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SUSTAINAKIT

TOWARDS A SUSTAINABLE
AND KM 0 COOKING EDUCATION

SUSTAINAKIT HANDBOOK



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SustainaKit: TOWARDS A SUSTAINABLE AND KM 0 COOKING EDUCATION

Work package n°2 - Good Practices Handbook

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Module 1: The Importance of Sustainability in Culinary VET Centres

Introduction

This handbook has been developed within the framework of the SustainaKit project (2024-1-SK01-KA220-VET-000243313), co-funded by the European Union. It forms part of a series of Good Practices Handbooks designed to support culinary Vocational Education and Training (VET) centres in integrating sustainability into their curricula, daily operations, and institutional culture. The project responds to the growing need for culinary education to prepare learners for a food and hospitality sector in which environmental responsibility, efficient resource use, social awareness, and economic resilience are increasingly part of professional practice.

Module 1 introduces learners and educators to the foundations of sustainability in culinary VET. It explains why sustainability has become essential for food systems and gastronomy, where decisions about sourcing, preparation, consumption, waste, energy, and water have direct environmental, economic, and social consequences. Particular attention is given to the three interconnected pillars of sustainability - environmental, economic, and social - and to the need for a holistic approach that balances responsible use of natural resources, long-term viability, fairness, inclusion, well-being, and high professional standards.

The module also focuses on the practical difference between sustainable and unsustainable culinary operations. Learners are encouraged to recognise how everyday kitchen routines can contribute to change through seasonal and local sourcing, food-waste prevention, efficient use of energy and water, reduction of unnecessary disposable materials, ethical procurement, and responsible menu planning. In this way, sustainability is presented not as an isolated theoretical topic, but as a professional competence that can be embedded in training kitchens and transferred directly to restaurants, catering services, hotels, and other food-related workplaces.

A central theme is the role of culinary VET centres as agents of sustainable transformation. Because these institutions shape the knowledge, skills, attitudes, and values of future chefs and hospitality professionals, they can act as role models and living laboratories of responsible practice. The module therefore explores how sustainability can be integrated into curricula, school policies, routines, learning outcomes, projects, assessments, partnerships with local producers and industry, and the wider institutional culture. It also highlights the importance of teachers, trainers, students, employers, and local communities in building shared responsibility for sustainable change.

Module 1 further connects culinary sustainability with the evolving labour market and with European policy priorities. It considers how green skills and transversal competences - such as problem-solving, creativity, teamwork, communication, and responsible decision-making - support employability and help graduates adapt to changing job profiles in the food and hospitality sector. The module also introduces the European and national policy frameworks that support this transition, including wider priorities related to sustainable food systems, responsible consumption and production, and green skills development.

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Structured around three learning outcomes, the module combines theory with practical exercises, case studies, benchmarking, and self-assessment. It helps learners and educators evaluate current practices, identify realistic improvements, and apply sustainability principles confidently in day-to-day culinary education.

Learning Outcome 1: Understanding Core Sustainability Principles

Learners will be able to:

1. Describe the core principles of sustainability & explain why sustainability is essential in the culinary VET sector today
2. Differentiate between sustainable and unsustainable practices in culinary operations
3. Describe how sustainability is currently integrated in culinary VET curricula across Europe

Topic 1: Foundations of Sustainability in the Culinary Sector

1. Definition of sustainability and its core pillars & why sustainability is essential in the culinary VET sector today

2. Differentiating sustainable vs unsustainable practices in VET kitchens

3. Sustainability application across EU VET curricula

1. Definition of sustainability and its core pillars & why sustainability is essential in the culinary VET sector today

Sustainability has become a fundamental concept across education, industry, and policymaking, including the field of culinary vocational education and training (VET). As societies face increasing environmental, economic, and social challenges, sustainability has emerged as a key framework for responsible development and long-term resilience. In its most widely accepted definition, sustainability refers to meeting the needs of the present without compromising the ability of future generations to meet their own needs. This definition highlights the importance of balancing current demands with future responsibilities, a balance that is particularly relevant in sectors closely connected to natural resources and human well-being, such as food and gastronomy.

One of the most pressing sustainability challenges within European food systems is food waste, which has a direct link to environmental impact, resource efficiency, and economic loss. According to data published by Eurostat, the European Union generates more than 58 million tonnes of food waste each year, equivalent to approximately 130 kilograms per person annually. This waste is generated across the entire food chain, including households, food manufacturing, retail and distribution, primary production, and restaurants and food services. The significant contribution of the hospitality and culinary sector highlights the responsibility of professional kitchens—and by extension, culinary VET centres—to actively address food waste through sustainable practices and education.

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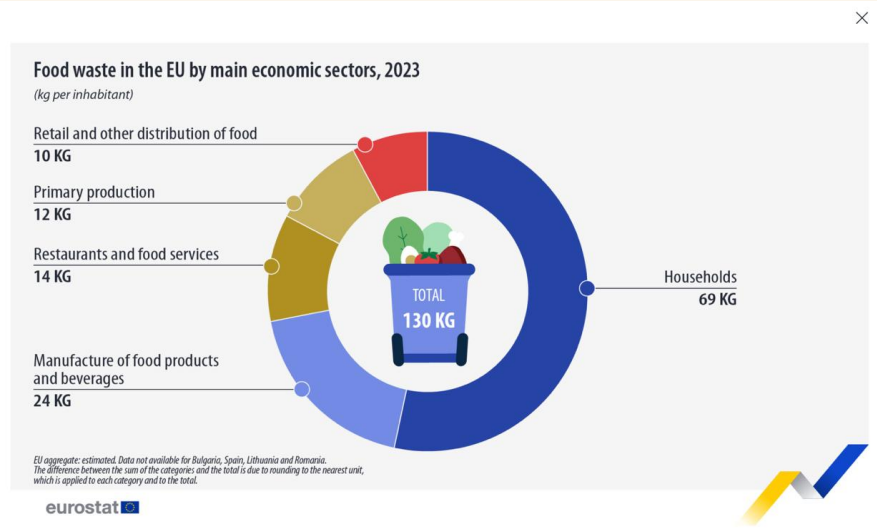


Figure **1**: The Food Waste by Sector in the EU

Source: Eurostat (2025). Food waste: early estimates. Available at: https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20251016-2

Within the culinary sector, sustainability addresses the entire food lifecycle, including how food is produced, processed, transported, prepared, consumed, and ultimately disposed of. Each stage of this lifecycle has a direct impact on the environment, the economy, and society. Culinary sustainability therefore requires a comprehensive and responsible approach that considers long-term environmental protection, efficient use of resources, economic viability, and social responsibility. For culinary VET learners, understanding this broader perspective is essential for developing professional competence that goes beyond technical cooking skills. At the core of sustainability are three interdependent pillars, which together form the foundation of sustainable culinary systems and guide decision-making in professional kitchens and training environments.

- **Environmental sustainability** focuses on protecting natural resources and minimising negative environmental impacts. In culinary contexts, this includes responsible sourcing of ingredients, reducing food waste, lowering greenhouse gas emissions, preserving biodiversity, and applying energy- and water-efficient practices in professional kitchens. It also involves raising awareness of issues such as climate change, soil degradation, and the environmental footprint of different food products.
- **Economic sustainability** ensures the long-term viability and resilience of culinary businesses and training institutions. It involves efficient resource management, cost control, reduction of food losses, and smart use of materials and energy. Supporting local and regional economies through short supply chains and sustainable procurement practices not only strengthens economic resilience but also reduces environmental impacts and creates closer connections between producers, kitchens, and communities.
- **Social sustainability** emphasizes fairness, inclusion, and well-being. In the culinary sector, this pillar relates to ethical labour conditions, food safety and hygiene, nutrition and public health, respect for cultural food heritage, and equal access to quality food and education. It also

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includes promoting diversity, inclusion, and responsible working practices in kitchens and food-related workplaces.

These three pillars are closely interconnected and must be addressed together. Focusing on only one dimension of sustainability can lead to imbalances and unintended consequences. For example, environmentally friendly practices that ignore social or economic aspects may not be viable in the long term. A holistic approach is therefore essential for achieving truly sustainable culinary practices.

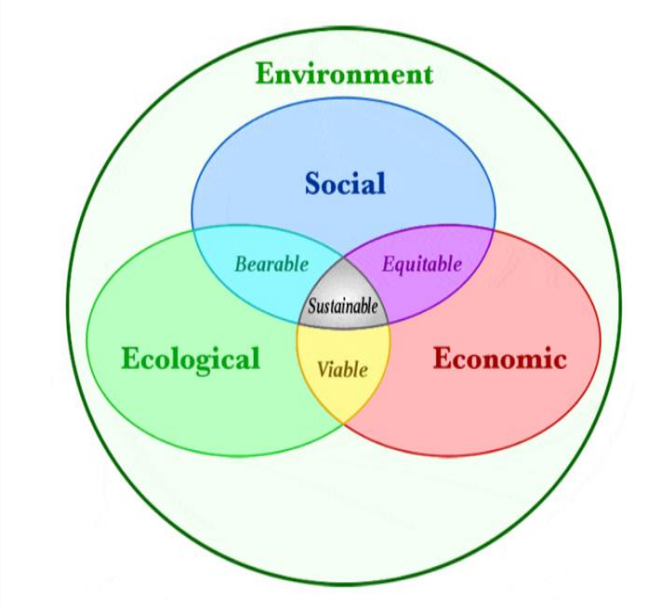


Figure **2**: The Three-Pillars of Sustainable Practice

Source: World Commission on Environment and Development (1987); three-pillar model of sustainability. Available at: https://en.wikipedia.org/wiki/Sustainability#/media/File:Visualization_of_pillars_of_sustainability.webp

Sustainability is particularly important in the culinary VET sector today due to the significant role food systems play in global challenges such as climate change, resource depletion, food waste, public health concerns, and social inequality. The hospitality and food service industries are among the highest contributors to energy consumption and food waste across Europe. As a result, culinary professionals are increasingly expected to understand the impact of their actions and to apply sustainable solutions in everyday practice.

Culinary VET centres play a crucial role in shaping the knowledge, skills, attitudes, and values of future chefs, kitchen staff, and food service professionals. These centres are often the first place where learners are introduced to professional kitchen environments and industry standards. By integrating sustainability principles into vocational education and training, VET centres ensure that learners are not only technically competent but also environmentally aware, socially responsible, and economically conscious professionals.

Moreover, sustainability education in culinary VET is closely aligned with key European priorities, including the European Green Deal, Agenda 2030, and the Farm to Fork Strategy. These initiatives highlight the importance of sustainable food systems, responsible consumption and production, and the development of green and transversal skills. In line with these priorities, employers across Europe

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increasingly expect graduates to demonstrate sustainability competences and to actively contribute to more responsible and resilient culinary operations.

By establishing a strong foundation in sustainability principles, culinary VET learners are better prepared to respond to current and future challenges in the food sector. This foundation enables them to make informed decisions, apply sustainable practices in their professional careers, and take an active role in the transition towards more sustainable, inclusive, and resilient food systems across Europe.

2. Differentiating Sustainable and Unsustainable Practices in VET Kitchens

Understanding the difference between sustainable and unsustainable practices is a key competence for learners in culinary VET centres. VET kitchens are not only spaces for developing technical cooking skills, but also learning environments where professional habits, attitudes, and values are formed. The routines and standards adopted during training strongly influence how learners will behave and make decisions in real professional kitchens throughout their careers.

In this context, sustainability must be understood as a daily practice, embedded in all aspects of kitchen operations, rather than as an abstract or theoretical concept. Culinary VET centres therefore have a responsibility to demonstrate sustainable practices through concrete actions and consistent routines.

Sustainable practices in VET kitchens aim to minimise negative environmental impacts, use resources responsibly, and promote ethical, efficient, and forward-looking kitchen management. These practices contribute not only to environmental protection but also to cost efficiency, food quality, and professional excellence. Key examples of sustainable practices include:

- **Planning menus based on seasonal, local, and responsibly sourced ingredients**, which reduces transport-related emissions, supports local producers, and increases learners' awareness of food origin and seasonality.
- **Applying food waste prevention measures**, such as accurate portioning, correct storage methods, stock rotation (FIFO principles), and creative reuse of surplus ingredients. These practices help learners understand the economic and environmental value of food.
- **Using energy- and water-efficient equipment** and encouraging responsible daily behaviours, including switching off appliances when not in use, using lids during cooking, and optimising cooking processes to reduce energy consumption.
- **Limiting the use of single-use plastics and disposable materials** by choosing reusable, recyclable, or biodegradable alternatives whenever possible, while still respecting hygiene and food safety standards.
- **Following ethical procurement principles**, including respect for animal welfare, fair labour conditions, transparent supply chains, and responsible purchasing decisions.
- **Maintaining high standards of food safety and hygiene** while avoiding unnecessary consumption of resources, demonstrating that sustainability and hygiene are complementary rather than conflicting objectives.

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Choosing zero-kilometer suppliers reduces environmental impact in two connected ways. First, shorter transport distances directly lower the greenhouse gas emissions associated with moving ingredients from producer to kitchen, since food transported by truck or air over long distances carries a significantly higher carbon footprint than produce sourced from nearby farms or markets. Second, local and zero-kilometer suppliers often distribute in bulk or in reusable containers rather than in individual plastic or cardboard packaging designed for long-distance retail logistics, meaning that reduced packaging waste frequently accompanies reduced transport emissions. As a practical exercise, learners can compare two versions of the same dish — one made with imported ingredients and one made with zero-kilometer alternatives — and estimate the difference in transport distance, packaging materials, and approximate CO_2 impact for each, developing a concrete understanding of how sourcing decisions shape a dish's overall environmental footprint.

By applying these practices consistently, VET kitchens act as role models of responsible culinary operations. Learners gain hands-on experience in sustainability and develop practical competences that can be directly transferred to professional workplaces.

In contrast, unsustainable practices in VET kitchens often result from insufficient awareness, lack of planning, limited resources, or reliance on outdated routines. These practices can undermine both sustainability goals and the educational mission of VET centres. Common examples include:

- **Excessive food waste** caused by overproduction, poor portion control, improper storage, or the absence of waste monitoring and reflection.
- **Frequent use of imported or highly processed ingredients**, even when sustainable and locally available alternatives exist, leading to higher environmental impacts and missed learning opportunities.
- **Inefficient use of energy and water**, such as leaving equipment running unnecessarily, using outdated appliances, or applying inefficient cleaning procedures.
- **Heavy reliance on disposable packaging and non-recyclable materials**, which increases waste generation and environmental pressure.
- **Ignoring social and ethical aspects**, including working conditions, responsible sourcing, nutritional quality, or cultural considerations related to food.
- **Limited reflection on long-term environmental, economic, and social consequences** of everyday kitchen decisions, resulting in short-term thinking and unsustainable habits.

Such practices not only increase operational costs and place unnecessary strain on natural resources but also contradict the role of VET centres as institutions that prepare learners for responsible and future-oriented professional practice.

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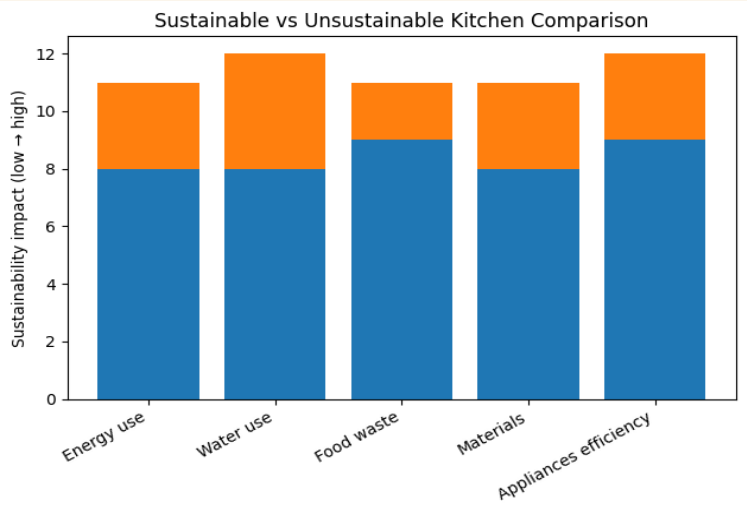


Figure **3**: Sustainable and Unsustainable Kitchen

Source: Based on data and principles from the European Commission (Circular Economy Action Plan), FAO (Food Waste and Sustainable Diets), and IEA (Household Energy Efficiency).

Learning to differentiate between sustainable and unsustainable practices supports the development of critical thinking, professional responsibility, and long-term awareness. It enables learners to evaluate everyday kitchen decisions, understand their broader impact beyond the immediate task, and recognise their role as active contributors to sustainable food systems.

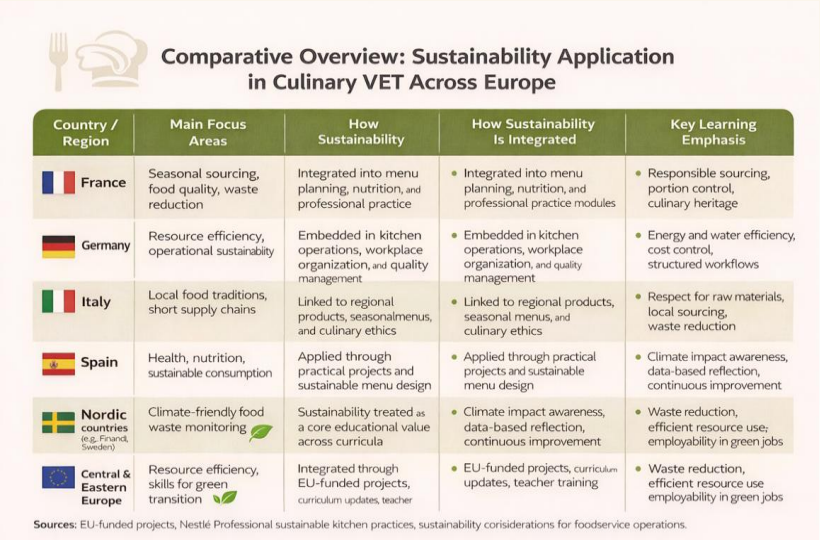
By embedding sustainable practices into daily training activities, culinary VET centres function as learning laboratories, where sustainability principles are transformed into concrete skills and behaviours. This approach helps learners transfer sustainable practices from the training environment to professional kitchens, catering services, and food-related enterprises, contributing to more resilient and responsible food systems across Europe.

3. Sustainability Application Across EU VET Curricula

Sustainability is increasingly embedded across vocational education and training (VET) curricula throughout the European Union, reflecting broader European strategies aimed at promoting sustainable development, green skills, and responsible consumption and production. Culinary VET programmes play a particularly important role in this transition, as they directly prepare learners for professions within food systems that have a significant environmental, economic, and social impact.

Across EU Member States, sustainability is no longer treated as an isolated or standalone subject. Instead, it is increasingly understood as a **cross-cutting competence** that is integrated into multiple learning areas within culinary education. This approach ensures that learners develop sustainability awareness alongside technical, entrepreneurial, and social skills, better preparing them for real-world professional environments and evolving labour market expectations.

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Comparative Overview: Sustainability Application in Culinary VET Across Europe

Country / Region	Main Focus Areas	How Sustainability	How Sustainability Is Integrated	Key Learning Emphasis
France	Seasonal sourcing, food quality, waste reduction	Integrated into menu planning, nutrition, and professional practice	• Integrated into menu planning, nutrition, and professional practice modules	• Responsible sourcing, portion control, culinary heritage
Germany	Resource efficiency, operational sustainability	Embedded in kitchen operations, workplace organization, and quality management	• Embedded in kitchen operations, workplace organization, and quality management	• Energy and water efficiency, cost control, structured workflows
Italy	Local food traditions, short supply chains	Linked to regional products, seasonalmenus, and culinary ethics	• Linked to regional products, seasonal menus, and culinary ethics	• Respect for raw materials, local sourcing, waste reduction
Spain	Health, nutrition, sustainable consumption	Applied through practical projects and sustainable menu design	• Applied through practical projects and sustainable menu design	• Climate impact awareness, data-based reflection, continuous improvement
Nordic countries (e.g. Finand, Sweden)	Climate-friendly food waste monitoring	Sustainability treated as a core educational value across curricula	• Climate impact awareness, data-based reflection, continuous improvement	• Waste reduction, efficient resource use; employability in green jobs
Central & Eastern Europe	Resource efficiency, skills for green transition	Integrated through EU-funded projects, curriculum updates, teacher	• EU-funded projects, curriculum updates, teacher training	• Waste reduction, efficient resource use employability in green jobs

Sources: EU-funded projects, Nestlé Professional sustainable kitchen practices, sustainability corisiderations for foodservice operations.

Figure **4**: Sustainability Integration in Culinary VET Across Europe

Source: European Commission; Cedefop; United Nations; Nestlé Professional; International Food Waste Coalition; Erasmus+ Programme Results Platform.

Examples of Sustainability Integration in Culinary VET Across Europe

Although national curricula differ in structure and emphasis, several common patterns of sustainability application can be observed across EU countries.

Common Approaches Across EU Culinary VET Systems

Despite national differences, sustainability application across EU culinary VET curricula typically includes several shared approaches:

- Embedding sustainability principles into existing subjects rather than creating separate modules
- Emphasising hands-on, practice-based learning in training kitchens
- Linking sustainability competences to learning outcomes and assessment criteria
- Encouraging cooperation with local producers and hospitality businesses
- Aligning training content with EU sustainability strategies

One common method of integration is curriculum embedding, where sustainability principles are incorporated into subjects such as food preparation, nutrition, menu planning, hygiene, kitchen management, and entrepreneurship. For example, learners may explore sustainable ingredient sourcing within procurement modules, food waste prevention during practical cooking sessions, or energy efficiency as part of kitchen operations training. This allows sustainability to be learned in a practical and contextualised way, rather than as abstract theory.

Practical and work-based learning is another key element of sustainability application across EU VET curricula. Many culinary VET programmes include hands-on activities such as waste audits, sustainable menu design, portion control exercises, and the use of seasonal and local ingredients. Through these

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activities, learners experience sustainability as part of daily kitchen routines and develop habits that can be transferred to professional workplaces.

In several EU countries, sustainability competences are also explicitly linked to assessment criteria. Learners may be evaluated not only on technical cooking skills, but also on their ability to minimise waste, use resources efficiently, follow ethical sourcing principles, and demonstrate awareness of environmental and social impacts. This reinforces sustainability as an essential professional competence.

Collaboration with industry partners further supports sustainability integration. Many VET centres cooperate with sustainable restaurants, catering companies, local producers, and hospitality businesses that apply responsible practices. These partnerships expose learners to real examples of sustainability in action and help ensure that training remains aligned with labour market needs.

Alignment with European Policies and Long-Term Impact

The integration of sustainability in culinary VET curricula is strongly aligned with European policy frameworks, including the European Green Deal, Agenda 2030, the Farm to Fork Strategy, and EU initiatives promoting green and digital skills. These frameworks encourage VET systems to equip learners with competences that support the transition towards more sustainable food systems and resilient economies.

While the level of integration still varies across countries and institutions, culinary VET centres across Europe increasingly recognise their role as drivers of change, using education as a tool to promote sustainable practices within the food and hospitality sector.

By applying sustainability principles across curricula, EU culinary VET programmes help ensure that learners graduate as skilled, responsible, and future-oriented professionals. This integrated approach supports individual employability while also contributing to broader European goals of environmental protection, social responsibility, and sustainable economic development.

Practical Exercise: Benchmarking Sustainability Integration

This exercise helps learners compare how sustainability is embedded into culinary VET curricula across different European countries.

Task: In small groups, research how sustainability is embedded into the culinary VET curriculum of two different European countries, using the common approaches described above as a starting point (e.g. curriculum embedding, practical and work-based learning, or cooperation with local producers). Compare the findings against your own VET centre's curriculum and identify one practice from each country that could realistically be adopted locally.

Deliverable: a short summary table comparing the two countries' approaches against your own VET centre's curriculum.

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Learning Outcome 2: Understanding the Role of Culinary VET Centres in Promoting Sustainable Transformation

Learners will be able to:

1. Explain how culinary VET centres can be agents of sustainable transformation through curricula, policies and routines
2. Connect sustainable culinary skills with the demands of the green job market
3. Describe strategies to embed a sustainability mindset across staff and students
4. Identify ways to raise awareness about sustainability

Topic 2: The Role of Culinary VET Centres in Promoting Sustainable Transformation

1. How VET centres can act as agents of change and role models of sustainable behaviour

2. How sustainable skills align with labour market needs & green job trends

3. Principles of a sustainability-oriented VET school culture

4. Sustainability awareness tools & methods

1. How VET Centres Can Act as Agents of Change and Role Models of Sustainable Behaviour

Culinary Vocational Education and Training (VET) centres occupy a strategic position in the transition towards more sustainable food systems. As institutions responsible for educating future chefs, kitchen staff, and hospitality professionals, they influence not only professional competencies but also the values, behaviours, and mindsets that learners will carry throughout their careers. Given the significant environmental footprint of the food and hospitality sector, culinary VET centres have the potential to become powerful drivers of sustainable transformation.

To act as effective agents of change, VET centres must go beyond theoretical instruction and integrate sustainability into everyday practice. Students learn most effectively when sustainable behaviour is visibly demonstrated in their learning environment. Training kitchens therefore function as living laboratories where sustainable principles can be applied, tested, and experienced in real-life conditions. When sustainability becomes part of daily routines rather than an isolated topic, it is more likely to be internalised by learners.

One of the most impactful ways culinary VET centres can model sustainable behaviour is through responsible food sourcing and menu planning. By prioritising seasonal, local, and ethically produced ingredients, VET centres reduce their environmental impact while teaching students how ingredient choices affect climate, biodiversity, and local economies. Working with local farmers, suppliers, or cooperatives allows learners to understand supply chains, product traceability, and the value of short food circuits. Seasonal menu planning also challenges students to adapt recipes and techniques according to availability, fostering creativity and flexibility—key professional skills.

Food waste reduction represents another critical area where VET centres can lead by example. Professional kitchens are major contributors to food waste, making this an essential topic in culinary

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education. Best practices include accurate portioning, efficient stock management, and the creative use of leftovers and by-products, such as transforming vegetable peels into broths or repurposing surplus ingredients into new dishes. Measuring and analysing food waste during practical lessons can be a powerful learning tool, helping students quantify waste and reflect on prevention strategies. Additional initiatives such as composting, cooperation with food banks, or awareness campaigns within the centre further reinforce responsible behaviour.

