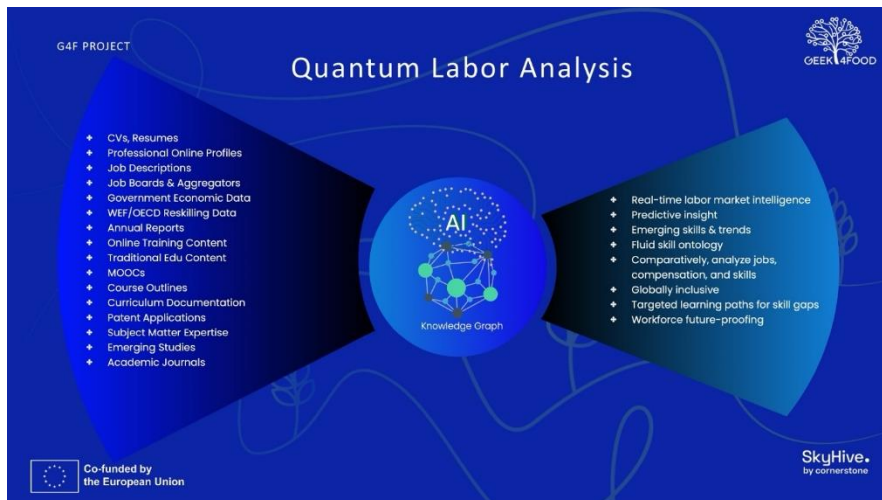



G4F PROJECT

Labor Market & Skills



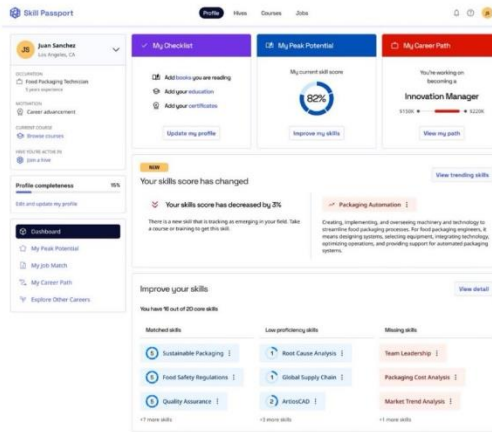


G4F PROJECT

Adaptive learning methods

Personalised education and real-time feedback



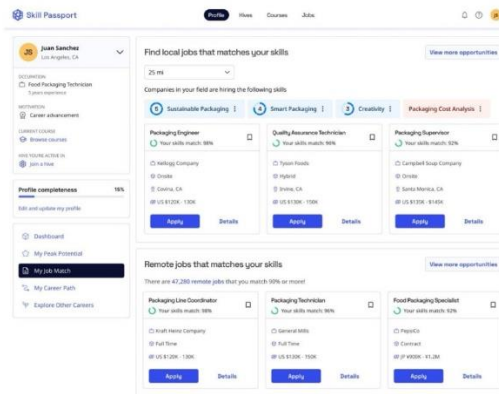
The screenshot shows a user profile for 'Joan Sanchez' with a 'My Peak Potential' score of 82%. It highlights a career path towards 'Innovation Manager' and lists skills to improve, such as 'Sustainable Packaging', 'Food Safety Regulations', and 'Quality Assurance'.



G4F PROJECT

Adaptive learning methods

Personalised education and real-time feedback



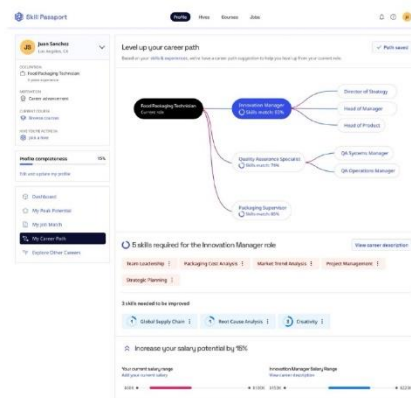
The screenshot displays 'Find local jobs that matches your skills' and 'Remote jobs that matches your skills'. It lists various roles like 'Packaging Engineer', 'Quality Assurance Technician', and 'Packaging Supervisor' with their respective skill match percentages.



G4F PROJECT

Adaptive learning methods

Personalised education and real-time feedback



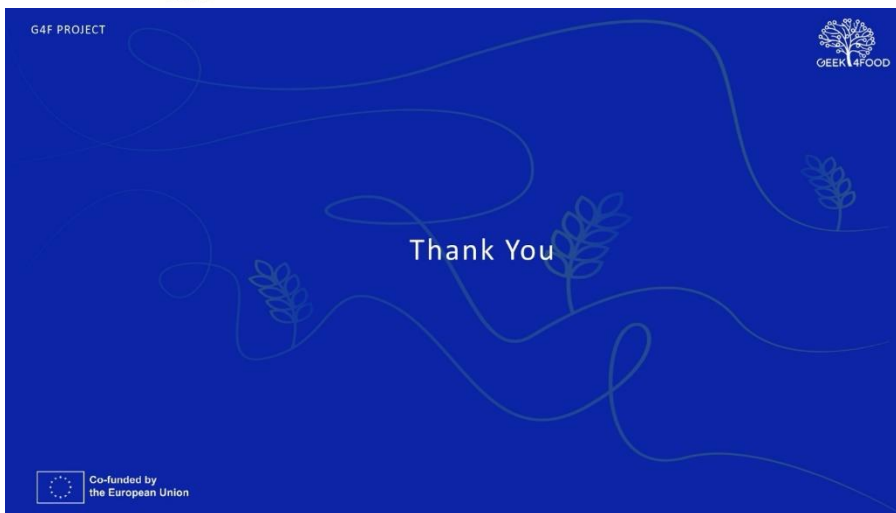
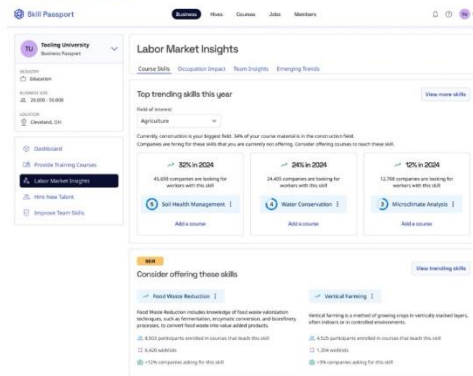
The screenshot shows a 'Level up your career path' visualization. It maps out a path from 'Packaging Technician' to 'Innovation Manager' and lists 'Skills required for the Innovation Manager role' such as 'Team Leadership', 'Packaging Cost Analysis', and 'Market Trend Analysis'.



G4F PROJECT

Adaptive learning methods

Personalised education and real-time feedback



ANNEXE 4 – Training + Group pictures – Training Aarhus





D5.1 - Report on specific/technical
and transversal skills courses for mentors

Annexes 5: Event posters – Training Aarhus



Addressing green skill needs in agri-food

Identifying and delivering emerging green skills



Understanding and identifying training and skills needs based on AI tools and future scenarios.



Analysing learner profiles to develop tailored training approaches.



Applying a harmonised model for training that ensures global consistency while adapting to local needs.

14 January 2025

University Conference Centre, Building 1422/122, Aarhus, Denmark



14th January 2025

Addressing green skill needs in agri-food

Identifying and delivering emerging green skills

University Conference Centre
Aarhus, Denmark

Fredrik Nielsens Vej 2-4, 8000
Room Richard Mortensen Stuen, building 1422/122



ANNEXE 6 – Training presentations and lectures -Training Aarhus



GLOBAL ECOSYSTEMS AND EXPANDED KNOWLEDGE FOR GREEN SKILLS AND CAPABILITY IN THE FOOD SECTOR - GEEK4FOOD -

14 January 2025 – Aarhus (DK)

Paola Pittia¹, Mario Roccaro² (et al.)

¹Prof, Dr /University of Teramo, Department of Biosci.&Tech. Food Agric. Env. (IT)

²Dr /EITFood (BE)



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www.geek4food.com

Introduction : *the background*



Erasmus Knowledge Alliance ASKFOOD

- Innovative skills and professions forecast based on "scenarios" (Forecast Aggregator, Interactive Training Id)



- Innovative teaching methods to promote innovation (Incubator, Gamification)
- Innovative ecosystem tools

www.askfood.eu

Competence frameworks The EIT Food one



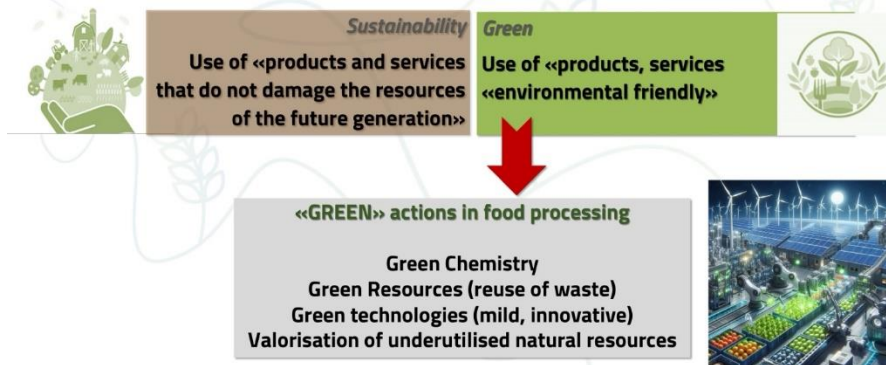
Other Erasmus Projects such as **FIELDS** and **I-RESTART**

Scenarios (current and future)
New skills for new jobs
Skills intelligence
Demand vs. supply job market
Competence framework effectiveness
The «green» landscape of the food system
??

Introduction : *the background*



SUSTAINABILITY OR GREEN?



