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SSPICEIT!
Sustainability Skills Program for International Catering operators and Entrepreneurs through Integrated Training

SSPICE IT! – Sustainability Skills Program for International Catering operators and Entrepreneurs through Integrated Training

WP	**WP3 - Co-design and testing of innovative training programme for green operators and entrepreneurs in the catering sector**
Task	**3.6 – Final release**
Task leader	**Pour la Solidarité**
Contribution	**All partners (CMRC, AKMI, Work's Quality, IED, EPATV, CIPFP)**
Version	**Version n.2 – December 2024**

SSPICE IT! project is co-funded by the European Commission within the Erasmus+ programme.

Città metropolitana di Roma Capitale · POUR LA SOLIDARITÉ European think & do tank · CIPFP CAMINO DE SANTIAGO ESCUELA DE HOSTELERÍA & TURISMO DE LA RIOJA · Escola Profissional AMAR TERRA VERDE · AKMI · WORK'S · iED · CAPITALE LAVORO

Module n° 02

THEMATIC AREA	**How to implement circular practices in one's business**
SUB AREA OF REFERENCE	*Sustainable food*
HOURS	15

LEARNING OBJECTIVES

By learning this module, the student should be able to:

1. **Identify and implement practices coherent with sustainable waste management.**
2. **Adopt sustainable practices in one´s job.**
3. **Develop a menu focused on seasonal ingredients, produced locally, using smaller amounts of animal products in dishes, and expanding plant-based dishes.**

LEARNING ACTIVITIES

Theoretical	Practical
Exposure of the contents through resources like PowerPoint and apps created specifically for this course.	Exercises, discussions, and practice tasks for the students to measure the knowledge acquired during the module.

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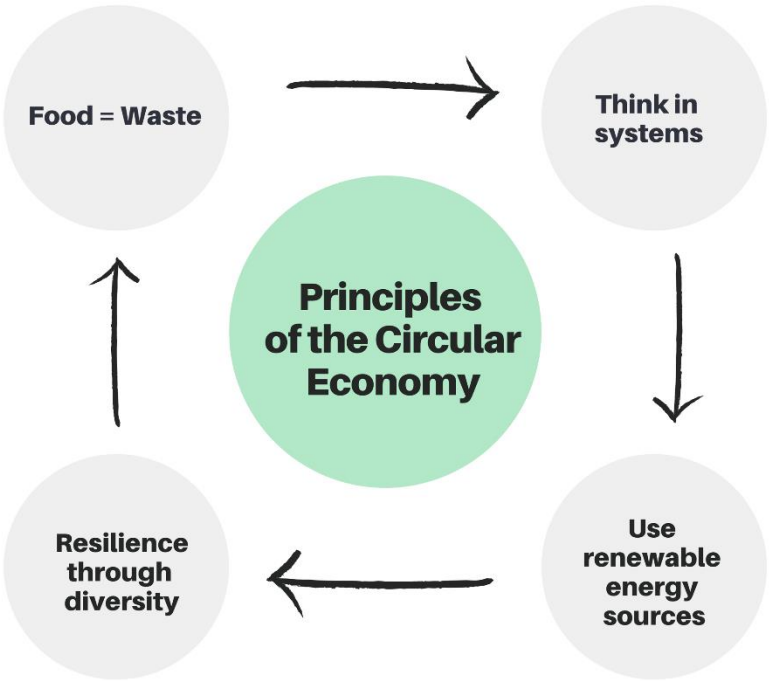
INTRODUCTION

Implementing circular practices in a business is essential in today's world, where sustainability and responsible resource management are paramount. Circular practices involve minimizing waste, reusing materials, and extending the lifespan of products and resources within a business's operations. In this guide, we will explore strategies and approaches for integrating circular principles into your business, highlighting the benefits of reducing environmental impact, improving resource efficiency, and fostering a more sustainable and resilient economic model. Whether you are a small startup or a large corporation, adopting circular practices can lead to positive environmental, economic, and social outcomes while positioning your business for long-term success in a changing world.

Figure 1. Circular Economy Business Models and Strategies to Learn From



Source: https://www.greenbusinessmba.com/blog/circular-economy-business-models

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CHAPTER 1: Less energy intensive cooking processes and food waste

Energy consumption in cooking processes can have a significant environmental impact for several reasons:

Greenhouse Gas Emissions: Most of the energy used in cooking comes from non-renewable sources such as fossil fuels (natural gas, coal, and oil). The combustion of these fuels releases carbon dioxide (CO2) and other greenhouse gases into the atmosphere.

Figure 2: A factory emits a harmful gas. (Image credit: Tatiana Grozetskaya /Shutterstock.com)

Resource Depletion: The production and extraction of non-renewable energy sources require significant amounts of natural resources. For example, the extraction of fossil fuels involves mining, drilling, and refining processes that can damage ecosystems and contribute to habitat destruction.

Figure 3: Scientist exploring a polluted area. (image credit: ArtPhoto_studio / Freepik.com)

Energy Production and Distribution: The generation of electricity for cooking purposes often relies on power plants that burn fossil fuels. These power plants emit pollutants, including sulphur dioxide (SO2), nitrogen oxides (NOx), and particulate matter, which contribute to air pollution and have harmful effects on human health and ecosystems.

Figure 4: Electricity generated by nuclear power stations. (image credit: vecstock / freepik.com)

Infrastructure and Appliances: Inefficient kitchen appliances and outdated infrastructure contribute to higher energy consumption during cooking. Older appliances, such as electric stoves or ovens without proper insulation, may waste a significant amount of energy.

Figure 5: Professional kitchen (image credit: fxquadro / freepik.com)

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To adopt energy-efficient cooking practices and minimize your ecological footprint, consider the following tips:

Use Energy-Efficient Appliances: Invest in energy-efficient appliances such as induction cooktops, convection ovens, and energy-efficient refrigerators. Look for appliances with the ENERGY STAR label, which indicates they meet high energy efficiency standards.

Figure 6: Modern professional kitchen. (image credit: freepik.com)

Optimize Cooking Time and Temperature: Preheat your oven only when necessary and avoid opening it frequently during cooking, as it can lead to heat loss. Match the size of your cookware to the size of the burner or heating element to prevent energy wastage. Use lids on pots and pans to retain heat and cook food more efficiently. Lowering the temperature while cooking can also save energy without compromising the quality of your dishes.

Figure 7: Chef working in the kitchen. (image credit: freepik.com)

Choose the Right Cookware: Use cookware made of materials with good heat conductivity, such as stainless steel or copper, as they heat up faster and distribute heat more evenly. Additionally, using flat-bottomed cookware ensures maximum contact with the heating surface, allowing for more efficient heat transfer.

Figure 8: A woman buying professional cookware. (image credit: prostooleh / freepik.com)

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Utilize Residual Heat: Take advantage of residual heat in your oven or stovetop. Turn off the heat a few minutes before your food is fully cooked to allow the remaining heat to finish the cooking process. The retained heat can be sufficient for completing the cooking while reducing energy consumption.

Figure 9: Baking bread (image credits: pressfoto / freepik.com)

Batch Cooking and Meal Planning: Prepare multiple meals at once by batch cooking. This saves energy by utilizing the oven or stovetop more efficiently. Plan your meals ahead to avoid last-minute cooking decisions, as this can lead to unnecessary energy usage.

Figure 10: Meal planning (image credtis: freepik.com)

Consider Alternative Cooking Methods: Explore alternative cooking methods that require less energy, such as using a slow cooker, microwave, or pressure cooker for certain dishes. These appliances are designed to be energy efficient and can significantly reduce cooking time.

Figure 11: Sous vide preparation. (image credits: freepik.com)

Regular Maintenance and Cleaning: Keep your appliances clean and well-maintained to ensure they operate efficiently. Regularly clean the burners, coils, and filters to remove any buildup that may impede their performance.

Figure 12: Kitchen maintenance (image credits: freepik.com)

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Unplug or Use Energy-Saving Features: When not in use, unplug small kitchen appliances or use power strips to easily turn them off completely. Many appliances have energy-saving features like standby or sleep mode, so utilize these features when available.

Figure 13: Teamwork in the kitchen (image credits: freepik.com).

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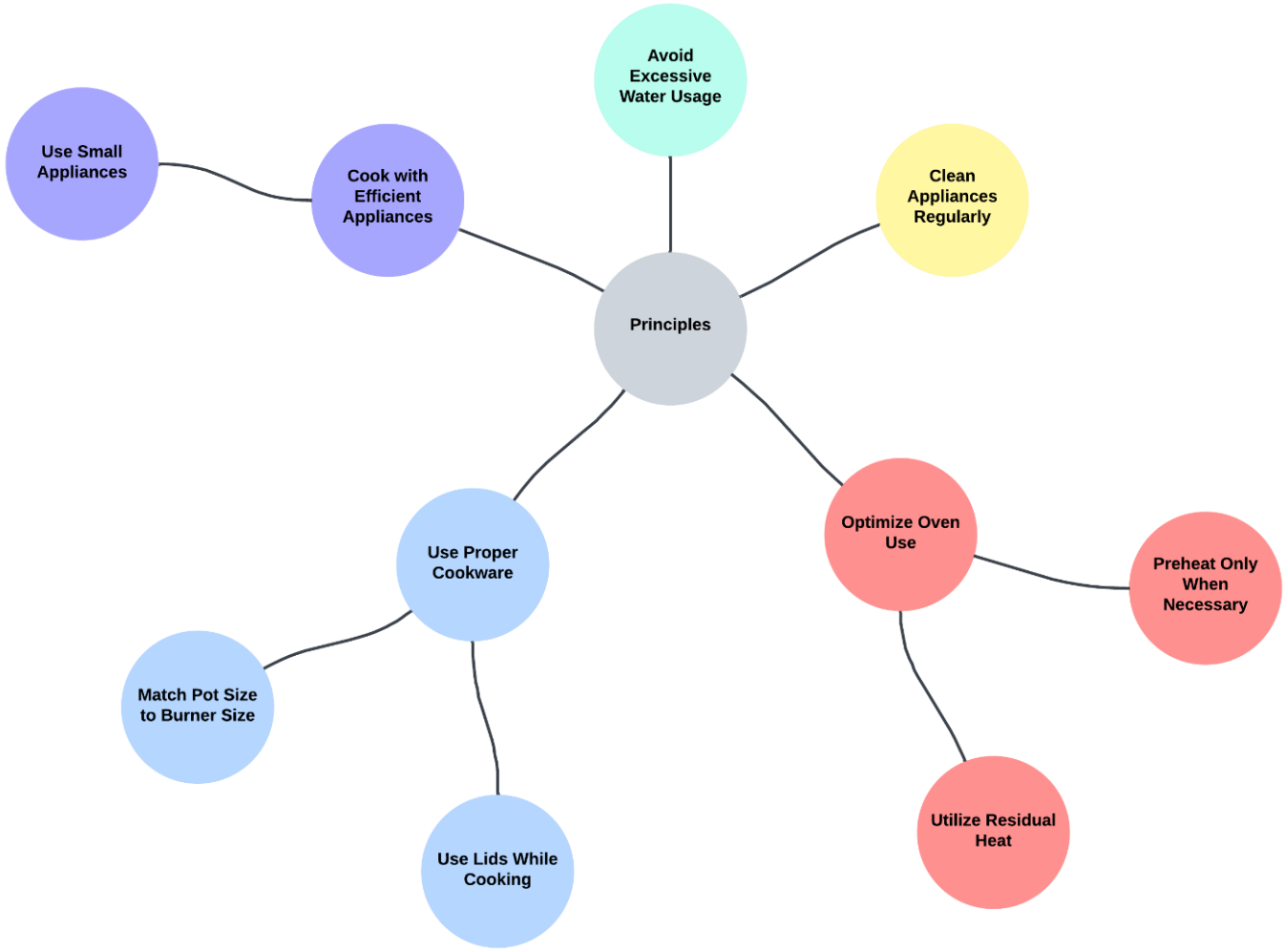
1.1. Smart cooking practices for energy conservation

The smartest cooking practices for energy conservation include:

Figure 14: Fluxogram of smart cooking practices.



Created with Lucidchart. (https://www.lucidchart.com)

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1.2. Benefits of adopting energy-efficient cooking practices

Figure 15: Energy-efficient practices.

Energy savings

By implementing these practices, you can significantly reduce your energy consumption in the kitchen. This, in turn, leads to lower energy bills and cost savings over time. Energy-efficient cooking practices can help you optimize your energy usage and prevent wastefulness.

Resource Conservation

Energy-efficient cooking reduces the demand for non-renewable energy sources such as fossil fuels. By using less energy, you contribute to the conservation of natural resources required for energy production, such as coal, oil, and natural gas.

Improved Cooking Efficiency

Energy-efficient practices often result in improved cooking efficiency. By matching pot sizes to burner sizes, using lids, and utilizing residual heat, you can cook food more evenly and in less time. This can lead to better-tasting meals and more consistent cooking results.

Environmental Impact

Energy-efficient cooking practices contribute to a reduced carbon footprint and lower greenhouse gas emissions. By conserving energy, you help mitigate the environmental impacts associated with energy production and reduce your contribution to climate change.

Increased Sustainability

Embracing energy-efficient cooking practices aligns with a sustainable lifestyle. It promotes responsible resource use, reduces waste, and helps create a more sustainable food system. By making conscious choices in the kitchen, you contribute to a healthier and more environmentally friendly future.

Role Modelling and Awareness

By adopting energy-efficient cooking practices, you become a role model for others, inspiring friends, family, and peers to make sustainable choices in their own kitchens. Your actions can help raise awareness about the importance of energy conservation and encourage others to follow suit.