Sustainable transformation also requires attention to energy and water consumption. Culinary VET centres can model efficient kitchen operations by using energy-efficient appliances, maintaining equipment properly, and promoting conscious energy use during cooking processes. Teaching techniques such as batch cooking, using lids, optimising oven loads, or switching off appliances when not in use helps students understand how small actions can significantly reduce resource consumption. Water-saving practices, including efficient cleaning methods and responsible use of dishwashing equipment, can be systematically incorporated into practical training.

Another important best practice is the promotion of plant-forward and balanced menus. Culinary VET centres can introduce a wider variety of plant-based dishes while maintaining nutritional balance and culinary quality. This approach familiarises students with legumes, vegetables, grains, and alternative proteins, responding to current sustainability and health trends. Rather than eliminating animal products, students are encouraged to consider quality over quantity, responsible sourcing, and respectful use of ingredients, including nose-to-tail or root-to-stem cooking principles.

From a pedagogical perspective, VET centres can strengthen their role as change agents by embedding sustainability into learning outcomes, projects, and assessments. Project-based learning approaches—such as designing sustainable menus, calculating the environmental footprint of dishes, or proposing sustainability improvements for a professional kitchen—enable students to apply theoretical knowledge in practical contexts. These activities support critical thinking, problem-solving, and teamwork, while reinforcing the relevance of sustainability in the labour market.

Teachers and trainers play a crucial role in this process by acting as role models and facilitators. Their attitudes, daily choices, and teaching methods significantly influence student behaviour. Continuous professional development for teaching staff in sustainability-related topics ensures that educators remain confident, informed, and motivated to promote sustainable practices.

Importantly, role modelling is not limited to teachers and local partners. Students themselves can act as powerful role models for their peers, both within the VET centre and in future workplaces. By visibly practising good habits — such as reducing food waste, using seasonal ingredients, or following energy-saving routines — students demonstrate that sustainable behaviour is a normal, achievable part of professional life rather than an external requirement. Peer-to-peer influence of this kind, reinforced through student-led initiatives, mentoring of younger cohorts, or informal example-setting during shared kitchen work, helps sustainable habits spread organically alongside the leadership shown by teachers and industry partners.

Beyond internal operations, culinary VET centres can extend their influence by engaging with the local community and industry partners. Collaborations with sustainable restaurants, hotels, NGOs, municipalities, and local food producers provide learners with real-world examples of sustainable practices in action. Guest lectures, study visits, internships, and joint projects strengthen the

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connection between education and the labour market while positioning VET centres as hubs of sustainable innovation at the local level. VET centres can further strengthen this local role by organising their own local events, such as open days showcasing sustainable culinary practices, collaborations with local producers and farmers' markets, or community cooking workshops built around seasonal and zero-kilometer ingredients. These events raise public awareness, strengthen ties with the surrounding community, and position the VET centre as an active local leader in sustainability, complementing its work within professional curricula.

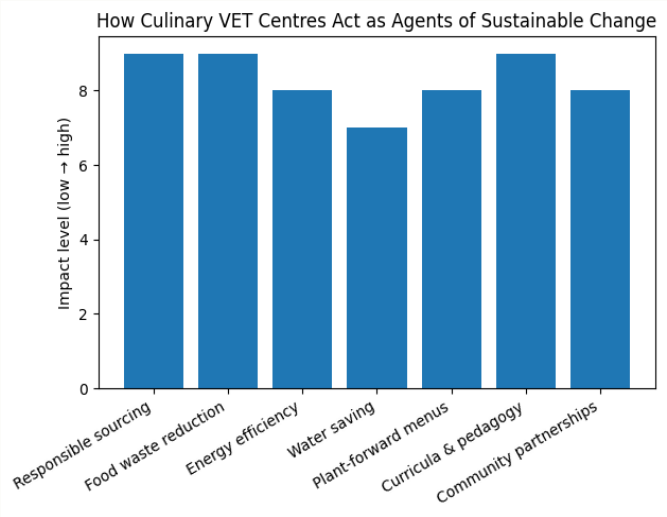


Figure **5**: How Culinary VET Centres Act as Agents of Sustainable Change

Source: Own elaboration, based on the agent-of-change practices discussed in this section.

In conclusion, culinary VET centres have a unique opportunity to shape a more sustainable future for the food and hospitality sector. By integrating sustainability into daily operations, teaching practices, and partnerships, they not only educate skilled professionals but also empower responsible citizens and future sustainability ambassadors. Through consistent leadership and practical engagement, VET centres can play a decisive role in driving sustainable transformation across the culinary and hospitality industries.

2. How Sustainable Skills Align with Labour Market Needs and Green Job Trends

The transition towards a greener and more sustainable economy is profoundly transforming the food and hospitality sector. Climate change mitigation policies, environmental regulations, rising energy and food costs, changing consumer preferences, and increasing awareness of social and ethical responsibility are reshaping how food is produced, sourced, prepared, and consumed. In this context, sustainability is no longer an optional or niche concern for businesses, but a structural requirement that directly influences competitiveness, resilience, and long-term viability. Consequently, the labour market increasingly demands professionals who combine high-level culinary expertise with sustainability-related knowledge, skills, and attitudes.

Culinary Vocational Education and Training (VET) centres occupy a strategic position within this transformation. They act as key intermediaries between education systems and labour market needs, ensuring that future professionals are equipped to respond to emerging challenges and opportunities

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linked to the green transition. By aligning sustainable culinary skills with real professional requirements, VET centres help shape a workforce capable of supporting the environmental, economic, and social sustainability goals of the food and hospitality sector.

Sustainable culinary skills directly reflect current and anticipated labour market demands. Responsible ingredient sourcing, food waste prevention and management, energy- and water-efficient kitchen operations, and plant-forward menu development are increasingly essential competencies across a wide range of roles. Employers seek professionals who can contribute to cost reduction, regulatory compliance, and sustainability reporting, while also responding to consumer demand for healthier, more ethical, and environmentally friendly food options. Graduates who possess these skills are therefore better positioned to access employment opportunities and to progress within organisations undergoing sustainability-driven transformation.

Green job trends within the food and hospitality sector reveal both the evolution of traditional roles and the emergence of new and hybrid professional profiles. Established positions such as chefs, kitchen supervisors, and catering managers are being redefined to include responsibility for environmental performance, resource efficiency, and waste reduction. For example, eco-conscious chefs are expected not only to demonstrate culinary creativity but also to design menus that minimise environmental impact, reduce food waste, and incorporate seasonal, local, and plant-based ingredients. Sustainable kitchen managers increasingly oversee energy and water consumption, waste monitoring systems, supplier selection, and compliance with sustainability standards or certification schemes.

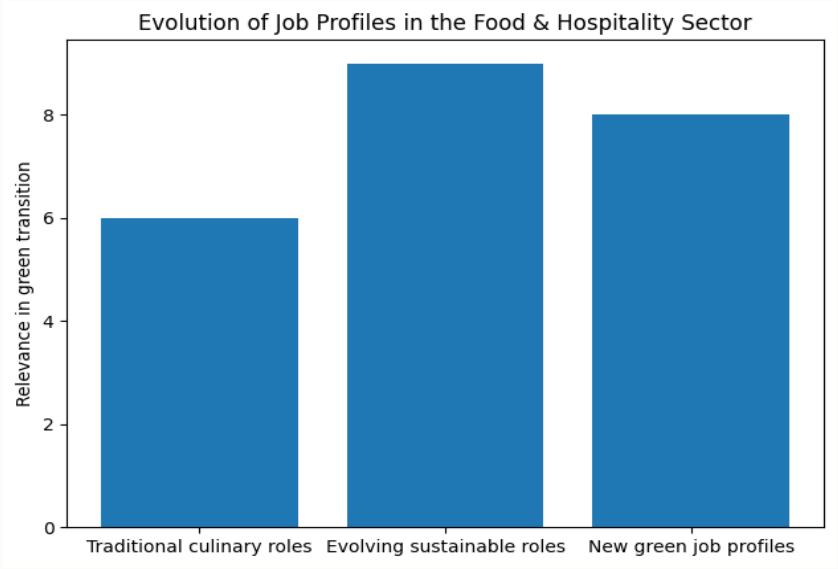


Figure **6**: Evolution of Culinary Job Profiles in the Context of the Green Transition

Source: European Commission, European Green Deal (2019) & New Skills Agenda (2020); CEDEFOP, Skills for Green Jobs – European Synthesis Report (2020); ILO, Skills for Green Jobs (2018); UNESCO-UNEVOC, Greening TVET (2021); World Economic Forum, Future of Jobs Report (2023).

At the same time, the green transition is generating new professional roles that sit at the intersection of culinary practice, management, and sustainability. Sustainability officers in hotels, restaurant chains, or catering companies require applied knowledge of sustainable food systems, environmental impact assessment, data collection, and sustainability reporting. Menu developers specialising in

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sustainable and plant-based cuisine combine culinary innovation with nutrition science and environmental awareness to meet evolving market demand. Procurement specialists focussing on ethical, local, and transparent sourcing play a critical role in ensuring supply chain resilience, traceability, and alignment with corporate sustainability policies. Culinary VET centres can introduce learners to these emerging roles through curriculum content, applied projects, simulations, and close cooperation with industry partners.

Beyond occupation-specific competencies, sustainability-oriented culinary education supports the development of transversal skills that are increasingly valued across the green labour market. Problem-solving skills are strengthened when learners redesign menus to reduce waste, adapt to seasonal availability, or respond to resource constraints. Innovation and creativity are fostered through the development of alternative protein dishes, low-impact cooking techniques, and new approaches to traditional recipes. Teamwork, communication, and leadership are reinforced through collaborative projects aimed at improving sustainability performance in kitchen operations. These transversal competencies enhance graduates' ability to adapt to changing job roles, technologies, and organisational contexts.

Culinary VET centres further strengthen alignment with labour market needs through structured cooperation with employers, professional associations, and local sustainability initiatives. Work-based learning, apprenticeships, internships, guest lectures, and study visits expose learners to real-world sustainability challenges and professional practices. This direct engagement with the labour market enables students to understand employer expectations, regulatory frameworks, and industry standards, while also allowing VET centres to continuously update training content in response to emerging green job trends.

Teachers and trainers play a decisive role in maintaining this alignment by acting as mediators between sustainability policy, labour market developments, and educational practice. Continuous professional development in areas such as green technologies, sustainable food systems, and labour market trends ensures that educators can integrate up-to-date knowledge and practices into teaching. By embedding real-world case studies, current policy frameworks, and industry examples into learning activities, trainers help learners recognise sustainability as a long-term career pathway rather than a temporary or external requirement.

In conclusion, culinary VET centres are central actors in aligning sustainable culinary education with labour market needs and green job trends. Through the integration of sustainability into skills development, awareness of evolving professional roles, and cultivation of transversal competencies, VET centres prepare learners to contribute meaningfully to the green transformation of the food and hospitality sector. In doing so, they support the development of a resilient, competitive, and environmentally responsible workforce capable of meeting the complex challenges of the green transition and shaping the future of sustainable food systems.

3. Principles of a Sustainability-Oriented VET School Culture

A sustainability-oriented VET school culture is built over time through consistent leadership, shared values, and everyday practices that reflect a long-term commitment to sustainable development. In culinary Vocational Education and Training (VET) schools, this culture influences not only what is

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taught, but how teaching, learning, management, and professional behaviour are organised. Sustainability becomes a guiding framework shaping decision-making, relationships, and institutional identity rather than a collection of isolated initiatives.

Whole-School Commitment and Shared Vision

A strong sustainability-oriented culture begins with a clearly articulated vision that is shared by the entire school community. School leadership plays a crucial role in embedding sustainability into the institution's mission, strategic objectives, and quality assurance processes. When sustainability is explicitly included in school development plans, investment priorities, and internal policies, it sends a clear message that sustainable transformation is a long-term institutional goal.

In practice, this may involve adopting a formal sustainability strategy or charter that outlines environmental, social, and economic priorities relevant to culinary education. Schools may set measurable objectives, such as reducing food waste in training kitchens, increasing the use of local and seasonal ingredients, or strengthening partnerships with sustainable businesses. Regular communication of these goals during staff meetings, student orientations, and public events helps ensure that sustainability is understood as a shared responsibility rather than an optional activity.

Leadership and Role Modelling

Leadership is a decisive factor in shaping school culture. School directors, department heads, teachers, and trainers act as powerful role models whose daily behaviour strongly influences attitudes and norms within the institution. In a sustainability-oriented VET school, leaders consistently demonstrate responsible decision-making in areas such as procurement, resource management, and operational planning.

In culinary VET schools, trainers may model sustainability by explaining why certain suppliers are chosen, why energy-efficient equipment is used, or why waste separation is mandatory in training kitchens. School management may prioritise sustainable investments, such as upgrading to energy-efficient appliances or supporting staff participation in sustainability training. When learners observe that sustainability principles guide both teaching and management decisions, they are more likely to internalise these values as part of their professional identity.

Integration of Sustainability into Teaching and Learning

A sustainability-oriented school culture requires sustainability to be fully integrated into teaching and learning processes. This goes beyond adding sustainability-related content to curricula and involves embedding environmental, social, and economic considerations into learning outcomes, assessment methods, and pedagogical approaches across all subjects.

In culinary education, sustainability can be integrated through project-based learning, case studies, and practical assignments that mirror real professional challenges. Students may be tasked with designing sustainable menus, calculating the environmental impact of dishes, or proposing improvements to kitchen operations. Assessment criteria may include not only technical performance but also responsible resource use, teamwork, and reflection on sustainability impacts. Such approaches help learners understand sustainability as a core component of professional competence rather than a theoretical concept.

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Participatory and Inclusive School Environment

Participation and inclusion are essential for creating a sustainability-oriented culture that is meaningful and resilient. When students, teachers, and staff are actively involved in shaping sustainability initiatives, they develop a sense of ownership and responsibility for outcomes.

Culinary VET schools may establish sustainability committees or working groups that include representatives from different stakeholder groups. Students may lead awareness campaigns, propose initiatives to reduce waste, or participate in decision-making related to menu planning in training kitchens. Inclusive practices also support social sustainability by promoting equality, well-being, and respectful collaboration within the school community, reinforcing the idea that sustainability encompasses social as well as environmental dimensions.

Sustainable Operations and Daily Practices

Everyday operations play a central role in translating sustainability values into lived experience. In culinary VET schools, training kitchens and school facilities function as living laboratories where sustainable practices are demonstrated and practised daily.

Best practices include the systematic use of seasonal, local, and responsibly sourced ingredients, structured food waste monitoring, and clear waste separation systems. Energy- and water-efficient equipment, combined with routines such as switching off appliances when not in use or applying water-saving cleaning techniques, reinforces responsible behaviour. Environmentally friendly cleaning products and maintenance practices further support sustainability goals. When operational practices are aligned with educational objectives, students learn sustainability through direct experience rather than abstract instruction.

Continuous Learning and Professional Development

A sustainability-oriented VET school culture recognises that sustainability is a dynamic field requiring continuous learning and adaptation. Teachers, trainers, and staff need ongoing opportunities to update their knowledge of sustainability trends, green technologies, and labour market developments.

Professional development activities may include workshops on sustainable food systems, participation in Erasmus+ projects, or peer-learning sessions where staff exchange best practices. Reflective practices, such as regular reviews of sustainability initiatives or teaching approaches, support institutional learning and innovation. By investing in staff development, schools ensure that sustainability education remains relevant, credible, and aligned with real-world challenges.

Partnerships and Community Engagement

Strong partnerships with external stakeholders extend the impact of sustainability-oriented school cultures beyond the institution itself. Culinary VET schools that collaborate with local producers, sustainable restaurants, NGOs, and public authorities create meaningful learning opportunities while supporting local sustainability initiatives.

These partnerships may involve guest lectures by industry professionals, study visits to sustainable businesses, internships focused on sustainability practices, or joint community projects. Such engagement helps learners understand how sustainability is implemented in professional contexts and positions the school as an active contributor to sustainable development at the local and regional level.

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Monitoring, Evaluation, and Continuous Improvement

Finally, sustainability-oriented school cultures are supported by systematic monitoring and evaluation. Collecting data on resource use, waste reduction, learning outcomes, and stakeholder engagement allows schools to assess progress and identify areas for improvement.

Best practices include setting clear indicators, conducting regular internal reviews, and communicating results transparently to the school community. Feedback from students, staff, and partners informs continuous improvement and reinforces accountability. Over time, this reflective approach helps sustainability become an integral and evolving part of the school's identity.

Principle	Best Matching Visual Style
1. Vision & Shared Commitment	Strategy diagram / mission + objectives infographic
2. Leadership & Role Modelling	Leadership icons + flow diagrams
3. Teaching & Learning Integration	Education infographic (curriculum + skills mapped)
4. Participation & Inclusion	People-centric diagrams / participatory flow
5. Operations & Daily Practices	Sustainability action icons (energy, waste, water)
6. Professional Development	Step-by-step learning pathway visuals
7. Partnerships & Engagement	Network maps / stakeholder interaction graphics
8. Monitoring & Improvement	Feedback loop / metrics dashboard style infographic

Figure **7**: Sustainability-Oriented VET School Culture Principles

Source: Own elaboration, based on the sustainability-oriented school culture principles discussed in this section.

By embedding these principles into leadership, teaching, operations, and partnerships, culinary VET schools create environments where sustainability is lived daily rather than taught in isolation. A sustainability-oriented school culture not only prepares learners for green careers but also empowers them to become responsible professionals and active contributors to sustainable food systems. In this way, VET schools play a crucial role in supporting the long-term sustainable transformation of the food and hospitality sector.

4. Sustainability Awareness Tools & Methods

Raising sustainability awareness is a crucial component of the role Culinary Vocational Education and Training (VET) centres play in promoting sustainable transformation. Beyond technical skills, learners must develop awareness, motivation, and critical thinking related to the environmental, social, and economic impacts of culinary practices. Sustainability awareness tools and methods help translate abstract concepts into meaningful learning experiences, enabling students and staff to understand why sustainability matters and how individual and collective actions can contribute to positive change.

Experiential and Practice-Based Learning Tools

Experiential learning is one of the most effective methods for building sustainability awareness in culinary VET education. Training kitchens provide ideal environments for hands-on experimentation

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and reflection. Tools such as food waste audits, ingredient origin tracking, and resource-use monitoring allow learners to observe the direct impact of their actions. By measuring food waste after practical sessions, monitoring energy or water consumption, or comparing menus based on seasonal availability, students gain concrete insights into sustainability challenges and solutions within professional kitchen settings.

Visualisation and Communication Tools

Visual tools play an important role in making sustainability impacts visible and understandable. Posters, infographics, dashboards, and labels placed in training kitchens and learning spaces can highlight key sustainability messages, such as food waste reduction tips, energy-saving practices, or the environmental footprint of ingredients. Digital tools, including interactive screens or online platforms, can be used to present sustainability indicators, progress toward goals, or case studies from the food and hospitality sector. These tools reinforce learning by maintaining sustainability as a visible and ongoing topic within the school environment.

Project-Based and Reflective Methods

Project-based learning methods encourage learners to engage actively with sustainability challenges. Students may work in teams to design sustainable menus, propose waste reduction strategies, or develop awareness campaigns for their peers. Reflection tools such as learning journals, group discussions, or sustainability self-assessment questionnaires support deeper understanding by encouraging learners to analyse their decisions and reflect on outcomes. These methods foster critical thinking and help learners connect sustainability principles with professional practice.

Gamification and Interactive Approaches

Gamified learning methods can increase engagement and motivation around sustainability topics. Quizzes, challenges, competitions, and simulations allow learners to explore sustainability concepts in an interactive and accessible way. For example, teams may compete to reduce food waste during practical sessions, optimise energy use, or create the most sustainable menu within given constraints. Digital learning tools and interactive modules further support engagement by allowing learners to experiment with scenarios and receive immediate feedback.

Guest Speakers and Real-World Case Studies

Inviting guest speakers from sustainable restaurants, hotels, catering companies, or local food initiatives provides learners with real-world perspectives on sustainability in professional contexts. Case studies based on real businesses help illustrate how sustainability tools and methods are applied in practice, including challenges, trade-offs, and economic considerations. These external inputs strengthen the relevance of sustainability education and help learners understand labour market expectations.

Awareness Campaigns and Whole-School Initiatives

Sustainability awareness is most effective when reinforced through whole-school initiatives. Campaigns focused on food waste reduction, sustainable sourcing, or responsible consumption can involve students, staff, and partners in collective action. Sustainability weeks, themed events, exhibitions, or student-led initiatives encourage dialogue and shared responsibility. Such activities help

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embed sustainability awareness into the everyday culture of the VET centre rather than limiting it to classroom settings.

Digital Tools and Online Resources

Digital platforms and online resources offer flexible and scalable tools for sustainability awareness. Learning management systems, interactive e-learning modules, videos, and online quizzes can support blended learning approaches. Sustainability calculators, carbon footprint tools, and online dashboards help learners explore data-driven aspects of sustainability and develop analytical skills. Digital tools also facilitate access to up-to-date information, policy frameworks, and global sustainability initiatives.

Evaluation and Feedback Tools

Finally, evaluation and feedback tools are essential for reinforcing sustainability awareness. Surveys, self-assessment tools, and feedback sessions help learners and staff reflect on progress, attitudes, and behavioural change. Regular evaluation ensures that sustainability awareness tools remain relevant and effective, while also supporting continuous improvement within the VET centre.

Measuring Success: Key Performance Indicators (KPIs)

When VET centres design training modules or awareness initiatives around ethical sourcing and low-carbon cooking, it is important to track whether these efforts are actually working. Key Performance Indicators (KPIs) provide measurable evidence of progress and help justify the time and resources invested in sustainability training. Useful KPIs for a culinary VET centre include: the percentage reduction in food waste (kg per week or month), the percentage of ingredients sourced from certified ethical, local, or seasonal suppliers, cost savings resulting from reduced energy and water consumption, and the participation rate of staff and students in sustainability training activities. Reviewing these indicators regularly — for example, once per term — allows VET centres to demonstrate the economic feasibility of their sustainability initiatives alongside their environmental and social benefits, and to adjust their approach where targets are not being met.

By using a diverse combination of sustainability awareness tools and methods, culinary VET centres can create engaging learning environments that promote understanding, motivation, and responsible behaviour. These tools support learners in developing sustainability awareness as a professional competence, empowering them to contribute actively to sustainable transformation within the food and hospitality sector.

Practical Exercise: Designing a Mini Awareness Campaign

This exercise gives learners hands-on practice combining sustainability awareness tools into a mini campaign.

Task: In small groups, choose one sustainability topic (e.g. food waste, energy use, or seasonal sourcing) and design a one-week awareness campaign for your VET centre, selecting at least two tools or methods from those described above (for example, a poster series combined with a short in-class challenge).

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Deliverable: a short campaign outline stating your target audience, key message, chosen tools, and one simple KPI you would use to judge whether the campaign succeeded (e.g. a measurable drop in food waste, or the number of students taking part in the challenge).

Learning Outcome 3: Understanding Policy Frameworks about Sustainability

Learners will be able to:

1. Summarize the key objectives of EU sustainability frameworks relevant to the culinary sector (e.g., Green Deal, Farm to Fork, Circular Economy, Skills Agenda)
2. Compare how different European countries integrate sustainability into their VET strategies and culinary education frameworks
3. Identify success stories where sustainability is effectively integrated in European culinary VET centres

Topic 3: EU and National Policies Supporting Sustainability in Culinary Training

1. EU sustainability frameworks for the culinary sector: EU Green Deal, Farm to Fork Strategy, Circular Economy Action Plan, EU Skills Agenda

2. How sustainability is currently implemented in the VET sector across Europe

3. Success stories about sustainability integration in European culinary VET centres

1. EU sustainability frameworks for the culinary sector: EU Green Deal, Farm to Fork Strategy, Circular Economy Action Plan, EU Skills Agenda

Sustainability in culinary Vocational Education and Training (VET) does not develop in isolation; it is strongly shaped by European policy frameworks that guide Member States, education providers, and industry towards greener and more resilient food systems. Over the past years, the EU has positioned the food and hospitality sector as a key area for sustainability transformation, because professional kitchens influence resource consumption, food waste levels, purchasing patterns, and consumer behaviour. For culinary VET centres, understanding EU sustainability frameworks is therefore essential, as these policies increasingly determine skills priorities, curriculum orientation, funding opportunities, and labour market expectations.

A central umbrella framework is the European Green Deal, adopted as the EU's long-term roadmap for sustainability transformation and climate neutrality. It outlines how the EU aims to reduce environmental pressures while ensuring economic development and social fairness, with a strong focus on sectors connected to energy use, production, and consumption. In culinary training, the Green Deal is particularly relevant because it reinforces the importance of reducing emissions linked to food systems, improving energy and water efficiency in operations, and supporting a shift towards sustainable consumption patterns—areas that directly connect to how training kitchens are managed and how learners are prepared for modern workplaces.

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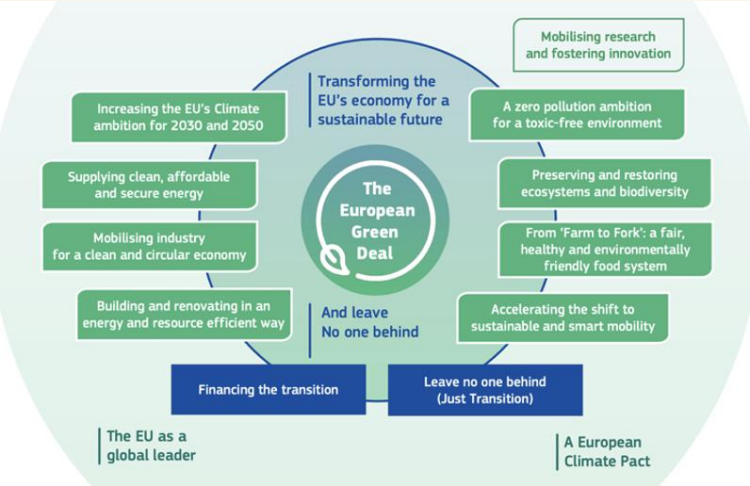


Figure **8**: The European Green Deal

Source: European Commission (2020d). European Green Deal infographic. Available at: https://commission.europa.eu/system/files/2020-02/1_-_ruud_-_green_deal_infograph_nieuw.pdf

Within the Green Deal, the Farm to Fork Strategy provides the most direct policy link to the culinary sector, as it focuses specifically on transforming the entire food chain "from farm to fork" into a more sustainable, fair, and healthy system. This strategy emphasises sustainable food production and consumption, healthier diets, improved food information for consumers, and the reduction of food loss and waste. For culinary VET centres, the Farm to Fork approach translates into curriculum priorities such as seasonal and local sourcing, sustainable menu planning, nutrition-aware cooking, responsible procurement practices, and food waste prevention techniques. It also strengthens the educational relevance of teaching learners about ingredient origin, supply chains, and the environmental footprint of food choices—competences that are increasingly expected in professional kitchen environments.