Erasmus+ <Forward Looking projects>

- To foster innovation, ground-breaking methods and practices, *and/or*
- To ensure a **transfer of innovation** (across countries, policy sectors or target groups), thus ensuring a **sustainable exploitation of innovative project results** and/or transferability into different contexts and audiences.

...with a coherent and comprehensive **set of sectoral or cross-sectoral activities**....

...(partnership) **mix of public and private organisations** combining **researchers, practitioners and partners** with the **capacity to reach policy-makers**.

<Forward looking> approach to <green> skills



GREEN and sustainable food value chains?

- Innovation
- Research
- Training (skills, knowledge)



- **Innovative skills needs and gaps search approaches : Artificial Intelligence (skills intelligence)**
- **<Systemic> and foresight thinking abilities of talents**
- **Modern HE training models to adapt to a <fluid> skills gaps and job market needs**



GEEK4FOOD

Development of a **working, cross-sectorial framework** to support the food system transition towards **sustainable and green solutions** by the implementation of **disruptive tools** able to boost a **fluid upskilling and reskilling** of the current workforce of the next generation of future professionals.

Artificial/skills intelligence tools



Innovative training models for reskill & upskill

Pilot green-based and entrepreneurship training initiatives



GEEK4FOOD

Development of a **working, cross-sectorial framework** to support the food system transition towards **sustainable and green solutions** by the implementation of **disruptive tools** able to boost a **fluid upskilling and reskilling** of the current workforce of the next generation of future professionals.

Higher Education Training providers (Learners, teachers)



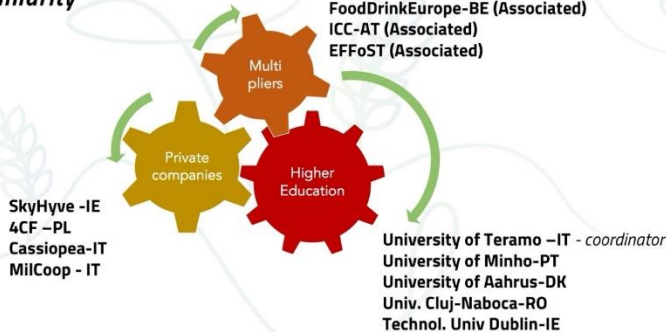
Professionals/workers Enterprises/business

Policymakers



The partnership

Inter-disciplinary
Trans-disciplinary



Plan of work and of outcomes



Digital Ecosystem



**GEEK4FOOD
(A.I. based)
SKILLS Tool**

Interactive learner-centric virtual platform for green skill mapping to merge learners/organisation needs with training offers and agri-food job opportunities (3P-GEEK4Food Hub).

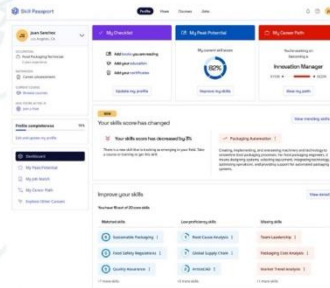
GEEK4Food Platform



Integrating AI into Education models

AI-based tool to support

- Educators/trainers
- Food industry
- Government



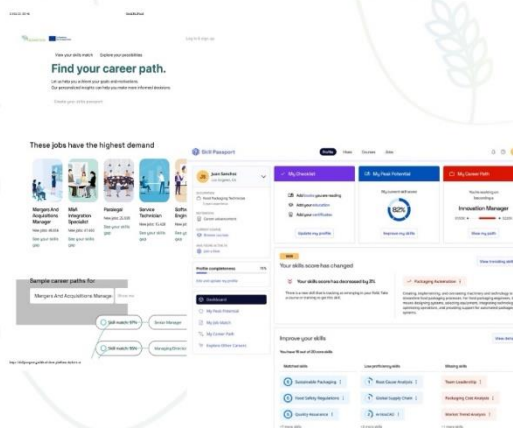
GEEK4Food Skills passport



Integrating AI into Education models

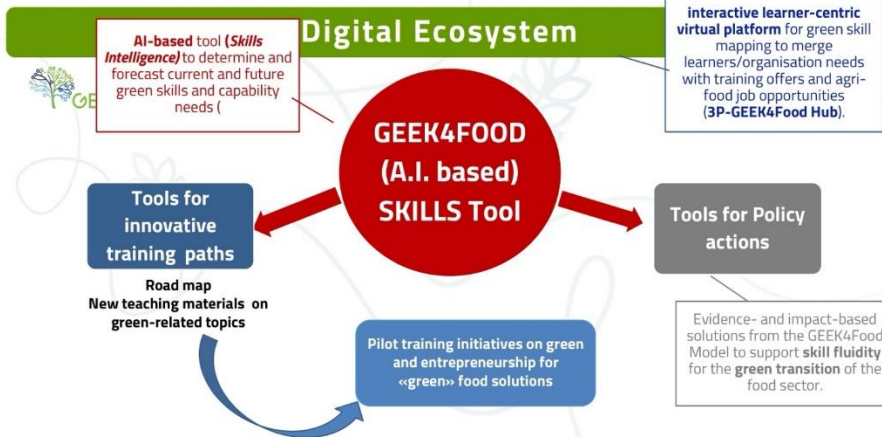
Adaptive learning methods

Personalised education and real-time feedback



Plan of work and of outcomes

Co-funded by the European Union



Green Skills demand job market (June 2023-2024, >62 millions posts)

Co-funded by the European Union



| Country Code | country | % Green Skills (on the total in the country) |
|--------------|-----------------------------|--|
| All | All | 1,1% |
| FR | France | 1,0% |
| ES | Spain | 1,0% |
| IT | Italy | 1,3% |
| BE | Belgium | 0,9% |
| DE | Germany | 1,3% |
| NL | Netherlands, Kingdom of the | 1,3% |
| SK | Slovakia | 0,2% |
| PL | Poland | 0,9% |
| AT | Austria | 1,2% |
| PT | Portugal | 0,4% |
| SE | Sweden | 3,9% |
| IE | Ireland | 2,2% |
| DK | Denmark | 3,7% |
| GR | Greece | 0,5% |
| CZ | Czechia | 0,7% |
| FI | Finland | 1,7% |
| RO | Romania | 0,5% |
| HU | Hungary | 0,7% |
| BG | Bulgaria | 4,0% |
| CY | Cyprus | 0,2% |
| LU | Luxembourg | 0,5% |
| HR | Croatia | 2,5% |
| MT | Malta | 0,9% |
| LT | Lithuania | 0,5% |
| SI | Slovenia | null |
| EE | Estonia | 0,2% |
| LV | Latvia | 2,5% |

Quantum Labour Market®, SkyHive

Top-20 Green Skills demand (June 2023-2024) (> 2.5 million posts)

Co-funded by the European Union



| Keyword | % |
|---------------------------------|------|
| Biotech | 39,2 |
| Circular economy | 14,8 |
| Waste-to-value | 12,6 |
| Biomass | 6,5 |
| Sustainable transportation | 4,7 |
| Upcycling | 4,2 |
| Biogas | 4,1 |
| Wastewater treatment | 3,3 |
| Energy audits | 2,1 |
| Environmental regulation | 2,1 |
| Composting | 1,2 |
| Led lighting | 1,2 |
| Sustainable packaging | 1,2 |
| Life cycle assessment | 0,8 |
| Environmental impact assessment | 0,8 |
| Sustainable supply chain | 0,6 |
| Sustainability principles | 0,5 |

Quantum Labour Market®, SkyHive

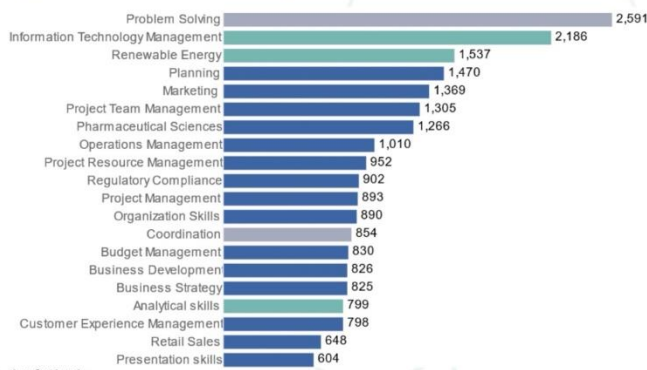
Top-20 Green Skills demand (June 2023-2024) (> 2.5 million posts)



| Company sector /label | Total n. of companies with postings (% on total) | N. Postings with Green Skills-GS | % on GS posting (on total) |
|---|--|----------------------------------|----------------------------|
| Agriculture | 571 (10,3%) | 87 | 15,3 |
| Food manufacturing/processing | 918 (16,6%) | 71 | 7,7 |
| Food safety | 87 (1,5%) | 25 | 28,7 |
| Food service * | 843 (15,2%) | 48 | 5,7 |
| Distribution** | 2866 (51,8%) | 192 | 6,7 |
| Miscellaneous (various sectors, primary transformation, etc.) | 250 (4,5 %) | 77 | 30,8 |
| ALL categories | 5537 (100 %) | 500 | 9,0 |

Quantum Labour Market *, SkyHive

Top-20 Entrepreneurial Skills demand (June 2023-2024)



Quantum Labour Market *, SkyHive

Expected impact

- AI-supported and impact-driven tools and patterns to favour innovative green training and educational models at the academia, corporate and people-to-people levels.
- Support to a "green" and sustainable innovation within the "Knowledge Triangle" in the food system.
- Tools for policy makers to promote adherence to green transition and the whole institution approaches to sustainably twin change after the EU Green Deal.