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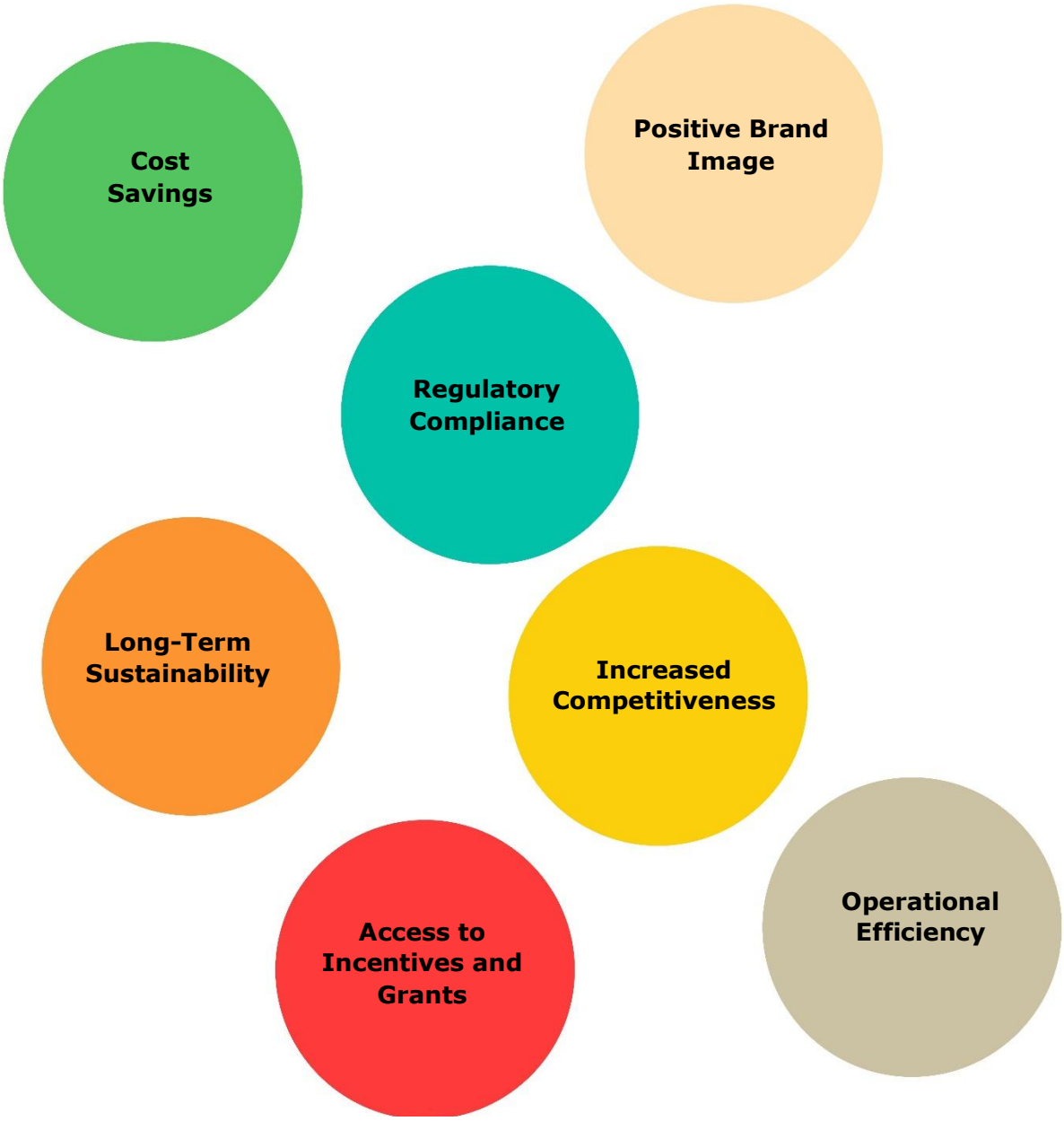
Those practices can also have positive impacts on the economy, particularly for businesses in the food industry. Here are some benefits:

Figure 16: Benefits of energy-efficient practices.



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By prioritizing sustainability, businesses can align with consumer demands, meet regulatory requirements, and contribute to a greener and more sustainable economy.

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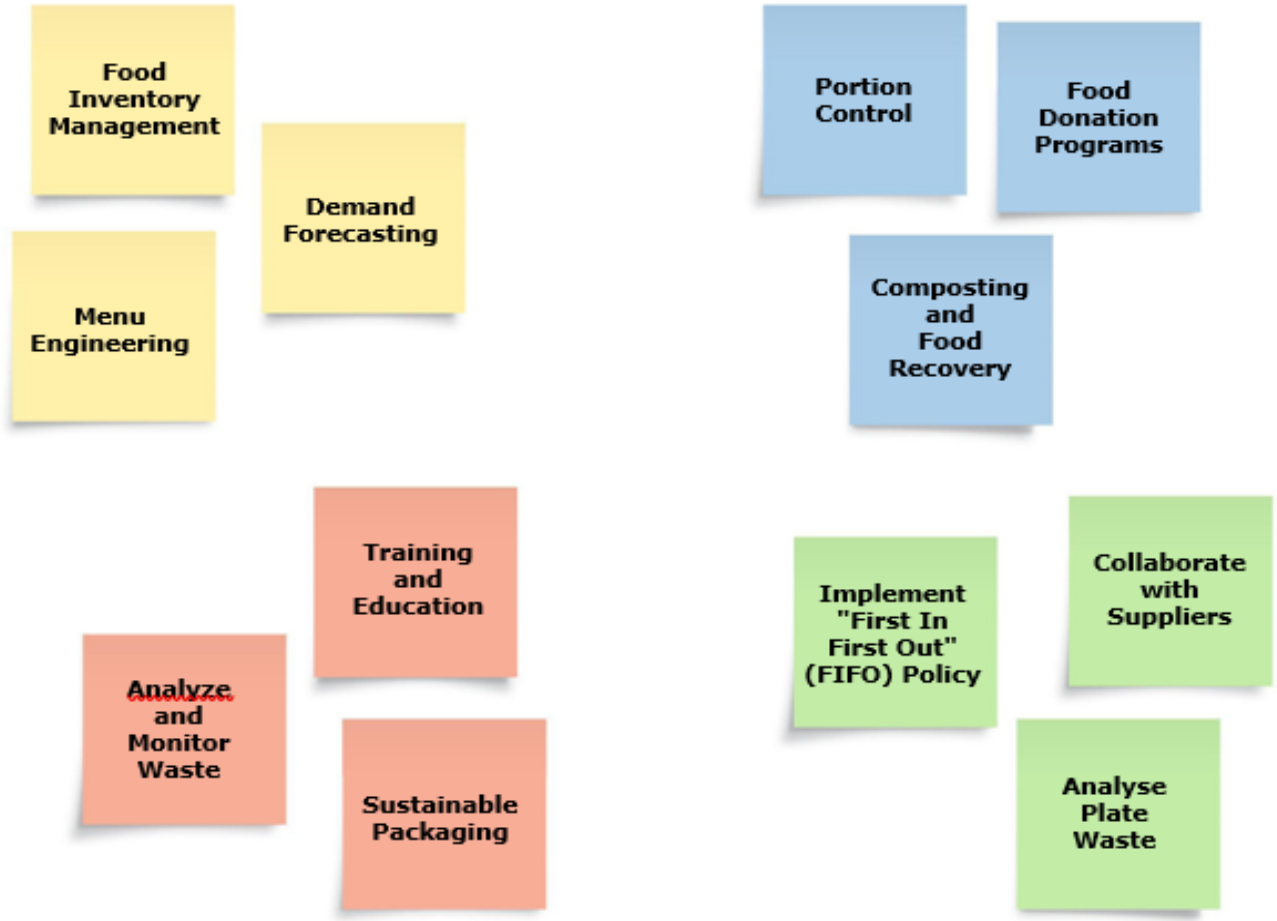
1.3. Minimizing food waste

Minimizing food waste in the food industry requires a comprehensive and systematic approach. Here are some strategies that businesses can implement to reduce food waste effectively:

Figure 17: Strategies for minimizing food waste.



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1.4. Technical recipe sheet

The **technical recipe sheet** it is one of the best tools to control the quantity, as well as the quality, of the kitchen's production. With this tool we can learn about the food cost, waste, portion control, sales ratios, etc… It consists of standards and procedures to be followed in the preparation and service of each menu item. Recipe standardization is the key to menu consistency and operational success.

It is a fundamental instrument in any kitchen, and the greater the degree of precision, the easier it tends to be to manage the business. In general, technical recipe sheets must contain the following information:

- Item name.
- Number of Doses Served.
- Serving Quantity.
- List of Ingredients.
- Preparation and Methods.
- Cooking Time and Temperature.
- Special Instructions if necessary.
- Cost of Revenue.

Reasons for implementing the technical sheet system with standardized recipes include:

- **Controlled purchases**, without the technical sheet it would be impossible to manage meal costs and stock.
- **If there is any type of diet control**, meal providers must know the nature of the ingredients and the exact amount of nutrients in each menu item.
- **Meal suppliers must be able to** inform diners about the type and quantity of ingredients in their recipes.
- **Comparing the quantity** of food used with the sales revenue would be impossible without the technical sheet.
- **Calculating the price on the menu** in relation to the cost of the recipe would be impossible without the technical sheet.
- **New kitchen employees could not be trained without the technical sheet**.

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- **The computerization of the total operation of the restaurant** or provision of meals should be impossible without the technical data sheet elements with standardized recipes implemented.

For a culinary preparation to be carried out successfully, several factors are important, such as the type of utensils, temperature, and preparation time, in addition to the quality of the ingredients. The reproduction of these conditions will ensure that similar results are obtained with each repetition of the recipe or protocol, even when prepared several times and by different cookers. The writing of a recipe must contain clear and precise information, to enable its reproducibility. When executing a recipe, it is essential that the ingredients are measured accurately. The technical recipe sheets are important tools for determining the cost of dishes on the menu, as it is based on the premise that the cost of preparing the recipe is determined and is not a variable. We can start from a variable that is what the average expenditure of a customer should be on a meal for this restaurant, located in this location, serving this type of food, in this type of environment. This way, you can arrive at a value for the dish, and these calculate your contribution margin. As a rough example, the cost of food when preparing the recipe obtained from the technical sheet and cost sheet must be between 15% and 25% of the price of the dish on the menu. This means that, if the price of a certain dish on the menu is €20.00, the cost of raw materials should not exceed €5.00.

1.5. How to use a technical recipe sheet:

The technical recipe sheet is made up of a series of data that must be calculated using a series of formulas (most of them are simple rules of three), which will give us the result of the data we want to obtain to know the costs, benefits and up to the sales price of a recipe. Therefore, we must familiarize ourselves with a series of criteria and nomenclatures before starting to create a technical sheet.

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Nomenclature	
Reference:	Reference corresponding to the internal code of the technical sheet (Example: FISH001 for the first fish technical sheet)
Type:	Identification of the type of dish (Appetizer, Starter, Main Course, Dessert, etc.)
Name:	Internal name assigned to the dish
Number of doses:	Yield in portions of the dish
Ingredients:	Description of the different ingredients that make up the dish
Measure:	Unit for measuring each ingredient (must always be Kg., Lt. or Unit.)
N.W.:	Net Weight (Example: the weight of the already peeled potato)
C.F.:	Correction Factor (numerical value that determines the amount of waste. Example: The value that represents the weight of the potato peel)
G.W.:	Gross Weight (Example: the weight of the potato with the skin)
P.C.:	Production Coefficient (percentage that represents the weight of each ingredient in the total weight of the recipe)
Unit P.:	Unit Price (Price per Kg., Lt. or Unit of each ingredient. Example: Potato - €1.10 for each Kg.)
Total P.:	Total Price (Price referring to the necessary quantities of each ingredient. Example: If we need 2 kg of potatoes, the total P. will be €2.20)
C.C.:	Contribution Coefficient (percentage that represents the cost of each ingredient in the total cost of the recipe)
Total Cost:	Sum of the total price of all ingredients
Production:	Total quantity, in kg, of the sum of the net quantities of all ingredients used in the recipe
Cost Kg Prod.:	Cost associated with the production of 1 kg of the prepared recipe
Cooking Index:	Cooking Index (Value number that represents the amount of weight lost while cooking the recipe)
Net Production:	Net Production (Quantity, in kg, resulting from cooking the recipe)
Per Capita:	Per Capita (Weight corresponding to each of the doses into which the recipe is divided)

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Unit Cost:	Cost per Dose (Cost corresponding to each of the doses resulting from the preparation of the recipe)
Net S.P.:	Net Sales Price (Sales value without VAT assigned to each dose)
VAT:	Monetary value of VAT attributed to each dose
Cont. Margin:	Contribution Margin (Value in € corresponds to the benefit obtained from the sale of the dish. Difference between the Unit Cost and the Net S.P.)
Ratio:	Percentage corresponding to the value of the Contribution Margin
Presentation:	Indication of how to serve the dish (In an individual portion, on a platter, on a buffet tray, etc.)
Temperature and cooking time:	Temperature and cooking time (approximate indication of these values considering the cooking methods applied)
Packaging and expiration date:	How and for how long the recipe can be stored (Example: In a vacuum bag / 7 days)
Storage Temperature:	Considering the packaging and expiration date of the recipe, at what temperature should we store it? (Example: +3 ºC)
Allergies:	Considering the ingredients that make up the recipe, what are the main potential allergens? (Lactose, gluten, shellfish, eggs, etc.)
Photograph of the dish:	Image of the final dish for guidance on the plating to be carried out to always have the same presentation to the customer
Description and preparation method:	Explanation of the steps to be taken for the mise-en-place, preparation, and plating of the recipe
Equipment:	Describe the main equipment and utensils needed to prepare the recipe (Example: cutting board, chef's knife, tray, stove, oven, spatula, etc.)

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Reference:	SOUPS0001	Type:	Soups and Starters
Name:	Quick mushroom noodle soup		
		Number of doses:	2

Ingredients	Measure	N.W.	C.F.	G.W.	P.C.	Unit P.	Total P.	C.C.
Sesame oil	Lt.	0,020	1	0,02	1%	€19,00	€0,38	7%
Mixed mushrooms	Kg.	0,200	1	0,2	14%	€14,95	€2,99	52%
Garlic clove	Kg.	0,015	1	0,015	1%	€5,48	€0,08	1%
Chilli flakes	Enough							
Fresh vegetable or chicken stock	Kg.	0,800	1	0,8	57%	€0,57	€0,46	8%
Udon noodles	Kg.	0,200	1	0,2	14%	€5,60	€1,12	19%
Pak choi	Kg.	0,150	1	0,15	11%	€3,99	€0,60	10%
Soy sauce	Enough		1					
Lime juice	Enough		1					
Crispy chilli in oil	Kg.	0,005	1	0,005	1%	€19,95	€0,10	3%
					Total Cost		€5,73	

Production	1,390	Cooking Index	0,7	Per Capita	0,487	VAT	€3,29	Contr. Margin	€8,58
Cost Kg Prod.	€4,12	Net Production	0,973	Unit Cost	€2,86	Net S.P.	€11,44	Ratio	75%

Presentation	Serve in individual bowl
Temperature and cooking time	Boil 100 ºC per 10 minutes
Packaging and expiration date	Consume immediately
Storage temperature	----------
Allergies	Gluten

Description and preparation method:

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Step 1: Heat the sesame oil in a large, deep saucepan over a medium heat and fry the mushrooms for 3-4 mins until evenly coloured. Add the garlic and chilli flakes and cook for another minute. **Step 2:** Add the stock (or crumble in the stock cube and add 400ml water) and bring to the boil. Tip in the noodles and pak-choi, reduce the heat and simmer for 3-4 mins until the noodles are warmed through. Ladle the soup into a bowl and season with a splash of soy sauce, squeeze of lime juice and the crispy chilli in oil. Serve immediately.
Equipment: Cutting board, chef's knife, tray, pan with lid, spoon, ladle, bowl.

Let's analyse our technical recipe sheet and know how to calculate the different content of this tool.