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Figure **9**: Farm to Fork

Source: ResearchGate (n.d.). Farm to Fork Strategy. Available at: https://www.researchgate.net/figure/Farm-to-Fork-Strategy-For-A-Fair-Healthy_fig1_349229399

Another key framework supporting sustainability in the culinary field is the EU Circular Economy Action Plan (CEAP), which promotes a shift away from the linear "take–make–dispose" model towards systems where resources are kept in use longer and waste is minimised. In the context of culinary education, circular economy principles are especially important because they support practical approaches such as waste audits, portion control, improved storage and stock rotation, reuse of by-products (root-to-stem and nose-to-tail techniques), packaging reduction, and proper waste separation. The Circular Economy Action Plan strengthens the case for embedding "zero-waste thinking" in training kitchens, ensuring that learners see food not as disposable, but as a valuable resource whose loss has environmental and economic consequences.

Finally, sustainability transformation in the culinary sector requires people with the right competences, which is where the European Skills Agenda becomes particularly relevant. The Skills Agenda aims to support upskilling and reskilling across Europe to respond to the green and digital transitions, encouraging education and training systems to modernise and focus on future-oriented competences. For culinary VET centres, this reinforces the need to define sustainability not only as knowledge, but as a set of practical "green skills" and transversal competences, including responsible decision-making, resource efficiency, innovation, entrepreneurship, teamwork, and adaptability. It also supports closer alignment between VET providers and employers, helping ensure that training content reflects real sustainability requirements in restaurants, catering services, hotels, and institutional kitchens.

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Indicators	Objectives for 2025	Current level (latest year available)	Percentage increase
Participation of adults aged 25-64 in learning during the last 12 month (in %)	50%	39.5% (2022)	+27%
Participation of low-qualified adults 25-64 in learning during the last 12 months (in %)	30%	18.4% (2022)	+63%
Share of unemployed adults aged 25-64 with a recent learning experience (in %)	20%	14.1% (2023)	+42%
Share of adults aged 16-74 having at least basic digital skills (in %)	70%	55.6% (2023)	+26%

Figure **10**: The European Skills Agenda Objectives

Source: European Commission (2020c). European Skills Agenda for sustainable competitiveness, social fairness and resilience. Available at: https://employment-social-affairs.ec.europa.eu/policies-and-activities/skills-and-qualifications/european-skills-agenda_en

Taken together, these EU frameworks provide both a policy justification and a practical direction for integrating sustainability into culinary VET. They support the shift from seeing sustainability as an "extra topic" to recognising it as a core professional competence, shaping how future culinary professionals source ingredients, manage resources, design menus, prevent waste, and contribute to sustainable food systems across Europe.

2. How Sustainability Is Currently Implemented in the VET Sector Across Europe

Across Europe, sustainability has become an increasingly integral component of Vocational Education and Training (VET) systems, reflecting broader European strategies aimed at supporting the green transition, social responsibility, and long-term economic resilience. Rather than being addressed as a standalone topic, sustainability is progressively embedded as a cross-cutting principle within VET policies, curricula, teaching methodologies, and institutional practices. This integrated approach enables learners to acquire sustainability-related competences in direct connection with their professional training and future occupational roles.

Policy and Strategic Integration at EU and National Levels

At national level, many EU Member States have aligned their VET strategies with European sustainability frameworks such as the European Green Deal, the Farm to Fork Strategy, the Circular Economy Action Plan, the EU Skills Agenda, and Agenda 2030. These strategies are reflected in updated qualification standards, occupational profiles, and national curricula.

For example, **Germany** integrates sustainability strongly into its dual VET system. Environmental protection, efficient resource use, and responsible waste management are included as mandatory learning outcomes across many occupational standards, including hospitality and food-related professions. Apprentices learn sustainability both in vocational schools and directly in companies, ensuring a strong link between theory and practice.

In **France**, sustainability is embedded through national education reforms that promote "education for sustainable development" (Éducation au développement durable – EDD). Culinary and hospitality VET programmes include learning outcomes related to food waste reduction, sustainable sourcing,

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nutrition, and environmental responsibility. Many VET institutions also participate in national eco-certification schemes, encouraging whole-school sustainability approaches.

Curriculum Integration and Learning Outcomes

Across Europe, sustainability is most implemented through curriculum embedding, where sustainability principles are integrated into existing vocational subjects rather than taught separately.

In **Italy**, culinary VET programmes integrate sustainability into modules such as gastronomy, nutrition, food science, and restaurant management. Learners explore topics such as Mediterranean diets, local food traditions, seasonal ingredients, and food waste prevention, linking sustainability with cultural heritage and regional identity.

In **Spain**, sustainability is incorporated into hospitality and culinary curricula through competence-based learning outcomes related to responsible consumption, energy efficiency, and waste management. Some regions emphasise sustainable tourism and gastronomy, reflecting the importance of hospitality to the national economy and environmental challenges related to mass tourism.

Practice-Based Learning and Training Environments

Hands-on learning is central to sustainability implementation across European VET systems. Training kitchens, workshops, and laboratories increasingly function as learning laboratories where sustainability principles are applied through daily routines and practical exercises.

The **Nordic countries** (such as Sweden, Finland, and Denmark) are often highlighted for their strong focus on sustainability in VET. Culinary training frequently includes plant-forward menu planning, seasonal cooking, sustainable fish sourcing, and strict food waste monitoring. Sustainability is treated as a normal part of professional quality rather than an additional requirement.

In **the Netherlands**, many VET centres actively involve students in sustainability projects, such as measuring food waste in training kitchens, redesigning menus to reduce environmental impact, or cooperating with local producers. These activities are often linked to assessment, reinforcing sustainability as a practical competence.

Work-Based Learning and Industry Cooperation

Work-based learning plays a crucial role in reinforcing sustainability competences across Europe. Apprenticeships, internships, and partnerships with sustainable businesses expose learners to real-world practices and labour market expectations.

In **Austria**, hospitality VET programmes often collaborate with eco-certified hotels, restaurants, and catering companies. Learners gain experience with energy-efficient kitchen operations, sustainable procurement, and environmental management systems, helping them understand sustainability as part of professional standards.

Similarly, in **Belgium**, cooperation between VET centres and local food networks supports learning about short supply chains, ethical sourcing, and regional food systems, particularly in culinary and hospitality education.

Assessment, Quality Assurance, and Whole-School Approaches

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Assessment methods across EU VET systems increasingly include sustainability-related criteria. Learners may be evaluated not only on technical performance but also on their ability to minimise waste, use resources efficiently, and demonstrate responsible behaviour.

In **Ireland**, sustainability and green skills are explicitly promoted within further education and training strategies, encouraging providers to integrate sustainability into assessment and institutional quality processes. Many VET centres apply whole-school approaches that combine sustainable operations, inclusive practices, and community engagement.

In **Portugal**, VET institutions increasingly integrate sustainability into school management, including waste reduction policies, energy efficiency measures, and community-based food initiatives, reinforcing sustainability as an institutional value.

Teacher Training and Professional Development

Across Europe, the role of teachers and trainers is recognised as central to effective sustainability implementation. Many countries support sustainability-related professional development through national programmes, Erasmus+ projects, and peer-learning networks.

For example, **Finland** places strong emphasis on teacher autonomy and continuous professional development, enabling educators to integrate sustainability creatively across vocational subjects. Teachers are encouraged to use project-based and interdisciplinary approaches that reflect real-life sustainability challenges.

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Figure **11**: Sustainability Focus Areas in Vocational Education and Training (VET) Across Europe

Source: Own elaboration based on EU sustainability policies and European VET research (EC, Cedefop, UNESCO-UNEVOC).

Country examples across Europe demonstrate that sustainability is increasingly embedded in VET systems through policy alignment, curriculum integration, practice-based learning, work-based learning, assessment, and whole-school approaches. While implementation varies depending on national contexts and resources, a shared direction is evident: sustainability is recognised as a core professional competence essential for employability and long-term sector resilience.

By learning from diverse national approaches—from dual systems and eco-certified training environments to project-based learning and strong industry cooperation—European VET systems collectively contribute to preparing learners for the green transition. In sectors such as culinary and hospitality education, these approaches are particularly impactful, equipping future professionals to actively support sustainable, responsible, and resilient food systems across Europe.

3. Success Stories About Sustainability Integration in European Culinary VET Centres

Across Europe, numerous culinary Vocational Education and Training (VET) centres have successfully integrated sustainability into their educational models, demonstrating that sustainable transformation in culinary education is both feasible and beneficial. These success stories highlight how sustainability can be embedded into curricula, training kitchens, institutional culture, and partnerships with industry, producing measurable educational, environmental, and professional outcomes.

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Germany: Sustainable Practice Through the Dual VET System

In Germany, several culinary VET schools operating within the dual education system have integrated sustainability by aligning school-based learning with environmentally responsible workplace practices. Learners receive training in food waste prevention, energy-efficient kitchen operations, and sustainable sourcing both in vocational schools and during apprenticeships in certified restaurants and hotels.

One key success factor is the close cooperation between VET centres and industry partners that apply sustainability standards, such as eco-certified hospitality businesses. Apprentices actively participate in waste monitoring, menu optimisation, and responsible procurement processes. This approach ensures that sustainability is experienced as a professional norm rather than an abstract concept, leading to strong transfer of sustainable habits into employment.

France: Whole-School Sustainability and Food Waste Reduction

In France, several culinary VET centres have adopted a whole-school approach to sustainability, integrating environmental responsibility into teaching, operations, and school governance. Sustainability is embedded across culinary modules, with particular emphasis on food waste reduction, seasonal menu planning, and nutrition education.

Successful initiatives include structured food waste measurement in training kitchens, partnerships with local producers, and collaboration with food banks for surplus redistribution. Students are involved in sustainability projects and awareness campaigns, strengthening their sense of responsibility and professional identity. These practices have resulted in measurable reductions in food waste while enhancing learner engagement and practical competence.

Nordic Countries: Sustainability as a Quality Standard

Culinary VET centres in Nordic countries such as Sweden, Finland, and Denmark are often recognised as leaders in sustainability integration. In these systems, sustainability is treated as an inherent component of culinary quality and professionalism.

Training programmes emphasise plant-forward menus, sustainable fish sourcing, seasonal cooking, and strict resource management. Learners regularly analyse the environmental impact of dishes and adapt recipes to reduce waste and emissions. The success of this approach lies in its normalisation of sustainability: students perceive sustainable practices as standard professional behaviour, not as additional requirements.

The Netherlands: Circular Economy and Zero-Waste Kitchens

In the Netherlands, several culinary VET centres have successfully applied circular economy principles in training kitchens. Students engage in practical projects focused on zero-waste cooking, creative reuse of by-products, and sustainable packaging alternatives.

Learners are often tasked with redesigning menus to minimise waste or developing concepts for circular kitchen operations. These projects are linked to assessment and often conducted in cooperation with local restaurants and food entrepreneurs. The project-based and entrepreneurial nature of Dutch VET education encourages innovation while reinforcing sustainability as a business opportunity.

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Italy: Sustainability Through Local Food and Cultural Heritage

Italian culinary VET centres frequently integrate sustainability by connecting it with local food traditions, regional identity, and the Mediterranean diet. Training programmes emphasise seasonal and locally sourced ingredients, traditional preservation methods, and respectful use of raw materials.

Students learn to combine sustainability with culinary heritage, understanding that protecting local food systems supports biodiversity, cultural continuity, and economic resilience. This approach resonates strongly with learners and demonstrates that sustainability can enhance culinary creativity and authenticity rather than limit it.

Austria and Belgium: Industry Partnerships and Sustainable Procurement

In Austria and Belgium, strong cooperation between culinary VET centres and industry partners has supported successful sustainability integration. Many programmes collaborate with eco-certified hotels, restaurants, and catering companies, allowing learners to experience sustainability in professional contexts.

Students are trained in sustainable procurement, ethical sourcing, energy efficiency, and compliance with environmental standards. These partnerships ensure that sustainability skills match labour market needs and prepare learners for employment in increasingly sustainability-driven hospitality sectors.

Key Factors Behind Successful Integration

Across these European examples, several common success factors can be identified:

- Strong alignment with European and national sustainability policies
- Integration of sustainability into everyday kitchen practice rather than isolated lessons
- Active involvement of learners through projects and hands-on activities
- Close cooperation with sustainable businesses and local stakeholders
- Supportive leadership and continuous professional development for teachers

These success stories demonstrate that sustainability integration in European culinary VET centres is most effective when sustainability is embedded in everyday practice, helping schools reduce environmental impact while preparing learners for evolving professional roles.

Through these approaches, sustainability becomes a source of innovation, quality, and professional pride—equipping future culinary professionals to actively contribute to more sustainable and resilient food systems across Europe.

Practical Exercise: Success Factors Checklist

This exercise helps learners translate the success factors behind Europe's best examples into a concrete next step for their own VET centre.

Task: Using the five common success factors identified above (policy alignment, everyday integration, learner involvement, cooperation with sustainable businesses, and supportive leadership), rate your

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own VET centre on each factor and identify the single factor that, if strengthened, would most improve sustainability integration locally.

Deliverable: one short, realistic next step to act on the chosen factor, drawing inspiration from whichever country example resonated most with your own context.

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Module 2: Responsible Consumption (Ways of a Sustainable Consumption for Culinary Centres and Individuals)

Introduction

For most of human history, food consumption was closely tied to local production and seasonal availability, which naturally limited waste. Globalisation, industrial production, and changing consumer habits have since distanced people from the origins of their food, creating new environmental, social and economic challenges. This is reflected in United Nations Sustainable Development Goal 12 (SDG 12), which calls for responsible consumption and production through efficient resource use, waste reduction, and sustainable lifestyles.



Figure **12**: SDG 12 Indicators

Source: United Nations, 2015.

Food production is today among the largest contributors to environmental pressure worldwide, requiring significant land, water and energy while generating emissions, biodiversity loss and waste (WWF). Culinary centres, hospitality institutions and catering services have consequently become key actors in the transition to sustainable consumption, shaping not only their own operations but also the attitudes of students, staff and customers. The Menus of Change Principles Report (Culinary Institute of America and Harvard T.H. Chan School of Public Health) shows how menu design centred on plant-forward, seasonal and local ingredients can support both health and sustainability.

Food waste remains one of the sector's most pressing challenges: large quantities of edible food are lost during preparation, service and consumption. The Restaurant Food Waste Map identifies kitchen preparation, service, and customer consumption as the three critical stages, and recommends

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prioritising prevention over reduction and redistribution. Individual choices also matter — selecting seasonal and local products, reducing packaging, and supporting sustainable businesses — as underlined by the EU Code of Conduct on Responsible Food Business and Marketing Practices.

Responsible consumption is therefore a collective effort involving producers, educators, businesses, policymakers and consumers. Culinary centres are particularly well placed to lead this transition, combining educational, cultural and operational roles through sustainable procurement, menu planning, waste prevention and consumer education.

Learning Outcome 1: Understanding Responsible Consumption

Learners will be able to:

1. Explain what responsible consumption means and its core principles
2. Explain why responsible consumption is essential for sustainable food systems
3. Recognise the environmental, economic and social impacts of purchasing and consumption choices in the culinary sector

Topic 1: Principles and Meaning of Responsible Consumption

1. *Definition of responsible consumption and its principles*
2. *Why responsible consumption is essential for sustainable food systems*
3. *Environmental, economic and social impacts of purchasing and consumption choices in the culinary sector*

1. Definition of responsible consumption and its principles

Responsible consumption is the conscious and responsible use of food and resources, aimed at meeting current needs while minimising environmental impacts, reducing waste, supporting social equity, and preserving resources for future generations. In conclusion, responsible consumption is a fundamental element of sustainable food systems. It requires individuals and organisations to understand the environmental, economic, and social impacts of their choices and to adopt practices that reduce waste, improve resource efficiency, support ethical production, and promote healthy diets. By applying these principles, consumers and culinary professionals can contribute to food systems that are more resilient, efficient, equitable, and sustainable for future generations. The main principles of responsible consumption are the following.

Efficient use of resources - Responsible consumption means using food, water, energy, and raw materials efficiently and avoiding unnecessary waste. The goal is to obtain the greatest possible benefit while using the fewest natural resources. This principle helps reduce environmental pressure and supports the sustainable management of resources.

Reduction of food waste - Food should be purchased, stored, prepared, and consumed in ways that minimise waste. Reducing food losses and waste throughout the food chain is one of the main objectives of Sustainable Development Goal 12 and is considered essential for achieving sustainable food systems.

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Sustainable purchasing choices - Consumers and food service professionals should prioritise seasonal, local, and sustainably produced foods. These choices can reduce environmental impacts, support biodiversity, and encourage more sustainable agricultural practices.

Reduction of packaging and waste - Responsible consumption encourages the selection of products with minimal, reusable, or recyclable packaging. Limiting unnecessary packaging helps reduce waste generation, resource extraction, and pollution.

Support for ethical and fair production - Consumers should support companies and producers that respect workers' rights, local communities, and environmental standards throughout the supply chain. Ethical purchasing contributes to more equitable and sustainable food systems.

Promotion of healthy and sustainable diets - Responsible consumption involves choosing foods that support both human health and environmental sustainability. Diets rich in fruits, vegetables, legumes, and whole grains are often associated with lower environmental impacts and better health outcomes.

Awareness of environmental impacts - Consumers should consider how their food choices affect climate change, biodiversity, water consumption, and ecosystem health. Understanding these impacts helps promote more sustainable behaviours.

Support for local economies - Whenever possible, responsible consumers should purchase from local farmers and suppliers. This supports local employment, strengthens regional economies, and often reduces transportation-related environmental impacts.

Reuse and redistribution of surplus food - Edible surplus food should be reused, shared, or donated rather than discarded. Food redistribution initiatives can help reduce waste while supporting people facing food insecurity.

Informed decision-making - Responsible consumption requires consumers to understand the origin, production methods, and impacts of the products they buy. Access to information and awareness are essential for making sustainable choices.

2. Why responsible consumption is essential for sustainable food systems

Sustainable food systems are food systems that provide safe, nutritious, and affordable food for current and future generations while protecting natural resources, supporting economic development, and promoting social well-being. They consider the entire food chain, from agricultural production and food processing to distribution, consumption, and waste management. Their goal is to balance food security with environmental protection, ensuring that food production remains within the ecological limits of the planet.

According to Shaikh et al. (2024), current agri-food systems are at risk of exceeding important environmental limits, particularly those related to cropland use, threatening the long-term sustainability of global food production. The authors emphasize that food systems affect not only land use but also other planetary boundaries through greenhouse gas emissions, ecosystem degradation, and pressure on natural resources.

In this context, responsible consumption represents one of the most important tools for improving the sustainability of food systems. Responsible consumption can be defined as the conscious use of food

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and resources in ways that reduce environmental impacts, support economic efficiency, and contribute to social equity. It encourages both consumers and food professionals to understand that every purchasing and consumption decision has consequences extending far beyond the individual meal. The United Nations recognises responsible consumption and production as a key element of Sustainable Development Goal 12 because sustainable food systems cannot be achieved without changes in consumption patterns.

One of the main principles of responsible consumption is the efficient use of resources. Food production depends on finite resources such as fertile land, water, biodiversity, and energy. When food is wasted or resources are used inefficiently, unnecessary environmental pressures are created. Responsible consumption promotes better planning, efficient purchasing, careful food preparation, and sustainable resource management. By reducing unnecessary consumption and improving efficiency, consumers and food businesses can contribute to reducing the environmental footprint of food systems.

Food waste reduction is another fundamental principle. Large quantities of edible food are wasted every year during production, processing, distribution, food service, and household consumption. When food is discarded, all the resources used to produce it are wasted as well. According to the Restaurant Food Waste Map, waste occurs primarily during food preparation, food service operations, and customer consumption, highlighting the importance of prevention strategies throughout the food chain.

The scientific study by Shaikh et al. (2024) reinforces the importance of reducing waste by showing that food consumption and production are directly linked to the use of cropland resources around the world.

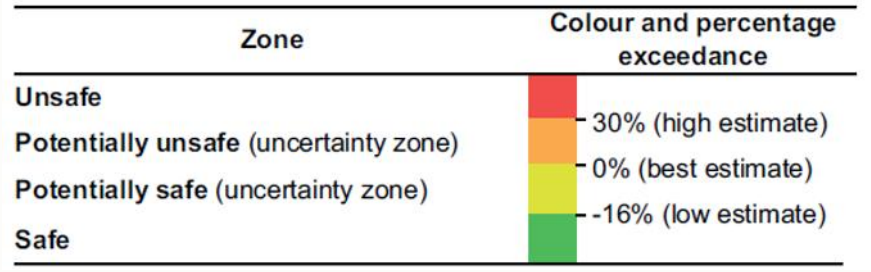


Figure **13**: Classification of Regions by Cropland Limits

Source: Shaikh et al., 2024.

The authors demonstrate that consumption choices in one country can contribute to environmental pressure and land-use exceedance in other countries through international trade. Their results reveal that responsible consumption should not only consider how much food is consumed, but also where and how that food is produced.

Sustainable purchasing choices represent another essential principle. The selection of local, seasonal, and sustainably produced ingredients can reduce transportation requirements, lower environmental impacts, and support more resilient supply chains. Responsible consumers should also consider the environmental footprint embedded within food products. According to Shaikh et al. (2024), agricultural commodities such as oilseeds, cereals, wheat, fruits, and vegetables account for a large

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share of global cropland use. Consumer demand for these products influences land-use patterns not only locally but also internationally through complex trade relationships.

One of the most important contributions of the study is the concept of shared responsibility between producers and consumers. The authors argue that responsible consumption and responsible production cannot be treated separately because food systems are increasingly interconnected through global trade. A country may operate within its own environmental limits while relying heavily on imports produced in countries that are already exceeding sustainable land-use thresholds. For example, the study found that although China remained within its consumption-based cropland limits, 86% of the cropland footprint associated with its food consumption originated from regions exceeding their production-based limits. This demonstrates that sustainability assessments must consider entire supply chains rather than only national consumption levels.

Responsible consumption also promotes healthier and more sustainable diets. The Menus of Change Principles Report highlights the importance of dietary patterns based on vegetables, fruits, legumes, and whole grains, which can simultaneously improve health outcomes and reduce environmental impacts. Reducing excessive consumption of resource-intensive foods and increasing the consumption of plant-based foods can lower demand for land, water, and energy while contributing to healthier populations.

The social dimension of responsible consumption is equally important. Food systems influence employment, food security, working conditions, and community well-being. At the same time, millions of people around the world continue to experience food insecurity despite sufficient global food production. More responsible management of food resources through waste reduction, redistribution initiatives, and ethical sourcing practices can contribute to more equitable food systems and improve access to nutritious food.

Because of its importance for sustainable food systems, responsible consumption should be a central component of vocational education and training. Culinary schools, hospitality institutes, and professional training centres educate future chefs, restaurant managers, hospitality workers, and food service professionals whose decisions will directly influence food procurement, menu design, resource management, and customer behaviour. Developing sustainability awareness during education can therefore generate long-term benefits across the entire food sector.

Recent research on sustainable food literacy education demonstrated that students who participate in sustainability-focused learning programmes develop stronger competencies related to green consumption, healthy diets, agriculture, and social responsibility. The study also found significant improvements in sustainable food choices and sustainable culinary practices, highlighting the value of integrating responsible consumption topics into vocational curricula.

For vocational education students, several competencies should be strengthened. First, they should develop sustainable food literacy, understanding how food systems affect the environment, the economy, and society. Second, they should acquire practical skills in food waste prevention and management, including inventory control, portion planning, storage techniques, and surplus food redistribution. Third, they should learn sustainable procurement practices that prioritise local, seasonal, ethical, and environmentally responsible ingredients. Additional competencies should include resource-efficiency management, sustainable menu planning, ethical decision-making, and

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effective communication strategies capable of promoting responsible behaviours among customers and stakeholders. These competencies are increasingly important as food businesses face growing expectations to contribute to sustainable development.

Ultimately, sustainable food systems cannot be achieved solely through improvements in agricultural production. They also require significant changes in consumption patterns. The principles of responsible consumption, including efficient resource use, food waste reduction, sustainable purchasing, healthy dietary choices, and ethical decision-making, directly support the environmental, economic, and social sustainability of food systems. As highlighted by Shaikh et al. (2024), consumers and producers share responsibility for ensuring that food production remains within planetary limits. For this reason, education, awareness, and professional training are essential tools for preparing future food professionals to contribute actively to a more sustainable and resilient food system.

3. Environmental, economic and social impacts of purchasing and consumption choices in the culinary sector

According to the European Commission, food service operators, restaurants, catering companies, hospitality businesses, and culinary professionals play a crucial role in promoting sustainable consumption patterns through their purchasing decisions, menu design, food preparation practices, and waste management strategies. These choices influence not only business performance but also environmental sustainability, social equity, and public health.

According to EU Code of Conduct on Responsible Food Business and Marketing Practices, the main purchasing and consumption choices that can affect environmental sustainability, social equity, and public health are the following.

Local and seasonal sourcing - Choosing ingredients produced locally and consumed during their natural season. This helps support local farmers and preserve regional food traditions. Economically, it strengthens local supply chains and contributes to local economic development.

Sustainable sourcing of food products - Selecting products from sustainable agriculture, certified fisheries, or environmentally responsible suppliers. Socially, this supports fair working conditions and ethical production practices. Economically, it promotes long-term resource availability and reduces risks associated with unsustainable production.