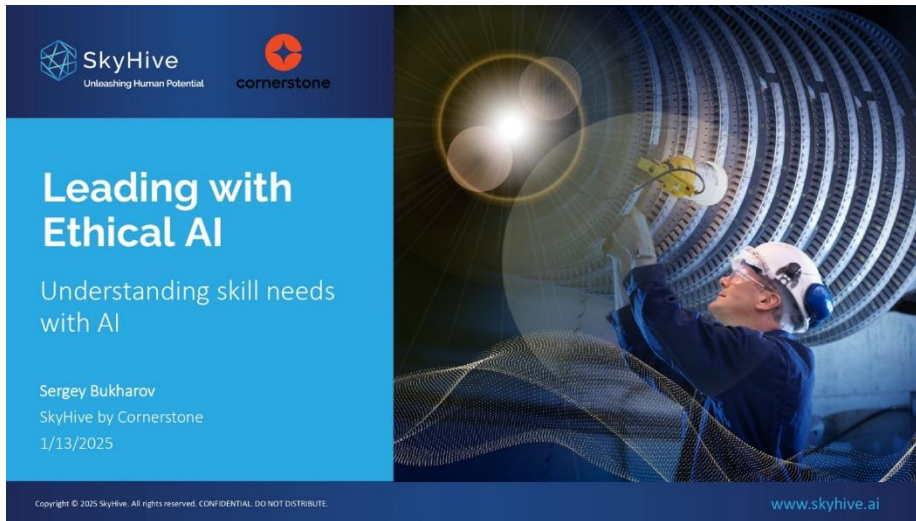


Our partners



Associated partners





About SkyHive by Cornerstone

WHO WE ARE

- SkyHive is a global workforce intelligence software provider.
- Vision: To reskill the world
- Mission: To organize the world's workforce data

SPECIFICS

- Founded 2017
- Palo Alto, Vancouver, NYC
- Certified B-Corporation
- Acquired by Cornerstone On Demand in 2024

WHAT WE OFFER

- Operating system powering the skills-based workforce of the future
- SkyHive Enterprise
- SkyHive Platform
- Skill Passport Ecosystem

PARTNERS & INVESTORS



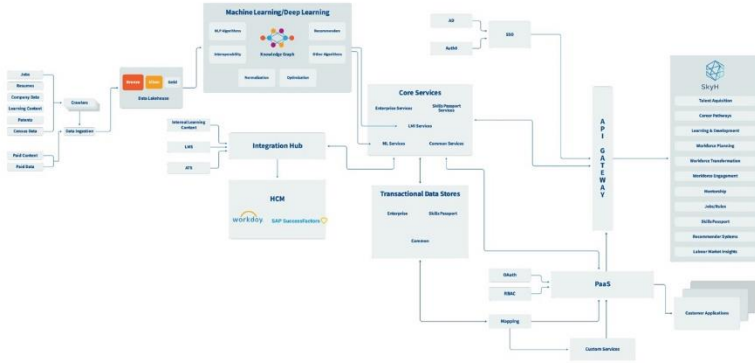
OUR DIFFERENTIATION

- Real-time Labor Market Intelligence (LMI), globally
- Quantum Labor Analysis*
- Responsible & Ethical AI

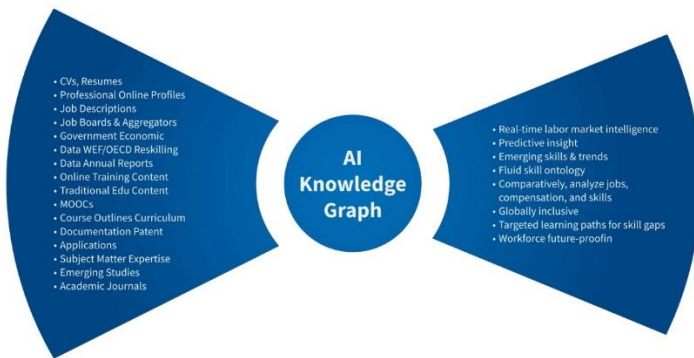
RECOGNITION



SkyHive Logical Architecture



Quantum Labor Analysis®

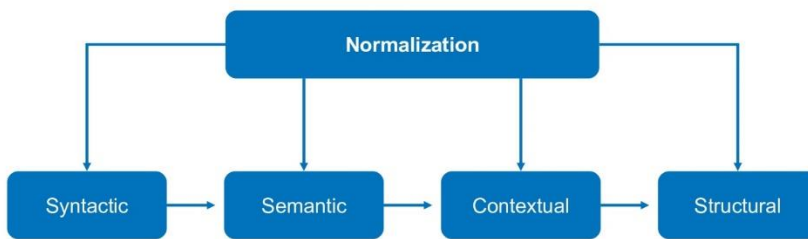
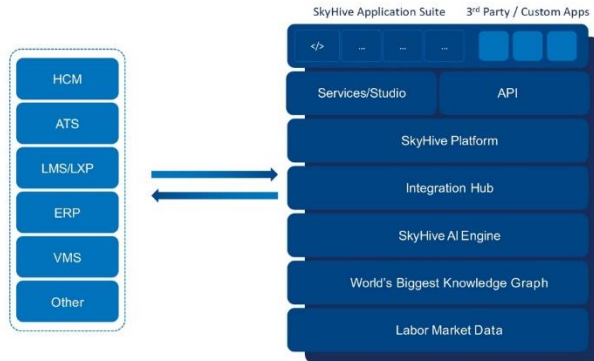


SkyHive AI Highlights

- Approx. 74 Models
- Classical Machine Learning and Deep Learning Models
- Predominantly NLP
- Comprehensive MLOps
- Support Multilingual

D5.1 - Report on specific/technical and transversal skills courses for mentors

The Human Capital Operating System Stack



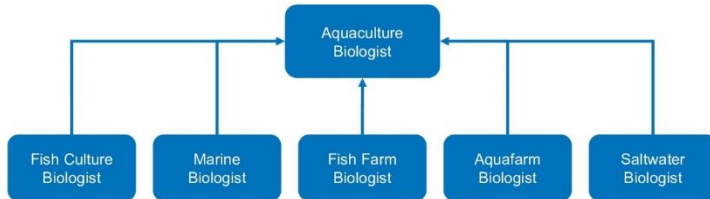
Syntactic Normalization

- Sentence structure, grammar rules and pattern matching are used to predict the cluster title.
- Traditional Natural Language Processing techniques: stemming, lemmatization, part of speech tagging etc.



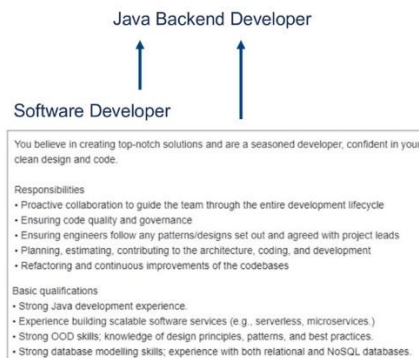
Syntactic Normalization

- Model understands word meanings
- Creates a semantic representational space
- Deep Learning techniques: Transformers, Siamese Networks, Contrastive Representation Learning



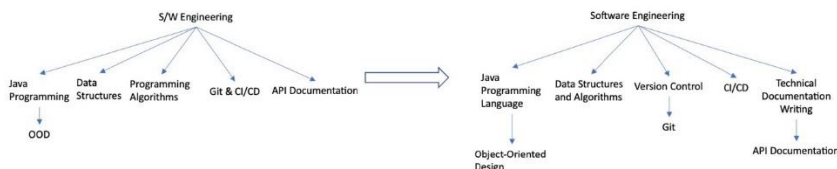
Context Normalization

- Uses additional text involving responsibilities, skills, qualifications, definitions, etc. as context for normalization
- The contextual information can be a long text using this model
- Deep Learning techniques: Large Language Transformer Models as Siamese Networks



Structural Normalization

- Mapping from a set of categories to another set of categories while maintaining the structural coherence
- Normalization includes one-to-many and many-to-one relationships
- Taxonomy to taxonomy mapping; Ontology to ontology mapping
- State-of-the-art Graph Representation Learning, Graph Deep Learning Models

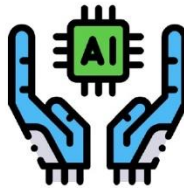




Ethical AI

SkyHive Walks the Talk on Responsible AI

- SkyHive's goal is to be a leader in Responsible AI
- SkyHive has invested in analyzing emerging legislation worldwide to create a framework that will position SkyHive to comply with pending AI laws and best practices worldwide. We have created our own Responsible AI Framework (Midas +)



SkyHive Walks the Talk on Responsible AI

We have worked with external experts to develop operational practices that align with the following:

| | |
|---|---|
| UNITED STATES <ul style="list-style-type: none"> • US Algorithmic Accountability Act of 2022 (draft) • EO: Safe, Secure, and Trustworthy Development and Use of AI (2023) • National Institute of Standards and Technology: <ul style="list-style-type: none"> • Proposal for Identifying and Managing Bias in Artificial Intelligence (SP 1270) (2021) • Four Principles of Explainable Artificial Intelligence Draft NISTIR 8312 (2020) • Summary Analysis of Responses to the NIST Artificial Intelligence Risk Management Framework (AI RMF) (2021) • AI RMF Concept Paper (2021) • Federal Trade Commission Guidance • New York City Ordinance on Artificial Intelligence (Local Law 144) | INTERNATIONAL <ul style="list-style-type: none"> • EU Artificial Intelligence Act of 2023 • European Commission High-Level Expert Group on Artificial Intelligence: Ethics Guidelines for Trustworthy AI (2019) • Singapore's Model AI Governance Framework • ISO/IEC TR 24027:2021: Bias in AI systems and AI aided decision making • ISO/IEC TR 24028:2020: Overview of trustworthiness in artificial intelligence • ISO/IEC TR 24372:2021: Overview of computational approaches for AI systems • ISO/IEC 38507:2022 - Information technology — Governance of IT — Governance implications of the use of artificial intelligence by organizations |
| CANADA <ul style="list-style-type: none"> • Bill C-27, Artificial Intelligence and Data Act (2024) • Treasury Board of Canada, Directive on Automated Decision-making | RESPONSIBLE AI INSTITUTE |