In the beginning, we will find the following designations:

- **G.W.**: Gross Weight, how the ingredient is received in our kitchen. Before it was fixed. A whole salmon, for example, from which we will have to remove the scales, fins, guts, head, and bones (waste).
- **N.W.**: Net Weight, the quantity of salmon that remains after we harvest it. The quantity that will give us income to prepare the recipe. This income will be represented by a percentage, which will become a standard for the calculations of the restaurant's technical data sheets.
- **C.F.**: Correction Factor, the difference between the gross weight and the net weight.

For example, if we buy 5 kg of rump (G.W.), and clean it to prepare it for later cooking, it will weigh approximately 4,5 kg (N.W.), so the rump correction factor will be (4,5 divided by 5 = 0.90) 90% profit.

C.F. = N.W. / G.W.

Ingredients	Measure	N.W.	C.F.	G.W.
Mixed mushrooms	**Kg.**	**0,200**	**1**	**0,2**

C.F.= 0,200/0,200 = 1

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This means that there are not leftovers in the case of the mixed mushrooms.

We will then always use this correction factor value to calculate the quantities of ingredients needed for each recipe. If we are going to prepare a recipe with rump for 50 people, we will have to do the math considering the amount of already cleaned meat that we are going to serve in each serving. Let us imagine that the total will be 7 kg, but we must take the correction factor into account before buying it. With the technical sheet we will be able to know the gross quantity required, which will be calculated as follows: 90% = 7/0.90 = 7.8 kg. Using this formula, we must buy 7.8 kg of rump to have the 7 kg we need to serve 50 people.

From the technical recipe sheet, we can see that the cost price of this recipe for 2 doses is €5,73. To arrive at this value, we must check the Total P. (Total Price) of each ingredient and then add the value of all the necessary ingredients, to do this we make a simple rule of three with the Unit P. (Unit Price) of each ingredient, multiplied by the G.W. (Gross Weigh) and dividing the result by 1 (kilo/litre equivalence). The formula should be as follows:

Total P. = (G.W. x Unit P.)/1

Ingredients	Measure	G.W.	Unit P.	Total P.
Mixed mushrooms	Kg.	0,2	€14,95	€2,99

Total P. = (0,2 * 14,95) / 1 =2,99€

But the purpose of the technical recipe sheet is none other than to determine the costs of each portion and the corresponding sales price to obtain a profit from preparing the recipe. To verify this data, we must make some more calculations regarding the T.C. (total cost), the U.C. (unit cost), the Contribution Margin, the VAT. (In the case of Portugal, it is 23%) and finally the Recommend Sell Price (obtained from the sum of the U.C. plus the Contr. Margin plus the VAT. The T.C. (Total Cost) of the recipe we will

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obtain by adding the unit prices of the ingredients that make up the dish, the formula will be as follows:

Total Cost = Sum of Total P. of each ingredient

In our example the result is 5,73€

We also need to look and calculate two special information, who are the P.C. (Production Coefficient) and the C.C. (Contribution Coefficient). In these columns we can see the importance of each ingredient on the recipe. For example, on the P.C. is important to know which is the main ingredient of the dish, because it need to have the high percentage of weigh compared to the rest of the ingredients. In the case of the C.C., we will know who the most expensive ingredients of our dish are, and if we need to change something at that point to get a much efficient dish in terms of costs… To calculate this information, we need to do the next calculations:

P.C. = (G.W. x 100%) / Sum of all G.W.

C.C. = (Total P. x 100%) / Total Cost

Ingredients	Measure	G.W.	P.C.	Unit P.	Total P.	C.C.
Mixed mushrooms	Kg.	0,2	14%	€14,95	€2,99	52%

P.C. = (0,2 X 100%) / 1390 = 14%

C.C. (2,99 X 100%) / 5,73 = 52%

Now we need to look to the Production, the Cooking Index, the Net Production, and the Per Capita information. This is a crucial point to value if our technical recipe sheet is well calculated and balanced between ingredients and doses. We should use a Food Portions guide to verify this balance.

The Production should be calculated by summing the NET Weigh of all ingredients:

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Production = Sum of N.W.

In our example the result is 1,390 Kg.

The Cooking Index is something a little bit difficult to calculate, because involves measuring the ingredients before and after cooking the dish. But is a particularly important information because we can see the Net Production thanks of that calculation:

Cooking Index = Net Production / Production

In our example we need to calculate the cooking index the first time we do the recipe. We need to measure the net production (the amount of the N.W.) and then to measure the result after cooking:

Cooking Index = 0,973 / 1,390 = 0,7

By calculating the Cooking Index one time, we can use the result for every time we do this recipe, no matter if we make 2 our 200 doses of the dish.

As a result of that calculation, we already know the Net Production every time, by multiplying the Production and the Cooking Index:

Production	1,390	Cooking Index	0,7	Per Capita	0,487	VAT	€3,29	Contr. Margin	€8,58
Cost Kg Prod.	€4,12	Net Production	0,973	Unit Cost	€2,86	Net S.P.	€11,44	Ratio	75%

Net Production = Production x Cooking Index

Net Production = 1,390 x 0,7 = 0,973

Now we can know the weight of the recipe that goes for every dose, by dividing between Net Production and Number of Doses:

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Per Capita = Net Production / Number of Doses

Per Capita = 0,973 / 2 = 0,487

The next step is to calculate the Unit Cost (cost of a single dose). To do this, we will divide the T.C. by the Number of Doses:

U.C. = T.C. / (Number of Doses)

U.C. = 5,73 / 2 = 2,86€

Now we are going to calculate the Net S.P., the needed sold price without VAT of our dish. This calculation should be done by defining the % of the cost of the ingredients that we want to apply. This should be determined according to the style and kind of service of our restaurant. We are going to consider 25%:

Net S.P. = (U.C. x 100%) / 25%

Net S.P. = (2,86 x 100%) / 25% = 11,44€

Once we reach this point, we must determine the percentage of Ratio that we want to obtain. This percentage will vary depending on the type of establishment, the type of service and cuisine, as well as the average price of our menu. Normally, the Ratio sought is around 60-75%, but there will be cases in which the margin will be higher, and others in which it will be lower, mainly due to raw material prices. Since we want to determine the Ratio percentage for our menu, we must carry out the following formula, to obtain the result in money, in the case of this recipe we will aim for a Ratio around 75%:

Ratio = ((Net S.P. – Unit Cost) x 100)/Net S.P.

Ratio = ((11,44 – 2,86) x 100) / 11,44) = 75%

According to the ratio, we can calculate the Contribution Margin by calculating the difference between the Net. S.P. and the Unit Cost:

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Cont. Margin = Net. S.P. – Unit Cost

Cont. Margin = 11,44 – 2,86 = 8,58€

Which is the NET profit that we obtain by selling or noodles at the recommended price of the technical recipe sheet.

Now, all we need to do is calculate the VAT (23% currently in Portugal) and the R.R.P. (Recommended Retail Price for each dish). In the case of VAT, just sum the U.C. plus the Net S.P. and do a simple rule of three with the VAT of your country, for our example is 23%:

VAT = ((U.C. + Net S.P). x 23%) / 100%

VAT = ((2,86 + 11,44) x 23%) / 100% = 3,29€

The Recommended Retail Price results from the Net S.P. plus the VAT. This value that we will obtain will be, as I said, a symbolic value, as the final value to be attributed to the price of this dish will depend on other factors, such as the average price of the menu, the type of service, the decoration of the establishment, etc.

R.R.P. = Unit Cost + Net S.P. + VAT

R.R.P. = 2,86 + 11,44 + 3,29 = 17,59€

According to our calculations, we should sell our Quick mushroom noodle soup at a price of 17,59€ to have the best profit with it attempting to our expectations and needs.

Thanks to that calculations we can know the recommended sale price of our dish, plus any other information, and the amount of food waste on our recipe, so we can adopt strategies to minimize the waste and reuse it on the proper way.

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1.6. Strategies for reusing leftovers.

When we cook, we usually have leftovers. It is especially important to know what we can do to reuse it in the right way to take a profit from them. So, reusing leftovers is an excellent way to minimize food waste and get creative with your cooking. Here are some examples of strategies for reusing leftovers:

Reinvent as New Meals:

- Turn leftover roasted vegetables into a frittata or quiche.
- Transform cooked meats (e.g., chicken, beef, or pork) into sandwiches, wraps, or tacos.
- Use leftover rice or pasta to make a stir-fry or fried rice.
- Blend leftover fruits into smoothies or use them as toppings for yogurt or oatmeal.

Figure 18: Imagem de Kamram Aydinov on Freepik.

Soups and Stews:

- Combine leftover vegetables, meat, or grains to make hearty soups or stews.
- Use broth or stock made from meat or vegetable scraps to enhance the flavour.

Figure 19: Imagem of Vecstock on Freepik

Leftover Salad:

- Repurpose leftover salad as a base for wraps or sandwiches.
- Blend salad ingredients into a refreshing smoothie with added fruits and yogurt.

Figure 20: Image of Stockking from Freepik

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Pizza or Flatbreads:

- Top leftover vegetables, meats, or cheeses on pizza dough or flatbreads for a quick and easy meal.

Figure 21: Image of 8photo from Feepik

Casseroles and Bakes:

- Combine leftover meats, vegetables, and grains in a casserole or baked dish with sauce or cheese.

Figure 22: Image of Stockqiu from Freepik

Leftover Grains:

- Use leftover grains like rice, quinoa, or couscous in salads, soups, or stuffed peppers.

Figure 23: Image of Vecstock from Freepik

Croutons and Breadcrumbs:

- Dry out leftover bread to make homemade croutons or breadcrumbs to use in salads or as toppings.

Figure 24: Image from Freepik

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Leftover Pasta:

- Turn left over pasta into a cold pasta salad with added vegetables, herbs, and dressing.
- Pan-fry or bake leftover pasta with cheese for a crispy pasta dish.

Figure 25: Image from Freepik

Omelettes and Frittatas:

- Incorporate leftover vegetables, meats, and cheeses into omelettes or frittatas for a hearty breakfast or lunch.

Figure 26: Image from Freepik

Leftover Breads:

- Use stale bread for bread pudding, French toast, or panzanella salad.

Figure 27: Image of Vecstock from Freepik

Remember to store leftovers properly in the refrigerator or freezer to maintain their quality and safety for reuse. By getting creative with your leftovers, you can reduce food waste and enjoy delicious meals without letting any ingredients go to waste. Those leftovers should be used on the daily menus; the Chef's suggestions and recommendations or even on the aperitives when the clients arrive.

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1.7. Composting for nutrient recycling

Creating compost in a professional kitchen, especially in a sustainable restaurant, can be an effective way to recycle food scraps and organic waste.

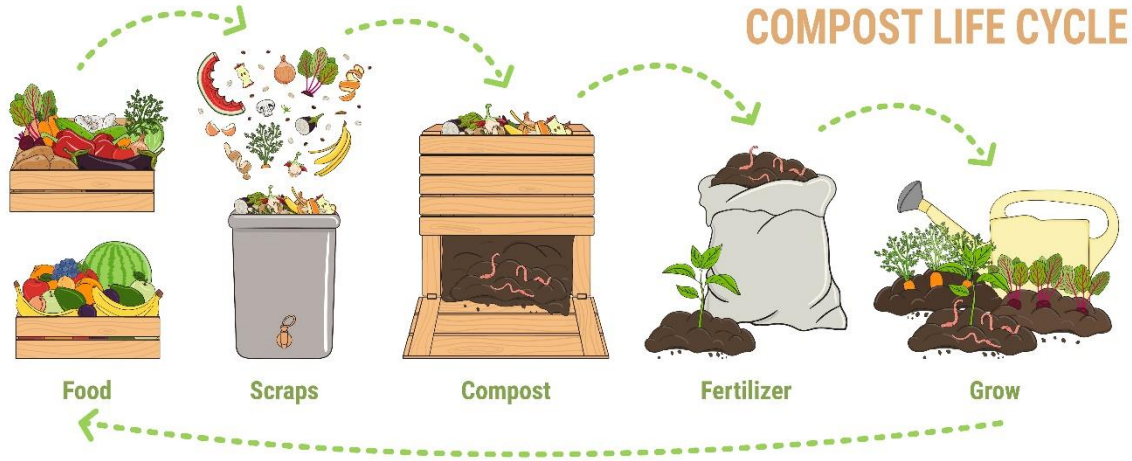

Figure 28: Sequence of composting. Source: https://parkseed.com/

Here are some examples of how to make compost in a sustainable restaurant setting:

Separate Food Scraps: Set up designated bins or containers in the kitchen for food scraps and organic waste. Educate kitchen staff about what can be composted, such as fruit and vegetable peels, coffee grounds, eggshells, and non-meat food scraps.

Composting Stations: Place composting stations conveniently throughout the kitchen to encourage staff to use them. Consider having stations near food preparation areas, dishwashing stations, and where food waste is most likely to be generated.

Use Biodegradable Containers: Serve takeout or to-go orders in biodegradable or compostable containers made from materials like plant-based plastics or compostable paper.

Compostable Packaging: Ensure that any compostable packaging used in the restaurant is certified compostable and can be included in the composting process.

Composting Bins in Dining Area: If your sustainable restaurant separates food waste in the dining area, provide clearly labelled composting bins for customers to dispose of their leftover food and biodegradable packaging.

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Educate Staff: Train kitchen staff about the importance of composting and how to correctly segregate food waste. Make composting part of your restaurant's sustainability culture.

Establish Composting Partnerships: Collaborate with local composting facilities or community composting programs to collect and process your restaurant's organic waste. Alternatively, consider having an on-site composting system if space allows.

Monitor and Manage Composting: Regularly monitor the composting process to ensure it remains efficient and does not produce foul odours. Turn the compost regularly and manage the carbon-to-nitrogen ratio for optimal decomposition.

Use Compost in the Garden: If your sustainable restaurant has a garden or plants on the premises, use the compost produced to enrich the soil and support sustainable agriculture.

Track and Share Results: Keep track of the amount of food waste diverted from landfills through composting. Share this information with staff and customers to demonstrate your restaurant's commitment to sustainability.

Engage Customers: Inform customers about your composting efforts and encourage them to participate by providing information on your menus, table tents, or signage.

Thanks to those composting practices, your sustainable restaurant can significantly reduce its environmental impact, close the food waste loop, and promote a more circular and eco-friendly food system.

Exercise 1: Reduce and reuse food waste and leftovers	
Pre-requisites	Knowledge of the principal cooking processes and the way we handle the food wastes and leftovers.
Time	1 hour
Tools	PC or Smartphone, internet connection, optional kitchen tools
Objectives	1. Recognize, assess, and apply environmentally responsible methods for handling and disposing of waste materials.

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	2. Create strategies to reduce, reuse, recycle, and properly dispose of waste in ways that minimize negative impacts on the environment and human health.
Instructions	
Carefully read the module chapter and study the food offer of your school cafeteria. After analysing the situation, create a strategy to reduce food waste and to reuse leftovers, by implementing technical recipe sheet and analysing the results you get from them.	