Food waste prevention - Reducing waste during purchasing, storage, preparation, and service. This contributes to food security by making better use of available food resources and supporting redistribution initiatives. Economically, it reduces costs related to purchasing, disposal, and inefficient operations.

Portion size management - Serving portions that meet customer needs without generating excessive leftovers. Socially, this encourages healthier eating habits and raises awareness about food value. Economically, it reduces ingredient waste and improves cost control.

Sustainable packaging choices - Using recyclable, reusable, or reduced packaging materials. This helps reduce pollution and encourages environmentally responsible behaviour among consumers. From an economic perspective, it can lower waste management costs and improve business reputation.

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Sustainable menu design - Offering healthier and more sustainable food options, including plant-based dishes and seasonal products. Socially, this promotes healthier diets and more sustainable lifestyles. Economically, it responds to changing consumer preferences and can create new market opportunities.

Ethical supplier selection - Choosing suppliers that respect environmental, social, and ethical standards. This contributes to fair labour conditions and greater transparency throughout the food chain. Economically, it strengthens supply-chain reliability and builds consumer trust.

According to the European Commission's *EU Code of Conduct on Responsible Food Business and Marketing Practices*, these purchasing and consumption choices help food service operators contribute to food systems that are environmentally sustainable, socially responsible, and economically viable.

Practical Exercise: Comparing Two Sourcing Decisions Across the Three Dimensions

A useful way to apply the environmental, economic, and social dimensions in practice is to compare two contrasting sourcing decisions for the same dish and evaluate each one against all three dimensions rather than a single criterion.

Task: Compare the two contrasting sourcing decisions below across all three dimensions.

- **Case A – Imported, out-of-season ingredient:** a tropical fruit flown in during winter offers year-round menu consistency (economic advantage for the business) but carries a high carbon footprint from air transport and offers little support to local producers (environmental and social trade-offs).
- **Case B – Local, seasonal alternative:** a seasonal regional fruit reduces transport emissions and strengthens the local economy (environmental and social benefits), but may require menu redesign and could have a shorter availability window (economic and operational trade-off).

Deliverable: a short written judgement on which case better reflects responsible consumption overall, recognising that a genuinely sustainable decision rarely maximises all three dimensions at once and instead requires a balanced, context-dependent judgement.

Learning Outcome 2: Promoting Responsible Consumption in VET Centres

Learners will be able to:

1. Understand how culinary professionals and VET centres can model and promote responsible consumption
2. Analyse responsible consumption principles/practices in the culinary sector
3. Explain how to communicate and promote responsible consumption effectively
4. Identify real examples of responsible consumption success across Europe

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Topic 2: The Role of Culinary Professionals and VET Centres in Promoting Responsible Consumption

1. How chefs, students, and educators can model and promote responsible consumption

2. Responsible consumption principles/practices in the culinary sector

3. Communicating and Promoting Responsible Consumption

4. Success Stories: Responsible Consumption in Practice Across Europe

1. How chefs, students, and educators can model and promote responsible consumption

The transition towards sustainable food systems requires the active engagement of all actors involved in culinary education and professional practice. According to the European Commission's Farm to Fork Strategy and the EU Code of Conduct on Responsible Food Business and Marketing Practices, food service operators, educational institutions, and consumers all have a shared responsibility in promoting healthier and more sustainable consumption patterns.

Chefs play a central role in promoting responsible consumption because they directly influence food purchasing, menu design, preparation methods, and consumer choices. They can contribute to sustainability by prioritising local and seasonal ingredients, selecting products from responsible suppliers, reducing food waste, and improving resource efficiency in professional kitchens. The European Commission identifies food service operators as key actors in creating food environments that make sustainable and healthy choices easier for consumers. Chefs can also educate customers through their menus and communication practices, encouraging awareness of sustainable diets and responsible food consumption. By adopting food waste prevention measures and promoting the use of sustainable ingredients, they help reduce environmental impacts while supporting local food systems and responsible production practices.

Students represent the future workforce of the culinary and hospitality sectors and therefore have a key role in supporting the transition towards sustainable food systems. During their education and training, they can develop an understanding of how food choices affect environmental sustainability, social well-being, and economic resilience. The European Commission emphasises the importance of building sustainability competences that enable individuals to make informed and responsible decisions in both their professional and personal lives. Students can model responsible consumption by reducing food waste, selecting sustainable ingredients during practical activities, and applying resource-efficient behaviours in kitchens and learning environments. Participation in sustainability projects, awareness campaigns, and food waste reduction initiatives can further strengthen their understanding of responsible consumption and production. Through apprenticeships and workplace learning, students can also transfer sustainable practices into real professional settings and contribute to organisational change.

Educators are essential in preparing future culinary professionals to address sustainability challenges. Their role extends beyond teaching technical skills to fostering awareness, values, and behaviours that support responsible consumption. According to the European Commission, education and skills development are crucial components of the green transition and the achievement of sustainable food systems.

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Educators can promote responsible consumption by integrating topics such as sustainable food systems, food waste prevention, ethical sourcing, circular economy principles, and sustainable diets into culinary curricula. They can also use practical learning methods, case studies, and project-based activities to help learners understand the environmental, social, and economic consequences of food-related decisions. In addition, educators should act as role models by promoting sustainable practices within training environments and encouraging critical thinking about food consumption patterns. By collaborating with businesses, public authorities, and community organisations, they can ensure that training reflects current sustainability objectives and labour market needs.

Responsible consumption in the culinary sector depends on the combined efforts of chefs, students, and educators. Chefs can influence sustainable purchasing and consumption patterns through professional practices; students can develop and apply responsible behaviours throughout their education and careers; and educators can equip future professionals with the knowledge, skills, and values needed to support sustainable food systems. Together, these actors contribute to the European Union's objective of creating food systems that are environmentally sustainable, socially responsible, and economically resilient.

2. Responsible consumption principles/practices in the culinary sector

Responsible consumption in the culinary sector refers to the adoption of food production, preparation and consumption practices that minimise environmental impacts, reduce waste and promote social and economic sustainability. This concept is closely linked to Sustainable Development Goal 12 (SDG 12), which aims to ensure sustainable consumption and production patterns. The hospitality and food service sectors play a crucial role in achieving this objective, as their decisions directly influence resource use, food waste generation and consumer behaviour.

One of the most important principles of responsible consumption is the prevention of food waste. According to Delgado et al. (2023), food waste remains one of the major challenges to sustainable development, particularly in industrialized countries where large quantities of edible food are discarded despite the persistence of global food insecurity. The hospitality and tourism sectors are therefore increasingly expected to contribute to food waste reduction strategies that support climate change mitigation and food security objectives.

In professional kitchens, responsible consumption begins with sustainable menu planning and efficient inventory management. Camilleri (2021) highlights the importance of reducing menu complexity, adapting production volumes to actual demand and applying inventory management systems such as FIFO (First In, First Out) or FEFO (First Expired, First Out). These practices reduce spoilage, prevent unnecessary waste and improve operational efficiency. Furthermore, portion control strategies can help align food production with customer needs, minimising leftovers and overconsumption.

Another key principle involves sourcing local and seasonal products. Delgado et al. (2023) argue that gastronomic tourism can promote sustainable food systems when it supports traditional food cultures, local suppliers and regional agricultural heritage. Local sourcing reduces transportation-related greenhouse gas emissions, strengthens local economies and helps preserve biodiversity. Traditional dietary models, such as the Mediterranean diet, also demonstrate how cultural food heritage can support both human health and environmental sustainability.

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The adoption of circular economy principles is increasingly recognised as a best practice in the hospitality sector. According to Camilleri (2021), culinary businesses should move away from the traditional linear model of "take, make and dispose" and adopt regenerative approaches that maximise resource efficiency. This includes the utilization of surplus ingredients, the reuse of edible by-products, and the recycling of unavoidable organic waste. Circular economy strategies contribute to reducing operational costs while simultaneously improving environmental performance.

Food surplus management is another important aspect of responsible consumption. Hospitality businesses can donate safe, edible surplus food to food banks and charities or redistribute it through digital platforms designed to connect consumers with discounted surplus meals. Such initiatives not only reduce food waste but also generate positive social outcomes by increasing food availability for vulnerable populations.

Good practice example: the digital platform Too Good To Go, launched in Copenhagen in 2016, connects restaurants, bakeries, and hotels with customers who can buy unsold food at a reduced price at the end of the service day. Now active in more than 20 countries across Europe and beyond, the platform has helped save over 500 million meals from being wasted, equivalent to roughly 1.3 million tonnes of CO2e avoided. For culinary VET learners, it is a practical illustration of how a simple digital tool can turn a restaurant's surplus food into both an environmental benefit and a source of extra revenue.

For food that can no longer be consumed, responsible waste management practices become essential. Camilleri (2021) identifies composting, anaerobic digestion for methane production and the transformation of organic residues into animal feed as effective alternatives to landfill disposal. These approaches help recover value from food waste and contribute to the creation of more sustainable and circular food systems.

Education and food literacy also play a central role in fostering responsible consumption. Delgado et al. (2023) emphasize that reducing food waste requires behavioural change among both consumers and professionals. Increasing awareness of food preservation, portion adequacy and nutritional needs can support healthier dietary patterns while reducing unnecessary waste generation. In this context, chefs and hospitality professionals act not only as food providers but also as educators capable of promoting sustainable consumer choices.

In conclusion, responsible consumption in the culinary sector requires an integrated approach that combines food waste prevention, sustainable sourcing, circular economy principles, resource efficiency and consumer education. By adopting these practices, culinary businesses can contribute significantly to the achievement of SDG 12, climate change mitigation and food security, while enhancing their long-term competitiveness and resilience.

3. Communicating and Promoting Responsible Consumption

Chefs, kitchen staff, and hospitality professionals do not only influence sustainability through what they purchase and prepare, but also through how they communicate sustainability to customers, colleagues, and the wider public. The European Commission's EU Code of Conduct on Responsible Food Business and Marketing Practices highlights consumer awareness and engagement as essential conditions for the transition towards sustainable food systems, meaning that responsible sourcing and

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menu design only achieve their full impact when they are clearly and honestly communicated to the people who make purchasing and consumption decisions.

Effective communication does not happen by chance; it needs to be planned and reviewed. Communication and marketing specialists commonly distinguish between ex ante, ongoing, and ex post evaluation of a communication strategy. Ex ante evaluation checks, before a message is launched, whether it is clear, credible, and likely to reach the intended audience. Ongoing evaluation monitors how customers and staff are actually responding while a campaign or menu message is in use, allowing quick adjustments. Ex post evaluation looks back once the initiative has ended, asking whether awareness, attitudes, or behaviours actually changed. Applying this three-stage logic helps culinary professionals move beyond simply publishing sustainability messages and instead understand whether those messages are genuinely influencing responsible food choices.

In practice, culinary centres and food businesses can promote responsible consumption through a range of simple and low-cost tools, including in-kitchen and in-restaurant awareness campaigns, printed posters, table cards, and social media content. Menus themselves are a communication tool: short notes explaining that a dish uses local, seasonal, or KM0 ingredients help customers understand and value sustainable choices rather than simply consuming them without awareness. Consistent visual identity, clear and non-technical language, and honest claims are essential, since exaggerated or unclear sustainability messages can undermine customer trust rather than build it.

VET students have a particular role to play as communicators of responsible consumption among their peers, families, and future customers. Recent research on sustainable food literacy education found that students who took part in sustainability-focused learning developed stronger competencies in green consumption and social responsibility, competencies that are strengthened further when students are asked to explain and promote these practices to others. Designing a simple awareness campaign, such as a poster series or a short social media brief on reducing food waste or choosing seasonal ingredients, is therefore also a practical learning exercise: it requires students to translate technical sustainability knowledge into messages that are simple, accurate, and persuasive for a non-specialist audience.

In conclusion, communicating and promoting responsible consumption turns individual sustainable practices into shared knowledge and collective behaviour change. By evaluating their communication strategies before, during, and after implementation, and by using accessible tools such as menus, posters, and social media, chefs, educators, and students can extend the impact of responsible sourcing and menu planning beyond the kitchen, encouraging customers, colleagues, and the wider community to make more sustainable food choices.

4. Success Stories: Responsible Consumption in Practice Across Europe

Seeing how responsible consumption principles have already been put into practice at national and institutional level helps learners connect the concepts covered in this module to real, verifiable change.

France – Regulating Sustainable Procurement in Collective Catering

Since 2018, France's EGalim law has required all collective catering establishments (schools, hospitals, canteens) to source at least 50% of products from sustainable or quality-labelled sources, including a minimum of 20% organic, and to offer a weekly vegetarian menu. This is one of the most concrete

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examples in Europe of responsible consumption being embedded directly into public procurement policy, showing learners how sourcing criteria covered later in Topic 3 of this module can be enforced at national scale.

Nordic Countries – Linking Nutrition and Environmental Guidance

In 2023, the Nordic Council of Ministers published the Nordic Nutrition Recommendations (NNR2023), which for the first time in their forty-year history combined dietary health advice with environmental sustainability criteria, recommending a predominantly plant-based diet with moderate fish, dairy, and meat. This shows how the menu-planning principles covered in Topic 4 of this module are already shaping official dietary guidance for an entire region.

Italy – The Slow Food Movement and Short Supply Chains

Founded in Italy in 1986, the **Slow Food movement** was one of the first organised responses to industrial, fast-food consumption, promoting local, seasonal, and traditional food production and shorter supply chains between producers and consumers. Its network of local chapters continues to support culinary education initiatives that connect chefs and students directly with small-scale producers, illustrating the sourcing principles discussed in Topic 3.

Spain and the Mediterranean – A Heritage-Based Model of Sustainable Eating

In 2010, UNESCO recognised the Mediterranean diet as an Intangible Cultural Heritage of Humanity, citing Spain, Italy, Greece, and Morocco (with Cyprus, Croatia, and Portugal added in 2013). The Mediterranean diet is now widely cited by nutrition and environmental researchers as a model that supports both public health and lower environmental impact through its emphasis on plant-based foods, legumes, and seasonal, local ingredients — directly reflecting the balance between sustainability and nutrition addressed in Topic 4 of this module.

Netherlands – Sector-Wide Commitment to Food Waste Reduction

Dutch hospitality and food service organisations have been among the most active in Europe in adopting voluntary sector-wide agreements to reduce food waste, in line with the United Nations Sustainable Development Goal 12.3 target of halving food waste by 2030. National platforms bring together hotels, restaurants, and catering companies to share measurement tools and best practices, showing how the waste-reduction concepts introduced in Topic 5 of this module can be organised collectively across an entire industry rather than kitchen by kitchen.

Together, these five examples show that the ideas explored throughout this module — responsible sourcing, sustainable menu planning, and waste reduction — are not abstract goals, but are already shaping real regulation, professional practice, and public guidance across Europe.

Practical Exercise: Which Model Fits Us?

This exercise helps learners judge which national example is most transferable to their own context.

Task: Choose one of the five country examples above and identify one specific element of it (a rule, a guideline, a network, or a voluntary agreement) that could realistically be introduced or piloted at your own VET centre.

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Deliverable: a short pitch (a few sentences) explaining the chosen element and one first step to introduce it locally.

Learning Outcome 3: Sustainable Sourcing and Ethical Procurement

Learners will be able to:

1. Identify responsible sourcing options in culinary procurement (local, seasonal, fair trade, KM0, certified products)
2. Explain basic sustainability criteria used to assess ingredients
3. Identify key elements of ethical procurement policies
4. Outline a simple sourcing policy based on sustainability criteria

Topic 3: Sustainable Sourcing and Ethical Food Procurement

1. Ethical sourcing and fair-trade practices

2. Sustainability criteria for ingredients' assessment

3. Recognise key elements of ethical procurement policies

4. From Sourcing Criteria to a Simple Sourcing Policy

1. Ethical sourcing and fair-trade practices

Ethical sourcing and fair-trade practices refer to the procurement of food products based not only on price and quality, but also on social justice, environmental sustainability, transparency, and respect for human rights throughout the supply chain. According to La Bara, Fiorani and Litardi (2017), ethical consumption is grounded in the idea that consumers and organisations can influence production systems through responsible purchasing decisions, encouraging companies to adopt more sustainable and socially responsible behaviours.

For ethical sourcing to function effectively, several conditions are required. First, supply chains must be transparent and traceable, allowing buyers to verify where products come from and under which conditions they are produced. Second, suppliers must guarantee fair labour conditions, adequate wages, and respect for workers‘ rights. Third, organisations need clear sustainability criteria when selecting ingredients and suppliers. Finally, collaboration among producers, businesses, governments, research institutions, NGOs, and consumers is essential to create a system capable of supporting sustainable production and responsible consumption. The article emphasizes that stakeholder cooperation and public-private partnerships are critical for achieving sustainable development objectives.

Fair trade represents one of the most established models of ethical sourcing. Fairtrade certification guarantees a Minimum Price that protects producers from market instability and ensures that production costs can be covered. In addition, producers receive a Fairtrade Premium, an extra payment invested in projects chosen democratically by farming communities. These investments often

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support education, healthcare, business development, environmental protection, water conservation, and climate adaptation measures.

Reading Product Labels and Certifications

Beyond knowing that a certification scheme exists, learners need to be able to recognise and interpret the labels they will actually see on packaging and supplier catalogues in a professional kitchen.

- **Fairtrade label:** the black-and-blue-and-green logo indicating compliance with Fairtrade social, economic, and environmental standards.
- **Organic / EU Organic (Euro-leaf) logo:** confirms production without synthetic pesticides or fertilisers and compliance with EU organic farming regulation.
- **Marine Stewardship Council (MSC) and Aquaculture Stewardship Council (ASC) labels:** certify seafood and aquaculture products sourced from sustainably managed fisheries and farms.
- **Rainforest Alliance seal:** indicates that ingredients such as coffee, cocoa, or tea were produced according to environmental and social sustainability standards.

Being able to identify these labels quickly allows culinary professionals to make faster, more confident purchasing decisions and to explain to customers, with credibility, why a particular ingredient was chosen.

The article highlights that fair trade is founded on dialogue, transparency, and respect between producers and consumers. For fair trade to work properly, consumers must be willing to support certified products, organisations must integrate ethical procurement policies into purchasing decisions, and certification systems must ensure credibility and accountability. Consumer awareness is therefore a fundamental component of the system. The study refers to the concept of „voting with the portfolio“, meaning that every purchase can reward businesses that operate responsibly and encourage more sustainable market practices.

In the hospitality and food service sector, ethical sourcing and fair trade provide several benefits. Restaurants can improve the quality and traceability of their ingredients, strengthen their reputation among increasingly sustainability-conscious customers, and demonstrate commitment to corporate social responsibility principles. Ethical procurement also helps establish long-term relationships with reliable suppliers and supports compliance with sustainability goals, including the United Nations Sustainable Development Goal 12 on responsible consumption and production.

The Fairtrade system also benefits food service businesses by ensuring more stable supply chains and contributing to producer resilience against climate change. The article notes that Fairtrade Premium funds have been used by coffee farmers to reduce soil erosion, improve water management, plant trees, and adopt sustainable agricultural practices. These interventions strengthen farming communities while helping maintain the long-term availability of quality agricultural products.

The World Fairtrade Challenge discussed in the study demonstrates how collective action can raise awareness of responsible consumption and support producers in developing countries. The initiative involved universities, businesses, governments, and civil society organisations, confirming that sustainable procurement requires the active participation of multiple stakeholders. The authors

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conclude that fair trade represents a best practice because it combines economic value creation with social responsibility, environmental protection, poverty reduction, and local community development. Through ethical sourcing and fair-trade practices, food service organisations can play an active role in building more sustainable and equitable food systems.

The scale of this market illustrates how far ethical sourcing has moved into the mainstream. Fairtrade-labelled products generated more than €11.6 billion in global retail sales in a recent year, with Europe's five largest markets (the UK, Germany, France, Switzerland, and Italy) accounting for the great majority of this revenue. In Germany alone, Fairtrade sales reached €2.6 billion in 2023, an increase of 8.5% on the previous year. For culinary VET learners, this growth signals a genuine and expanding market opportunity for chefs and food businesses that build their sourcing strategy around certified, ethically traded ingredients.

2. Sustainability criteria for ingredients' assessment

In the culinary sector, sustainability assessment helps chefs, food buyers, restaurants, and catering organisations select ingredients that minimise environmental impacts, support social responsibility, and contribute to long-term food security. Sustainable ingredients are not evaluated solely on quality, taste, or cost; they are also assessed according to specific sustainability criteria that consider their environmental, social, and economic effects throughout the supply chain.

1. Origin and Food Miles - One of the first criteria used to assess an ingredient is its origin. This refers to the geographical location where the food is produced and the distance it travels before reaching the kitchen. The concept of food miles measures the transportation distance between producer and consumer. Ingredients sourced locally generally require less transportation, resulting in reduced greenhouse gas emissions and lower energy consumption. In addition, local sourcing often supports regional farmers and strengthens local economies. However, distance alone should not be the only factor considered; production methods and transportation efficiency must also be evaluated.

2. Seasonality - Seasonality refers to consuming fruits, vegetables, and other products during their natural growing season. Seasonal ingredients typically require fewer artificial inputs such as heated greenhouses, extended storage, or intensive preservation methods.

Using seasonal products offers several sustainability advantages:

- Lower energy consumption.
- Reduced environmental impact.
- Better flavour and freshness.
- Support for local agricultural cycles.

For example, purchasing tomatoes during their natural summer season is generally more sustainable than importing them from distant regions during winter.

3. Production Methods - The way food is produced significantly influences its sustainability profile. Sustainable production methods aim to minimise environmental damage while maintaining long-term productivity. Important aspects include:

- Reduced use of pesticides and synthetic fertilizers.

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- Protection of soil fertility.
- Efficient water management.
- Preservation of biodiversity.
- Responsible animal welfare practices.

Organic agriculture, agroecological farming, regenerative agriculture, and integrated pest management are examples of production approaches often associated with improved sustainability performance.

4. Carbon Footprint - The carbon footprint measures the total greenhouse gas emissions generated throughout an ingredient's life cycle, including production, processing, packaging, transportation, and storage. Foods with lower carbon footprints are generally considered more sustainable. For example, plant-based ingredients often generate fewer emissions than highly processed foods or products derived from intensive livestock systems. Evaluating carbon footprint allows food professionals to understand the environmental consequences of purchasing decisions and identify opportunities to reduce emissions within food service operations.

5. Water Footprint - The water footprint refers to the amount of freshwater used to produce an ingredient. Water consumption includes irrigation, processing, cleaning, and manufacturing activities. This criterion is increasingly important because many agricultural regions face water scarcity. Sustainable sourcing favors ingredients produced through efficient water-management practices and in regions where water resources are not excessively stressed. By considering water footprint, food businesses can encourage more responsible use of one of the world's most valuable natural resources.

6. Biodiversity Impact - Biodiversity refers to the variety of living organisms within ecosystems. Agricultural practices can either support or threaten biodiversity depending on how land is managed. Ingredients are considered more sustainable when their production:

- Preserves natural habitats.
- Protects pollinators such as bees.
- Prevents deforestation.
- Maintains healthy ecosystems.
- Encourages crop diversity.

Protecting biodiversity contributes to ecosystem resilience and helps ensure long-term food production capacity.

3. Recognise key elements of ethical procurement policies

In modern food systems, sustainability also includes social responsibility and ethical business practices. Ethical procurement policies are a set of principles, standards, and procedures that guide organisations in purchasing goods and services in a way that respects people, communities, and the environment. In the culinary and hospitality sectors, these policies help restaurants, hotels, catering companies, and food service organisations ensure that the ingredients they purchase are produced, processed, and distributed under fair and responsible conditions. An effective ethical procurement policy goes beyond

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selecting products based solely on price, quality, and availability. Instead, it evaluates the social and ethical impacts of purchasing decisions throughout the supply chain. Ethical procurement requires transparency, accountability, and a commitment to protecting the rights and well-being of all individuals involved in food production.

Fair Wages – One of the most important elements of an ethical procurement policy is the guarantee of fair wages. Workers involved in farming, harvesting, processing, packaging, and distribution should receive compensation that reflects the value of their labor and allows them to maintain a decent standard of living. Low wages are often associated with poverty, poor living conditions, and limited access to education and healthcare. Ethical procurement policies encourage organisations to work with suppliers that provide fair compensation to employees and producers. Fairtrade certification, for example, supports minimum pricing mechanisms that help farmers cover production costs and achieve greater economic stability. This contributes to reducing poverty and promoting more equitable economic development.

Safe Working Conditions – Ethical procurement policies require suppliers to provide safe and healthy working environments. Agricultural and food-processing workers can face numerous risks, including exposure to chemicals, dangerous machinery, extreme temperatures, and physically demanding tasks. Organizations implementing ethical procurement policies should verify that suppliers comply with occupational health and safety regulations, provide appropriate protective equipment, and establish procedures to prevent accidents and injuries. Safe working conditions not only protect employees but also improve productivity, well-being, and long-term sustainability within the supply chain.

Respect for Human Rights – Respect for human rights is a fundamental principle of ethical procurement. Every worker should be treated with dignity and respect regardless of nationality, ethnicity, religion, gender, age, or social status. Human rights considerations include freedom of association, freedom from discrimination, protection against exploitation, and access to fair grievance mechanisms. Companies should ensure that suppliers respect internationally recognised human rights standards and should monitor their supply chains to identify and address potential violations. By integrating human rights considerations into procurement decisions, food businesses contribute to creating supply chains that prioritise human dignity and social justice.

Elimination of Child Labour – The elimination of child labour is a critical requirement in ethical sourcing policies. In some agricultural sectors around the world, children may be involved in work that interferes with their education, health, or development. Ethical procurement policies require suppliers to comply with national and international labour regulations and to demonstrate that child labour is not used at any stage of production. Auditing systems, supplier assessments, and certification schemes play an important role in verifying compliance and ensuring transparency. Preventing child labour helps protect children‘s rights and supports access to education, which is essential for long-term social and economic development.

Gender Equality and Non-Discrimination – Ethical procurement policies also promote gender equality and equal opportunities. Women represent a significant portion of the global agricultural workforce, yet they often face barriers to fair employment, leadership positions, financing opportunities, and access to resources. Organizations committed to ethical procurement seek suppliers that provide

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equal pay for equal work, prevent discrimination, support women's participation in decision-making processes, and create inclusive workplaces.