D5.1 - Report on specific/technical and transversal skills courses for mentors

SkyHive's Guiding Ethical AI Principles

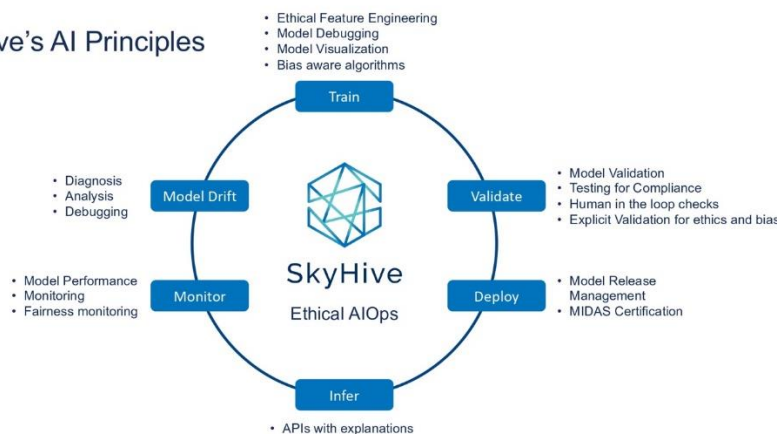


Operationalizing Ethical AI at SkyHive

MIDAS + AI Ethics Framework

| Prioritization & Design | Development Testing | Deployment | Operation & Monitoring |
|---|---|---|---|
| <p><i>Assess feasibility, understand potential risks, select most effective modeling technique(s), and define business outcomes and thresholds.</i></p> <ul style="list-style-type: none"> Problem identification, business case, and ROI analysis Understand potential risks and benefits to stakeholders Classify systems including potential limits and human-in-the-loop requirements Test and select more effective model technique(s) Define performance thresholds for robustness, fairness/bias, transparency, and privacy | <p><i>Conduct data exploration, test and validate models, conduct qualitative and quantitative reviews.</i></p> <ul style="list-style-type: none"> Test for bias in development and testing datasets Ensure required consent for in-scope data (if required) Qualitative model review Quantitative model review including robustness testing for fairness/bias, transparency, and privacy | <p><i>Deploy solutions to customer environment. Train and ensure use case purpose and capabilities are clearly understood.</i></p> <ul style="list-style-type: none"> Deployment with customer includes customer training on intended purpose, limitations, and safe use of the systems Define and implement safeguards to ensure system resiliency, safety, and security Ensure transparency with notice and disclosure (if required) | <p><i>Deploy, monitor, maintain, and re-train on an ongoing basis while considering AI risks, model drift, and feedback from impacted stakeholders.</i></p> <ul style="list-style-type: none"> Define roles, responsibilities, and accountabilities for system operation and maintenance (including human-in-the-loop if required) Embed mechanisms for tracking identified risks over time Gather feedback from impacted stakeholders (if applicable) Re-evaluation based on customer feedback or performance thresholds |

SkyHive's AI Principles



D5.1 - Report on specific/technical and transversal skills courses for mentors

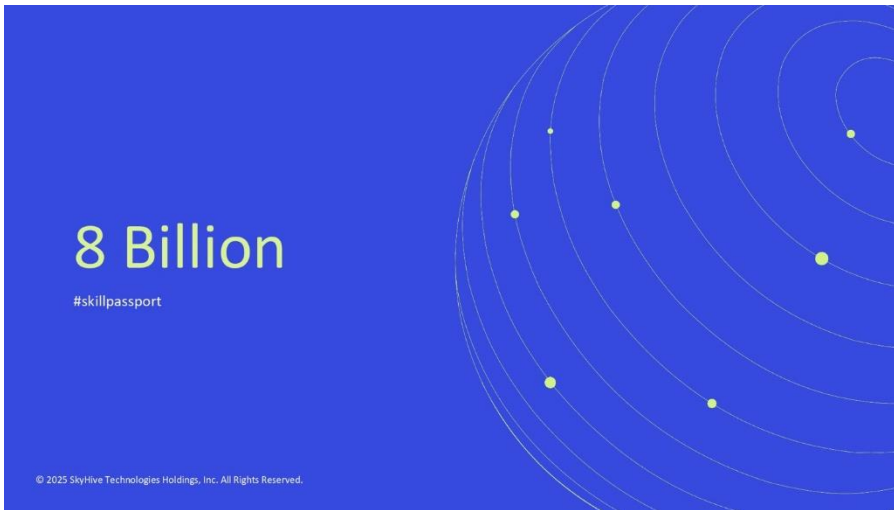


SkyHive's AI Principles

- Be **socially beneficial**
- **Avoid** creating or reinforcing **unfair bias**
- Be built and tested for **safety**
- Be **accountable**
- Incorporate **ethical and privacy design principles**
- Uphold high standards of **scientific excellence**

AI & The Skills Passport

D5.1 - Report on specific/technical
and transversal skills courses for mentors



1995

Manual Labor Economy

2007

Digital Labor Economy

2025

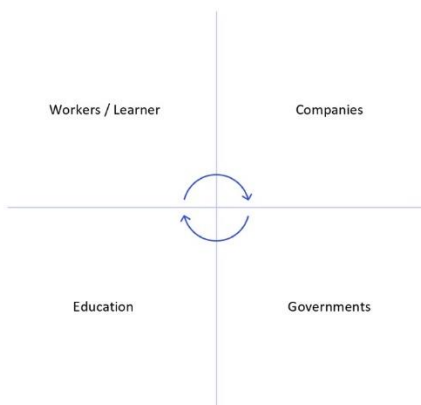
Intelligent "Planetary" Labor Economy



Example Jobs



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- Hundreds of millions of people unemployed
- Gender and income gaps widening
- Companies struggling to adapt to changes
- Trillions in losses to economies
- Education not keeping pace with the needs of industry
- Government policies, programs, and spending not achieving their intended goals
- Social unrest
- People and economies being left behind
- Trouble even knowing what the problem is or where to start

1% improvement in employment
\$2 Trillion GDP

How Can the SkyHive Skill Passport Help You?

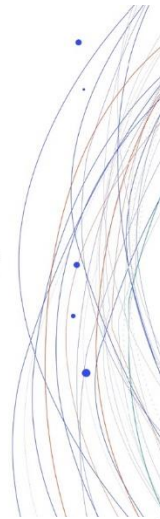
Workers/Learners

- Have a complete picture of **your skills and how they fit into any job or career.**
- Find **highly relevant jobs** faster than ever before.
- Earn more income as you take control of the skills you are learning and the **opportunities** you are pursuing.
- **Be matched with training** that is hyper personalized to any career pathway.
- Build a **highly specific professional network** of friends, colleagues, peers, and advisors.

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Companies

- **Find exceptional talent** faster than ever before.
- Monitor **real-time competitive intelligence.**
- **Upskill/reskill** your employees at a fraction of the time and cost.
- **Future-proof** your company with **real-time** signals of workforce trends impacting your business.



How Can the SkyHive Skill Passport Help You?

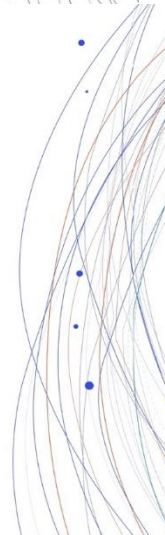

Education

- Acquire more learners for your **learning programs.**
- Monitor the quality and relevancy of your programming in relation to the **changing needs of industry, in real time.**
- Monitor **real-time signals and data** that will help you build relevant courses now into the future.

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Government

- **Monitor the impact** that an intelligent labor economy is having on your micro and macroeconomic performance, in real-time.
- **Future-proof** your community with real time signals of workforce trends impacting your community.
- Monitor, to the dollar, **the impact your policies, programs, and investments** are having on your economy.
- Help your citizens **find jobs.**
- Help your employers **grow.**
- Help your educational institutions **remain relevant.**

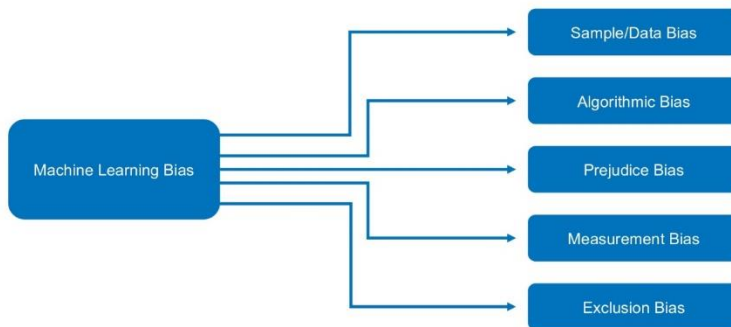
SkyHive
Unleashing Human Potential

Learn more: www.skyhive.ai

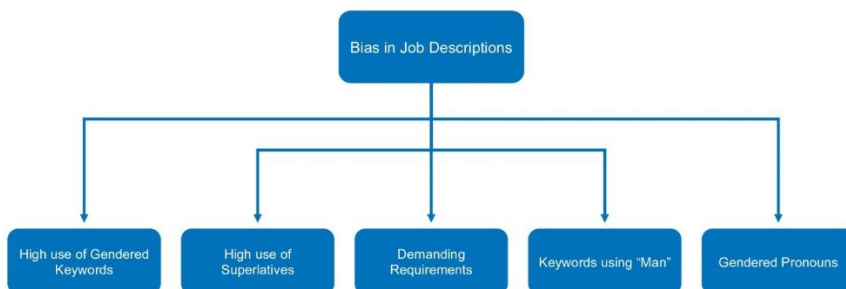
Ask a question: sbukharov@csod.com

Appendix A: Bias Mitigation Methods

SkyHive Employs Different Bias Mitigation Methods



SkyHive Employs Different Bias Mitigation Methods



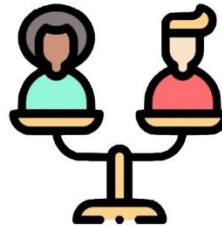
SkyHive Employs Different Bias Mitigation Methods

| | |
|----------------------------|---|
| Machine Translation | Translating "He is a nurse. She is a doctor." to Hungarian and back to English results in "She is a nurse. He is a doctor." |
| Sentiment Analysis | Sentiment Analysis Systems rank sentences containing female noun phrases to be indicative of anger more often than sentences containing male noun phrases |
| Language Models | "He is doctor" has a higher conditional likelihood than "She is doctor" |
| Word Embedding | Analogies such as "man : woman :: computer programmer : homemaker" are automatically generated by models trained on biased word embeddings |