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CHAPTER 2: Packaging reduction

Packaging reduction is a sustainability strategy aimed at minimizing the environmental impact of product packaging by using fewer materials, optimizing packaging design, and promoting more eco-friendly alternatives. The goal is to reduce the amount of waste generated from packaging and its production.

Figure 29: Image from freepik.com

The concept of packaging reduction is based on the principles of the circular economy, where products and materials are kept in use for as long as possible and waste is minimized. It involves a shift from single-use, excessive, or non-recyclable packaging to more sustainable options that prioritize reusability, recyclability, and compostability.

2.1. Understanding the impact of food packaging

Packaging in the food industry plays a significant role in preserving food quality, ensuring safety during transportation, and providing information to consumers. Here are some key points related to the impact of food packaging in the EU:

Packaging Waste Generation: The food industry is a major contributor to packaging waste in the European Union. Packaging waste includes materials like plastics, paper,

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glass, and metals. In 2020, the EU generated approximately 177,9 kg of packaging waste per person, with the food and beverage sector accounting for a significant portion of this waste.

Plastic Packaging: Plastic packaging, particularly single-use plastics, is a growing concern in the EU due to its persistence in the environment and its negative impact on marine ecosystems. A large percentage of plastic waste in the EU comes from food and beverage packaging.

Recycling Rates: The EU has been working to improve recycling rates for packaging waste. In 2020, the average recycling rate for all packaging waste in the EU was around 64%. However, plastic packaging recycling rates were relatively low, highlighting the need for better recycling and waste management systems.

Marine Litter: Packaging waste, especially plastic, is a significant contributor to marine litter in the EU. This poses threats to marine wildlife, ecosystems, and human health, as microplastics can enter the food chain.

Greenhouse Gas Emissions: The production, transportation, and disposal of packaging materials contribute to greenhouse gas emissions. Reducing packaging waste and adopting more sustainable packaging solutions can help mitigate these emissions.

To address the environmental impact of packaging in the food industry, the EU has been implementing various initiatives and regulations, such as the Single-Use Plastics Directive and the Circular Economy Action Plan. These aim to promote more sustainable packaging practices, encourage recycling, and reduce plastic waste.

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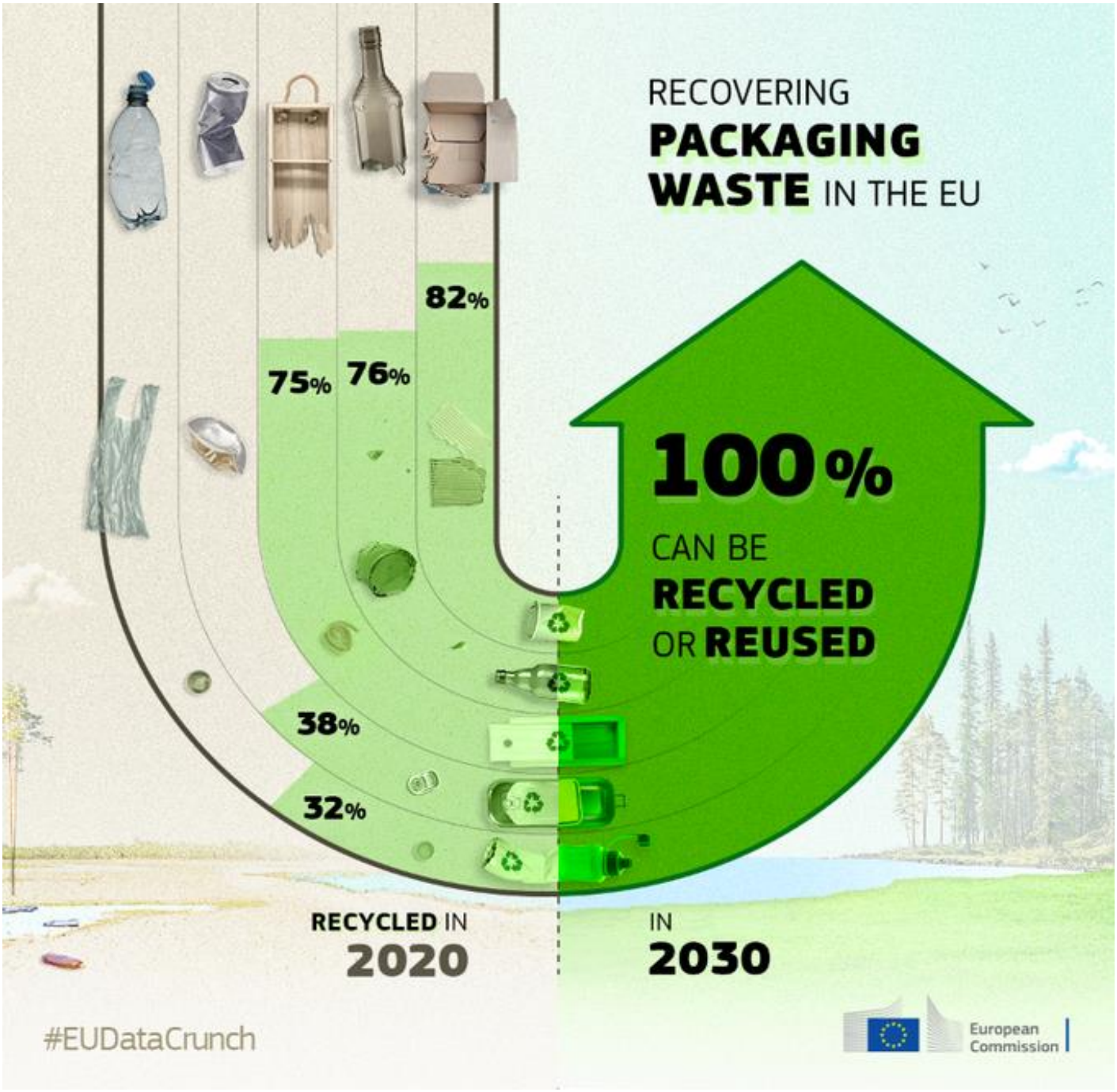

Figure 30: Infograph from Eurpean Commission site

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2.2. Life cycle assessment (LCA)

LCA is like a secret recipe for understanding the whole story of our ingredients, from where they start to how they end up on our plates. Imagine LCA as the 'behind-the-scenes' tour of your favourite recipes. It helps us uncover how our ingredients are grown, harvested, transported, and even what happens to the leftovers. It is like a map that shows us the journey of our food, from farm to fork.

But why is this relevant in the culinary world? Well, as chefs and culinary experts, we have a special role in making choices about the ingredients we use and how we prepare them. By understanding the environmental impact of our culinary choices, we can create amazing dishes that not only taste great but also help protect our planet.

In today's culinary adventure, we will learn about the different ingredients, how they are sourced, and their impact on the environment. We will see how 'farm to table' is not just a catchphrase but a concept we can influence.

LCA is like a detective tool for the culinary world. It helps us look at food and ingredients from start to finish, just like the journey of a recipe. Here is what it involves:

- **The Beginning (Raw Materials):** It starts with where our ingredients come from. For example, where are the vegetables grown? How are the animals raised for meat? LCA looks at how these things impact the environment.

Figure 31: Image of jcomp from freepik.com

- **The Middle (Production and Cooking):** When we cook, we are in the middle of our food's journey. LCA helps us understand how cooking methods, like grilling, baking, or frying, can affect the environment.

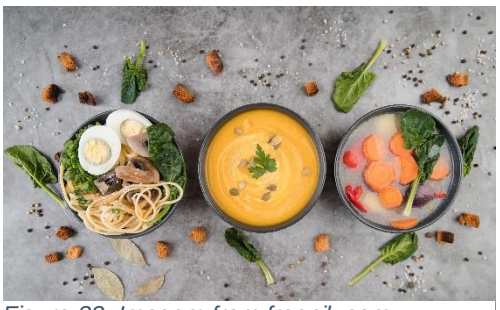

Figure 32: Imagem from freepik.com

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- **The End (Waste and Disposal):** After a meal, there are leftovers and rubbish. LCA helps us see what happens to the food scraps and packaging. Can they be composted or recycled, or do they end up in a landfill?

Figure 33: Image from freepik.com

2.3. Challenges in the kitchen

Sometimes, it is not easy to make the most eco-friendly choices in the kitchen. We may need to balance taste, cost, and sustainability. LCA helps us find solutions.

Let us break down the four stages of Life Cycle Assessment (LCA) with practical examples:

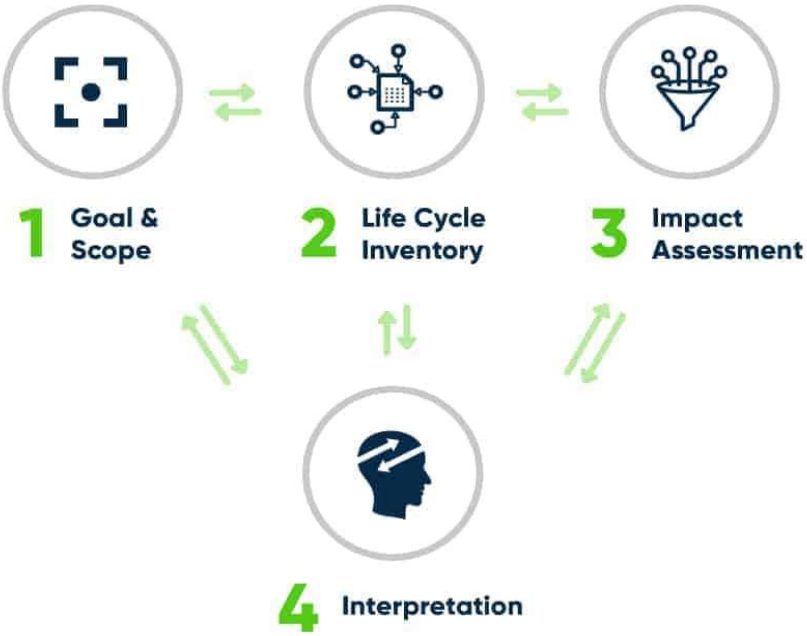

Figure 34: Image from ecochain.com

- **Goal and Scope Definition:** This is where we set our culinary detective mission. We decide what we want to investigate and why. For instance, we might want to know the environmental impact of our signature pasta dish. Our goal is to understand where we can make it more sustainable.

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- **Life Cycle Inventory (LCI):** In this stage, we gather all the clues or data we need. For our pasta dish, this means finding out where our ingredients come from. We would collect information on the pasta, the sauce, vegetables, and even the energy used to cook it. This helps us see the whole picture.

- **Life Cycle Impact Assessment (LCIA):** Now, it is time to put on our detective glasses. We take the data we have collected and analyse it. We want to know how our pasta dish affects the environment. Do any of our ingredients have a big carbon footprint? Are there water or energy issues we need to consider?

- **Interpretation:** This is where we become culinary eco-detectives. We look at the results from our analysis. For example, we might find that using locally grown vegetables reduces the carbon footprint of our pasta. We would then decide to source our veggies from local farms and encourage our customers to do the same.

2.4. Practical example

This practical example outlines the Life Cycle Assessment (LCA) for a signature dish, Grilled Salmon with Seasonal Vegetables. The assessment evaluates the environmental impact of sourcing, preparing, and serving the dish, identifying opportunities to reduce its carbon footprint, water usage, and waste.

1. Goal and Scope Definition:

Goal: To assess and minimize the environmental impact of preparing and serving one portion of Grilled Salmon with Seasonal Vegetables.

Functional Unit: 1 serving of the dish (200g salmon, 150g vegetables, 10g olive oil, spices).

System Boundaries: From sourcing raw ingredients to serving the dish. Exclusions include restaurant construction and kitchen equipment manufacturing.

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2. Life Cycle Inventory (LCI):

Ingredient Sourcing:

Ingredient	Origin	Transport Mode	Distance (km)	Farming Practice	Packaging
Salmon (200g)	Farmed in Norway	Refrigerated Truck	1,500	Aquaculture	Styrofoam Box
Zucchini (80g)	Local Farm (Portugal)	Small Truck	50	Organic	Cardboard Box
Carrots (70g)	Local Farm (Portugal)	Small Truck	50	Organic	Loose
Olive Oil (10g)	Spain	Large Truck	600	Conventional	Glass Bottle

Kitchen Utilities:

The dish requires utilities such as a gas stove for grilling and water for cleaning vegetables. Below is the utility usage per serving:

Utility	Activity	Usage per Serving	Energy Source
Stove (Gas)	Grilling salmon	8 minutes	Natural Gas (0.2 kg CO_2)
Water	Cleaning vegetables	2 litters	Tap Water

Waste Generated:

Waste includes organic vegetable peels, non-recyclable Styrofoam from salmon packaging, and recyclable cardboard from vegetables.

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3. Life Cycle Impact Assessment (LCIA)

The environmental impacts are calculated for the following categories:

Step 1: Carbon Footprint

The carbon footprint is calculated for ingredient transport, farming practices, and cooking.

- Salmon Transport: 1,500 km × 0.0017 kg CO_2/km = 2.55 kg CO_2
- Zucchini Transport: 50 km × 0.0017 kg CO_2/km = 0.085 kg CO_2
- Carrots Transport: 50 km × 0.0017 kg CO_2/km = 0.085 kg CO_2
- Olive Oil Transport: 600 km × 0.0017 kg CO_2/km = 1.02 kg CO_2
- Farmed Salmon: 4 kg CO_2/kg × 0.2 kg = 0.8 kg CO_2
- Organic Vegetables: 0.2 kg CO_2/kg × 0.15 kg = 0.03 kg CO_2
- Gas Stove Cooking: 0.2 kg CO_2 = 0.2 kg CO_2
- **Total Carbon Footprint: 4.77 kg CO_2 per serving**

Step 2: Water Footprint

Water usage includes farming and kitchen utilities:

- Salmon Farming: 10 liters/kg × 0.2 kg = 2 liters
- Vegetables Farming: 50 liters/kg × 0.15 kg = 7.5 liters
- Cleaning Vegetables: 2 liters
- **Total Water Use: 11.5 liters per serving**

Step 3: Waste Assessment

The waste generated is classified by type and disposal method:

Waste Type	Quantity per Serving	Disposal Method
Vegetable Peels	30g	Compost
Styrofoam (Salmon)	15g	Landfill
Cardboard (Vegetables)	5g	Recycling

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4. Interpretation and Recommendations

Key Findings:

- Hotspot: Salmon transportation contributes 53% of the total carbon footprint.
- Secondary Impact: High water usage in vegetable farming.

Recommendations:

- Replace salmon with a locally sourced fish (e.g., trout) to reduce transport emissions by 90%.
- Use energy-efficient appliances to reduce cooking-related emissions.
- Switch from Styrofoam to biodegradable packaging for salmon.
- Compost vegetable waste to avoid landfill impact.

5. Revised Carbon Footprint:

By implementing these changes, the estimated carbon footprint per serving is reduced to 2.3 kg CO_2, a 52% reduction.