Promoting gender equality contributes to stronger communities, improved economic performance, and more resilient supply chains. The Fairtrade model itself has been associated with broader objectives such as reducing inequalities and supporting inclusive development.

Support for Local Communities – Ethical procurement extends beyond individual workers and includes the welfare of local communities. Procurement policies should encourage sourcing practices that generate positive social impacts in producing regions.

Support for local communities may include investments in education, healthcare, infrastructure, clean water access, training programmes, and local economic development. Fairtrade Premium funds are an example of this approach, as producer communities democratically decide how additional resources should be invested to improve social and economic conditions. These investments often contribute to long-term community development and resilience.

Transparency and Traceability – Transparency is another essential component of ethical procurement policies. Organizations must know where their ingredients come from, who produced them, and under what conditions they were produced. Traceability systems allow businesses to monitor products from farm to table and verify compliance with ethical standards. Transparent supply chains help identify risks, prevent unethical practices, and build trust with consumers. Restaurants and food service companies increasingly use traceability information to demonstrate their commitment to responsible sourcing and to meet growing consumer expectations for ethical and sustainable products.

Supplier Accountability – Ethical procurement policies require suppliers to meet clearly defined standards and to demonstrate continuous compliance. Supplier accountability involves regular assessments, audits, reporting requirements, and corrective action plans when problems are identified. Organizations should establish codes of conduct that define expectations regarding labour practices, environmental protection, business integrity, and human rights. Long-term partnerships with responsible suppliers help strengthen sustainability performance across the entire supply chain.

Ethical Certifications and Standards – Certifications provide practical tools for implementing ethical procurement policies. Standards such as Fairtrade help organisations identify products that meet defined social, economic, and ethical requirements. Certification systems often verify compliance with criteria related to fair trading conditions, worker protection, democratic participation, environmental management, and community development. These certifications provide assurance to buyers and consumers while encouraging continuous improvement among producers. According to the Fairtrade case study, certification helps protect small producers, promotes fairer trading conditions, and supports ethical principles in the workplace.

Recognising the key elements of ethical procurement policies is essential for responsible decision-making in the culinary sector. Effective policies require fair wages, safe working conditions, respect for human rights, elimination of child labour, gender equality, support for local communities, transparency, traceability, supplier accountability, and credible certification systems. Together, these elements create supply chains that are not only economically viable but also socially responsible and sustainable. By adopting ethical procurement policies, restaurants and food service organisations can

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contribute to poverty reduction, improved working conditions, stronger communities, and a more equitable global food system.

4. From Sourcing Criteria to a Simple Sourcing Policy

Sourcing criteria become genuinely useful only when they are applied consistently. This section introduces two practical tools that help turn the theory of ethical sourcing into everyday supplier decisions: life-cycle thinking and a supplier evaluation checklist.

Life-Cycle Thinking

A useful starting point when assessing any ingredient or product (including local and traditional / heritage culinary ingredients) is to think through its full life cycle: raw material extraction, production, packaging, transport, use in the kitchen, and final disposal or recovery. Considering impacts at each of these stages — rather than only the purchase price — helps learners see, for example, that a cheap imported ingredient may carry hidden environmental costs in transport and packaging that a slightly more expensive local or traditional alternative avoids. Traditional ingredients often also carry additional social and cultural value that should be weighed in the assessment.

Practical Exercise: Life-Cycle Analysis, Supplier Evaluation & Sourcing Proposal

This exercise combines supplier evaluation with life-cycle thinking to turn ethical sourcing into a concrete proposal for the VET centre's menu.

Task: Select one local modern ingredient and one traditional/regional ingredient (e.g. a heritage vegetable, a traditional grain, or a farmhouse cheese typical of the region). Compare both across production, packaging, transport, kitchen use, and end-of-life, noting the environmental, social and economic impacts of each. Then use the checklist below to evaluate potential suppliers for both ingredients before deciding whether to include their products in a menu or purchasing plan.

Sustainability Criterion	What to Check Before Approving a Supplier
Origin and distance	Is the product local, regional, or imported? How far has it travelled?
Seasonality	Is the ingredient in season, or does it require energy-intensive storage or greenhouse production?
Certification	Does the supplier hold a recognised label (Fairtrade, Organic/Euro-leaf, MSC/ASC, Rainforest Alliance)?
Labour conditions	Is there evidence of fair wages and safe working conditions across the supply chain?
Packaging	Is packaging minimal, reusable, recyclable, or compostable?
Price transparency	Does the price reflect a fair distribution of value between producer, distributor, and retailer?

Deliverable: a short written proposal (half a page) recommending which ingredient to prioritise, concrete menu changes, and the expected benefits for responsible consumption — supported by the completed comparison and supplier checklist above.

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This turns life-cycle thinking and ethical sourcing into a concrete proposal for the VET centre's menu, while keeping traditional and heritage ingredients — and the cultural and biodiversity value they carry — part of the decision.

Learning Outcome 4: Menu Planning for Sustainability and Nutrition

Learners will be able to:

1. Describe basic principles and tips for planning more sustainable menus
2. Explain how to balance/combine sustainability considerations with nutritional guidelines in a menu planning
3. Apply sustainability and nutrition principles when designing a practical weekly menu

Topic 4: Menu Planning for Sustainability and Nutrition

1. *Principles & tips for planning more sustainable menus*

2. Balancing sustainability considerations with nutritional guidelines in a menu planning

3. Practical example: designing a balanced, low-impact weekly menu

1. Principles & tips for planning more sustainable menus

Planning a sustainable menu means choosing foods and recipes that are good for both people and the planet. In modern food service, chefs are increasingly expected to consider not only taste, quality, and cost, but also the environmental and social impacts of the ingredients they use. According to the European Commission's Farm to Fork Strategy, restaurants and food businesses can contribute to healthier and more sustainable food systems by encouraging responsible consumption and offering nutritious, environmentally friendly meals.

One of the easiest ways to make a menu more sustainable is to use local ingredients. When food is produced close to where it is consumed, transportation distances are reduced, which can help lower emissions associated with food distribution. Buying locally can also support farmers and producers in the surrounding area, strengthening the local economy and creating closer relationships between suppliers and restaurants.

Another important principle is choosing seasonal products. Fruits and vegetables that are naturally in season generally require fewer resources to grow and often have better flavor and freshness. For example, strawberries are more sustainable during their natural harvest season than when they are imported from distant countries or grown in heated greenhouses. Seasonal menu planning helps chefs use ingredients when they are at their best quality and most readily available.

A sustainable menu should also include more plant-based dishes. Organizations such as WWF encourage diets that contain a larger variety of vegetables, fruits, legumes, and whole grains because these foods usually require less land, water, and energy compared to many animal-based products. Offering attractive plant-based options does not mean eliminating meat completely. Instead, chefs can create a better balance by including dishes such as vegetable curries, lentil soups, bean burgers, or grain salads alongside traditional meat and fish dishes.

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Reducing food waste is another key element of sustainable menu planning. Every year, large amounts of food are wasted throughout the food chain. Careful planning can help prevent this problem. Chefs can use ingredients in multiple recipes, purchase only the quantities they need, and find creative ways to use edible leftovers. For example, vegetable trimmings can be transformed into stocks and soups, while day-old bread can be used for breadcrumbs, stuffing, or croutons.

Choosing responsibly sourced ingredients is equally important. Many restaurants now look for products that have sustainability certifications. Labels such as Fairtrade or Organic help identify products that have been produced according to specific environmental and social standards. These certifications often support responsible farming methods, fair treatment of workers, and better management of natural resources.

Another useful recommendation is to promote food diversity. Modern diets often rely on a small number of crops, while many nutritious and sustainable ingredients remain underused. By including different vegetables, grains, legumes, and regional specialties, chefs can create more interesting menus while supporting agricultural biodiversity. A varied menu is also more appealing because it offers different flavours, colours, and textures.

Menu planning should also focus on simplicity and efficiency. A menu with too many dishes may require large inventories and increase the risk of food spoilage. A smaller menu built around versatile ingredients can reduce waste, improve kitchen organisation, and help maintain consistent quality. Many successful sustainable restaurants prefer a limited number of dishes prepared with fresh seasonal ingredients rather than an extensive menu available throughout the year.

Finally, sustainable menus should consider the efficient use of energy and water. Cooking methods, equipment selection, and kitchen organisation all affect resource consumption. Simple actions such as cooking full batches, minimising unnecessary refrigeration, and using energy-efficient equipment can reduce the environmental footprint of food preparation.

2. Balancing sustainability considerations with nutritional guidelines in a menu planning

Creating a menu is not only about offering tasty dishes. Culinary professionals must also ensure that meals are both nutritious for customers and sustainable for the environment. Balancing sustainability and nutrition mean finding food choices that support human health while reducing negative impacts on natural resources, climate, and biodiversity.

According to the European Commission‘s Farm to Fork Strategy, future food systems should provide food that is healthy, safe, affordable, and environmentally sustainable. This means that chefs and food service professionals should consider both nutritional value and environmental impact when designing menus.

A sustainable menu is not necessarily the healthiest menu, and a healthy menu is not always the most sustainable. The goal is to combine both aspects. For example:

- A meal rich in vegetables may have a low environmental impact
- A meal rich in nutrients supports human health
- The best menu combines nutritional quality with responsible ingredient choices

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A chef should therefore evaluate every ingredient from two perspectives:

IS IT GOOD FOR PEOPLE? YES + 2. IS IT GOOD FOR THE PLANET?

YES = BALANCED MENU

Balancing sustainability considerations with nutritional guidelines means designing meals that are healthy for people and responsible toward the environment. Chefs should prioritise seasonal foods, increase plant-based ingredients, provide balanced nutrients, control portions, reduce food waste, and select responsibly sourced products.

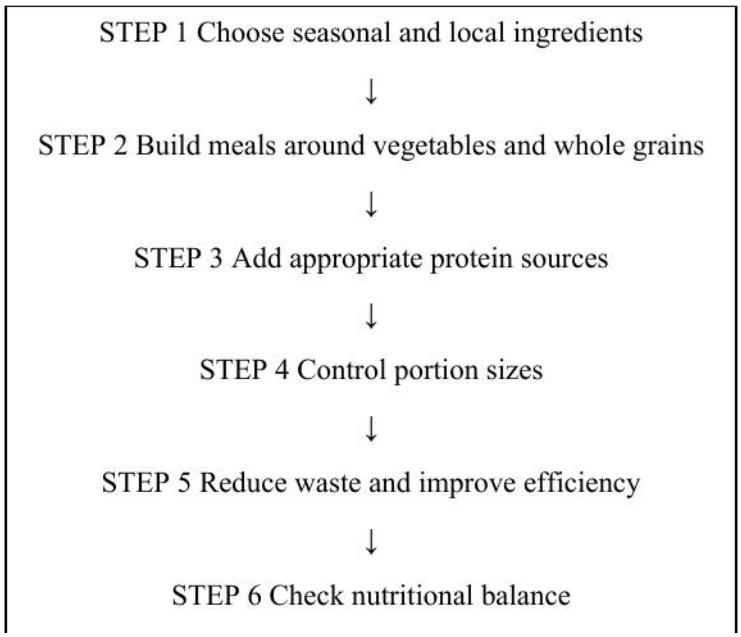


Figure **14**: Practical Framework for Menu Planning

Source: Own elaboration, based on the menu-planning principles discussed in this section.

The European Commission and WWF both emphasize that the future of food depends on diets that combine nutritional quality, environmental protection, and responsible consumption. By applying these principles, culinary professionals can create menus that satisfy customers while contributing to more sustainable and resilient food systems.

These principles are consistent with the EU Farm to Fork Strategy, which explicitly links sustainable food systems to healthy diets, and with national Food-Based Dietary Guidelines, which most EU countries publish to translate nutrition science (balanced portions of vegetables, whole grains, and moderate animal protein) into practical everyday recommendations. Aligning a training menu with these two reference points — one European and one national — gives learners a concrete, authoritative benchmark for what a “balanced and sustainable” menu should look like, rather than relying on general impressions alone.

3. Practical example: designing a balanced, low-impact weekly menu

Origin and provenance matter to customers as well as to the planet. According to a Eurobarometer survey conducted for the European Food Safety Authority, where food comes from is the single most

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important factor for European consumers when buying food, cited by 53% of respondents. Communicating the origin and seasonality of dishes on the menu therefore supports both sustainability goals and customer trust. The example below illustrates how the principles discussed in this topic can be translated into a concrete weekly lunch menu for a culinary VET training restaurant.

- **Monday** – Seasonal vegetable and legume soup with local bread; plant-forward main to lower the meal's carbon and water footprint.
- **Tuesday** – Whole-grain salad with seasonal vegetables and a small, moderate portion of certified sustainable fish, balancing protein needs with lower-impact sourcing.
- **Wednesday** – Fully plant-based dish (e.g. legume and grain bowl) built around vegetables nearing the end of their shelf life, reducing both environmental impact and food waste.
- **Thursday** – Local, KM0 poultry or legumes with seasonal roasted vegetables, sourced from producers within a limited transport radius to reduce food miles.
- **Friday** – "Root-to-stem" special using vegetable trimmings and leftovers from earlier in the week (for example, a vegetable stock risotto), closing the week with a zero-waste dish.

Across the five days, at least three of the five main dishes are fully plant-based or plant-forward, matching the good-practice benchmark of designing at least 60% of weekly dishes around local, seasonal, and low-impact ingredients. Students can be asked to evaluate their own weekly menus using simple indicators such as the share of plant-based dishes, the share of local/seasonal ingredients, and an estimate of ingredients rescued from being wasted, turning the exercise into both a menu-planning task and a self-assessment of sustainability performance.

Practical Exercise: Designing Your Own Low-Impact Weekly Menu

Task: Using the weekly menu example above as a model, design your own five-day lunch menu for a training kitchen, then:

- Check that at least 60% of main dishes are plant-based or plant-forward, local and seasonal.
- Flag at least one ingredient per dish that could use surplus or off-cut produce.
- Present the menu to peers, explaining the sustainability reasoning behind at least two dishes.

Deliverable: a five-day lunch menu meeting the criteria above, presented to peers with the sustainability reasoning for at least two dishes.

Learning Outcome 5: Reducing Environmental Impact in Culinary Operations

Learners will be able to:

1. Identify methods to reduce packaging and single-use materials in kitchens and catering
2. Recognise strategies for efficient energy and water usage in culinary operations
3. Identify feasible waste reduction alternatives and sustainable operational improvements

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Topic 5: Reducing Environmental Impact through Waste, Packaging, Energy, and Water Management

1. Reducing packaging and single-use plastics in kitchens and catering; exploring reusable/compostable options

2. Efficient energy and water usage in culinary operations

3. Waste reduction alternatives and sustainable operational improvements

1. Reducing packaging and single-use plastics in kitchens and catering; exploring reusable/compostable options

Reducing packaging and limiting single-use materials are practical and achievable strategies for improving sustainability in professional kitchens and catering services. Purchasing ingredients in bulk, selecting suppliers that use responsible packaging, and replacing disposable products with durable reusable alternatives can significantly reduce waste and resource consumption. As future culinary professionals, students should learn to view packaging and material management as important elements of sustainable kitchen operations, contributing not only to environmental protection but also to greater operational efficiency and long-term economic savings.

The scale of the challenge is significant at EU level. According to Eurostat, the EU generated 79.7 million tonnes of packaging waste in 2023, equivalent to 177.8 kg per inhabitant, of which 35.3 kg per person was plastic packaging alone. Restaurants and food services are also a measurable part of the food waste picture: Eurostat estimates that this sector generates around 11% of all EU food waste, close to 7 million tonnes every year. These figures show that packaging and waste decisions made in individual kitchens add up to a substantial share of the EU's overall environmental footprint, reinforcing the importance of the practical measures presented in this topic.

Both packaging reduction and better management of single-use materials contribute to a more sustainable culinary operation. The main benefits include:

- Reduced waste generation.
- Lower disposal and waste management costs.
- Reduced consumption of raw materials.
- Lower environmental footprint.
- Less plastic pollution.
- Improved resource efficiency.
- Enhanced sustainability reputation among customers.
- Better alignment with environmental policies and sustainability goals.

These practices also help culinary students develop a more responsible approach to food service management. By understanding how purchasing decisions, packaging choices, and material use affect the environment, future chefs can play an active role in creating more sustainable kitchens.

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Packaging waste has become one of the most important environmental challenges facing the food service sector. Restaurants, catering companies, and institutional kitchens use large quantities of packaging materials every day to receive, store, prepare, transport, and serve food. Much of this packaging is used only once before being discarded, creating unnecessary waste and increasing pressure on natural resources. For this reason, sustainable kitchen management increasingly focuses on reducing packaging and limiting the use of disposable materials. These practices support the objectives of the European Union's Farm to Fork Strategy, which promotes more sustainable food systems and encourages businesses to reduce their environmental footprint.

In situations where reusable alternatives are not practical, businesses should seek solutions with lower environmental impacts, such as recyclable or compostable materials. However, according to waste management principles, reducing and reusing remain preferable to simply replacing one disposable product with another.

2. Efficient energy and water usage in culinary operations

Professional kitchens use large quantities of resources every day for cooking, refrigeration, cleaning, lighting, and food preparation. By learning simple sustainable practices, culinary students can reduce waste, lower operating costs, and help protect the environment.

The United Nations Sustainable Development Goals (SDGs), particularly Goal 6 (Clean Water and Sanitation), Goal 7 (Affordable and Clean Energy) and Goal 12 (Responsible Consumption and Production), encourage individuals and organisations to use natural resources more efficiently and reduce waste. The European Union's Farm to Fork Strategy also promotes more sustainable food systems and responsible use of resources throughout the food chain.

Water is one of the most valuable resources in a kitchen. It is used for washing vegetables, preparing food, cleaning equipment, and maintaining hygiene. Students can learn many simple ways to save water during daily activities.

For example, when washing fruits and vegetables, it is better to use a bowl or sink filled with water rather than leaving the tap running continuously. This allows several products to be washed with the same water and significantly reduces consumption. Students should also remember to turn off taps immediately when they are not needed. Even a few seconds of unnecessary water flow repeated many times a day can result in substantial waste.

Dishwashing is another area where water can be saved. Running a dishwasher only when it is fully loaded reduces both water and electricity use. In addition, students should learn to report leaking taps or pipes as soon as possible. Small leaks may seem insignificant, but over time they can waste hundreds of litres of water.

When cooking pasta, rice, or vegetables, using only the amount of water required for the recipe is also important. Excess water not only wastes water itself but also requires additional energy to heat it. By measuring water carefully, students improve both efficiency and sustainability.

Electricity is another resource widely used in professional kitchens. Refrigerators, freezers, ovens, mixers, ventilation systems, and lighting all require electrical energy. A simple but effective habit is

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switching off lights and appliances when they are not being used. Many kitchens consume unnecessary electricity because equipment remains operating during quiet periods.

Students can also learn how to use refrigeration equipment correctly. Refrigerator and freezer doors should be opened only when necessary and closed quickly. Every time a door remains open, cold air escapes and the appliance must use more electricity to return to the correct temperature.

Planning kitchen activities is another way to save electricity. For example, if several dishes need baking, they can often be cooked together in the same oven rather than using the oven multiple times. This reduces energy consumption and improves kitchen efficiency.

The WWF encourages reducing unnecessary resource consumption and improving efficiency throughout food systems. Responsible use of electricity is one practical way food service businesses can reduce their environmental footprint.

Gas is also commonly used in professional kitchens. Students can improve gas efficiency through simple cooking practices. One example is using a pot or pan that matches the size of the burner. If a small pan is placed on a large flame, much of the heat is lost around the sides. Using the correct equipment allows heat to be transferred more efficiently to the food.

Covering pots with lids is another effective strategy. Lids help retain heat, reduce cooking times, and lower gas consumption. Students should also prepare ingredients before turning on burners. There is no reason to keep a flame burning while vegetables are still being cut or ingredients are being gathered.

Keeping burners clean is equally important. Burners covered with food residue or grease may not operate efficiently and can consume more energy than necessary.

Using resources efficiently also means thinking about the connection between food waste and energy consumption. Every ingredient that is wasted represents water, energy, transportation, and labour that were used during production. By planning carefully, storing food correctly, and using ingredients efficiently, students can indirectly save large amounts of water and energy.

3. Waste reduction alternatives and sustainable operational improvements

Every day, restaurants, catering services, hotels, and institutional kitchens generate significant amounts of food waste, packaging waste, and unnecessary resource consumption. Many of these losses can be avoided through better planning, improved working methods, and greater awareness among kitchen staff. For students attending culinary VET schools, learning how to reduce waste and improve daily operations sustainably is an essential professional skill.

Preventable and Unpreventable Food Waste

Not all food waste is the same, and distinguishing between its main categories helps kitchens target their reduction efforts more effectively.

- **Preventable waste:** food that could have been eaten but was discarded, such as over-prepared portions, plate leftovers, or ingredients that spoiled before use due to poor stock rotation. This is the category with the greatest potential for reduction through better planning, portion control, and inventory management such as FIFO/FEFO.

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- **Possibly preventable waste:** parts of food that some people eat and others do not, such as bread crusts, potato skins, or fish skin. Creative kitchen techniques (e.g. root-to-stem and nose-to-tail cooking) can shift much of this waste into the "preventable" category by turning it into an edible product.
- **Unpreventable waste:** food parts that are not normally eaten under any circumstances, such as bones, eggshells, or fruit pits. This waste cannot be eliminated, but it can still be reduced in environmental impact through composting or other recovery methods.

Practical Exercise: Waste Sorting Diagnostic (Preventable / Possibly Preventable / Unpreventable)

Task: Sort all food waste generated during a single shift (or a practical class) into the three categories above. Weigh or estimate volumes for each category, then discuss which category offers the greatest opportunity for reduction and what concrete actions (portion control, FIFO, root-to-stem cooking, better forecasting) could move items from "preventable" or "possibly preventable" into avoided waste.

Deliverable: a recorded breakdown of waste by category, plus three immediate improvements proposed for the training kitchen.

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Module 3: Food waste and use of KM0 products

Introduction

Before industrialised food production, the food calendar was set by the seasons. Households ate what was produced nearby, much of it from their own gardens and animals, and processed it themselves — grain into flour, grapes into wine. Little was packaged and little was thrown away, and whatever could not be eaten was reused or fed to animals. The village of La Siberia in Extremadura, Spain, is often cited as an illustration of this pattern; it describes how food systems worked before industrialised production, not present-day practice. What was then a necessity — local, seasonal and low-waste consumption — is close to what experts recommend today.

The industrial revolution and the growth of large-scale production changed that. Buying from local producers gave way to long supply chains, and with them came a larger carbon footprint and far more waste, both of food and of packaging. Roughly a third of the food produced for human consumption is lost or wasted, and the land, water, energy and labour used to produce it are lost with it (Gustavsson et al., 2011). European policy has responded with binding reduction targets, and professional and training kitchens are among the places where the difference is made day by day.

This module is organised in three topics, and each topic corresponds to one learning outcome. Topic 1 deals with food waste itself: where it comes from in procurement, storage, preparation and service, what its environmental, economic and social consequences are, and which everyday methods prevent it, from stock control, portioning and first-in-first-out systems to menu planning, second-life dishes and basic circular-economy principles. Topic 2 deals with KM0 products: what "zero kilometre" means, why short supply chains matter, what benefits they bring, where a kitchen can realistically buy local produce, how local sourcing can be maintained season by season across the year, and how KM0 ingredients are built into everyday menus. Topic 3 deals with best practices and policy: what Greece, Slovakia, Cyprus, Italy, Spain and other countries are already doing, which EU commitments frame that work, and how a VET centre can turn all of this into a short, repeatable routine in its own training kitchen.

The handbook is written for VET providers, trainers and learners in culinary and hospitality education. Throughout the text, "kitchen" refers to a training kitchen in a VET centre as much as to a professional kitchen; where examples come from restaurant research, it is because that is where most published data has been collected, and each is followed by what it means for a training kitchen. Every topic closes with practical exercises that a trainer can run with a group in a single session or across a working week.

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Learning Outcome 1: Understanding and Minimising Food Waste

Learners will be able to:

1. Identify the main sources and causes of food waste in professional and training kitchens
2. Describe the environmental, economic and social consequences of food waste and link them to specific kitchen practices
3. Apply basic methods to minimise food waste (stock control, portioning, inventory techniques, smart purchasing, first-in-first-out systems)

4. Plan menus and store ingredients so that surplus and by-products are given a second life in new dishes

5. Apply basic circular-economy principles and address common misconceptions about food waste in everyday kitchen communication

Topic 1: Food Waste: Causes, Impacts, and Prevention

1. Overview of causes of food waste in kitchens (procurement, storage, preparation, service)

2. Environmental, economic, and social impacts of food waste

3. Practical methods to minimise food waste (stock control, portioning and inventory techniques, smart purchasing, and first-in-first-out systems)

4. Menu planning, storage, and giving leftovers a second life

5. Circular economy principles and zero-waste communication in the kitchen

1. Overview of causes of food waste in kitchens (procurement, storage, preparation, service)

One of the key difficulties in teaching food waste reduction is building a culture of responsibility and awareness. In professional kitchens, staff work under time pressure and often prioritise speed of service over careful portioning and waste management; in VET training kitchens, learners arrive with the same habits, and groups change every few weeks. Without clear guidelines, written standards and regular reinforcement, good practice is quickly abandoned in favour of what is quickest. New staff, temporary workers and each new intake of learners are the points at which waste-reduction routines are most often lost.

Limited resources and budget constraints add to the difficulty. Small independent restaurants, and equally small VET providers, struggle to allocate time and funding to specialised training, which makes standardised waste-reduction procedures hard to introduce; larger chains and larger training institutions face the opposite problem of ensuring that the same practice is applied consistently across sites, shifts and trainers. In both settings, the practical answers are the same: simple digital or paper tools, visible targets, and regular waste audits that make progress measurable for the whole team or the whole group.

We can divide the causes of food waste in the kitchen into four main reasons: procurement, storage, preparation, and services.