SkyHive Employs Different Bias Mitigation Methods

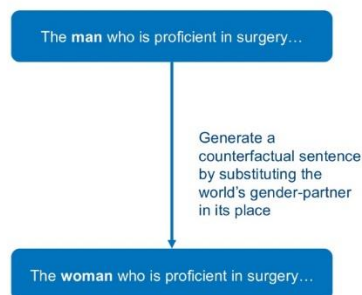
SkyHive takes the approach of creating a dataset and allowing the model to measure the bias to measure it correctly and then subtract the effect of that bias on the outcome.

- The biased data contains the following features: gender (male and female), years of experience, and career. The algorithm extracts skills given these features and compensation recommendations etc.
- The data features are designed to have
 - A positive relationship between years of experience and salary
 - Males earn more money relative to females
 - Certain locations will extract more skills
 - Bias in degrees from certain universities
- SkyHive then extracts the prediction-specific interactions to cancel their effect. SkyHive uses the XGBoost method with Shapley Additive Explanation to extract feature contributions at individual prediction levels. We use the same technique to extract the weights from hand coded interactions (L1 or L2 linear regression derivatives).
- The last step is to cancel all the influence driven by the biased variables.



Counterfactual Data Remedies

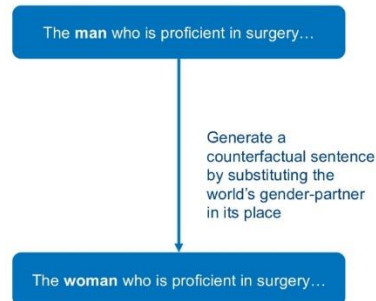
Duplicating examples and swapping gendered terms in training data can help with debiasing word embeddings, pretrained language models, and coreference resolution models.



Counterfactual Data Remedies

Requires a curated list of words to substitute. This has to be curated for different languages.

Gender swapping is much harder in languages where the adjectives, articles, and pronouns that agree with these nouns also adjust to comply with gender



Other Techniques

- Data Augmentation
- Gender Tagging
- Bias Fine Tuning
- Hard Debiasing
- Learning Neutral Embeddings
- Constraining Predictions
- Adjusting Adversarial Discriminator



Futures literacy: anticipating skills needs through future(s) scenarios

14 January 2025, Aarhus



1. Draw one card from the Future(s) Icebreaker Cards pile.
2. Find one person to pair with. Introduce yourself to the other person and say what institution you represent.
3. Then read aloud the questions on your cards.
4. Each person can choose one of the two questions and then answer them in conversation with their partner. This takes about 90 seconds.
5. After this time has elapsed, the other person answers their chosen question. This lasts for another 90 seconds.
6. After 3 minutes you will hear a sound marking the end of the meeting. Exchange cards and look for a new person to pair up with.
7. The 3-minute meeting according to the above pattern starts again with a new person.



What's this?



© CC BY SA <https://digibetnismuseum.no/011025220196/mobils telefon>



What's this?



30 years ago...
Motorola International 3200,
first digital hand-held
Introduced in 1992
½ - 1 hour talktime

© CC BY SA <https://digitalmuseum.no/011025226998/mobiletelefon>



What's this?



What's this?

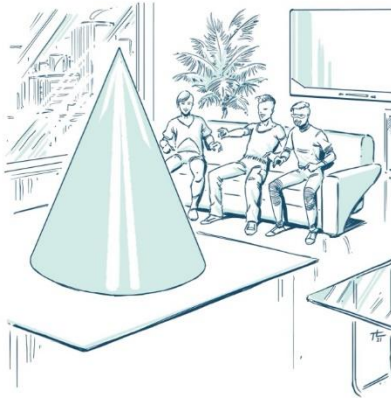
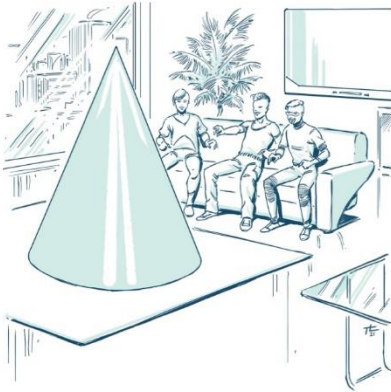


You're living in 1992.

Someone asks you to try to
imagine that you're living 30
years into the future - in 2025.

The photo shows a very
common object in 2025.
What is it???





Imagine that you're living 26
years from now, in the
2050s.

This is a very common scene
in the 2050s.

What's happening here???



The future will be.....



The future will be.....
DIFFERENT



Goal & expected outcomes of the workshop

Enhance Futures Literacy skills of participants via working with the notions of uncertainty and scenarios.
Facilitate development of alternative scenarios of the food system transition in a 15-year perspective, **and insights** regarding potential future threats and opportunities, recommendations and new skills, related to different aspects of food system.



Agenda

Introduction to foresight, futures literacy and scenarios,
Presenting the results of the pre-workshop exercise:

- ▷ List of uncertainties underlying the future of the the food system transition in a 16-year perspective with projections

Launching the group scenario-making exercise.



D5.1 - Report on specific/technical
and transversal skills courses for mentors

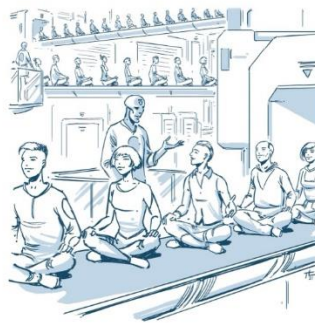


Introduction to foresight, Futures Literacy and scenarios



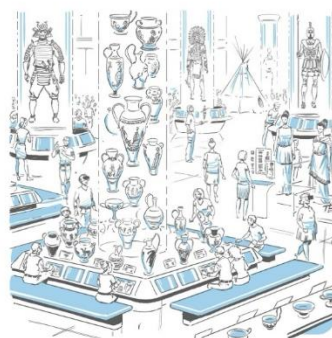
How we can think about the future?

The future is **not predictable**. We are therefore forced to consider what the plausible futures are. The future is **not totally predetermined**. There is an infinite number of potential alternative futures, some of which may be more probable than others. To some extent, **future can be shaped** by our choices in the present. Even though we cannot determine which of the infinite possibilities for a future will eventuate, we can influence the probability of a certain outcome with our choices (both actions and indications) in the present.



What is foresight? 1/2

Foresight is a process that enhances persons' or organisations' abilities to understand all the internal and external factors and alternative decisions that form the space of possible, plausible, probable or preferred futures paths.



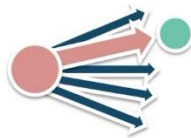
What is foresight? 2/2

Thanks to such knowledge, persons and organisations are able to **identify issues that are of major importance for the future and the present**, they have a better understanding of what is relevant and what can be ignored, and they are better informed to make strategic and visionary decisions facilitating their long-term plans and objectives.



Foresight goes beyond forecasting

FORECAST \rightleftharpoons **FORESIGHT**



Two fundamentals of foresight

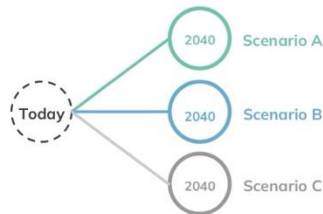
01
360 degree view of a given system



Recognising & understanding trends and early signals of change

Based on: C. Daheim (EMCDDA, 2022)

02
Anticipating alternative futures



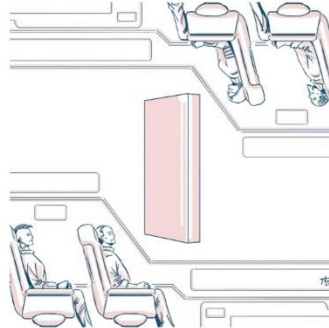
Mapping out options for different scenarios. Embracing uncertainty.



Unique value proposition of foresight 1/2

The key value of foresight lies in its ability to obtain sufficient details (insights) on the external situation sufficiently **early** to enable an internal organisational **response**, such as:

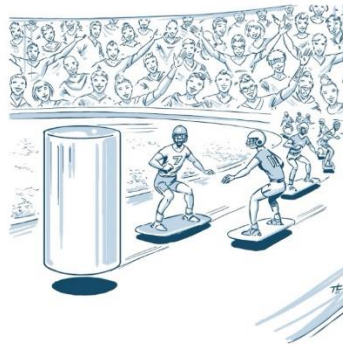
- ▷ taking advantage of emerging opportunities by changing organisational goals or
- ▷ addressing potential adverse consequences of emerging threats by taking adaptive, mitigative or preventive actions related to existing organisational goals.