2.5. Why LCA matters.

Ingredient Sourcing: Let us say you are considering two different suppliers for your signature tomato sauce. Supplier A provides tomatoes grown locally using sustainable farming practices, while Supplier B's tomatoes are imported from another country.

LCA can help you assess the environmental impact of each option. You find out that Supplier A's tomatoes have a lower carbon footprint because they require less energy for transportation and use fewer chemicals in their farming process. This means you are making more eco-friendly choices for your sauce.

Waste Reduction: You are also focused on reducing food waste. LCA helps you analyse your food preparation and serving processes. You discover that by adjusting portion sizes and using creative recipes for leftover ingredients, you can significantly cut down on food waste.

Menu Development: LCA guides your menu development. You realize that certain dishes have a smaller environmental footprint. For example, plant-based dishes tend to be more sustainable than those centred around animal products. This knowledge influences your menu choices and encourages you to feature more plant-based options.

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Customer Awareness: As you share your commitment to sustainability with your customers, they appreciate your efforts. They are not just dining at a restaurant; they are supporting a mission to reduce the environmental impact of their meals. This builds customer loyalty and helps attract environmentally conscious diners.

Economic Benefits: LCA is not just about being eco-friendly; it can also be economically beneficial. By sourcing locally, reducing waste, and choosing more sustainable ingredients, you can lower operational costs and increase profitability. Plus, as sustainability becomes a selling point, you gain a competitive edge in the restaurant industry.

2.6. Challenges and limitations for LCA

Challenges:

1. **Data Availability:** Gathering accurate and comprehensive data for all stages of a product's life cycle can be challenging. Some data might be proprietary, incomplete, or unavailable. This can affect the accuracy of the assessment.

Figure 35: Designed by rawpixel.com / Freepik

2. **System Boundaries:** Deciding what to include within the system boundaries of an LCA can be complex. It is not always clear what stages should be considered, especially when dealing with complex products or systems.

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Figure 36: Image from freepik.com

3. **Interconnected Processes:** Products and processes are often interconnected. For example, changes made to reduce one environmental impact may increase another. Balancing these trade-offs can be difficult.

Figure 37: Image from freepik.com

4. **Complexity:** LCA models can become overly complex, especially for multifaceted products. Managing and interpreting this complexity can be a challenge.

Figure 38: Image from freepik.com

5. **Lack of Standardization:** There are various methods and software tools for conducting LCA, but there is not always a consistent standard. This can make it challenging to compare assessments conducted using different methods.

Figure 39: Designed by vectorjuice / Freepik

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Limitations:

1. **Simplifications:** LCA involves simplifications to make the process manageable. For example, it may assume linear processes, constant product compositions, and fixed lifetime of products, which can lead to some inaccuracies.

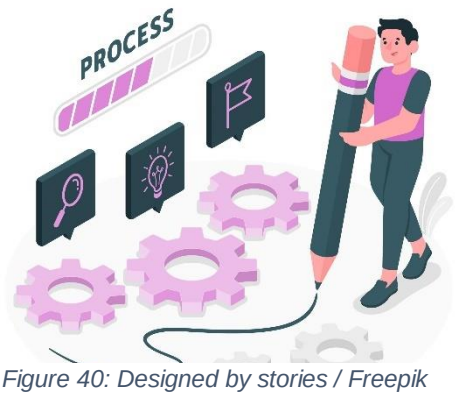

Figure 40: Designed by stories / Freepik

2. **Subjectivity:** Setting the goals and scope of an LCA involves subjective decisions. What environmental impact categories to consider, what time frames to use, and how to weigh different impacts are subjective choices that can influence results.

Figure 41: Image from freepik.com

3. **Temporal Aspects:** LCA typically considers environmental impacts at a single point in time. It may not capture how impacts change over time or the cumulative effects of a product over its life.

Figure 42: Image from freepik.com

4. **Local Variability:** Environmental impacts can vary significantly based on the location and local conditions. LCA might not capture these variations accurately.

Figure 43: Image from freepik.com

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5. **Limited Future Predictions:** LCA is retrospective, looking at past or current data. It cannot predict future technological advancements or changes in consumer behaviour that may affect the environmental impact.

Figure 44: Designed by vectorjuice / Freepik

6. **Single-Issue Focus:** LCA often focuses on specific environmental impacts like greenhouse gas emissions or energy use. This may overlook social or economic considerations.

Figure 45: Image from freepik.com

Our dishes not only delight the palate but also leave an imprint on the planet. As we conclude our exploration of Life Cycle Assessment (LCA), we have gained a new lens through which to view our culinary creations.

LCA is the compass that guides us on a journey from the source of our ingredients to their final resting place. It illuminates the environmental footprints of our choices and provides insights into how we can become culinary eco-champions. Through LCA, we have discovered that our culinary decisions matter, not only in taste but in sustainability.

By choosing locally sourced, seasonal, and eco-friendly ingredients, we reduce our carbon footprint and nourish our planet. We have recognized that minimizing food waste and embracing plant-based options can transform our menus into champions of sustainability.

But we must also acknowledge the challenges and complexities of LCA. It is a tool that relies on data, and in a world of interconnected systems and subjective choices, not all answers are straightforward.

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As culinary professionals, students, and enthusiasts, we now hold the power to make a difference with every dish we create. We can choose to be mindful of the environment, to be conscious of the impact of our culinary decisions. LCA has shown us that each plate is an opportunity to make the world a greener, more sustainable place.

2.7. Types of packaging

Packaging serves as a crucial element in various industries, including the culinary field. Different types of packaging are designed to protect, preserve, and present products. Here is an overview of some common packaging types and their applications:

1. Primary Packaging: Primary packaging is the first layer of packaging that directly encloses the product. It is in direct contact with the product.

Examples: For food, primary packaging includes cans, bottles, pouches, jars, and plastic containers. In the culinary world, it is what you see on the supermarket shelf.

Figure 46: Image from freepik.com

2. Secondary Packaging: Secondary packaging is used to group or bundle primary packages. It does not come into direct contact with the product.

Examples: Cardboard boxes, paperboard cartons, and corrugated containers are common forms of secondary packaging. They provide additional protection and branding opportunities.

Figure 47: Image from freepik.com

3. Tertiary Packaging: Tertiary packaging is designed for transportation and bulk handling of products. It often involves pallets and large containers.

Examples: Pallets, stretch wrap, and shipping containers are part of tertiary packaging. They are essential for the safe and efficient movement of products.

Figure 48: Image from freepik.com

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4. Flexible Packaging: Flexible packaging is lightweight and adaptable, making it ideal for various products. It often involves materials like plastic films, foils, and paper.

Examples: Stand-up pouches, foil bags, and flexible wraps are commonly used in the food industry for items like snacks, granola, and frozen foods.

Figure 49: Image of jannoon028 from freepik.com

5. Rigid Packaging: Rigid packaging provides structure and protection. It is durable and often used for premium or fragile products.

Examples: Glass jars, metal cans, and plastic clamshells fall into the category of rigid packaging. These are commonly used for sauces, preserves, and high-end products.

Figure 50: Image from freepik.com

6. Sustainable Packaging: Sustainable packaging aims to minimize its environmental impact. It can include various materials and design strategies to reduce waste and resource consumption.

Examples: Recycled and biodegradable materials, minimalist designs, and lightweight packaging fall into the category of sustainable packaging. It is an important consideration in the culinary industry to reduce the environmental footprint of packaging.

Figure 51: Image from freepik.com

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7. Vacuum Packaging: Vacuum packaging removes air from the packaging to extend the shelf life of perishable products.

Examples: Vacuum-sealed bags are commonly used for meats, cheese, and other perishable food items.

Figure 52: Image from freepik.com

8. Aseptic Packaging: Aseptic packaging involves sterilizing both the product and the packaging to maintain product quality and extend shelf life.

Examples: Aseptic cartons, often used for beverages and liquid products, are a good example.

Figure 53: Image from freepik.com

9. Modified Atmosphere Packaging (MAP): MAP involves changing the atmosphere within the packaging to slow down product degradation.

Examples: MAP is widely used for fresh produce, meat, and bakery products to maintain freshness.

Figure 54: Image from freepik.com

Each type of packaging has its own advantages and is chosen based on the specific requirements of the product. In the culinary field, packaging plays a critical role in keeping food fresh, safe, and appealing to consumers. It also provides opportunities for branding and marketing.

The environmental pros and cons of packaging materials can vary widely depending on factors such as production methods, recycling capabilities, and disposal options.

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Here is an overview of the environmental aspects of different packaging materials:

Figure 55: Environmental aspects of different packaging materials

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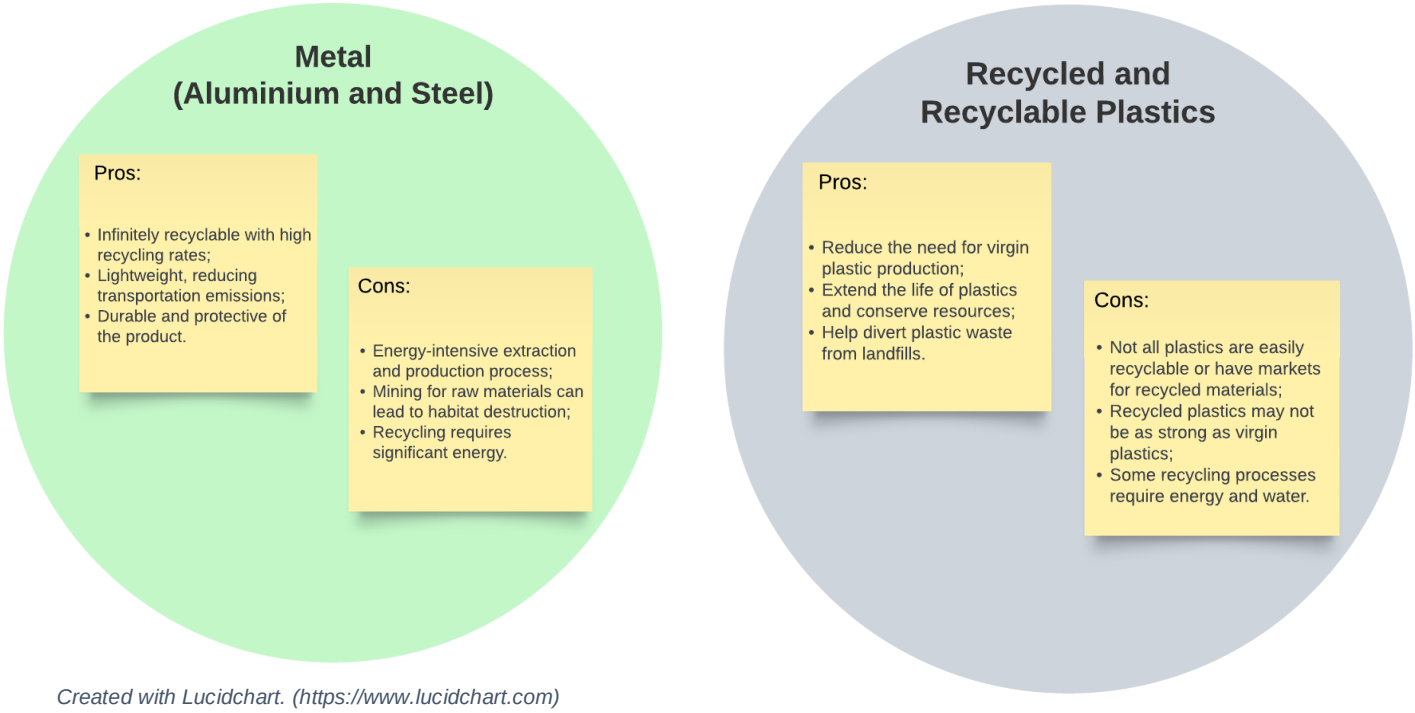

Created with Lucidchart. (https://www.lucidchart.com)

It is essential to consider a material's entire life cycle, including production, transportation, use, and end-of-life options, to determine its overall environmental impact. Additionally, innovations in sustainable packaging materials, recycling technologies, and waste management practices are continuously evolving, offering opportunities to reduce the environmental cons associated with packaging materials. Sustainable choices, such as recycled content, biodegradable options, and responsible sourcing, can help mitigate some of the environmental drawbacks of packaging materials.

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Exercise 2: Conducting an LCA of a specific ingredient	
Pre-requisites	Knowledge of Life Cycle Assessment (LCA), its phases, and the environmental impacts of food production.
Time	1,5 hours
Tools	PC or smartphone, internet connection, notebooks, calculators, and research tools.
Objectives	1. To engage students in applying the LCA process to analyse the environmental impact of a specific ingredient. 2. To develop critical thinking and problem-solving skills by identifying and addressing sustainability challenges associated with food production.

Instructions

1. Understand the Problem

Begin by selecting a single ingredient used in your dishes. This could be an imported item (e.g., avocado, coffee beans) or a locally sourced ingredient (e.g., potatoes, olive oil). Make sure the ingredient has specific sustainability challenges (e.g., long transport distances, high water use in cultivation, or excessive packaging).

2. Empathize

Put yourselves in the role of different stakeholders (e.g., farmers, suppliers, chefs, and consumers).

- What are the key needs and concerns related to this ingredient?
- For example, a chef may prioritize quality and availability, while a consumer might value eco-friendly sourcing and minimal waste.
- Think about environmental concerns like carbon emissions, deforestation, or water use associated with this ingredient.

3. Define the Problem

Identify specific sustainability challenges associated with the ingredient's life cycle.

- Example questions:
  - Where is this ingredient sourced from?
  - What is the environmental impact of its farming or production process (e.g., pesticide use, irrigation)?
  - How is it transported and stored?
  - Does its packaging contribute to environmental waste?

Document the most critical issues to be addressed in your analysis.

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4. Ideate

Brainstorm ideas for improving the ingredient's environmental impact at each stage of its life cycle.

- Example improvements:
  - Sourcing the ingredient locally to reduce transport emissions.
  - Switching to suppliers who use organic farming methods.
  - Encouraging reusable or biodegradable packaging.

5. Prototype

Develop a visual representation of your findings and solutions.

- Create a simple diagram or flowchart showing the current life cycle of the ingredient and the proposed improvements.
- Indicate the stages where your solutions can make the greatest impact.

6. Test and Gather Feedback

Present your findings and ideas to the class or group.

- Highlight the specific sustainability issues and how your proposed changes address them.
- Gather feedback from peers on the feasibility and effectiveness of your ideas.

7. Refine and Iterate

Based on the feedback, adjust your proposed solutions.

- Ensure that your recommendations are practical and align with consumer needs.
- Document any trade-offs or limitations (e.g., higher costs for sustainable farming methods).

8. Final Presentation

Deliver a final presentation to the class or instructor. Include:

- A summary of the ingredient's life cycle and its sustainability challenges.
- Proposed solutions and their expected impact.
- A clear diagram of the ingredient's improved life cycle.