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In the first place, procurement causes overorders, which is one of the main causes of food waste in professional and training kitchens, because they buy based on a subjective point of view instead of a data-based analysis. Hence, there is a big amount of waste. Principato et al. (2018) found that 60–70% of food waste in foodservice can be traced back to inaccurate estimation of future demand. Improving their forecasting systems by utilizing historical sales trends and reservation data could mitigate overordering and reduce food waste substantially. Another significant factor contributing to food waste is supplier practices, since food service organisations may be forced by supplier contracts or organizational structures to buy goods in large bulk packaging, even when such quantities exceed actual usage. This is particularly problematic for smaller kitchens with limited storage capacity, as unused items may expire before use.

Production and packaging errors are another, often overlooked, cause of food waste in kitchen operations. Mislabelled or incorrectly dated packaging can lead staff to discard products that are still safe to use, while damaged or poorly resealable packaging accelerates spoilage once opened. Errors at the production stage — such as incorrect portion sizing by suppliers, inconsistent fill weights, or packaging not suited to a product's shelf life — can also generate waste before an ingredient ever reaches the plate. Reviewing incoming deliveries for packaging integrity and correct labelling, and giving feedback to suppliers when problems recur, helps kitchens catch this source of waste early.

Furthermore, the quantity of food waste a kitchen may generate is directly affected by menu planning. A large range of uncommon and fresh ingredients, many of which may be highly perishable and utilized in little quantities, are frequently needed for poorly prepared or overly complicated menus. When the demand for certain dishes is low or unpredictable, ingredients for those dishes sit unused and eventually spoil. Food waste output is strongly correlated with the number of unique ingredient requirements, according to research on menu complexity. Also, frequent or quick menu changes can make the problem worse by leaving excess inventory that is difficult to incorporate into new offerings.

Then, storage causes also affect the amount of food wasted: To start with the temperature control, one of the most important factors in preventing food spoilage during storage. For foods such as dairy, meat, and seafood, improper refrigeration accelerates microbial growth, leading to faster spoilage and increased food waste. Regular calibration of refrigeration units and maintaining temperature logs help ensure foods remain safe and last longer. Moreover, there is great importance in labelling and rotation because they are essential to prevent ingredients from being forgotten or discarded unnecessarily. Without proper expiration dates, older items may be overlooked while newer stock is used, causing avoidable waste.

Another reason may be the cross-contamination and organisation factors. Cross-contamination may happen from inadequate raw and prepared food storage, necessitating the discarding of safe food. It is challenging for employees to determine which things should be used first due to crowded storage areas and poor shelving arrangements. Stock that is misplaced or forgotten is reduced by well-organised shelves with distinct labels and groups of related products. Regular cleaning and systematic storage reviews also reduce waste caused by contamination or misplacement.

Moving on to the preparation causes, in this case we can find preparation errors: errors made during food preparation, such as overtrimming vegetables or throwing away edible portions. Food is also thrown out before it is served to diners due to recipe mistakes, such as using the wrong amounts or

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overcooking. This issue is made worse by inconsistent portioning and lack of adherence to recipes, which result in an excess of food that is useless. Research indicates that a significant amount of waste in commercial kitchens can be attributed to preparation errors alone. Batch cooking may cause large amounts of food waste. When kitchens make more food than necessary as a result of erroneous demand estimates, batch cooking may accidentally increase waste.

Excess food is frequently left unused and thrown away in the absence of defined portioning recommendations. Overproduction is particularly common in buffets, catering, and high-volume food service operations. According to research, preparation-related waste can be cut by up to 20–30% with thorough batch planning and consumption trend monitoring. Moreover, staff unfamiliarity with efficient preparation techniques is a key contributor to food waste. Improper handling, cutting, and cooking methods increase the likelihood of spoilage or unusable products.

Last but not least, we can also observe service causes: the portion sizes served, according to Filimonau and De Coteau (2019), oversized servings are a significant cause of food waste in cafeterias, restaurants, and catering services. When customers cannot finish their meals, leftover food is often discarded rather than repurposed. By standardising portion proportions and providing small, medium, and large portion alternatives, plate waste can be greatly decreased. Another reason is buffet and self-service formats frequently generate higher waste because customers serve themselves more than they can eat. For safety concerns, excess cooked food must be thrown out at the end of service. Overproduction for buffets is typically estimated using inaccurate forecasts, compounding waste problems.

According to studies, buffet-related food waste can be greatly decreased by closely monitoring buffet replenishment and preparing food in smaller batches. Customer behaviour also impacts service-related food waste. Uneaten food is frequently thrown away due to dietary constraints, individual preferences, and selective eating patterns. The amount of food that is left uneaten can be decreased by designing the menu with popular preferences and allergy-friendly options in mind. Additionally, promoting leftover takeout options and informing customers about portion amounts reduces waste resulting from individual decisions.

Many everyday food-waste behaviours can be shifted with small, low-cost changes. Encouraging staff and customers to request smaller portions when unsure of their appetite, offering a simple “half portion” or “smaller size” option on the menu, and normalising takeaway boxes for leftovers all reduce plate waste without major operational change. Within the kitchen, a short daily check-in on what was over-produced or returned the previous shift helps staff notice patterns in their own habits and adjust preparation quantities accordingly. These changes are inexpensive to implement and can be introduced gradually as part of everyday routine, rather than as a separate waste-reduction programme.

2. Environmental, economic, and social impacts of food waste

According to the Food and Agriculture Organization of the United Nations (FAO), food waste has become a major environmental and social concern, and its impact will most likely increase as the population grows. They have predicted that by 2050, food production will increase by more than 70%

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to feed 9.1 billion people. We could compare the food waste with an iceberg because we cannot observe at first sight what all the effects are. Usually what most people observe are only the social consequences.

Before these impacts are examined one by one, it is worth connecting them to the practices described above. Every over-order, every product lost to poor temperature control, every over-trimmed vegetable and every oversized portion carries three costs at the same time: the resources already spent on growing, transporting and storing that food (environmental), the money the kitchen paid for it plus the labour and energy used to handle it (economic), and edible food withdrawn from a food system in which many people still lack access to adequate nutrition (social). The three groups of consequences below therefore all begin at the same four points in the kitchen: procurement, storage, preparation and service.

Starting with the social effects, the first two are closely connected — food insecurity and the nutritional consequences that follow from it — while the third, culture and behaviour, is better understood as a driver of food waste than as one of its consequences:

- **Food insecurity:** We have a very high volume of food waste, even as millions of people lack access to adequate nutrition. This also raises ethical concerns due to the unequal distribution of food. Wasted food can be interpreted as missed opportunities to feed the more vulnerable part of the population.
- **Health and nutrition (closely linked to food insecurity):** Food is our main source of energy and is essential for our health; hence, the waste of it contributes indirectly to the nutritional loss, hunger, and malnutrition, particularly in societies with uneven food distribution. Moreover, wealthy households often buy more fresh food than they actually need, which results in a large portion of it being thrown away.
- **Cultural and behavioural dimensions (a driver rather than a consequence):** Cultural norms, traditions, and social expectations influence how people deal with food waste. The study shows that the practices about hospitality, abundance, and social status can make people prepare too much food, which leads to leftovers. In addition, past experiences such as times of scarcity can affect how families or societies behave, making them store more food, serve large portions, or feel the need to finish everything on their plate. These dimensions are included in the social picture because they explain why food waste persists even in kitchens where the figures are perfectly well known, and because they are the level at which training can intervene most quickly.

However, calculating the economic impact of food waste reduction involves more than just a one-to-one translation in savings; instead, this calculation should take into account the interactions between actors and sectors in the food system and in the entire economy.

Some of the strong economic impacts are:

- **Household loss:** Food waste directly affects household finances, as money spent on uneaten food is lost. Due to spoiling, overspending, and inadequate meal preparation, families in wealthy countries typically discard hundreds of dollars' worth of food each year. This is a substantial hidden cost, particularly for households with lower incomes and limited food

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budgets. Waste and financial loss can be decreased by teaching households how to prepare meals, plan portions, and store food properly.

- **Business costs:** A significant cost burden for restaurants, canteens, catering services and VET training kitchens is food waste. In addition to buying extra food, businesses also spend money on labour, energy, and disposing of leftover goods. Costs are raised by overproduction, oversized portions, and ineffective inventory control. Food waste can make up as much as 4–10% of all food service expenses, according to studies, which shows that there is a significant financial incentive to use waste reduction techniques.
- **Supply chain inefficiencies:** Costs are raised both upstream and downstream when waste occurs at one point in the supply chain. Food costs are increased across the supply chain due to overstocking, spoiling, and ineffective handling, which necessitate additional labour, storage, and transportation. The financial repercussions of lost goods fall on distributors, retailers, and suppliers. Throughout the supply chain, improving forecasting, inventory control, and logistics can cut down on inefficiencies and save a substantial amount of money**.**
- **Macro costs:** Food waste costs billions of dollars in lost production value annually on a global scale. Considering the resources, labour, and processes used in production, FAO estimates that food waste costs the country about $1 trillion a year. These losses have an impact on national economies, raise food costs, and exacerbate economic inefficiencies. Therefore, cutting down on food waste can benefit the environment and the economy by stabilizing markets and enhancing food security.

In addition, food waste directly affects our environment in many different ways:

- **Greenhouse gas emissions**: Food waste significantly contributes to global GHG emissions. When people produce food but never consume it, the emissions associated with the production (transport or storage) are being wasted. Globally, wasted food accounts for between 8–10% of global emissions. Therefore, reducing food waste is critical for mitigating climate change and lowering the carbon footprint of the food system. Some studies say that if food waste were a country, it would be the third-largest emitter of greenhouse gases on the planet.
- **Resource waste:** Food waste is also a waste of the energy, water, and land used in its production. For example, growing food that is never consumed requires hectares of land and billions of litters of water each year. Food that is eventually wasted is also processed, transported, and refrigerated, all of which need energy. These natural resources can be used more sustainably and effectively by decreasing food waste.
- **Landfill and chemical impacts:** Food discarded in landfills generates methane, a greenhouse gas far more potent than carbon dioxide, during anaerobic decomposition. Methane emissions from landfills are a serious environmental problem and a big contributor to climate change. Furthermore, extra fertilizers and pesticides from food production can contaminate soil and waterways, and land utilized for agricultural production affects biodiversity. In addition to lowering methane emissions, reducing food waste also reduces chemical runoff that damages ecosystems and land-use pressure.

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According to research by Ritchie et al. (2022) at Oxford University's Our World in Data, food and agriculture have the following environmental impacts:

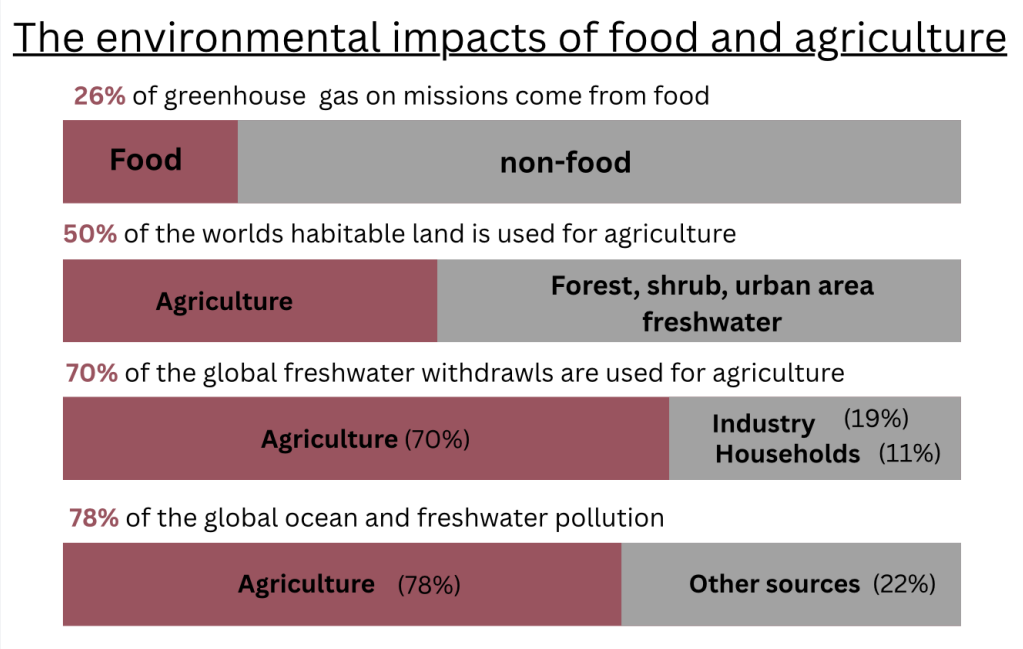


Figure **15**: The Environmental Impacts of Food and Agriculture

Source: Ritchie et al., 2022.

3. Practical methods to minimise food waste (stock control, portioning and inventory techniques, smart purchasing, and first-in-first-out systems)

Some of the methods that are recommended to minimise food waste according to Moraes et al. (2021):

- **Stock control:** The main goal is to avoid overstocking or understocking. Basically, what the kitchen must do is regularly monitor inventory levels; they can use automated inventory management systems to track expiry dates and quantities, as well as identify slow-moving items to prevent spoilage.
- **Portioning techniques:** The main goal here is to reduce plate waste and over-serving by standardising the portion sizes in restaurants, canteens, training kitchens and food services. Use portion-controlled packaging for ready-to-eat meals or catering.
- **Inventory techniques:** In relation to the stock control, we also have the inventory techniques, where the aim is to efficiently manage stock to minimise spoilage. Some of the methods that exist to carry through this strategy include:
    a. First-In-First-Out (FIFO): Ensure older stock is used before newer stock.
    b. Batch rotation: Rotate items based on use-by dates.
    c. Regular stock audits: Detect expired or near-expiry items early.
    d. Demand forecasting: Predict consumption trends to avoid over-ordering.

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- **Smart purchasing:** With this approach the kitchen only buys what is needed and suitable for demand. This approach may include strategies such as:
    a. Order based on accurate consumption data.
    b. Work with suppliers to receive smaller or more frequent deliveries.
    c. Avoid bulk purchasing unless storage and consumption capacity allow.
    d. Prefer flexible orders to adjust to seasonal changes or customer demand.

Other techniques that may be applied include: menu planning, where kitchens design menus so that ingredients are used efficiently across multiple dishes. In addition, cross-utilization involves using surplus ingredients in other recipes or daily specials to minimise waste. Moreover, monitoring and analytics can help track waste sources and continuously improve processes by analysing which items are ordered more frequently and which are ordered less. Finally, educating and training staff on proper handling, storage, and food preparation techniques is essential to reducing waste and maintaining quality.

4. Menu planning, storage, and giving leftovers a second life

Careful menu planning is one of the simplest and most effective ways to reduce food waste in a professional or training kitchen. When menus are designed around ingredients that can be used across several dishes, less produce is left unused or discarded. Matching purchasing quantities to expected demand and adjusting portions and recipes to make use of the whole ingredient (for example, using vegetable trimmings for stocks or bread ends for croutons), helps kitchens get more value out of every delivery.

Storage also plays a central role. Keeping ingredients at the right temperature, using clear labelling and rotation systems such as first-in-first-out (FIFO), and checking stock regularly all help prevent food from spoiling before it can be used.

Leftovers and by-products do not need to be treated as waste. Vegetable peels, bones, stale bread, and other by-products can often be transformed into new dishes or components, such as stocks, purées, crackers, or garnishes. This practice, sometimes called “upcycling,” extends the useful life of ingredients that would otherwise be discarded and can also add variety and creativity to a menu.

- Some simple, low-effort ways learners can apply this in a training kitchen include:
- Planning a small number of “flexible” recipes that can absorb daily surplus ingredients
- Labelling and dating stored items so nothing is forgotten at the back of the fridge or store
- Reviewing, at the end of each service, what was left over and why

5. Circular economy principles and zero-waste communication in the kitchen

The circular economy is an approach that aims to keep resources in use for as long as possible, extracting maximum value before recovering and regenerating materials at the end of their life. Applied to a kitchen, this means thinking beyond the traditional “take-make-dispose” model: instead of treating food waste as an unavoidable end point, kitchens can look for ways to reduce, reuse, and

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recover value from ingredients at every stage. A widely used way to structure this thinking is the food waste hierarchy proposed by Papargyropoulou et al. (2014), which ranks options from most to least preferable: first prevent waste from being created at all; where that is not possible, reduce the amount generated; then reuse edible surplus for people (for example, staff meals or food donation); recycle what cannot be eaten, such as composting; and only as a last resort, recover energy from waste or send it to landfill or incineration. For a training kitchen, this means always asking, in order, whether an item of surplus food can be prevented, reduced, reused, or recycled before it is simply thrown away.

In practice, this can be as simple as prioritising suppliers and recipes that generate less packaging and organic waste, composting unavoidable food scraps, or donating safe surplus food to local organisations instead of discarding it. Even small, consistent choices at this level contribute to a more circular and resource-efficient kitchen.

Applied to everyday kitchen practice, each level of the hierarchy looks different in concrete terms:

- **Prevent:** accurate demand forecasting and correct portion planning at the ordering stage, so surplus is never bought in the first place
- **Reduce:** smaller, more frequent batch cooking, and flexible recipes that can absorb whatever quantity of an ingredient is left over
- **Reuse:** turning safe surplus into staff meals, or donating edible surplus to local food banks or community organisations
- **Recycle:** composting unavoidable food scraps, or sending used cooking oil for recycling into biodiesel
- **Recover/Dispose:** as a last resort, recovering energy from food waste (for example, through anaerobic digestion) rather than sending it to landfill

Working down this list before accepting that something must be thrown away is a simple habit that, over time, has a measurable effect on both a kitchen's waste volumes and its costs.

Three misconceptions come up particularly often in kitchens and can be addressed directly with learners:

- **Misconception:** "Reducing waste means smaller, less generous portions." Reality: most waste reduction comes from better planning and storage, not from serving less food to customers.
- **Misconception:** "Leftovers are lower quality than freshly made dishes." Reality: many "upcycled" dishes (stocks, purées, preserves) are established culinary techniques valued for their flavour, not a compromise.
- **Misconception:** "Sustainable practices always cost more." Reality: reducing waste generally lowers costs, since it means buying, storing, and discarding less food overall.

In the training kitchen: putting the methods to work

The methods above become concrete once they are attached to a routine. None of the following actions requires new equipment or additional budget, and each of them can be started in a single session:

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- Fix standard portion sizes for the five most frequently served dishes, write them on the recipe cards, and check plate returns for one service to see whether they hold.
- Label every stored item with content and date, and place new stock behind older stock at every delivery, so that first-in-first-out becomes automatic rather than a rule to remember.
- Keep the order sheet next to last month's actual consumption figures, so that orders are placed on the basis of data instead of an impression.
- Run a five-minute review at the end of each service: what was left over, why, and what will be done differently tomorrow.
- Agree two or three flexible recipes (soup, frittata, risotto, pesto, stock) that can absorb whatever surplus the week produces.
- Weigh waste once a week in three separate streams — preparation trimmings, cooking losses and plate returns — and write the three figures on the same sheet, so that progress is visible to the whole group.

Practical Exercise: One-Day Food Waste Audit

Task: In small groups, learners conduct a one-day audit of food waste in their training kitchen (or, where this is not possible, in a home kitchen). Across one full day of preparation and service, they record every item discarded, however small, using a simple log with the following columns:

- What was thrown away (ingredient or dish) and at which stage (procurement, storage, preparation, or service)
- An estimated quantity or weight
- The likely cause, using the categories introduced in this topic (e.g. poor storage, preparation error, over-portioning, spoilage)
- One idea for putting the largest source of waste to use: which part of the ingredient is normally discarded, how it could be transformed (technique, storage, combination with other ingredients), and how the resulting dish or component would be described to guests or learners.

Deliverable: At the end of the day, each group totals its log, identifies its single largest source of waste, and prepares a short report (half a page, or a two-minute verbal summary) proposing one realistic change to reduce that type of waste, together with the dish or component that would put it to use. Groups compare findings in a short class discussion: were the main causes of waste similar across groups, or did they differ by station or by shift?

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Learning Outcome 2: KM0 Products and Local Sourcing

Learners will be able to:

1. Explain what KM0 products are and why they matter for sustainability
2. Describe the economic, environmental and social benefits of using KM0 products
3. Identify practical local sourcing options for a professional or training kitchen
4. Apply basic methods for integrating KM0 products into daily culinary operations and menus

Topic 2: KM0 Products: Local and Seasonal Sourcing

1. What KM0 products are: local, seasonal and zero-kilometre

2. Why KM0 matters: economic, environmental and social benefits

3. Objectives of KM0 sourcing and local sourcing options

4. Seasonality: covering the year with local products

5. Putting KM0 to work: integrating KM0 products into menus

1. What KM0 products are: local, seasonal and zero-kilometre

Definition

KM0 (zero-kilometre) products are foods that are produced, processed and sold close to where they are consumed — in most European definitions within the same region, or within a radius of roughly 100 kilometres — and that reach the kitchen through a short supply chain, with no intermediary or only one between the producer and the buyer. Two conditions therefore have to be met at the same time: geographical proximity and a short chain. A tomato grown forty kilometres away, but sent to a central warehouse five hundred kilometres away and delivered back again, is not a KM0 product in any meaningful sense.

KM0 is closely related to seasonal sourcing but is not the same thing. Seasonality concerns when a food is harvested; KM0 concerns where it comes from and how many steps it takes to arrive. In practice the two are used together, because local produce is abundant, cheaper and at its best precisely when it is in season.

Why KM0 is necessary, and what it aims to achieve

The objectives behind KM0 sourcing are usually summarised in four points: to shorten the distance and the number of steps between producer and plate; to keep a larger share of the value of the food with the producer and within the local economy; to reduce the transport, packaging and cold-storage impact of each ingredient; and to make the origin of food visible to the person who eats it. For a kitchen, these translate into four practical questions about every delivery: who grew this, how far away, how many hands did it pass through, and can this be explained to a guest or a learner?

In recent decades, the globalized production and consumption model has led to significant environmental changes, which we are already beginning to notice, especially in everything related to the food system. Large-scale industrial production, international food distribution, and the increase in

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freight transport have significantly contributed to the rise in greenhouse gas emissions and the deterioration of ecosystems.

Faced with these disastrous consequences, the need arises to create new initiatives that promote more responsible forms of consumption, among which the zero-kilometer or Km 0 concept stands out. The KM 0 concept, also known as "short supply chain," highlights the importance of local food systems, specifically referring to agricultural and livestock products that are grown, processed, and sold within a short distance, defined as no more than 100 km. This "label" represents a cultural and political movement toward local economies and sustainable consumption. While shortening food supply chains is generally promoted as a sustainability strategy, experts in this field caution that it should be seen as part of a much broader systemic transition.
The local sourcing model fosters a direct link between rural and urban areas, generating benefits that go beyond simply reducing the carbon footprint. By shortening distribution channels, not only is the environmental impact reduced, but the regional economy is also revitalized §and mutually trusting business relationships are established. These strategies prioritise product freshness and consumer health by eliminating unnecessary intermediaries. They also represent a tool for food sovereignty, allowing local producers to compete against the hegemony of large distribution corporations.
From a sustainability perspective, consuming local products shapes the relationship between production, distribution, and consumption. The main objective is to reduce the environmental impact of the global food system, which is currently identified as the primary driver of high greenhouse gas emissions. Therefore, promoting local products allows us to move towards more sustainable and resilient economic models.
The European Green Deal and the Farm to Fork Strategy underscore the urgent need for a transition to more sustainable and resilient food systems than those currently in place. To better understand this, the European Green Deal is the growth strategy proposed by the European Union to achieve climate neutrality by 2050, reducing emissions by at least 55% by 2030.
The Farm to Fork Strategy, on the other hand, is an initiative within this strategy to transform the food system, making it sustainable, fair, and healthy.
The role of local sourcing (Kilometer Zero) is to mitigate climate change and contribute to the revitalization of rural areas. Therefore, it is necessary to guide policy frameworks and strengthen local food initiatives. Short food supply chains play a vital role in fostering rural development, restoring trust in these systems through spatial, social, and economic proximity.
Relocating food production generates numerous systemic benefits, such as climate change mitigation, economic strengthening, and even financial innovation, thanks to a pioneering model that links carbon dioxide (CO2) reductions with the EU Emissions Trading System (ETS). This allows us to implement eco-schemes that offer a beneficial methodology for subsidizing low-carbon supply chains.

2. Why KM0 matters: economic, environmental and social benefits

In recent years, the search for more sustainable production and consumption models has gained significant importance in society. In this context, locally sourced products (known locally as "zero-kilometer products") are presented as an alternative that promotes a more direct relationship between producers and consumers, reducing transportation distances and fostering a more responsible food model. This approach contributes to generating benefits in three fundamental areas: economic, environmental, and social.

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From an economic perspective, consuming locally sourced products strengthens the local economy by supporting farmers, ranchers, and small producers in the region. By reducing the presence of intermediaries and long distribution chains, a greater portion of the value generated remains in the territory, contributing to the economic development of local communities. Furthermore, this model can stimulate job creation and generate new opportunities for small businesses in the agri-food sector. In this way, consuming locally sourced products not only benefits producers but also contributes to boosting regional economic activity.
Regarding environmental benefits, one of the most relevant aspects of consuming locally sourced products is the reduction of the ecological impact associated with transportation and logistics. By reducing the distance food travels from its place of production to the point of consumption, greenhouse gas emissions generated by transportation are significantly reduced.

This model also favours more sustainable production systems, which tend to use less packaging and promote more responsible management of natural resources. As a result, consuming local products can contribute to reducing the carbon footprint and preserving ecosystems and biodiversity. However, one of the main benefits of consuming locally sourced products is the reduction of carbon dioxide emissions, primarily associated with the transportation of food goods. Many products travel thousands of kilometers before reaching their final consumer, which implies intensive fuel use. This international logistics generates a significant carbon footprint and contributes to the environmental disaster of climate change.
On the other hand, social benefits also play a fundamental role in the development of the local food model. Consuming locally sourced products strengthens the link between producers and consumers, generating greater transparency in the food chain and increasing trust in the origin of food. Furthermore, this type of consumption promotes knowledge of local products and culinary traditions of the region, which contributes to preserving the cultural identity and culinary heritage of each area
Another important social aspect is food quality. Locally sourced products (km0) typically reach consumers sooner after production, allowing them to better retain their nutritional properties and freshness. Furthermore, consuming seasonal foods promotes a healthier and more balanced diet.
In general, consuming locally sourced products represents a strategy that integrates economic, environmental, and social benefits into a single development model. This approach contributes to promoting more sustainable food systems, capable of meeting the current needs of the population without compromising the resources or well-being of future generations.
It is useful to place these benefits alongside conventional, global supply chains rather than in isolation. Global sourcing can offer lower unit prices through economies of scale, year-round availability regardless of local season, and a wider variety of products than a given region can produce. KM0 sourcing, by contrast, generally involves higher per-unit costs and a more limited, season-dependent range, but offers shorter and more transparent supply chains, lower transport-related emissions, fresher products, and stronger support for the local economy. Availability is the main trade-off: a kitchen relying mainly on KM0 products needs to plan menus around what is locally in season, while a conventional supply chain can supply the same ingredient at any time of year, often at an environmental and social cost that is less visible to the kitchen. In practice, most kitchens combine both models, using local, seasonal products where possible and conventional sourcing to fill gaps in availability.