Unique value proposition of foresight 2/2

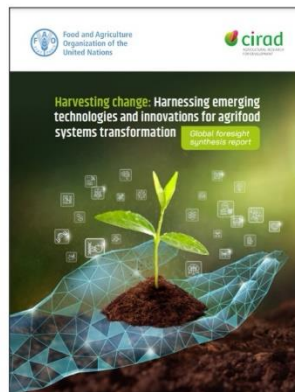
To sum up, the main benefits of **foresight** are as follows. Foresight:

- ▷ helps decision-makers develop and make choices,
- ▷ challenges long-held beliefs and/or orthodoxies,
- ▷ focuses resources and attention of decision-makers,
- ▷ helps prevent and anticipate certain developments.



Example - agrifood systems

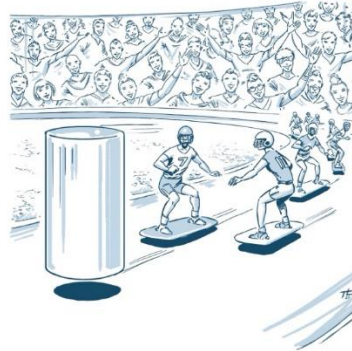
The horizon scanning and strategic foresight on emerging technologies and innovations in the agrifood systems was developed to inform strategic long-term planning for a conducive policy environment to ensure that technologies and innovations are effective, inclusive and sustainable, and can address intertwined and complex challenges facing agrifood systems.



Why scenario-thinking

People (still) tend to imagine the future as a continuation of the present

- ▷ In an ever changing reality of disruptions:
 - ▷ September 11th
 - ▷ Financial crisis 2007
 - ▷ Pandemic
 - ▷ Ukraine war...



 The Futures Literacy Company

Scenario planning–The Oxford Approach

Scenarios in OSPA are **NOT**:

- Data or facts
- Predictions
- About preference or probability
- About the self
- For anyone
- Truthful & timeless
- A number or projection
- A product

...but rather:

- Surfaced assumptions
- Structured fictions
- Plausible, purposeful
- About the context
- For someone
- Useful (and disposable)
- A 'reframing support'
- A dynamic process of inquiry



 The Futures Literacy Company

What scenarios can/cannot do

Help people imagine and discuss future developments of a given topic or focal area.
 Test the robustness of a set of possible actions.
 Support anticipatory decision-making.
 Help reframe the present situation.

Predict the future.
 Produce 100% comprehensive depictions of the future.
 Guarantee any choice today will actually be relevant when the future comes.

SCENARIOS => a tool, a means to an end, not an end in itself

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The Scenario Planning Method

What is it?

A structured process for envisioning multiple possible futures and developing strategies to address them.

Key Features:

- Holistic: considers a wide range of interconnected factors, not just isolated trends.
- Multifaceted: explores diverse possibilities, not just a single "most likely" outcome.
- Insightful: reveals complex interactions and potential disruptions.
- Equally Probable and Preferable: each scenario is developed to be as likely and desired as any other.



Benefits of using Scenario Planning Method

Reduces Uncertainty:

- Identifies potential risks and opportunities
- Enables proactive risk management
- Builds resilience to unexpected events
- Helps to navigate a complex future with greater confidence

Supports Decision-Making:

- Tests strategies against different futures
- Facilitates more informed and effective decisions
- Encourages stakeholder engagement

Fosters Innovation and Adaptation:

- Stimulates creative thinking and problem-solving
- Uncovers new possibilities and pathways
- Promotes flexibility and adaptability to change

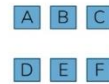
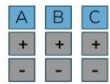
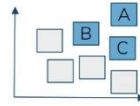
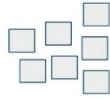


How the scenarios were created?



How the scenarios are developed*

1. Identifying factors that influence a given system/ topic of the analysis
2. Prioritizing key factors (drivers of change in a given system)
3. Developing projections of key factors (drivers)
4. Creating clusters of projections of uncertainties
5. Creating and describing alternative scenarios



*There are many approaches to scenario making

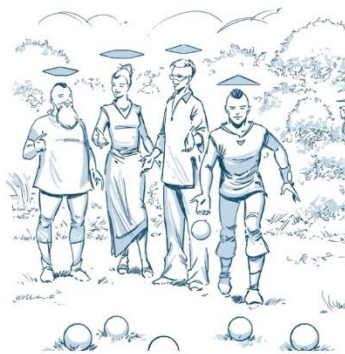


Results of the pre-workshop RvW exercise



Rip van Winkle exercise

The future of the food system transition in a 15-year perspective



What was the task 1/2

Imagine that you are able to talk to a person from the future – who lives in the year 2040 and is able to correctly answer any question about the world in 2040. You can ask this person up to **5 questions in order to find out more about the way in which** food system transition is taking place **in 2040**. Please choose your questions wisely to obtain valuable insights, which could support strategic decisions during the next 17 years.

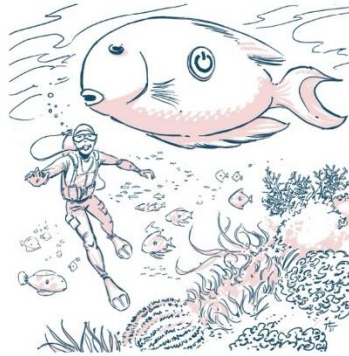


What was the task 2/2

Each question must have **a yes or no answer** and none can be contingent on a previous question.

Example:

- ▷ Correct phrasing: Is teleportation available in 2040?
- ▷ Wrong phrasing: How many teleportation devices are there in the world in 2040?
If any - how expensive is it to use one? (doesn't have a yes/no answer; contains contingency)



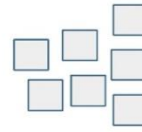
Identifying and defining uncertainty with RvW method

- ▷ The questions that the experts formulate reveal certain aspects of the future which they are **uncertain** about.
- ▷ The number of questions that the experts may ask is limited, forcing them to focus on the **most important** uncertainties that might influence the topic under discussion.



Linkages between uncertainty and scope of knowledge

Results of Step 1



Collecting RvW questions

80

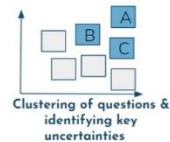
Valid YES/NO questions about the future of food system transition in 2040

Identified uncertainties (examples)

- Are animal proteins still the one of the three main protein sources of human diet?
- Is 3D printing a widely used technology for food production?
- Have international efforts and policies mitigated climate change impacts on global agriculture and food security by 2040?
- Are non-thermal processing technologies the main processing technologies used by the industry to produce foods?
- Will EU food system be sustainable?
- Do all food retailers need to obtain a special certification on Food & Planet, in order to start a business?
- Is food affordable among the different social classes?
- Is food substantially safe?
- in respect to the last decade, consumption of meat from livestock has reduced?
- are there enough arable lands to guarantee sufficient crop production?
- Will food security highly improved at global level by 2040?
- Has Europe largely adopted a low carbon diet (along the lines of the 'Eat Lancet' Report)?
- Is food grown in vertical factories?
- Will food safety agencies be routinely sampling and analysing foodstuffs for microplastics and associated toxins the way they now do for chemical contaminants?

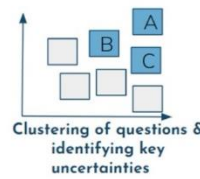
Results of Step 2

1. Sustainable and net-zero food system
2. Sustainable and net zero diet and eating practices
3. New technologies for sustainability of food system
4. Education in food (system) sustainability
5. Food production: self-sufficiency, farming, vertical farming
6. Sustainable packaging of food
7. Sustainable food supply chains and retail
8. Emerging technologies of food production and processing
9. Tech & diet, nutrition and eating habits
10. Edutech for new green and digital skills in agrifood sector
11. Meat, proteins, plant-based diet & alternative food sources
12. Incentives and other economic tools and mechanisms to promote a sustainable food system
13. Food security
14. Food safety
15. Eating habits and health



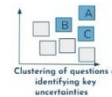
Results of Step 2

- 16. Policies and global efforts related to climate change mitigation and adaptation
- 17. Policies and regulations related to food sustainability & safety
- 18. Europe's position in the global food system
- 19. Food waste
- 20. Availability and cleanliness/pollution of natural resources: water, air and soil



Step 2 (another view)

| Political (policies) and regulatory | Economic | Societal | Technological | Environmental | Education |
|--|---|---|--|--|--|
| Food safety Policies and global efforts related to climate change mitigation and adaptation Policies and regulations related to food sustainability & safety | Food production: self-sufficiency, farming, vertical farming Incentives and other economic tools and mechanisms to promote a sustainable food system Food security Europe's position in the global food system | Sustainable and net zero diet and eating practices Meat, proteins, plant-based diet & alternative food sources Eating habits and health | New technologies for sustainability of food system Emerging technologies of food production and processing Tech & diet, nutrition and eating habits Edutech for new green and digital skills in agrifood sector | Sustainable and net-zero food system Sustainable packaging of food Sustainable food supply chains and retail Food waste Availability and cleanliness/pollution of natural resources: water, air and soil | Education in sustainability of food (system) |

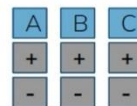


These are the key **driving factors**, which can influence the future of the food system transition (*according to survey participants)



Results of Step 3

| Clusters of uncertainties | Projection (Min) | Projection (Max) |
|---|------------------|------------------|
| Sustainable and net zero diet and eating practices | | |
| Meat, proteins, plant-based diet & alternative food sources | | |
| Eating habits and health | | |
| Education in sustainability of food (system) | | |
| Food safety | | |
| Policies and regulations related to food sustainability & safety | | |
| Policies and global efforts related to climate change mitigation and adaptation | | |