Deliverables:

A written or visual summary of the LCA for the selected ingredient, highlighting key findings and sustainability recommendations.

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2.8. Recycling vs Upcycling

Both are methods to reduce waste and minimize the environmental impact of discarded materials, but they differ in their approaches and outcomes:

Recycling:

Recycling is the process of converting waste materials into new products or materials. It involves collecting, sorting, and processing used items to extract raw materials or create new products.

Recycled materials are transformed into new items or raw materials that can be used in the production of different products. The original product often loses its original form and purpose during the recycling process.

- **Examples:** Recycling paper to make new paper products, recycling glass to create new glass containers, and recycling plastic bottles to produce new plastic products.
- **Environmental Impact:** Recycling conserves resources, reduces the need for extracting and processing virgin materials, and minimizes waste in landfills. It can significantly reduce the carbon footprint associated with the production of new items.

Upcycling:

Upcycling is the process of creatively repurposing or transforming discarded or old items into new products or materials of higher quality, value, or functionality.

Upcycled items retain their original form, or they are transformed into something with a different, often higher, value or purpose. The goal is to enhance the original item's aesthetics or utility.

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- **Examples:** Turning old wooden pallets into stylish furniture, converting discarded jeans into fashionable bags, or using old doors to create a unique room divider.
- **Environmental Impact:** Upcycling reduces waste and promotes the reuse of existing materials, extending the lifespan of items, and reducing the need for new production. It can be a more sustainable and creative way to repurpose items and reduce their environmental impact.

Key Differences:

- **Transformation:** Recycling involves breaking down items to extract raw materials for new products, often changing their form and purpose. Upcycling focuses on creatively enhancing or repurposing items without significant alteration.
- **Original Purpose:** In recycling, the original purpose of the item may change, and it is typically used to create entirely new products. Upcycling aims to maintain or improve the original item's functionality or aesthetics.
- **Value:** Upcycling aims to add value to the original item, making it more attractive or functional, while recycling aims to reuse materials efficiently.
- **Environmental Impact:** Both recycling and upcycling reduce waste and contribute to environmental sustainability. However, upcycling often has a smaller carbon footprint because it typically requires less energy and transportation than recycling.

Ultimately, both recycling and upcycling play important roles in reducing waste and conserving resources, and their choice depends on the specific goals and materials involved.

2.9. Innovative Packaging Solutions

Innovative packaging solutions are continually evolving to meet the demands of a changing world. These solutions aim to improve sustainability, convenience, and product protection. Here are some innovative packaging trends and solutions:

1. **Eco-Friendly Materials:** Innovative packaging materials like biodegradable plastics, edible packaging, and packaging made from agricultural waste are gaining popularity. These materials reduce environmental impact and offer sustainable alternatives.

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2. **Minimalist and Reduced Packaging:** Brands are simplifying packaging designs to reduce waste and improve sustainability. Minimalist packaging often features simple, recyclable materials and less ink and labelling.

3. **Smart Packaging:** Smart packaging integrates technology to improve user experience and product safety. Examples include QR codes for product information, freshness indicators, and interactive packaging that enhances customer engagement.

4. **Reusable and Refillable Packaging:** Brands are introducing reusable and refillable packaging systems to reduce single-use waste. Customers can refill containers with products, reducing the need for new packaging.

5. **Aseptic and Extended Shelf-Life Packaging:** Aseptic packaging solutions maintain product quality without the need for refrigeration. This technology helps reduce food waste by extending the shelf life of products.

6. **Sustainable Labels and Inks:** Innovative label materials and inks are developed to reduce environmental impact. Water-based and soy-based inks, as well as recyclable label materials, are increasingly used.

7. **Active and Intelligent Packaging:** Active packaging releases substances to extend product life, such as oxygen absorbers in food packaging. Intelligent packaging can monitor product freshness and provide real-time information to consumers.

8. **Nanotechnology in Packaging:** Nanotechnology is used to create advanced packaging materials with improved barrier properties, allowing for better preservation of products and reducing food waste.

9. **3D-Printed Packaging:** 3D printing enables the creation of custom packaging designs with reduced material waste. It is particularly beneficial for prototyping and short-run production.

10. **Packaging for E-Commerce:** As online shopping grows, packaging solutions tailored to e-commerce, such as sustainable protective materials and designs for efficient shipping, are evolving.

11. **Waste-to-Energy Packaging:** Some innovative packaging solutions are designed to be converted into energy through incineration, helping to address waste challenges.

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12. **Blockchain for Transparency:** Blockchain technology is used to create transparency in the supply chain and verify the authenticity and origin of products.

13. **Edible Packaging:** Edible packaging is made from materials like rice paper or seaweed and can be consumed along with the product or used as a seasoning.

14. **Aesthetic Innovation:** Packaging design is also evolving to enhance the visual appeal and aesthetics of products, creating an emotional connection with consumers.

These innovative packaging solutions are driven by a growing awareness of environmental concerns, consumer preferences, and technological advancements. As the demand for sustainability and efficiency increases, the packaging industry continues to develop creative and responsible solutions to meet these challenges.

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2.10. Design Thinking

Design thinking is a problem-solving approach that places human needs and experiences at the centre of the design process. It encourages creativity, empathy, and innovation to develop solutions that not only address a problem but also provide a meaningful and user-centric experience. In the context of sustainable packaging, design thinking helps us to create eco-friendly solutions that enhance user experiences while minimizing environmental impact.

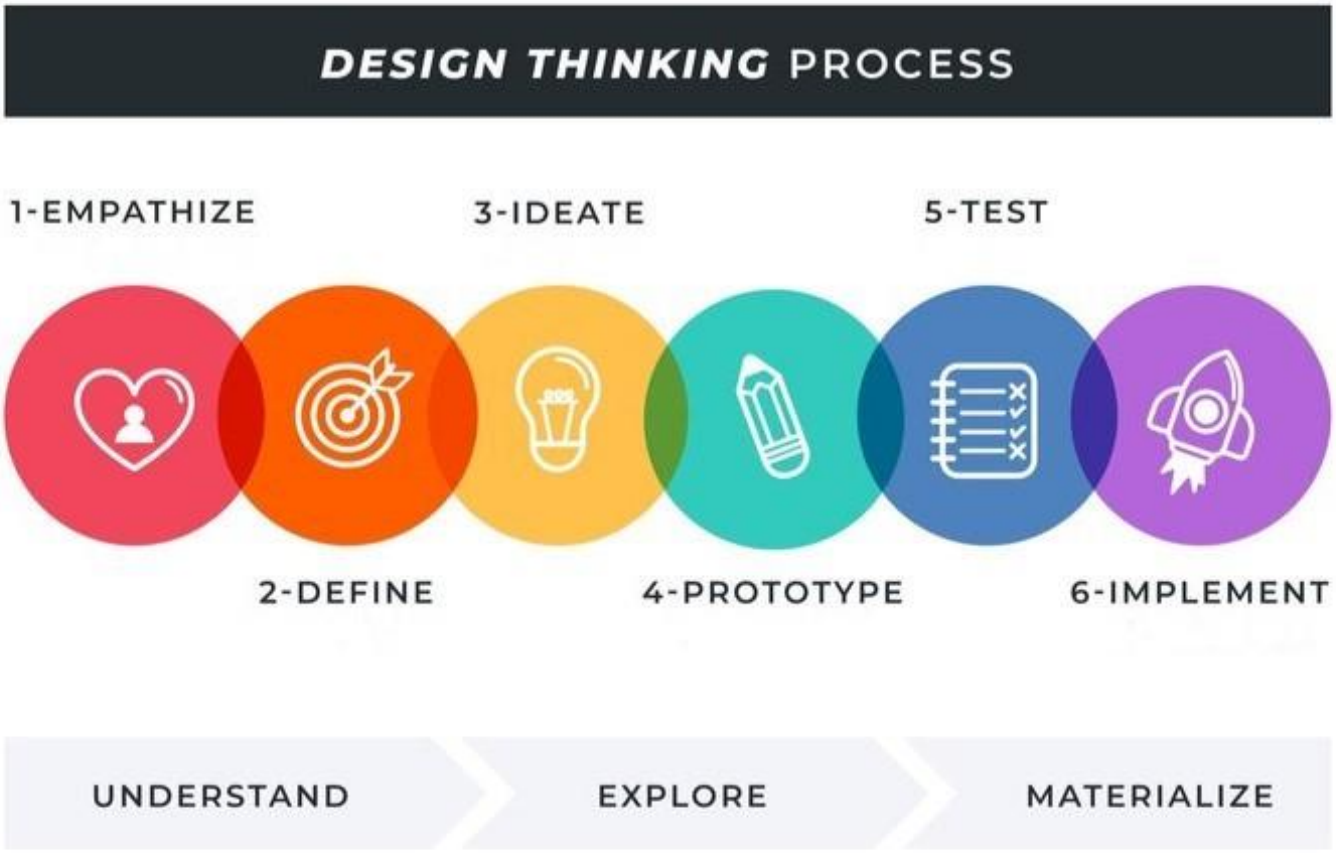

Figure 56: Image from freepik.com

1. **Empathize:** The first step involves understanding the needs and perspectives of the people for whom you are designing. This includes both direct users and other stakeholders. Design thinkers seek to empathize with the user's experiences, feelings, and challenges. Techniques such as interviews, observations, and surveys are used to gather insights into the user's context.

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2. **Define:** Once a deep understanding of the users and their needs has been established, the next step is to define the problem or challenge. This involves synthesizing the information gathered during the empathize stage and identifying key patterns and insights. The goal is to clearly articulate the problem that needs to be addressed. This step sets the foundation for the rest of the design process.

3. **Ideate:** In the ideation stage, creative thinking is encouraged to generate a wide range of possible solutions to the defined problem. Participants in the design thinking process, often working in collaborative sessions, brainstorm and explore new ideas without immediate judgment. The focus is on quantity and diversity of ideas. Techniques such as brainstorming, mind mapping, and "How Might We" questions are commonly used in this stage.

4. **Prototype:** This stage involves creating tangible representations of the ideas generated during the ideation phase. Prototypes can take various forms, from simple sketches or diagrams to more interactive and realistic models. The purpose of prototyping is to test and iterate on ideas quickly and inexpensively. Prototypes are shared and tested with users to gather feedback and refine the potential solutions.

5. **Test:** In the testing stage, prototypes are evaluated with users to gather feedback on their effectiveness and usability. This step helps designers understand how well their solutions address the defined problem and whether any adjustments are needed. The testing phase is iterative, and the insights gained are used to refine and improve the prototypes. The goal is to learn from user feedback and make informed decisions about the final design.

6. **Implement (or Launch):** The final stage involves implementing the refined solution into the real-world context. This may include developing a final product, service, or system. Implementation is not the end of the process; rather, it provides an opportunity for designers to gather additional feedback and adjust as needed. This step completes the design thinking cycle and may lead to further iterations or improvements based on ongoing user insights.

It is important to note that the design thinking process is non-linear, and teams often move back and forth between stages as they iterate and refine their ideas. This iterative nature allows for continuous improvement and ensures that the final solution is well-suited to the needs of the users.

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2.11. International Efforts to Combat Packaging Waste

Several international efforts are underway to address the global problem of packaging waste:

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal: This treaty, under the United Nations Environment Programme (UNEP), seeks to minimize the movement of hazardous waste, including some types of packaging waste, between nations. It aims to reduce the negative environmental and health impacts associated with such waste.

Figure 57: Logo from https://www.basel.int/

The Ocean Plastics Charter: Launched by Canada and the European Union, this initiative seeks to prevent plastic waste from entering the oceans by improving waste management and recycling systems, as well as promoting innovative solutions.

Figure 58: Logo from https://www.iucn.org

The New Plastics Economy Global Commitment: Led by the Ellen MacArthur Foundation and the United Nations Environment Programme (UNEP), this initiative unites governments, businesses, and organizations to address plastic pollution and promote a circular economy approach to plastics.

Figure 59: Logo from https://www.unep.org/new-plastics-economy-global-commitment

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Extended Producer Responsibility (EPR) Programs: Many countries and regions have adopted EPR programs, which hold producers accountable for the entire life cycle of their products, including the management of packaging waste. Producers are encouraged to design products with recycling and disposal in mind.

Figure 60: Logo from https://www.europen-packaging.eu

Plastic Bag Bans and Reductions: Various nations and municipalities have implemented bans or restrictions on single-use plastic bags and other excessive packaging materials, reducing their environmental impact.

Figure 61: Image from https://greatforest.com/

Circular Economy Initiatives: Countries and organizations are promoting the transition to a circular economy, where materials and products are designed for reuse, recycling, and reduced waste. This approach can significantly reduce packaging waste.

Circular Economy Initiative

Figure 62: Logo from https://www.circular-economy-initiative.de

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Research and Innovation: International collaboration on research and innovation is driving the development of sustainable packaging materials, such as biodegradable plastics, and improved recycling technologies.

Figure 63: Logo from https://www.rcdpackaging.com/

Efforts to combat packaging waste are a global priority. International agreements and collaborative initiatives are essential in addressing this issue, as packaging waste knows no borders and requires a coordinated response to protect the environment and human health.

2.12. Sustainable Brands

There are numerous brands and businesses that have made significant strides in prioritizing sustainable packaging and have inspiring success stories to share. Here are a few notable examples:

Unilever: Unilever, a consumer goods giant, has made significant commitments to reducing its environmental impact. They aim to make all of their plastic packaging recyclable, reusable, or compostable by 2025. They have also launched products with reduced packaging, such as their Love Beauty and Planet brand.

Figure 64: Logo from https://www.unilever-fima.com/planet-and-society/

Ecover: Ecover, a cleaning products company, uses plant-based and recycled materials for their packaging. They also designed bottles that use less plastic while being fully recyclable.

Figure 65: Logo from https://www.ecover.com/

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Package Free Shop: Package Free Shop is a zero-waste online store that curates sustainable products and uses minimal, eco-friendly packaging. They promote plastic-free, package-free living.

Figure 66: Logo from https://packagefreeshop.com/

Algramo: Algramo is a Chilean start-up that provides products in vending machines. Customers bring their own containers and refill them, reducing single-use packaging.

Figure 67: Logo from https://algramo.com/en/

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2.13. Strategies for minimizing packaging waste.

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Key aspects of packaging reduction include:

Lightweight and Minimalist Design: Designing packaging to be lightweight and minimalist helps reduce the amount of material required, leading to lower production and transportation impacts. By eliminating unnecessary layers or components, companies can reduce the overall environmental footprint of the packaging.

Source Reduction: Source reduction involves using fewer materials in the first place. Companies can optimize packaging design to minimize excess space, use thinner materials, and choose materials with lower environmental impact.

Sustainable Materials: Shifting towards sustainable and renewable materials for packaging is crucial. This includes using recycled content, bio-based materials, and compostable or biodegradable alternatives. Sustainable materials help decrease dependence on fossil fuels and reduce the burden on landfills.