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3. Objectives of KM0 sourcing and local sourcing options

Local sourcing comprises a practical set of key benefits for improving the supply chain, limiting risks, and contributing to sustainable value for both the producing business and the consumer. This is why many forms of local sourcing have been developed in various European Union countries.

One of the most common is direct sales from producer to consumer, which can take place in farmers' markets, local fairs, or on farms. This model has been used for centuries and was formerly known more as an exchange of products for mutual benefit. This model allows for the reduction of intermediaries, helping to lower fuel consumption and ensuring that products reach the end consumer in good condition. This contributes to much shorter delivery times and a reduced carbon footprint, resulting in significantly lower transport costs.
All of this contributes to environmental sustainability, as local sourcing reduces your carbon footprint by eliminating long-distance shipping. Fewer emissions from transportation mean a much greener and more environmentally friendly business. It also helps you stay up-to-date with environmental regulations.
As mentioned earlier, quality control is simpler and more comprehensive than with large-scale production, and communication is also easier since the consumer doesn't have to go through any intermediary suppliers to reach the original producer. Furthermore, this allows for visits and inspections of raw materials, so consumers can verify that both the process and the final product meet their quality standards.
Finally, another form of local sourcing in Europe can be seen in the incorporation of these types of products in many restaurants, supermarkets, and VET training kitchens, which prioritise locally sourced foods. This has led to an increase in the price of sustainable and ecological products, as it demonstrates that the Km 0 model is gaining considerable ground and relevance in current sales systems, including within culinary VET training

Sourcing options for a professional or training kitchen

In practice, local sourcing for a kitchen takes one of the following forms, and most kitchens end up combining several of them:

- Direct purchase from a farm or producer, with the order and the delivery day agreed in advance for the whole season.
- Farmers' markets and local fairs, useful for small quantities, for seasonal specialities and for building contacts.
- Producer cooperatives and short-chain wholesalers, which aggregate several small farms into one delivery and one invoice — often the most realistic option for a kitchen that needs volume, reliability and a single point of contact.
- Box schemes and community-supported agriculture, where the kitchen commits in advance to a share of the harvest.
- Local artisan processors: bakeries, dairies, mills, small butchers, preserve and cheese makers.
- The kitchen's own production: herbs, sprouts, ferments, pickles, preserves and stocks made in-house, frequently from local surplus bought cheaply at the height of the season.

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- Public and institutional short-chain schemes, where a region or municipality maintains a list of approved local suppliers that schools and VET centres can order from.

When choosing between these options, a kitchen weighs four practical factors: reliability and continuity of supply, minimum order size and delivery frequency, price and invoicing arrangements, and the food-safety documentation the supplier is able to provide.

4. Seasonality: covering the year with local products

Local sourcing is easy in August and difficult in March. A kitchen that decides to work with KM0 products therefore has to plan not for one menu but for the whole year, and the practical question is how large a share of the menu local produce can cover in each month. In most of Europe the year divides into four sourcing situations:

- **Spring:** the leanest period. Stored roots and cabbages are running out and the new harvest has not started — the so-called hungry gap. Local supply comes from leaf vegetables, herbs, radishes, spring onions, rhubarb, forced or greenhouse produce, eggs and dairy.
- **Summer:** the widest choice and the lowest prices. Vegetables, soft fruit and herbs are abundant, which makes this the season in which surplus should be bought deliberately and preserved for later in the year.
- **Autumn:** the harvest peak for roots, brassicas, pumpkins, apples, pears, plums, nuts, mushrooms and game. This is when storage crops are bought in quantity for the winter.
- **Winter:** supply comes from what was stored, preserved or grown under cover — root vegetables, cabbages, onions, potatoes, pulses, grains, flour, dairy, meat, and the pickles, jams, dried and frozen products made in the summer and autumn.

Three techniques allow a kitchen to keep the local share high even in the difficult months. The first is preservation: pickling, fermenting, drying, freezing, bottling and jam-making turn a summer surplus into a winter ingredient, and they are teachable skills in their own right. The second is storage: root vegetables, cabbages, apples, onions and pumpkins keep for months in the right conditions, and a kitchen that has cool, dark storage can buy them at harvest prices. The third is menu structure: if the menu is written as a set of dish concepts — a soup, a roast vegetable dish, a grain dish, a fruit dessert — the ingredient can change from month to month while the menu, the workflow and the costing stay the same.

What cannot be sourced locally should be named honestly rather than hidden. A realistic target for a training kitchen is not one hundred per cent local produce, but a known and rising share, measured every month, with the gaps understood and explained to learners and guests.

5. Putting KM0 to work: integrating KM0 products into menus

Currently, many restaurants, and increasingly VET training kitchens, are already immersed in the "farm-to-table" trend, which promotes the use of local ingredients through direct relationships with nearby suppliers and producers. This is supported by four pillars: proximity, food security, sustainability, and self-sufficiency.
Some basic methods for implementing locally sourced products include planning weekly menus

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according to food seasonality. By adapting to these cycles, it is more likely to ensure the highest quality, freshness, and nutritional value of the products, thus helping to conserve agricultural biodiversity and reduce food waste. Also, to adapt it to a basic economic model, menus called "sustainable menus" can be created, combining local ingredients, seasonal products, and culinary techniques that reduce environmental impact.
Another method is to adapt cooking techniques to the characteristics of local ingredients, since seasonal products generally require more tedious preparation processes to preserve their natural flavor and nutritional value. Incorporating local products into restaurant and training-kitchen menus generates increased culinary tourism and helps strengthen the regional economy. For VET learners, practising this kind of menu planning is also a direct rehearsal of a skill increasingly expected by employers in the sector.

In the training kitchen: five steps to a KM0 menu

- Start from the season, not from the recipe: list what is available locally this month, then design the dishes around that list.
- Keep a short core menu of dishes whose main ingredient can change with the season — soup, roast vegetables, salad, grain dish, fruit dessert.
- Agree one or two fixed local suppliers first, and add further ones only once the routine works.
- Name the origin on the menu ("carrots — Zelený dvor farm, 18 km"). It costs nothing and it is the part that guests and learners notice first.
- Preserve the surplus of the season by pickling, drying, freezing or fermenting, so that local ingredients remain on the menu when the season is over.

Practical Exercise 2: Comprehensive Zero-Waste KM0 Menu Plan

Task: Working in small groups, learners design a complete seasonal menu for their training kitchen that combines the zero-waste thinking of Topic 1 with the local, seasonal sourcing covered in this topic. The plan must cover a full menu, not a single showcase dish, and must include:

- A complete three-course menu (starter, main course and dessert) for a defined number of covers, with quantities.
- At least five KM0 ingredients, each of them justified: why it was chosen, which season it belongs to, which local source it would come from and at approximately what distance, and which non-local ingredient it replaces.
- At least two innovative recipe ideas that use parts of ingredients which would normally be discarded — peels, stalks, trimmings, bones, whey — and show the same ingredient being used across more than one course.
- An estimate of which parts of the menu's ingredients still end up unused, and one further idea for reducing that share.
- How the same menu structure would be rewritten for a second season, so that local sourcing can continue.

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- A twelve-month outline of local availability for the main ingredients, marking the two months in which local sourcing would be hardest and naming what would fill the gap: a preserved or stored product made earlier in the year, a different local ingredient, or an import that has to be accepted and named.

Deliverable: Each group presents its menu plan and its twelve-month outline to the class, justifying the five KM0 ingredients and the zero-waste chain behind the menu. As a class, learners agree which of the ideas could be introduced in the training kitchen next month, and what a realistic annual target for local sourcing would be for their centre.

Learning Outcome 3: Best Practices and Policy on Food Waste Reduction

Learners will be able to:

1. Identify best practices on food waste reduction and the use of KM0 products across European countries
2. Identify the EU and national policies that support food waste reduction, and translate them into concrete kitchen actions

3. Apply best practices and policy commitments as a short, repeatable routine in their own training kitchen

Topic 3: Best Practices and Policy on Food Waste Reduction

1. Best practices for food waste reduction and KM0 product use in Greece, Slovakia, Cyprus, Italy, Spain, and Other Exemplary Countries

2. Policy frameworks supporting food waste reduction

3. Application tips: from best practice to the training kitchen

1. Best practices for food waste reduction and KM0 product use in Greece, Slovakia, Cyprus, Italy, Spain, and Other Exemplary Countries

By bringing food production and consumption closer together, reducing food waste and encouraging the use of KM0 (local, short supply chain) products strengthen rural economies, improve sustainability, and reduce their negative effects on the environment. A variety of best practices have been created throughout different countries in Europe, ranging from corporate initiatives and technical tools to regulatory frameworks and community actions. Key strategies pertinent to Greece, Slovakia, Cyprus, Italy, Spain, and other notable cases are highlighted in the examples below.

1. Greece

Greece reduces food waste through a combination of NGO-led programmes, private sector initiatives, and public policy. The Alliance for the Reduction of Food Waste, coordinated by Boroume with government support, engages supermarkets, producers, and civil society to redistribute surplus food and raise public awareness. Supermarkets discount near-expiry items and work with food banks to reduce landfill disposal, while hotels have started utilizing data-driven systems to enhance forecasting

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and reduce kitchen waste. These programmes show that practical redistribution techniques and multi-stakeholder collaboration are successful means of lowering food waste on a national level.

2. Slovakia

Slovakia has taken part in EU thematic projects that support food waste prevention and circular food systems, especially in value chains like bread and baked goods. Through the participation of FOODRUS, a project that took place during the European Week for Waste Reduction, some experimental projects demonstrated circular solutions, such as reassessing production scheduling and enhancing supply chain coordination to avoid surplus generation. Although not all of the projects are KM0-specific, they do demonstrate how localized supply changes may reduce waste at critical junctures in food systems.

3. Cyprus

Cyprus has a high per-capita food waste and has therefore prompted industry and policy initiatives. According to research, hotels can cut waste by improving forecasting, controlling portions, and collaborating with charities on redistribution. In order to stop food waste at the home and institutional levels, community and non-governmental organisation-led initiatives like Sincerely and Food Cyprus concentrate on education, awareness, and school programmes. In order to reduce the negative effects on the environment and the economy, scholars also stress the adoption of circular economy practices, such as composting and upcycling food waste.

4. Italy

Italy is known for having some of Europe's most advanced local supply chain models and food waste regulations. To cut waste and help small producers, Italian initiatives frequently combine community action, education, and policy. Promoting short supply chains and KM0 networks, which link farmers and consumers directly through markets, cooperative projects, and seasonal food initiatives, is a well-known example of how to improve product traceability and minimise spoilage.. In order to separate edible food from waste streams, Italian retailers and organisations, like Carrefour Italy and Banco Alimentare, run extensive redistribution programmes that donate excess food to charities and social food banks. (European Trade).
A specific example is Osteria Francescana, situated in the centre of Modena, Italy. Created by the innovative chef Massimo Bottura, this three-star Michelin restaurant has gained an international reputation for its commitment to using ingredients that are sourced locally, frequently just a few kilometers away. This method improves the quality and authenticity of the food served while also lowering the carbon footprint related to food transportation.

5. Spain

Spain has reduced food waste throughout supply chains by implementing a number of evidence-based strategies. By redistributing excess food from retailers to disadvantaged groups, food banks like the Spanish Federation of Food Banks (FESBAL) promote social sustainability and divert edible food from waste streams. Additionally, studies show that encouraging consumers to accept local or imperfect products lowers household waste by promoting consumption rather than throwing away foods based on appearance. The best strategies for lowering food loss in the retail, hospitality, and home sectors combine technology, education, and policy.

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2. Policy frameworks supporting food waste reduction

The vast majority of recommendations are directed at citizens in their role as consumers, with the expectation that their own choices will contribute to the solution. Many experts considered a so-called "green revolution" in the last century, which took place due to overproduction and over-productivity of food resulting from scarcity caused by population growth.

According to some studies by the UN's IPCC, several recommendations have been made to citizens to contribute to the health of the planet, including:

- Reduce consumption of meat and animal fats
- Consume locally sourced, seasonal foods, preferably from local markets
- Make the most of all available resources

Therefore, consumer decisions are the most important source of impact in this instance, because the greater a person's awareness regarding their dietary choices, the more they contribute to the planet's sustainability. That is why much of the advice offered to the public is to make appropriate choices; that is, to plan menus based on personal consumption and available funds, prioritise food types, moderate excessive consumption and the overuse of ultra-processed foods, pay attention to the composition of the products they buy, and consider more ecological or natural substitutes.

Moreover, the EU has developed some policies to improve the difficulties:

In first place, one of the goals of the United Nations 2030 Agenda for Sustainable Development, particularly under Sustainable Development Goal (SDG) 12 is Responsible Consumption and Production. Specifically, Target 12.3 aims to:

- Halve per capita global food waste at the retail and consumer levels by 2030
- Reduce food losses along production and supply chains, including post-harvest losses

The European Union has formally committed to helping achieve this global goal, By incorporating food waste reduction into its agricultural and environmental policies. Governments, corporations, and consumers must work together throughout the whole food supply chain to achieve SDG 12.3. If we extrapolate this goal to the hospitality and food service industries, the EU will: make better systems for measuring waste, plan for sustainable production and procurement, create initiatives for food redistribution and promote circular economy remedies for inevitable food waste.

Then, the Farm to Fork Strategy was approved in 2020 as part of the European Green Deal, it is the EU's primary policy framework to change the food system into one that is equitable, healthful, and environmentally sustainable. The strategy looks to improve food system durability and reduce environmental effects while addressing the whole food value chain, from agricultural production to consumption.

One of its main objectives is to reduce food loss and waste through:

- Implementing goals to decrease food waste at the EU level
- Enhancing regulations regarding "use by" and "best before" dates on food labels
- Promoting ethical shopping practices and sustainable food consumption

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In addition, the EU has a Waste Framework Directive and Food Waste Targets, that is primarily regulated through the Waste Framework Directive, which establishes the legal basis for waste prevention and management.

Under this directive, EU member states are required to:

- Develop national food waste prevention programmes
- Monitor and report food waste levels
- Promote food donation and redistribution
- Apply the waste hierarchy, prioritising prevention over disposal.

Moreover, in connection to the SDG, to accelerate progress toward the establishment of the goal 12.3, the EU introduced legally binding food waste reduction targets that must be achieved by 2030:

- 10% reduction in food waste in food processing and manufacturing
- 30% reduction per capita in retail, restaurants, food services, and households

These targets represent the first legally binding food waste reduction goals at the EU level, requiring Member States to implement policies, monitoring systems, and prevention strategies across the food supply chain.

3. Application tips: from best practice to the training kitchen

The country examples and the policy targets in this topic describe what should happen at the level of a food system. A VET centre turns them into practice at the level of a four-week cycle, in which each week activates one part of this handbook and produces one concrete output:

- Week 1 — baseline audit. Waste is separated and weighed for one full service day in three streams (preparation, cooking, plate returns), and the three largest sources are identified. Output: a baseline figure in kilograms and in kilograms per portion.
- Week 2 — second-life and circular-economy dishes. The menu is built around the waste sources found in week 1, using stocks, pestos, crisps, purées, pickles and breadcrumbs. Output: at least two dishes sharing one upcycled component.
- Week 3 — seasonal KM0 menu. Local producers within roughly 100 kilometres are mapped, one is contacted, and the menu is built around what is genuinely available this season. Output: a seasonal menu with at least five KM0 ingredients and named sources.
- Week 4 — policy into practice, and review. Two policy commitments are turned into two house rules, and the audit of week 1 is repeated. Output: a comparison against the baseline and a written set of house rules for the kitchen.

Three indicators are enough to show whether the cycle worked, and all three can be collected with a kitchen scale and a paper log: waste per portion in week 1 compared with week 4; the share of local ingredients in the menu; and the number of reused components together with the number of dishes in which each of them appears. A fourth indicator, cost per portion, usually falls when trimmings are used, and it tends to persuade management more quickly than the environmental argument alone.

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Two conditions keep such a cycle realistic. It must run on the equipment and the budget the centre already has, and the log must stay with the trainer so that results accumulate from one group to the next instead of starting again with every intake.

Practical Exercise 3: From EU Policy to Kitchen Actions

Task: Working in small groups, learners take three policy references from this topic — SDG Target 12.3, the Farm to Fork Strategy, and the EU waste hierarchy / binding 2030 targets — and turn each one into one concrete action for their training kitchen.

For each of the three policies, the group writes:

• The policy name and the obligation or aim in one sentence

• One visible action learners or trainers can take in the next month (for example: weigh plate waste for one service; add a KM0 line on a menu; donate safe surplus; compost peelings)

• How they would know the action worked (a simple indicator: kg wasted, number of local ingredients used, number of portions donated)

Deliverable: Groups pin or share the three actions so the class leaves with a joint mini policy-to-practice list.

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Module 4: Implementation of Less-Consuming Culinary Techniques for a More Environmentally Respectful Kitchen

Introduction

Professional kitchens are among the most resource-intensive workplaces in the hospitality sector. Cooking, refrigeration, dishwashing and cleaning consume large amounts of energy and water every single service, and how that consumption is managed affects three things at once: the kitchen's environmental footprint, its operating costs, and the professional habits learners take with them when they leave.

Modules 1, 2 and 3 dealt with principles, with responsible consumption and with what enters the kitchen. Module 4 is about what happens once the ingredients are there: how food is cooked, what equipment does the cooking, how the space is arranged, and what is done with everything that is left.

The four topics follow one line of reasoning. Topic 1 identifies where energy and water actually go in a kitchen, and what inefficiency costs environmentally and financially. Topic 2 compares cooking techniques, and shows that the efficiency of a technique depends less on its reputation than on the product and the quantity it is used for. Topic 3 moves to the decisions with the longest consequences, layout, equipment, maintenance, and to the management of waste, an area now governed by binding EU rules. Topic 4 looks ahead: the technologies arriving in professional kitchens, and how to judge whether one of them is worth having.

This is not a separate technical annex to the rest of the handbook. It is where the earlier modules meet physical reality. A kitchen that plans production instead of running ovens "just in case" is avoiding waste and saving energy in the same movement. A kitchen that cooks seasonal, local ingredients with low-consumption techniques carries the sustainability gained upstream all the way to the plate.

And there is a professional reason to take it seriously. Employers are increasingly asking cooks to measure, record and justify what a kitchen consumes, alongside their culinary skills. A chef who can demonstrate a saving argues from a different position than one who can only claim it.

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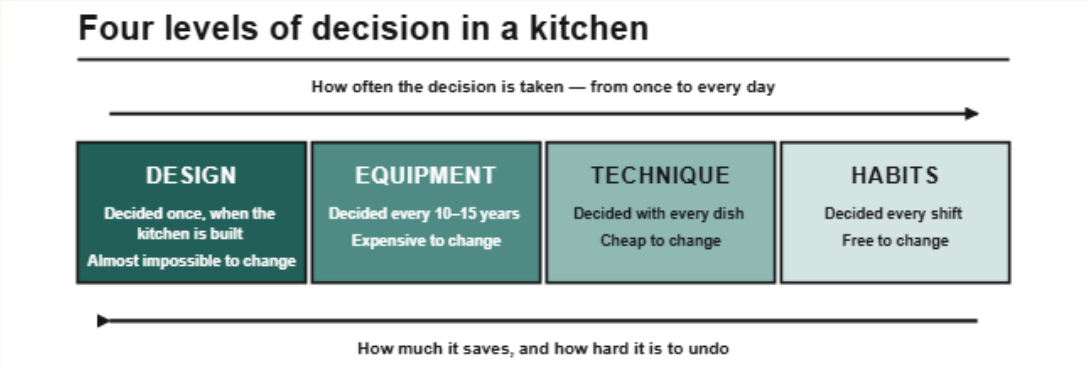


Figure **16**: Four Levels of Decision in a Kitchen

Source: Own elaboration.

1. Energy and Water Use in Culinary Operations

Learners will be able to:

1. Identify how cooking methods, equipment and kitchen workflows affect energy and water consumption
2. Describe the environmental and economic consequences of inefficient resource use
3. Identify common high-consumption activities in kitchens and learn energy and water saving strategies

1.1 General impact of cooking processes on energy and water consumption

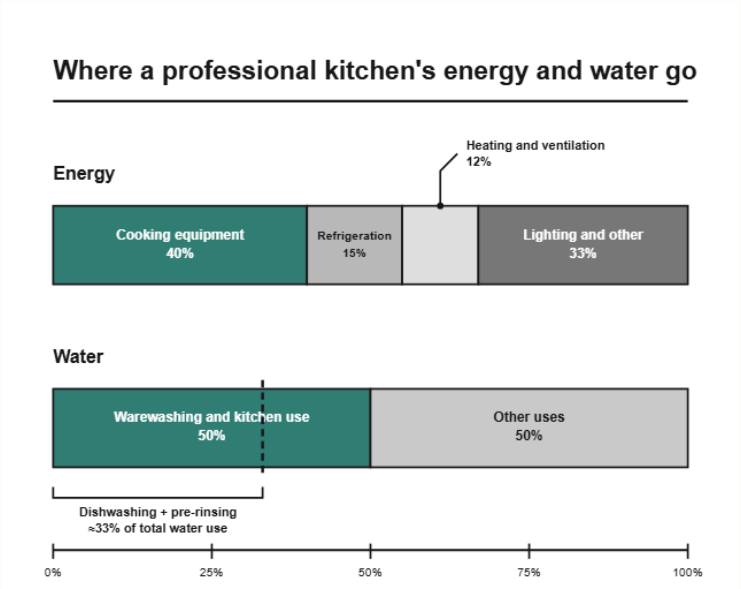


Figure **17**: Energy and Water Use by End-Use in Food-Service Kitchens

Source: Own elaboration. Note: Proportions vary with the type of kitchen and the fuel mix; the order does not.

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Professional kitchens use more energy per square metre than almost any other type of commercial building. Cooking, refrigeration, extraction and warewashing all run at once, and most of them run whether or not anything is being cooked.

The distribution varies with the type of kitchen, but the pattern is constant: cooking equipment is the largest consumer, followed by refrigeration and by extraction and ventilation, with water heating cutting across all of them. Reference benchmarks from the US food-service sector put cooking equipment at around 40% of total energy use, refrigeration at 15% and heating and ventilation at 12%. European kitchens vary with their fuel mix and type of service, but the order is the same: cooking first, refrigeration and ventilation next.

Water is equally concentrated: warewashing is the single largest water consumer in a commercial kitchen, ahead of preparation, ice and cleaning. And because most of that water is hot, every litre saved at the sink is saved twice: once as water, once as the energy used to heat it.

The decisive point is what happens when nothing is being cooked. Professional equipment consumes energy simply by holding temperature: a fryer, a griddle or an oven left on between services can spend most of its working day idling. This is why kitchen habits are not a minor factor but the main one: equipment switched on at the start of the shift and off at the end consumes for hours it is not used, and no amount of efficiency in the appliance compensates for that.

> *Try it in class. Plug a meter into a single oven for one practical session. Record total consumption, and record the minutes the oven actually had food in it. The gap between the two is the lesson.*

1.2. Environmental and economic consequences of inefficient resource use

Most kitchen energy still comes from grid electricity and, in many EU countries, mains gas, both carrying a carbon footprint that varies by country according to the local energy mix. A kitchen that cuts its energy use by a given percentage cuts its emissions by a comparable amount.

Energy and water are among the few operating costs a kitchen can reduce without touching the menu, the portion sizes or the prices. A significant share of what a kitchen spends on energy is spent producing nothing: equipment holding temperature between services, water heated and poured away, machines running half full. That share does not appear as a separate line on any invoice, which is precisely why it survives year after year. Inefficient consumption behaves like a fixed cost the kitchen has imposed on itself, and unlike ingredient costs or wages, it can be cut without anyone noticing a difference on the plate.

> Ask the class. If this kitchen wastes a third of what it spends on energy, who is paying for it, and what else could that money have bought?

1.3. Common high-consumption activities and energy and water saving strategies

Most of what a kitchen wastes is concentrated in a handful of moments, and the same moments repeat in every kitchen. Knowing which they are is what turns good intentions into results: a team that tries to save energy everywhere achieves very little, while a team that acts on the four or five points below

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sees the difference within weeks. The table sets out where consumption goes, why, and what can be done about it without changing the menu or buying anything.

Where it goes	Why	What to do
Equipment idling	Holding temperature costs energy whether or not food is inside	Switch on by station, not by shift. Preheat late, switch off early
Boiling and simmering	Water heated and held far above what the dish needs	Lid on, it roughly halves the energy to reach and hold the boil. Pan matched to hob. Only the water the recipe needs
Dishwashing and pre-rinsing	Energy and water at once, usually the biggest water load	Pre-rinse spray valve instead of a running tap, the shortest payback of any measure in a kitchen. Full loads only
Extraction	Often the largest single motor load, and usually runs flat out all day	Lower the speed outside peak service. Switch off when the line is closed
Holding food warm	Long hours of consumption for little culinary benefit	Shorter holding, smaller batches, residual heat
Peak service	Everything at once, and the moment most waste actually happens	Stagger preheating. Plan production so equipment runs full

> Try it in class. Boil the same volume of water twice, with and without a lid, timing both. Then repeat with a pan that overhangs the hob. Three minutes each, and the point is made for good.

Knowing where consumption goes is the first half of a saving strategy. The second half is knowing whether what you changed actually worked, and that requires numbers, however simple. A kitchen that switches off its ovens earlier but never checks the meter has an opinion, not a result.