Developing projections



| Clusters of uncertainties | Projection (Min) | Projection (Max) |
|---|--|--|
| Sustainable and net zero diet and eating practices | Consumers have reverted to traditional and unsustainable eating practices, moving away from a plant-based diet and opting for high-carbon foods, thereby blocking the transformation of the global food system toward a sustainable one. | The majority of the world's population has opted for a zero-carbon and primarily plant-based diet, making it - coupled with pressure on policymakers - an extremely important driver of the transformation of the food system toward a fully sustainable one. |
| Meat, proteins, plant-based diet & alternative food sources | Alternative sources of protein, such as insects, laboratory-produced meat and high-protein plant products, have been rejected by consumers and not only have they failed to enter the mainstream, but their consumption has dropped significantly from 2024. Consumption of industrially produced meat from livestock, on the contrary, has significantly increased relative to 2024 and is the most important source of protein for the vast majority of the global population. | Alternative sources of food have become common, cheap and widely available, and eating lab-grown meat, new plant-based products and insects has been widely accepted by most of the global population. Industrial production of livestock meat has been banned, and eating meat from livestock is a niche practice and seen as an exclusive barbarism. |
| Eating habits and health | Most of the population eats based on general, one-size-fits-all rules and does not tailor food to their individual needs and specificities, and obesity, malnutrition and food-related diseases have become a real scourge. Mostly highly processed food is eaten. Most of the food is prepared by ourselves in our own kitchens. | Personalized nutrition has become a common mainstream practice and has eliminated the problem of majority of food-related diseases, obesity, as well as malnutrition. Almost no processed food is eaten. There are no kitchens in our apartments and we do not prepare food ourselves. |



Developing projections



| Clusters of uncertainties | Projection (Min) | Projection (Max) |
|--|--|--|
| Education in sustainability of food (system) | There has been a failure to create attractive, relevant and quality programs related to education for sustainable food system, making it a marginalized, disliked and unpopular field. There is a lack of competent educators and publicly available reliable knowledge about sustainable food system. As a result, the level of competence in this area among the majority of the European population is close to zero. Educational programs on sustainable agriculture and food technology do not address the real needs of a sustainable food system, making them unattractive educational choices. Their meager quality translates into the fact that new agrifood professionals are poorly educated, have not possessed new green and digital skills, and their competencies do not resonate with the new job market in this area. | Education related to the sustainable food system is present at all levels of education, is relevant, high-quality, widely available, and popular, and sustainable food advisors and educators support different social and age groups in making the best choices. High-quality educational programs on sustainable agriculture and food technology - adequately developing green and digital skills - available both at universities and through informal vocational education - have produced a highly-competent cadre of agrifood professionals in Europe. Their knowledge and skills not only resonate with the needs of the new labor market, but also have transformative power, bringing real-ethical and sustainable - innovation to the system. |
| Food safety | Food, to a huge extent, is not safe. | Food is substantially safe. |
| Policies and regulations related to food sustainability & safety | Sustainable food and its safety is not a priority for any public policies, and those policies that address these topics in any way are not guaranteed any effective implementation mechanisms, and are therefore dead. Nor are there any effective control measures related to food at any stage of supply chains. | Food policies adequately and significantly address food-related topics such as health, safety, agricultural diversification, and food safety institutions effectively and widely implement them, auditing producers, supply chains, distributors, retailers, as well as the food itself (including for microplastics and other toxins). |



Developing projections



| Clusters of uncertainties | Projection (Min) | Projection (Max) |
|---|--|---|
| Policies and global efforts related to climate change mitigation and adaptation | International efforts and policies have failed to mitigate the negative impacts of climate change on global agriculture and food security. | International efforts and policies mitigated climate change impacts on global agriculture and food security. |
| Food production: self-sufficiency, farming, vertical farming | Households in Europe hardly ever grow vegetables and fruits for their own use. Food is hardly ever produced in vertical farms. | Most households in Europe grow at least some fruits and vegetables for their own consumption. Vertical farms have become a common and popular way to produce food. |



Developing projections



| Clusters of uncertainties | Projection (Min) | Projection (Max) |
|---|--|---|
| Incentives and other economic tools and mechanisms to promote a sustainable food system | There are no economic incentives and mechanisms to support the production, distribution, retail and consumption of sustainable food. | There are many effective, attractive and diverse economic incentives and mechanisms to support the production, distribution, retail and consumption of sustainable food. |
| Food security | Food insecurity affects almost the entire global population. Only small enclaves of the richest people have regular access to food. | Food security is 100 percent. Food resources fully cover the needs of all social groups and classes. |
| Europe's position in the global food system | Europe's food industry is uncompetitive and irrelevant internationally. | EU food industry is leading and is highly competitive at the international level. |
| New technologies for sustainability of food system | High-energy technologies are used in food production, and food waste has increased due to the use of new technologies. | The development of new energy-efficient technologies and biotechnologies has led to the creation of a zero-net circular economy and the reduction of food waste to almost zero. |
| Emerging technologies of food production and processing | Artificial intelligence is not widely used to improve the efficiency of food production, distribution, supply chain management and has not eliminated human manual labor. Biased AI systems lead to serious disruptions in the global food system, basing their predictions on statistical averages inadequate to local contexts. [alternative] AI is used to produce low-quality food and, through deep-fakes, promotes highly unsustainable patterns of food production and consumption. | AI and automation are widely used to enhance food production, distribution, and supply chain management, increasing efficiency and reducing manual labor. AI is widely used as a tool in designing high quality and safe food and promoting sustainable food system. |



Developing projections



| Clusters of uncertainties | Projection (Min) | Projection (Max) |
|---|---|--|
| Emerging technologies of food production and processing | Emerging technologies play virtually no role in the production and processing of food. | Emerging technologies - such as 3D printing, laboratory food production, non-thermal food processing - are widely used for food production and processing. |
| Tech & diet, nutrition and eating habits | AI used for personalised diets collects extensive biophysiological and medical data on its users for Big (Bio)Techs purposes, applies behavioural manipulation and conditions consumers to specific type of food and eating habits, which serve to generate corporate profit. | Consumers use AI for diet / nutritional purposes which translates into more balanced, individually appropriate and healthy diet. |
| Edutech for new green and digital skills in agrifood sector | The human being is the main actor in the process of upskilling and reskilling of food professionals which takes place virtually without the involvement of AI. | AI has replaced academic training and VET for upskilling and reskilling of food professionals. |
| Sustainable and net-zero food system | The food system is carbon-intensive and radically unsustainable. | The food system achieved the ability to produce food at net zero emissions. |
| Sustainable packaging of food | Packaging is unsustainable, disposable and produces a lot of non recyclable waste. | Packaging is fully sustainable and based on the reuse principle. |



Developing projections



| Clusters of uncertainties | Projection (Min) | Projection (Max) |
|--|---|--|
| Sustainable food supply chains and retail | The food system is based on long supply chains, retail is not controlled in any way and does not promote sustainable food. | All food retailers need to obtain a special certification on Food & Planet in order to start a business and alternative food networks (AFNs) achieved the capability to spread as a large-scale alternative to the conventional food supply chain. |
| Availability and cleanliness / pollution of natural resources: water, air and soil | There are very serious shortages of water, clean air and soil. All these resources are seriously polluted and contaminated. | Water, air and soil are available and clean. |



Developing projections



Step 4: Creating clusters of projections of uncertainties



Futures Scenarios of Agrifood System through 2040



Please, scan this qr code to access scenarios!



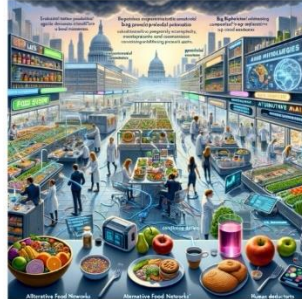
Scenario 1: The Great Food System Paradox: Excellence Without Access

- Food insecurity affects almost the entire global population. Only small enclaves of the richest people have regular access to food.
- Most of the population eats based on general, one-size-fits-all rules and does not tailor food to their individual needs and specificities, and obesity, malnutrition and food-related diseases have become a real scourge.
- High-quality educational programs on sustainable agriculture and food technology - adequately developing green and digital skills - available both at universities and through informal vocational education - have produced a highly-competent cadre of agrifood professionals in Europe. Their knowledge and skills not only resonate with the needs of the new labor market, but also have transformative power, bringing real - ethical and sustainable - innovation to the system.
- Biased AI systems lead to serious disruptions in the global food system, basing their predictions on statistical averages inadequate to local contexts.
- Most households in Europe grow at least some fruits and vegetables for their own consumption.
- Vertical farms have become a common and popular way to produce food.



Scenario 2: The Regulated Revolution

- All food retailers need to obtain a special certification on Food & Planet in order to start a business and alternative food networks (AFNs) achieved the capability to spread as a large-scale alternative to the conventional food supply chain.
- Emerging technologies - such as 3D printing, laboratory food production, non-thermal food processing - are widely used for food production and processing.
- AI used for personalised diets collects extensive biophysiological and medical data on its users for Big (Bio)Techs purposes, applies behavioural manipulation and conditioning consumers to specific type of food and eating habits.
- There are no kitchens in our apartments and we do not prepare food ourselves.
- The food system achieved the ability to produce food at net zero emissions.
- The human being is the main actor in the process of upskilling and reskilling of food professionals which takes place virtually without the involvement of AI.
- Europe's food industry is uncompetitive and irrelevant internationally.



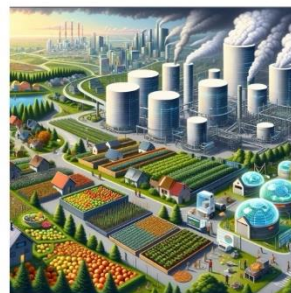
Scenario 3: AI-Mediated Food Transformation

- The majority of the world's population has opted for a zero-carbon and primarily plant-based diet, making it - coupled with pressure on policymakers - an extremely important driver of the transformation of the food system toward a fully sustainable one.
- Alternative sources of food have become common, cheap and widely available, and eating lab-grown meat, new plant-based products and insects has been widely accepted by most of the global population. Industrial production of livestock meat has been banned, and eating meat from livestock is a niche practice and seen as an exclusive barbarism.
- Food is substantially safe.
- Personalized nutrition has become a common mainstream practice and has eliminated the problem of majority of food-related diseases, obesity, as well as malnutrition.
- Consumers use AI for diet / nutritional purposes which translates into more balanced, individually appropriate and healthy diet.
- AI has replaced academic training and VET for upskilling and reskilling of food professionals.
- AI used for personalised diets collects extensive biophysiological and medical data on its users for Big (Bio)Techs purposes, applies behavioural manipulation and conditioning consumers to specific type of food and eating habits, which serve to generate corporate profit.
- AI and automation are widely used to enhance food production, distribution, and supply chain management, increasing efficiency and reducing manual labor.