Reusable and Refillable Packaging: Encouraging the use of reusable or refillable packaging can significantly reduce waste. Refill stations or programs can be implemented, where customers can bring back their empty containers for refilling.

Eco-Friendly Printing and Labelling: Using eco-friendly printing methods and materials for labels reduces the environmental impact of packaging further. This includes using water-based inks, minimalistic labelling, and avoiding non-recyclable label materials.

Responsible Disposal Options: Companies can inform consumers about the proper disposal methods for packaging. Encouraging recycling, composting, or returning packaging to the manufacturer for reuse or recycling can ensure responsible end-of-life management.

Collaboration with Suppliers: Engaging with suppliers and manufacturers in packaging reduction efforts can lead to innovative solutions and greater impact across the supply chain. Collaboration can result in shared goals for more sustainable packaging practices.

Consumer Awareness and Education: Raising awareness among consumers about the importance of packaging reduction and the benefits of choosing products with sustainable packaging can drive demand for eco-friendly options and foster a more responsible consumption culture.

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Packaging reduction is a critical component of sustainable business practices that align with the principles of environmental conservation and resource efficiency.

2.14. Practical examples for packaging reduction

Reducing packaging in one's business can have a positive impact on sustainability. Here are some practical examples of packaging reduction in a restaurant:

Reusable Tableware: Use reusable plates, utensils, and glassware for dine-in customers instead of disposable options. Encourage customers to bring their reusable cups for takeout beverages.

Eco-Friendly To-Go Containers: Invest in eco-friendly to-go containers made from materials like biodegradable plastics, paper, or cardboard. These options are more sustainable and can often be composted.

Minimalist Packaging: Streamline packaging for takeout orders. Use minimal packaging without excessive plastic or paper. Encourage customers to request utensils and condiments only if needed.

Compostable Packaging: Offer compostable to-go packaging for items like salads, sandwiches, and sides. Compostable containers break down naturally and are less harmful to the environment.

Customized Portion Sizes: Adjust portion sizes based on customer preferences to minimize food waste and the need for extra packaging.

Digital Menus and Receipts: Implement digital menus and receipts to reduce paper usage. This also saves printing costs.

Bulk Ingredients: Purchase ingredients in bulk or large containers to reduce the need for individual packaging. This can apply to spices, sauces, and other non-perishables.

Reduce Plastic Bags: If your restaurant uses plastic bags for takeout orders, encourage customers to bring their reusable bags. You can also consider using paper bags, which are more environmentally friendly.

Promote In-House Dining: Encourage customers to dine in the restaurant by creating an enjoyable atmosphere and offering incentives like discounts for eating in.

Recycling Stations: Set up recycling stations in your restaurant where customers can easily separate recyclables from general waste.

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Educate Staff and Customers: Train your staff to inform customers about your sustainable packaging practices and the importance of reducing waste. Customers who understand the effort are more likely to support it.

Collaborate with Suppliers: Work with suppliers who use minimal or sustainable packaging for ingredient deliveries. Encourage them to reduce packaging where possible.

Exercise 3: Designing Sustainable Packaging Solutions exercise	
Pre-requisites	Knowledge of the Sustainable Packaging Solutions, the LTA phases and how can we adapt and use better packaging solutions.
Time	1,5 hours
Tools	PC or Smartphone, internet connection, different kind of materials, etc…
Objectives	1. To engage students in a design thinking exercise to develop creative and sustainable packaging solutions for a specific product or scenario.

Instructions

In groups, carefully read the chapter and do the following exercise:

1. **Understand the Problem:** Begin by selecting a product or scenario for which sustainable packaging solutions are needed. This could be a food product, a personal care item, or any other consumer product. Ensure that the selected item has packaging-related sustainability challenges.

2. **Empathize:** Put yourselves in the shoes of the consumer. What are the consumer's needs, desires, and concerns related to the product and its packaging? Consider aspects like convenience, sustainability, safety, and aesthetics.

3. **Define the Problem:** What sustainability issues or challenges exist in the current packaging of the selected product? For example, it could be excessive plastic use, non-recyclable materials, or inefficient transportation.

4. **Ideate:** In this phase, brainstorm creative ideas for sustainable packaging solutions. You should focus on minimizing environmental impact while improving the user experience. Ideas could include using alternative materials, innovative opening/closing mechanisms, or eco-friendly labelling.

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5. **Prototype:** Try to create rough prototypes or sketches of your packaging ideas. These do not need to be fully functional; the goal is to visualize the concepts and how they might work in practice.

6. **Test and Gather Feedback:** Present your prototypes to the class. Collect feedback and suggestions for improvement. How do the prototypes address the defined problem, and how do they enhance the user experience?

7. **Refine and Iterate:** Based on the feedback received, you should refine your packaging designs. Iterate on your ideas, making adjustments to improve sustainability, user-friendliness, and other aspects.

8. **Final Presentation:** You should display your sustainable packaging solution. Explain how it addresses the identified problem, the materials used, and its impact on the environment.

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CHAPTER 3: Sustainable technologies in the kitchen

In today's rapidly changing world, the food industry faces increasing pressure to adopt more sustainable practices. Among the various sectors of the food industry, professional kitchens play a crucial role in driving positive change towards environmental stewardship and resource efficiency. Sustainable technologies offer innovative solutions that can transform traditional commercial kitchens into eco-friendly and efficient spaces, aligning with the principles of environmental responsibility and social consciousness.

From reducing energy consumption and minimizing food waste to improving water efficiency and embracing renewable resources, sustainable technologies hold the potential to revolutionize the way professional kitchens operate. These cutting-edge solutions not only help businesses meet environmental goals but also yield economic benefits through cost savings and enhanced operational efficiency.

By adopting these advanced technologies, foodservice establishments can not only improve their environmental performance but also take on a leadership role in shaping a more sustainable future for the entire food industry.

3.1 Introduction to sustainable kitchen appliances

Sustainable kitchen appliances are appliances designed and manufactured with a focus on environmental responsibility and energy efficiency. These appliances are part of the broader effort to promote sustainability and reduce the environmental impact of household activities, including cooking and food preparation. Here are some key features and benefits of sustainable kitchen appliances:

Energy Efficiency: Sustainable kitchen appliances are engineered to consume less energy during operation. They often come with energy-saving features such as programmable timers, sensors, and inverter technology. Energy-efficient appliances help reduce electricity consumption, leading to lower utility bills and a smaller carbon footprint.

Water Conservation: Sustainable kitchen appliances, such as dishwashers and faucets, incorporate water-saving technologies to minimize water usage. Low-flow

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faucets, water-efficient dishwashers, and smart water management systems contribute to water conservation and support sustainable water practices.

Recycled Materials: Many sustainable kitchen appliances are made using recycled materials, reducing the demand for new resources and diverting waste from landfills. Manufacturers may use recycled plastic, metal, or other materials in the production of these appliances.

Eco-Friendly Materials: Sustainable appliances may use eco-friendly materials that have a lower environmental impact during their lifecycle. For instance, some appliances feature bamboo, a rapidly renewable and biodegradable material, in their construction.

Longevity and Durability: Sustainable kitchen appliances are often designed to be durable and long-lasting, reducing the need for frequent replacements. Longer product lifespans contribute to waste reduction and resource conservation.

Non-Toxic and Chemical-Free: Sustainable appliances prioritize non-toxic materials and coatings to ensure that no harmful chemicals leach into the environment or food. This makes them safer for both users and the environment.

Smart Technology: Many sustainable kitchen appliances are equipped with smart technology, allowing users to monitor and control their energy and water consumption more effectively. Smart appliances may also optimize performance based on usage patterns.

Energy Star Certification: Appliances with the Energy Star label meet strict energy efficiency guidelines set by the U.S. Environmental Protection Agency (EPA) or similar regulatory bodies in other regions. Energy Star-certified appliances consume less energy and help users reduce greenhouse gas emissions.

Waste Reduction Features: Some sustainable appliances, such as composters and food waste disposers, aim to reduce food waste and promote responsible waste management in the kitchen.

As consumer demand for eco-friendly products continues to rise, manufacturers are increasingly incorporating sustainable practices into their appliance designs to meet the growing need for environmentally conscious solutions.

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3.2 Harnessing renewable energy for cooking

Harnessing renewable energy for cooking offers an environmentally friendly alternative to traditional fossil fuel-based cooking methods. Renewable energy sources are sustainable, readily available, and do not produce greenhouse gas emissions, making them a viable and eco-conscious option for cooking. Here are some ways to harness renewable energy for cooking:

Solar Cooking: Solar cookers and solar ovens use sunlight to heat and cook food. They typically consist of reflective surfaces that focus sunlight onto a cooking chamber. Solar cooking is especially effective in sunny regions and can be used for various cooking tasks, such as baking, boiling, and roasting.

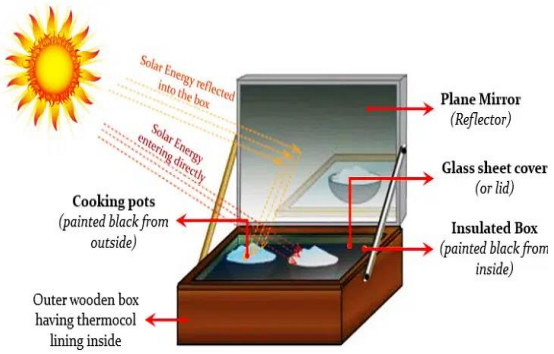

Figure 68: Image from https://collegedunia.com

Biomass Stoves: Biomass stoves use renewable plant-based fuels such as wood, crop residues, and agricultural waste to produce heat for cooking. Improved cookstove designs are efficient and reduce indoor air pollution compared to traditional open fires.

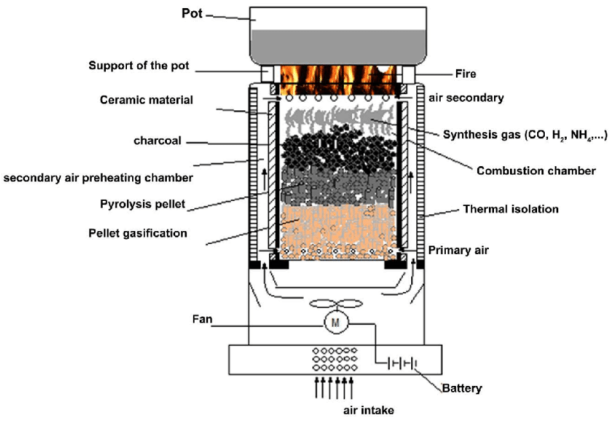

Figure 69: Image from Creative Commons Attribution 4.0 International

Biogas: Biogas is produced from the anaerobic digestion of organic materials, such as food waste, agricultural residues, or animal manure. Biogas can be used directly in biogas stoves or converted to electricity and used to power electric cookers.

Figure 70: Image from https://www.forbesargentina.com

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Hydroelectricity: If your home or community has access to hydropower, you can use electricity generated from flowing water to power electric cookers, induction cooktops, and other electric cooking appliances.

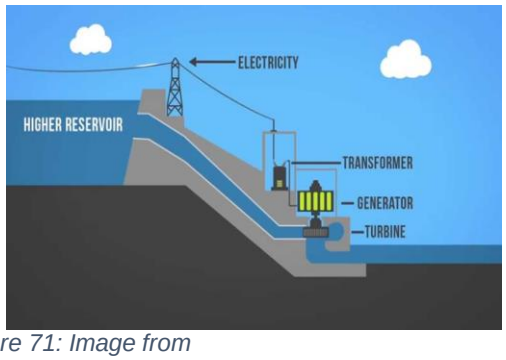

Figure 71: Image from https://energypedia.info/wiki/Hydro_Power_Basics

Wind Power: In areas with consistent wind resources, wind turbines can produce electricity for cooking purposes. Wind energy can be stored in batteries or fed into the grid and used when needed.

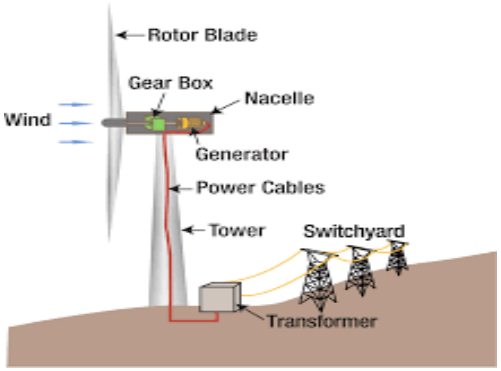

Figure 72: Image from http://www.history.alberta.ca/energyheritage/energy/wind-power/modern-wind-power/modern-turbines-how-

Geothermal Energy: In regions with access to geothermal energy, ground-source heat pumps can be used for cooking. Geothermal energy is extracted from the Earth's heat, providing a consistent and reliable source of energy.

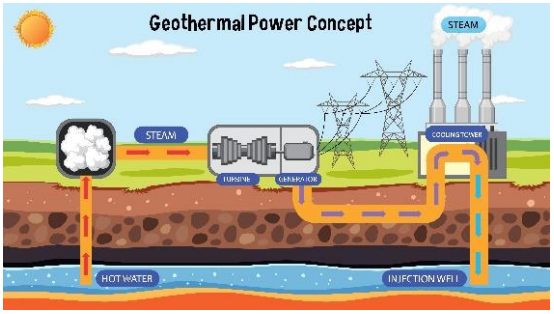

Figure 73: Image from freepik.com

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Community-Based Renewable Energy: In some areas, communities may invest in shared renewable energy systems, such as community solar farms or wind turbines. Community members can access renewable energy for cooking through these collective initiatives.

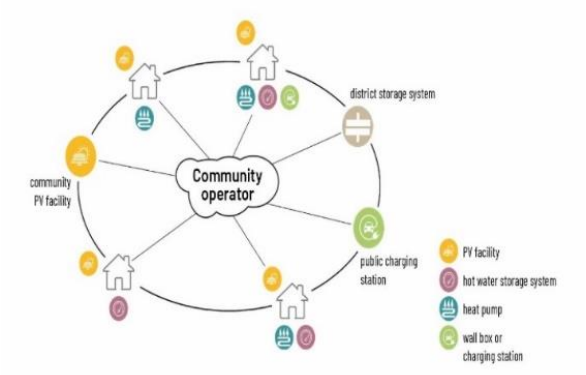

Figure 74: Image from freepik.com

Grid-Tied Renewable Energy: If your local energy grid is supplied with renewable energy from sources like wind or solar farms, you can use regular electric or induction cooktops powered by the renewable energy mix.

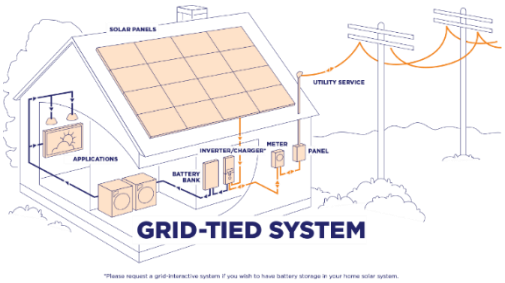

Figure 75: Image from freepik.com

It is important to note that the availability and feasibility of specific renewable energy options may vary depending on your location and local resources. Assessing the renewable energy sources available in your area and choosing suitable cooking technologies that align with those resources will be crucial in successfully harnessing renewable energy for cooking.