Measuring comes before saving. It needs no sophisticated instruments: utility bills give historical data, a plug-in meter isolates a single appliance, and a shared spreadsheet with daily readings is enough to start. Express consumption per cover served, not as a daily total, so a busy day can be compared fairly with a quiet one.

The benchmark is your own kitchen, last week. Published figures come from kitchens with different equipment, menus and service patterns, so they tell a class very little. What tells them a great deal is their own baseline, and whether the line moves after they change something.

Savings are best organised in **three levels**:

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Level	Examples
No cost: behaviour	Lids on, switching off idle equipment, full dishwasher loads, pan matched to hob, reporting leaks
Low cost: small equipment	Pre-rinse spray valve, tap aerators, timers
Investment	Replacing old appliances with efficient models, improving insulation, demand-controlled extraction

Start with the first level. It produces visible results within weeks, costs nothing, and builds the case for the investments that come later.

2. Sustainable, Low-Consumption Culinary Techniques

Learning objectives

Learners will be able to:

1. Identify and describe cooking techniques that reduce energy and water use compared to conventional methods (e.g., steaming, sous-vide, induction, low-temperature cooking)

2. Compare the resource use of traditional and low-consumption techniques for preparing the same type of dish

3. Describe an example of a low-heat or low-energy recipe

2.1. Sustainable and low-consumption cooking techniques

No technique is efficient in itself. What makes a technique efficient is the match between the technique, the product and the quantity being cooked. A steamer running three stacked baskets is efficient; the same steamer cooking one portion is not. This is the principle to hold on to throughout this topic.

HOW THE HEAT REACHES THE FOOD

Induction transfers energy directly into the pan through an electromagnetic field, rather than heating the hob and the surrounding air. Independent testing puts its thermal efficiency at around 85–90%, against roughly 65–75% for standard electric hobs and 32–40% for gas. It also stops heating the moment the pan is lifted, which removes the idle loss typical of a gas flame or an electric coil, and releases far less heat into the kitchen, lowering extraction and cooling loads in turn.

Steaming cooks with water vapour instead of a large volume of boiling water. Its advantage is water, and above all batch capacity: several products cook at once in stacked compartments, on a single heat source. For a single portion it offers no energy advantage over boiling; for a service, it replaces three or four hobs with one.

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Residual heat is the simplest technique and the most consistently ignored. Switching an oven or hob off before the dish is finished and letting the stored heat complete it costs nothing and changes nothing on the plate. The same applies to using the heat one appliance releases to hold another dish warm.

Pressure cooking and combi-steamers sit between conventional methods and the above: by raising pressure or controlling steam and convection precisely, they shorten cooking times substantially for pulses, root vegetables and tougher cuts, which cuts energy directly and, with pressure, water as well.

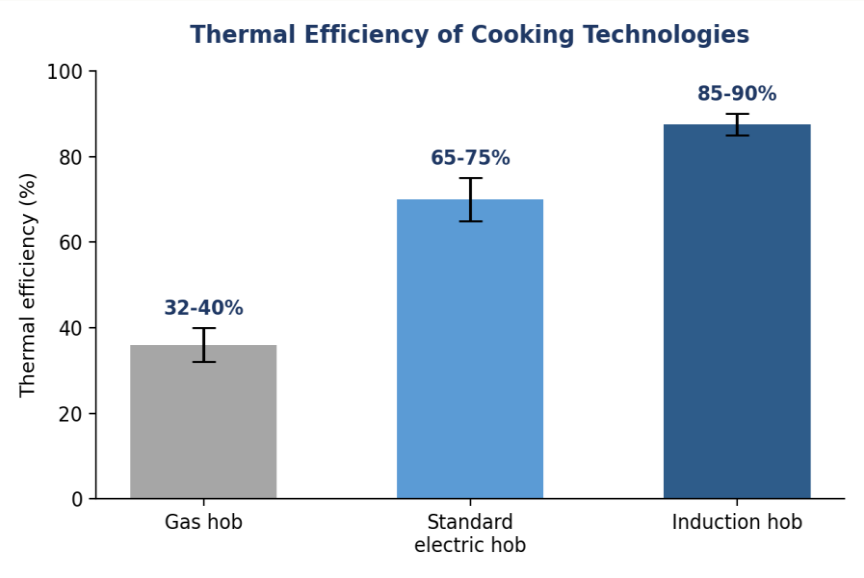


Figure **18**: Thermal Efficiency of Cooking Technologies

Source: Own elaboration based on Electric Power Research Institute / California Energy Commission (2014) and Oregon CUB (2022).

Sous-vide: the technique that needs a caveat. Sous-vide gives precise, gentle cooking and reduces losses, particularly on lower-value cuts. But it is not a low-energy technique by default. It holds a volume of water at temperature for hours, and at a small scale that costs far more per portion than a short, hot method.

It becomes genuinely efficient under three conditions, and learners should know all three:

- **Batch**: many portions in a single bath
- **Insulation**: a lid or cover on the bath, which cuts consumption substantially by limiting evaporation
- **Timing**: cooking overnight or off-peak, regenerating only what is ordered, which also reduces waste

Try it in class. Cook the same vegetable twice: once boiled in its own pan, once as part of a three-basket steamer load. Compare energy per portion, not per pan. The point is load, not technique.

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2.2. Low-heat and low-energy recipe ideas

Every cold dish on the menu is a dish that used no hob, oven or steamer. Building a repertoire of them is the most direct route a kitchen has to lower energy use, and it costs nothing to implement.

Cold and minimally heated preparations, tartare, ceviche, carpaccio, gazpacho, vichyssoise, marinated and cured dishes, rely on acidity, salt and time rather than heat. They also raise the demands on the ingredient rather than on the technique, which ties them directly to the seasonal and KM0 sourcing covered in Module 3.

This is culinary heritage, not a modern efficiency measure, and presenting it that way makes it far easier to sell to learners and to guests. Mediterranean cuisines are built around raw and marinated vegetables and fish with olive oil, citrus and herbs. Nordic and Central European traditions developed pickling, curing and cold soups precisely to preserve food without heat.

Fermentation, dehydration, curing and pickling work the same double shift: less energy than canning or long cooking, and a longer usable life for the ingredient, which feeds directly into the food-waste prevention of Module 3.

A worked example. Seasonal vegetables steamed together in a single stacked basket over induction, finished with a cold-emulsified raw sauce. Against the conventional version, each vegetable boiled in its own pan, the sauce cooked on the hob, the same finished dish uses less water and less energy, with no loss of flavour, texture or presentation.

And a warning about assumptions. In a controlled comparison of chicken breast, boiling used roughly 0.06 kWh per portion, steaming roughly 0.12, and sous-vide between 0.5 and 0.75 once the bath and the vacuum packer were counted. Read at portion level, steaming lost to boiling and sous-vide lost heavily to both. That does not make steaming or sous-vide unsustainable: it shows that a single portion is the worst case for any technique that heats a shared volume, and that the same steamer or bath running a full load reverses the figures entirely. Judge a technique by the service it serves, not by the plate.

> Try it in class. Ask the group to rank induction, steaming, sous-vide and boiling from most to least efficient, before reading this section. Then give them the chicken figures. The disagreement is the lesson.

3. Energy-Efficient Kitchen Design, Equipment, Maintenance and Waste Management

Learners will be able to:

1. Describe kitchen layout principles that reduce unnecessary energy and water use
2. Identify criteria for energy-efficient kitchen equipment
3. Explain simple methods for managing kitchen waste through reduction, reuse and recycling

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3.1. Smart kitchen layout principles

A kitchen is arranged before anyone cooks in it, and that arrangement decides what it will consume for the next fifteen years.

Equipment placed in the order food actually moves, receiving and storage, cold preparation, hot preparation, plating, warewashing, removes backtracking. And backtracking is not just wasted steps: it is the reason hobs and ovens get left running while staff walk somewhere else. A cook who has to cross the kitchen will not switch anything off on the way.

Two placement rules outrank the rest:

- Refrigeration away from heat sources. A fridge beside an oven spends its entire working life fighting that oven, and pays for it every hour of every day.
- Water-using equipment grouped together. Sinks, dishwashers and steamers on one run: shorter pipes, less heat lost along them, and leaks that get noticed instead of ignored.

Extraction is the consumer nobody sees. Hoods usually run at one constant speed all service, whether anything is cooking beneath them or not, and they are often the largest single motor load in the building. Positioning them over the equipment that actually produces heat and steam is the first fix. Demand-controlled ventilation, which varies the rate according to detected heat and steam, is the second — and it saves twice over: the fans themselves, and the make-up air that must be heated or cooled to replace what was extracted.

One more thing the layout decides: the peak. When everything starts at once, the kitchen draws far more power than its average suggests, and a kitchen pays for that peak as well as for the total. Staggering what switches on, and when, costs nothing and shows up on the bill.

> Try it in class. Draw the path of one dish from goods-in to the pass, then mark every point where the line crosses itself. Count the crossings. That number is the layout problem, and it is the same number for every service.

3.2. Criteria for energy-efficient kitchen equipment

Equipment is the decision with the longest consequences. Once installed it fixes a level of consumption for its whole working life, and a bad purchase is far harder to undo than a bad menu.

Start where the money is actually lost: size. Oversized equipment is the most common and most expensive purchasing mistake a kitchen makes, because equipment consumes according to its capacity, not according to what is cooked in it. A combi-oven bought for the busiest service of the year idles through the other three hundred days. Read rated consumption against real output, not against the worst-case service.

Then use the label as a filter, not as a decision. Under the EU Ecodesign Directive (2009/125/EC) and its energy labelling rules, ovens, hobs, hoods, refrigeration and dishwashers sold in the EU must meet minimum performance standards and carry a standardised label. It narrows the field. It does not choose for you.

Then look for the features that do the work:

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Equipment	Conventional	Efficient
Combi-oven	Higher standby and idle use	Insulation, automatic standby, humidity control
Steam cooker	~40 litres of water per hour	As little as ~3 litres per hour
Dishwasher	Fresh water every cycle	Water recycled within the cycle, ~50% less water and energy
Hob	Gas or standard electric	Induction, 85–90% efficiency
Pre-rinse spray valve	Standard flow	Low-flow (≤1.2 gpm), ~50% less water

The argument that convinces an employer is financial, and learners should be able to make it. A certified combi-oven can save several thousand euros a year against a standard model of the same output; an efficient fryer, several hundred. And the cheapest line on that table, the spray valve, has the shortest payback of anything in a kitchen. Efficiency is not always expensive. It is often just overlooked.

Maintenance is what protects the purchase. Efficient equipment does not lose its efficiency by breaking down; it loses it quietly, while still working. Two faults account for most of it:

- Scale in water heaters, steamers and dishwashers. A thin layer on a heating element makes it work noticeably harder for the same result, and eventually destroys it.
- Worn door seals on ovens, combi-ovens and refrigeration, which leak heat or cold continuously while the equipment compensates.

Both cost very little to fix once seen, which makes a short, regular visual check the highest-return sustainability action available to a kitchen. What makes it actually happen is naming who checks what, and how often, and in a training kitchen a rotating weekly responsibility works better than a permanent one, because then every learner acquires the habit rather than one learner acquiring the job.

> Try it in class. Slide a sheet of paper into the closed oven door and pull. Repeat at four points around the frame, and on the fridge. Where the paper comes out easily, the seal is gone. Then look inside the steamer for scale. Five minutes, and nobody will need the theory explained again.

3.3. Simple methods for managing kitchen waste

Waste in a professional kitchen is the most expensive waste there is. By the time an ingredient reaches the bin it has already been transported, stored, prepared and often partly cooked. Everything invested in it is lost along with it — which is why prevention sits above every other level, and why this section belongs in a module about resources and not only in Module 3.

Prevention is mostly about using what has already been bought. Root-to-stem and nose-to-tail cooking, trimmings into stocks and purées, bread and dairy near their date repurposed rather than

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discarded. To that, this module adds the operational half: ordering in pack sizes that match real usage, and standardised recipes with fixed quantities. Standardisation matters more than it sounds — it removes the small, repeated over-preparation that is invisible in a single service and substantial across a year.

Once waste is unavoidable, **the hierarchy orders what to do with it.**

Level	Check
1. Prevention	Are portions, purchasing quantities and prep recipes standardised to avoid over-production?
2. Redistribution / reuse	Is safe, unsold food redistributed, donation, staff meals, rather than discarded?
3. Recycling / composting	Is bio-waste separated and sent for composting or anaerobic digestion?
4. Recovery	Where composting is unavailable, is there any energy recovery from unavoidable waste?
5. Disposal	Is landfill genuinely a last resort?

Take one loaf of bread through all five. Order the right quantity and it is never surplus. Left over and still good, it goes to staff meal or to a food bank. Stale, it becomes breadcrumbs, croutons or a pudding. Beyond use, it goes to the bio-waste bin for composting. Only mouldy and unseparated does it reach the last level. Every loaf that reaches the bin passed four exits without being taken.

In practice this means separating bio-waste from packaging and general waste, cutting single-use packaging where reusable or compostable alternatives exist, and treating redistribution as a real option rather than a theoretical one. And none of it survives a busy service unless the sorting point is within reach of the station that produces the waste. A bio-waste bin across the kitchen is a bin that gets used when there is time, which during service means never.

This is no longer only good practice. Since January 2024, Article 22 of the EU Waste Framework Directive has required bio-waste to be recycled at source or collected separately, and that applies directly to restaurants, canteens and training kitchens. The revised Waste Framework Directive goes further, introducing the EU's first legally binding food-waste reduction targets for 2030, explicitly covering restaurants and food services.

And national rules are often stricter: Sweden and Ireland made separate collection of commercial food waste mandatory from 2024, and Estonia enforces it for any site producing more than 10 kg of bio-waste a day. The EU framework is a floor, not a ceiling.

For learners the practical consequence is concrete: employers increasingly ask for measurement, record-keeping and reporting alongside culinary skills.

> Try it in class. Weigh one service's bio-waste, then sort it into three piles: what could never have been avoided (bones, shells, peel), what could have been used (trimmings,

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stalks, crusts), and what should never have been cooked at all (over-production). Weigh the three separately. The second and third piles are the lesson, and they are almost always bigger than the group expects.

4. Green Innovation and Future Trends in the Culinary Sector

Learners will be able to:

1. Identify new green cooking technologies/tools
2. Explore future sustainable trends in the culinary sector

4.1. New green cooking technologies and tools

Everything in this module so far concerns what a kitchen can do with the equipment it already has. This section looks at what is arriving next, and at how to judge it, which matters more than the list itself. Nothing here transforms a kitchen on its own. These are extensions of practices already covered, and the question to ask of each one is always the same: what problem does it solve here, what does it cost, and what stands in the way? A technology with no problem to solve is not a bad technology. It is simply the wrong one for this kitchen.

Measuring, without doing it by hand

Learning Outcome 1 established that a kitchen cannot manage what it does not measure. What is new is that the measuring no longer has to be manual. Smart meters and sub-metering record energy and water continuously; sensors flag equipment left running outside service hours; software links consumption to production volumes, so the figure can be read per cover instead of per day.

A training kitchen needs very few metrics to learn a great deal: energy per cover, water per cover, and kilograms of food waste per cover. Two of these, tracked consistently across a term, tell learners more than a dozen tracked for a fortnight.

What stands in the way is not money, it is routine. The tools are cheap, a smart plug, a meter, and a scale. The reading has to happen every week, by someone whose job it is. That is the part that usually fails.

Recovering what the kitchen already produces

Heat recovery captures waste heat from refrigeration or extraction and uses it to preheat water, and since heating water is one of the largest loads in any kitchen, the saving is real. The obstacle is not the technology, it is the pipework: retrofitting an existing kitchen is far harder than designing it from the start.

Demand-controlled ventilation varies the extraction rate according to actual cooking activity instead of running flat out all service. The obstacle is the existing hood, which often cannot be adapted and has to be replaced.

Connected equipment and predictive alerts feed consumption into a platform continuously and flag an unusual pattern, a fault, a leak, a change of routine, before it becomes expensive. The obstacle is the fleet: most existing kitchen equipment cannot connect to anything.

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Alternative proteins

Plant-based products, and in some markets cultivated or insect-based proteins, are increasingly used to diversify protein sources and reduce the footprint associated with certain forms of animal production. Their integration should be guided by culinary quality and acceptance, never by novelty: a dish nobody orders saves nothing.

And here the obstacle is legal before it is anything else. In the EU, novel protein sources such as insect-based ingredients fall under the Novel Food Regulation ((EU) 2015/2283), which requires safety authorisation before an ingredient can be marketed at all. No authorisation, no dish, a concrete example of where food-safety policy and sustainability policy meet.

What it looks like when it works

Restaurant chains that replaced standard fryers, ovens and dishwashers with certified high-efficiency models have reported system-wide falls in energy and water use over several years without changing their menu or their service concept. At small scale, individual kitchens that fitted low-flow pre-rinse valves and efficient steam cookers from the outset have reported cutting water use on that equipment by more than 90% at full service volume.

Certification schemes, the Green Restaurant Association in the United States, and various national eco-labels across Europe, assess a kitchen against criteria covering energy, water, waste, sourcing and disposables. Formal certification will not be relevant to every centre, but the criteria make a ready-made checklist for internal self-assessment, and they show learners how the separate practices in this module combine into a single verified standard.

> Try it in class. Take the one problem the kitchen audit in Topic 1 identified most clearly. Ask which of the technologies above would address it, what it would cost, and what would have to happen first. Most of the time the answer is the cheapest option on the list, and that is the point.

4.2. Future-oriented culinary trends for sustainability

The previous section looked at what kitchens can do now. This one looks a little further ahead: what is coming, how soon, and what it will ask of the people working there. Not everything arrives at the same speed, and knowing the difference is part of the job, a chef who proposes the wrong thing at the wrong moment loses credibility, however good the idea.

Three speeds, not one

	What it means	Examples
Already standard	Expected in a professional kitchen today; not having it is the exception	Induction, energy labels, separated bio-waste, low-flow valves
Spreading now	Proven and real, a question of budget rather than of doubt	Smart metering, demand-controlled ventilation, heat recovery, plant-based dishes

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	What it means	Examples
Still a bet	Promising, but unproven at kitchen scale or not yet legal everywhere	AI demand forecasting, cultivated and insect proteins

Good practice is becoming law. Waste separation was voluntary a decade ago and is mandatory today; food-waste targets have followed the same path. Energy reporting is the most likely next step. Kitchens that already measure will simply carry on. The rest will start from zero, under a deadline.

That shift is changing what employers ask for. Cooking is no longer the whole job: records, measurements and reports are increasingly expected alongside culinary skill. This is a real cost, not only an opportunity, time spent recording is time not spent cooking, and someone has to be paid for it. But the chef who can prove a saving is in a very different position from the chef who can only claim one.

And the tools that do the recording come with conditions. Every monitoring system means a supplier, a subscription, and a company holding the consumption data of your kitchen. That is not an argument against them; it is a question worth asking before signing, and knowing to ask it is part of the competence.

The same caution applies further up. Artificial intelligence is beginning to be used to forecast demand and plan purchasing and production, which cuts waste and unnecessary consumption at once. But a forecast is only as good as the records behind it, and a confident prediction built on poor data is worse than no prediction at all. The unglamorous habit of writing down the meter reading is what makes the advanced tools work.

And none of it decides anything without the customer. Alternative proteins, smaller portions and seasonal menus reduce nothing unless people order them. A sustainable dish that nobody chooses saves nothing.

Where the real savings are decided

The largest decisions are taken before a kitchen is ever used: what equipment is bought, how the space is arranged, how the extraction is specified. Everything afterwards is an adjustment. The cooks who understand this are the ones invited into the room when a kitchen is designed.

WHAT TO TAKE FROM THIS MODULE

Four topics, and one idea underneath all of them: measure, understand, act. The techniques will change, the equipment will change, and the law will change with them. What will not change is the question worth asking of anything new: what problem does this solve here, what does it cost, and what stands in the way?

A learner who leaves with that question can judge a technology that does not exist yet, and that, rather than any list of tools, is what this module is for.

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Annexes

Exercise 1: Kitchen Energy and Water Audit and Saving Plan

This exercise combines the three parts of Topic 1 — seeing where resources are used, measuring them, and turning the findings into a plan — in a real or simulated VET training kitchen.

Task: Over one working week, each group audits its own training kitchen and produces a short saving plan covering:

- Walk-through: During one shift or practical class, map the kitchen into its main zones (storage, preparation, cooking, warewashing, service) and note where energy and water are actually used: equipment switched on and left idle, preheating times, pots without lids, taps left running, dishwasher cycles run half full.
- Measure: For five consecutive practical days, record one reading or proxy at the start and at the end of the class (electricity meter, water meter, number of full dishwasher cycles, minutes of oven preheating), and express the result per cover or per class so that days can be compared with one another.
- Plan: Turn the two highest-consumption findings into three actions, one from each category: a no-cost behavioural change, a low-cost equipment adjustment, and a longer-term investment. Name the person responsible for each action and how its effect would be checked.

Deliverable: A one-page audit sheet (observations plus the week's readings) and a three-action saving plan stating, for each action, who carries it out, when it is checked, and the expected effect in simple terms — a lower bill, less water, shorter running time.

Exercise 2: Comparing Two Cooking Techniques for the Same Dish

This exercise applies the low-consumption techniques of Topic 2 to a dish that a VET training kitchen can realistically cook in more than one way.

Task: In pairs or small groups, learners choose one dish from their training menu, cook it twice and add one no-heat alternative, covering:

- Choose and justify: List which of the techniques covered above (induction, steaming, sous-vide, low-temperature cooking, residual heat) could realistically be used for the dish, name the best fit, and give one reason why each of the others was rejected.
- Cook and measure: Prepare both versions with the same quantity of the same ingredients, recording cooking time, appliance setting, water used, and — where a meter is available — energy used.
- Add a minimal-heat option: Propose one cold or minimally heated dish from the regional repertoire (marinated vegetables, gazpacho, ceviche-style fish, pickles or ferments) that could replace the dish during a hot summer service.

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Deliverable: A comparison table of the two techniques (time, setting, water, energy where measured, culinary result), one sentence stating whether the lower-consumption method achieved a comparable result, and a short recipe card for the minimal-heat alternative.

Exercise 3: Efficient Kitchen Review and a Zero-Waste, Low-Impact Menu

This exercise brings Topic 3 together: the equipment, layout, maintenance and role decisions that make a kitchen efficient, and the menu that puts the resulting savings on the plate. It also covers the module requirement to develop a fully costed, seasonal menu with an efficient kitchen workflow and to justify its ecological and economic value to management or to clients.

Task: Working in small groups, learners review one training kitchen and design a menu for it. The review covers:

- Equipment: Choose one real piece of equipment (oven, dishwasher, steam cooker or hob) and score it against the criteria in the checklist below: energy label or rated consumption, capacity matched to real output, insulation and heat recovery, water consumption per cycle, controls and standby behaviour, and expected maintenance. Conclude whether it should be kept, adjusted or replaced, and why.
- Layout and maintenance: Sketch a simple plan of the kitchen and mark its zones (receiving and storage, cold preparation, hot preparation, warewashing, service). Trace one dish through the kitchen and mark every point of backtracking or heat conflict, such as a refrigeration unit standing next to an oven. Then list three pieces of equipment that need regular upkeep and, for each, the check, its frequency and the person responsible.
- Roles: Assign four roles for one service or practical class: rotating sustainability champion, closing cook responsible for shutdown, warewashing lead, and waste and recycling lead. For each role, name two concrete tasks and the moment at which they are checked.
- The menu: Design a five-dish seasonal lunch menu for the same kitchen, built on three to five KM0 ingredients and on the low-consumption techniques covered in Topic 2. For at least two ingredients, list every edible part that is normally discarded (peel, stem, trim, bone, whey) and show where each is used, so that the same ingredient appears in more than one dish.
- Workflow, waste and policy: Plan the production sequence: batch sizes, oven and hob loads, shared cooking slots and use of residual heat. For each dish, mark where waste arises and which level of the waste hierarchy applies to it. Then take one requirement from the EU framework above (separate bio-waste collection, the 2030 food-waste reduction target, or a stricter national rule), state what the kitchen already does about it, and name one next action with the person responsible.
- Costing: Cost the menu per portion: the ingredient cost, an estimate of the value of the parts that would otherwise be discarded, and the price the group would set.

Deliverable: A short improvement file — the completed equipment checklist with a recommendation, the annotated layout sketch with one concrete change, a one-page maintenance schedule and a four-row role table — together with the costed menu and its workflow plan, and a pitch of no more than five minutes to a manager or client stating the ecological value (waste avoided, lower energy and water

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use) and the economic value, expressed as cost per portion compared with a conventional version of the same menu.

Criterion	Check
1. Energy label	Does the equipment carry a recognised energy label or certification (e.g. EU energy label, ENERGY STAR-equivalent)?
2. Sizing	Is the equipment's capacity matched to actual expected demand, avoiding oversizing?
3. Water use	Does it recycle or minimise water use within its cycle (e.g. dishwashers, steam cookers)?
4. Standby/idle behaviour	Does it switch to a low-power or standby mode automatically when not in use?
5. Insulation	Is the unit well insulated to reduce heat loss (ovens, water baths, refrigeration)?
6. Maintenance access	Are filters, seals and heating elements easy to access, clean and replace?

Exercise 4: Kitchen Sustainability Dashboard and Innovation Scan

This closing exercise brings together the monitoring, innovation and certification themes of Topic 4, and uses the measurements made for Learning Outcome 1.

Task: In small groups, learners set up a simple dashboard for their training kitchen and add one forward-looking proposal to it, covering:

- Dashboard: Select three or four metrics (energy per cover, water per cover, kilograms of food waste per cover, share of bio-waste separated), record them across one week of practical classes, and calculate a simple average for each.
- Benchmark: Rate the kitchen informally against the certification categories described above — energy, water, waste, sustainable food, disposables — on a scale from weak to strong, and name the category that would be improved first.
- Innovation scan: Choose one emerging technology (heat recovery, smart ventilation, connected equipment) or one alternative protein (plant-based, cultivated or insect-based) and profile it in half a page: the expected sustainability benefit, the cost or regulatory obstacle, and one practical first step to trial it.

Deliverable: A one-page dashboard with the weekly averages and one clear insight with its matching action (for example: water use per cover was highest on banquet days, so the pre-rinse procedure will be changed), together with the benchmark rating and the technology profile.

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