Scenario 4: The Security-Sustainability Dilemma

- Food security is 100 percent. Food resources fully cover the needs of all social groups and classes.
- The food system is carbon-intensive and radically unsustainable.
- Most households in Europe grow at least some fruits and vegetables for their own consumption.
- There are many effective, attractive and diverse economic incentives and mechanisms to support the production, distribution, retail and consumption of sustainable food.
- High-energy technologies are used in food production, and food waste has increased due to the use of new technologies.
- AI and automation are widely used to enhance food production, distribution, and supply chain management, increasing efficiency and reducing manual labor.



Working with scenarios - connecting the dots and adding contexts - what is missing here?



Step 5: Sense-making exercise in groups



1. Each subgroup will focus on one of the following scenarios:

- Scenario 1: The Great Food System Paradox
- Scenario 2: The Regulated Revolution
- Scenario 3: AI-Mediated Food Transformation
- Scenario 4: The Security-Sustainability Dilemma

1. Within your assigned scenario, answer questions specific to each category:

- Production
- Processing
- Distribution, Retail, and Access
- Consumption
- Waste
- Society and Culture
- Food Safety
- System Dynamics and Power Shifts

1. Identify (or invent) relevant new skills



D5.1 - Report on specific/technical and transversal skills courses for mentors



“

*“It ain't what you don't know that gets you into trouble.
It's what you know for sure that just ain't so.”*

Mark Twain



Let's stay in touch:

THANK YOU!
bartek@4cf.pl



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GEEK4FOOD



Welcome to the workshop



Global Ecosystems and Expanded Knowledge for green skills and capability in the Food Sector

Addressing green skills needs in the Agri-food sector

Identifying and delivering emerging green skills
University's Conference Center, Frohrik Natteros, Via 2-4, 8000 Aarhus C, room Richard Mortensen
Sterns, building 1422/122 (the venue can be reached by tram: Lønbane L2)

Tuesday 14th JANUARY 9:30 – 16:00

- 8:30-9:00** Networking breakfast and registration
- 9:00-9:20** **GEEK4Food: Building a community for green skills development**
Paola Pittis, GEEK4Food Coordinator, Teramo University
Mario Roccaro, GEEK4Food co-coordinator, EST Food
- 9:20-10:00** **The role of AI in identifying and understanding skill needs and demands**
Mohan Reddy, SkyHive by Cornerstone OnDemand
- 10:00-10:15** Coffee break
- 10:15-11:45** **Futures literacy: anticipating skills needs through future scenarios**
Bartosz Frackowiak, 4CF The Futures Literacy Company
- 11:45-12:45** **Plenary sharing of skill needs insights**
- 12:45-13:30** Lunch break
- 13:30-14:00** **GEEK4Food framework for understanding and addressing learner needs**
Milena Cornejo, Aarhus University
- 14:00-14:20** **Plenary sharing on learning objectives**
- 14:20-14:45** Coffee break
- 14:45-15:30** **From local to global: adaptable principles for education and training**
Milena Cornejo, Aarhus University
- 15:30-16:00** Closing reflections and certificates





Futures literacy: anticipating skills needs through future scenarios

Bartosz Frackwokiak,
4CF The Futures Literacy Company



- Evaluate how the scenario proposed will influence the food value chain





- **Next step: identify which new skills are needed for Agri-food sector based on your scenario**

skill
 noun [C or U]
 us ˈskɪl / uk ˈskɪl /
 Add to word list

sk
 an ability to do an activity or job well, especially because you have practiced it:



- **Discuss: How can best deliver these skills in your environment/institution/society?**



GEEK4Food framework for understanding and addressing learner needs
 Milena Corredig, Aarhus University



Teaching 101: the course syllabus

| | |
|-----------------------------------|---|
| Course information | Title, dates, times, instructor details, contact information and methods of communication |
| Course description and objectives | Overview and objectives |
| Learning outcomes | Skills and knowledge LEARNERS are expected to gain |
| Course schedule | Weekly topics important dates |
| Assessment | ..., dates |
| Readings | Material and references |
| Policies | Attendance, late submissions, academic integrity etc. |

By the end of the course the learners will have acquired ... i.e. hands-on experience in ... [specific skill] or knowledge of..... They will be able to confidently apply this skill in their professional environment, demonstrating improved efficiency and effectiveness. Participants will also gain insights into best practices and common pitfalls, enabling them to troubleshoot and optimize their use of the skill. Additionally, they will leave with a set of resources and strategies for continued learning and development in this area.



GEEK4Food framework for understanding and addressing learner needs

Milena Corredig, Aarhus University



[JRC report: GreenComp. The European sustainability competence framework.](#)



JRC report: GreenComp. The European sustainability competence framework.



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Creating the module structure and content

1. **Balance theoretical knowledge with practical application.**
2. **Include as much interactive elements as possible.** Use group work, discussions, interactive exercises, peer-to-peer learning, flipped classroom.
3. **Assessment and reflection are part of the learning:** it ensures high level of awareness.
4. **Don't underestimate time management:** ensure that learners (and you!) stay engaged without feeling overwhelmed.



Content creation

1. **The challenge-based lecture** integrates real-world challenges or problem solving into the learning process.
2. **Content sessions** break down the material into three core topics for a more focused learning experience. Each content area can be presented with its own set of key concepts
3. **The case study activities** provide opportunities for learners to apply.
4. **Refining solutions** here the learners could be exposed to feedback, reflect, critically review and analyze
5. **Assessment**
6. **Training evaluation** important for identifying gaps and opportunities.

| |
|---------------------------------------|
| Title of the module |
| 1 challenge-based lecture |
| Content part 1 |
| Content part 2 |
| Activity based content – case study 1 |
| Content part 3 |
| Activity based content – case study 2 |
| Refining solution/ concluding session |
| Assessment |
| Training evaluation |

D5.1 - Report on specific/technical and transversal skills courses for mentors



Creating the right level of content

... summing up the learning objectives

BLOOM'S TAXONOMY

| | |
|-------------------|--|
| Create | Use Existing Information to make something new Invent, Develop, Design, Compose, Generate, Construct |
| Evaluate | Make judgments based on sound analysis Assess, Judge, Defend, Prioritize, Critique, Recommend |
| Analyze | Explore relationships, causes, and connections Compare, Contrast, Categorize, Organize, Distinguish |
| Apply | Use existing knowledge in new contexts Practice, Calculate, Implement, Operate, Use, Illustrate |
| Understand | Grasp the meaning of something Explain, Paraphrase, Report, Describe, Summarize |
| Remember | Retain and recall information Reiterate, Memorize, Duplicate, Repeat, Identify |

helpfulprofessor.com



3 areas
15 competences



D5.1 - Report on specific/technical and transversal skills courses for mentors

Value creation in every sphere of life



ENTRECOMP REFERENCE FRAMEWORK AND LEARNING OUTCOMES

Learning outcomes are statements of what a learner knows, understands and is able to do after completion of learning (Cedefop, 2009). These statements can be designed and used for educational planning and curriculum development or for different types of accountability such as legal or professional accountability (Probst, 2018). Entrepreneurial learning can hardly be reduced to fixed pre-specified statements of learning outcomes since it deals with the creation of value that does not exist prior to the entrepreneurial learning process and cannot be foreseen in abstraction.

However, learning outcome statements are considered as crucial to make the framework actionable. EntreComp learning outcomes have been developed as references for different purposes. They could be used in the formal education and training sector for curricula design. In a non-formal learning context, they could be used to inspire the creation of programmes which aim to foster entrepreneurship within existing organisations. They could also be used to guide the definition of tailored pedagogical, assessment methods, and learning environments that foster effective entrepreneurial learning. Thus, EntreComp learning outcomes should not be taken as normative statements to be directly transposed into actual learning activities, or be used to measure student performance. They are a basis for the development of specific learning outcomes that are fit for the specific context and a basis for the development of performance indicators. Though comprehensive, the list of learning outcomes below is not exhaustive as it aims to support transversal adaptability across educational contexts and application sectors.

| Area | Competence | Hint | Level of proficiency | | | | | | | | | |
|-------------------------------------|---|---|----------------------|---------|------------|---------|--------------|---------|----------|-----------|---------|--|
| | | | Progression | | Foundation | | Intermediate | | Advanced | | Expert | |
| | | | Discover | Explore | Experiment | Develop | Improve | Refine | Transfer | Transform | | |
| 1. Identify and seize opportunities | Identify and seize opportunities to create value by responding to social, cultural and economic landscapes that need to be met. Establish new connections and bring together resources. Create opportunities to create value. | Identify and seize opportunities to create value by responding to social, cultural and economic landscapes that need to be met. Establish new connections and bring together resources. Create opportunities to create value. | Level 1 | Level 2 | Level 3 | Level 4 | Level 5 | Level 6 | Level 7 | Level 8 | Level 9 | |
| | | | Level 1 | Level 2 | Level 3 | Level 4 | Level 5 | Level 6 | Level 7 | Level 8 | Level 9 | |



Discuss:
From Local to Glocal...
5 principles for adaptability of
(your) skills training





**Co-funded by
the European Union**

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