Transitioning to renewable energy for cooking not only reduces greenhouse gas emissions but also contributes to sustainable development, energy independence, and resilience to energy price fluctuations. As renewable energy technologies continue to advance, they offer a promising and sustainable pathway for the future of cooking.

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3.3 Promoting energy-efficient kitchen design

Promoting energy-efficient kitchen design involves integrating sustainable principles into the layout, equipment selection, and practices of the kitchen. By optimizing energy usage, reducing waste, and adopting eco-friendly technologies, energy-efficient kitchen designs can significantly lower the environmental impact while saving costs. Here is an example of how to promote energy-efficient kitchen design:

Example: Eco-Friendly Restaurant Kitchen

Appliance Selection: Choose energy-efficient appliances with the Energy Star label or other energy certifications. Opt for induction cooktops, which are more efficient than traditional gas or electric cooktops. Select refrigerators and freezers with high Energy Efficiency Ratings (EER) and invest in energy-efficient convection ovens.

Ventilation System: Install a well-designed, energy-efficient ventilation system. Use exhaust hoods with variable speed controls to adjust airflow based on cooking activity, reducing energy waste during low-demand periods.

LED Lighting: Replace traditional lighting fixtures with energy-efficient LED lighting. LED lights consume significantly less energy, have a longer lifespan, and produce less heat, reducing cooling load requirements.

Natural Light and Skylights: Maximize natural light through windows and skylights, reducing the need for artificial lighting during daylight hours.

Energy Management Systems: Implement smart energy management systems that control appliances, lighting, and HVAC based on occupancy and demand. These systems can automatically adjust settings for energy efficiency.

Insulation: Ensure proper insulation in walls, ceilings, and floors to prevent heat loss and gain, reducing the load on heating and cooling systems.

Water Conservation: Incorporate water-efficient fixtures, such as low-flow faucets and pre-rinse sprayers, to reduce water consumption. Use energy-efficient dishwashers with shorter wash cycles.

Waste Management: Implement a comprehensive waste management plan to recycle, compost, and minimize food waste. Recycling and composting can reduce the waste sent to landfills, mitigating methane emissions.

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Energy Audits and Monitoring: Conduct regular energy audits to identify opportunities for improvement. Install energy monitoring systems to track and optimize energy usage.

Employee Training: Train kitchen staff on energy-efficient practices, such as turning off appliances when not in use, using timers effectively, and practicing responsible water usage.

Highlighting a commitment to sustainability can resonate with customers, attract environmentally conscious diners, and contribute to a positive brand image. An energy-efficient kitchen serves as a model for sustainable practices, inspiring others in the foodservice industry to follow suit and promote a greener and more sustainable future.

Exercise 4: *Harnessing renewable energy for cooking*	
Pre-requisites	Knowledge of the sustainable technologies in the kitchen and how can we adapt and use different kind of appliances to cook taking advantage of the solar heat.
Time	1,5 hours
Tools	PC or Smartphone, internet connection, paper box, mirrors, foil paper, glue, etc…
Objectives	1. Integrating environmentally conscious actions and behaviours into one's daily work routines and responsibilities to create well balanced meals according to nutritional needs. 2. Make choices that reduce the ecological footprint associated with job tasks, such as conserving resources, minimizing waste, and supporting environmentally friendly initiatives.
Instructions	
In groups, carefully read the module and watch the link provided: https://www.youtube.com/watch?v=DaiGiRqCTQw After consulting links, create a handmade solar oven that you can use for dehydrating food or made recipes by slow cooking techniques. **Extra task:** Present a recipe made with your solar oven in 3 hours or less.	

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Case Study: Pepe Vieira – A Green Michelin Star Restaurant

Introduction:

Pepe Vieira is a Michelin-starred restaurant situated in the picturesque coastal region of Galicia, Spain. The restaurant has garnered acclaim not only for its exceptional gastronomy but also for its unwavering commitment to sustainability and environmentally responsible practices. This case study delves into Pepe Vieira's journey towards becoming a green Michelin star restaurant, highlighting its sustainable initiatives and their impact on the culinary world.

Background:

Chef Pepe Vieira: Chef José Antonio Vieira Rey, commonly known as Pepe Vieira, is the driving force behind the restaurant. He brings his passion for local, seasonal ingredients and innovative culinary techniques to create a unique dining experience.

Michelin Star: Pepe Vieira received its first Michelin star in 2001 and has maintained this prestigious recognition for its culinary excellence. Actually, the restaurant keeps two Michelin Stars and a Green Michelin Star, due to the effort made about the sustainability and awareness of local producers and food waste.

Sustainable Initiatives:

Local Sourcing: Pepe Vieira prioritizes the use of locally sourced ingredients, with a strong emphasis on Galician products. This not only supports local farmers and producers but also reduces food miles, lowering the restaurant's carbon footprint.

Seasonal Menus: The restaurant designs its menus around seasonal availability, ensuring that ingredients are at their freshest and most flavourful. This commitment to seasonality reduces the need for energy-intensive preservation methods.

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Zero-Waste Practices: Pepe Vieira is committed to minimizing food waste. The kitchen staff carefully plans portion sizes, creatively repurposes food scraps, and composts organic waste to close the loop on resource utilization.

Energy Efficiency: The restaurant employs energy-efficient technologies in its kitchen, including induction cookers and LED lighting. These initiatives reduce energy consumption and lower utility bills.

Water Conservation: Pepe Vieira emphasizes water conservation in its operations. Water-saving appliances and responsible water management practices contribute to reduced water usage.

Local Wine and Beverages: The restaurant displays a curated selection of local wines and beverages, supporting regional wineries and breweries and promoting the Galician viticultural tradition.

Impact:

Environmental Stewardship: Pepe Vieira's commitment to sustainability highlights the potential for high-end gastronomy to be environmentally responsible. It sets an example for other restaurants to adopt eco-friendly practices.

Community Support: By prioritizing local sourcing, the restaurant strengthens the local economy and supports Galician farmers and artisans.

Culinary Innovation: Pepe Vieira's innovative approach to sustainable cuisine demonstrates that sustainability and culinary excellence can coexist. It inspires chefs and food enthusiasts worldwide.

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Conclusion:

Pepe Vieira stands as a shining example of a green Michelin star restaurant that successfully combines culinary excellence with sustainability. Its commitment to local sourcing, seasonality, zero-waste practices, and energy efficiency sets a high standard for the restaurant industry. Chef Pepe Vieira's dedication to preserving the environment, supporting local communities, and pushing the boundaries of gastronomy has made his restaurant a beacon of sustainable culinary innovation in the Galician region and beyond.

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Final Task: Design of a Sustainable Menu

Final Task Module 2: Design of a Sustainable Menu	
Pre-requisites	Knowledge of sustainable food practices, energy-efficient cooking processes, composting, packaging reduction and adoption of sustainable technologies in professional kitchens.
Time	3 hours
Tools	PC or Smartphone, internet connection, optional kitchen tools
Objectives	1. To recognize factors, habits and food choices that influence our health, our planet, and our community. 2. To create well balanced meals according to nutritional needs and sustainable production.

Instructions

Carefully read the module and the presented Case Study.

After consulting links, create a menu (starter, main course, and dessert) attending to sustainable, circular, and waste reduction practices, as well as sustainable technologies and cooking processes in the kitchen. Don´t forget to do the technique recipe sheets to calculate the costs, leftovers, and profits from the menu.

By analysing LTA principles, use products with low impact on carbon prints, smart packaging solutions and sustainable practices, attending to seasonal and local ingredients.

Create a healthy menu using ingredients like these: cereals, vegetables, dry fruits, olive oil, etc…

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Summary of the chapter

Throughout the manual, we delved into various aspects of sustainable food practices. We explored the importance of energy-efficient cooking processes, composting, packaging reduction, and the adoption of sustainable technologies in professional kitchens. We also discussed the benefits of sustainable food practices, such as reduced environmental impact, enhanced food quality, and support for local economies.

Moreover, we explored the significance of consumer awareness and advocacy in driving sustainable food practices, as well as the positive impacts on the food industry's economy and social responsibility. Additionally, we touched on the concept of circular economy and its relation to the food industry, emphasizing the importance of reducing waste and promoting resource efficiency.

Furthermore, we focussed on the environmental impact of conventional food production and the benefits of adopting sustainable cooking processes. Strategies to minimize food waste in the food industry were also presented, along with examples of reusing leftovers and creating compost in a sustainable restaurant kitchen.

In conclusion, these module sheds light on the importance of sustainable food practices and the positive impacts they can have on the environment, local communities, and the overall food industry. By adopting energy-efficient techniques, reducing waste, supporting local producers, and embracing sustainable technologies, we can pave the way for a more resilient, equitable, and environmentally conscious food system. The journey towards sustainability in the food industry requires collective efforts, consumer awareness, and innovative solutions to ensure a better future for both people and the planet.

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Extras

5.1 Glossary of Key Terms

This glossary provides definitions for key terms used throughout the learning material. It serves as a handy reference for students to better understand the terminology related to sustainable food practices, energy efficiency, local food systems, and more.

Sustainable Agriculture: A method of farming that focuses on environmental stewardship, economic profitability, and social responsibility. It aims to minimize the negative impact of agriculture on the environment while ensuring the long-term viability of farming.

Energy Efficiency: The practice of using less energy to perform a specific task or achieve a particular outcome, often by using energy-efficient appliances, techniques, or practices.

Carbon Footprint: The total amount of greenhouse gases, primarily carbon dioxide (CO2), produced directly or indirectly by an individual, organization, event, or product throughout its lifecycle. It is often measured in units of carbon dioxide equivalent (CO2e).

Local Food: Food that is grown, produced, or sourced within a specific geographical region, typically with an emphasis on supporting local farmers and reducing food miles (the distance food travels from farm to plate).

Circular Economy: An economic system that aims to minimize waste and make the most of resources by designing products and materials for durability, reuse, remanufacturing, and recycling.

Food Waste: The edible food that is discarded at various stages of the food supply chain, from production and processing to distribution and consumption.

Composting: The natural process of breaking down organic matter, such as food scraps and yard waste, into nutrient-rich soil conditioner known as compost, which can be used to enrich soil for gardening and farming.

Sustainable Farming Practices: Methods of farming that prioritize environmental conservation and long-term ecological balance. Examples include crop rotation, cover cropping, and reduced pesticide use.

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Renewable Energy: Energy derived from sources that are naturally replenished, such as sunlight, wind, and hydropower, and do not deplete finite resources like fossil fuels.

Food Security: The condition in which all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life.

Monoculture: The practice of cultivating a single crop species over a large area of land, often with the aim of maximizing production but at the risk of depleting soil and increasing vulnerability to pests and diseases.

Sustainable Kitchen Appliances: Energy-efficient and eco-friendly kitchen appliances designed to reduce energy consumption, water use, and environmental impact.

Regenerative Agriculture: A type of farming that aims to improve soil health, sequester carbon, and enhance biodiversity through practices like minimal soil disturbance, cover cropping, and rotational grazing.

Food Miles: The distance food travels from the place of production to the consumer's plate. Reducing food miles is a key aspect of promoting local and sustainable food systems.

Circular Food System: An approach to food production, distribution, and consumption that minimizes waste, optimizes resource use, and emphasizes the importance of recycling and reusing food and food-related materials.

Food Resilience: The capacity of a food system to withstand and recover from shocks and stresses, such as climate change, economic fluctuations, and supply chain disruptions.

Sustainable Packaging: Packaging materials and designs that minimize environmental impact, reduce waste, and promote recyclability or compostability.

Fair Trade: A trading system that ensures fair wages and working conditions for producers in developing countries, often involving agricultural products like coffee and chocolate.

Biodiversity: The variety and variability of life on Earth, including the different species of plants, animals, and microorganisms, their genes, and the ecosystems they form.

Organic Farming: A farming method that avoids the use of synthetic pesticides, herbicides, and genetically modified organisms (GMOs) and emphasizes soil health, biodiversity, and sustainable practices.

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5.2 Bibliography

Content:

ENERGY STAR - Energy-Efficient Appliances: https://www.energystar.gov/products/appliances

Food and Agriculture Organization of the United Nations (FAO) - Energy-Smart Food for People and Climate: http://www.fao.org/energy-smart-food/

Sustainable Agriculture Research & Education (SARE) - Energy Efficiency on the Farm and in the Home: https://www.sare.org/resources/energy-efficiency-on-the-farm-and-in-the-home/

International Energy Agency (IEA) - Energy Efficiency Indicators: https://www.iea.org/topics/energy-efficiency/energy-efficiency-indicators

European Commission - Environment: https://commission.europa.eu/about-european-commission/departments-and-executive-agencies/environment_en

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Food and Agriculture Organization of the United Nations (FAO): https://www.fao.org/home/en

European Food Safety Authority (EFSA): https://www.efsa.europa.eu/en

European Environment Information and Observation Network (Eionet): https://www.eionet.europa.eu/

European Sustainable Development Network (ESDN): https://www.esdn.eu/

Sustainable Europe Research Institute (SERI): https://www.seri.at/

United States Environmental Protection Agency (EPA) - Energy Efficiency: https://www.epa.gov/energy/energy-efficiency

U.S. Department of Energy - Energy-Saving Tips for the Kitchen: https://www.energy.gov/energysaver/save-electricity-and-fuel/appliances-and-electronics/energy-saving-tips-kitchen

Local Harvest**:** https://www.localharvest.org/newsletter/

LCA Learning: https://www.lifecycleinitiative.org/

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5.3 Further readings

- ***Pollan, M. (2011). The omnivore's dilemma. Bloomsbury Publishing PLC.***- Explores the modern food industry and the impact of our food choices.
- ***Participant Media & River Road Entertainment present; a film by Robert Kenner; producers, Robert Kenner, Elise Pearlstein; writers, Robert Kenner, Elise Pearlstein, Kim Roberts; directed by Robert Kenner. (2009). Food, Inc. [Los Angeles, CA]: Magnolia Home Entertainment.*** - A visual exploration of the food production industry and its environmental and social consequences.
- ***Pollan, M. (2009). In defence of food. Penguin.*** - Offers practical advice on making healthier and more sustainable food choices.
- ***Dan Barber (2016). The Third Plate: Field Notes on the Future of Food. Paperback. Penguin Press.*** Chef Dan Barber explores the evolution of American food from the 'first plate,' or industrially produced, meat-heavy dishes, to the 'second plate' of grass-fed meat and organic greens and says that both of these approaches are ultimately neither sustainable nor healthy.

Websites:

- The Sustainable Food Trust: Offers articles, reports, and resources on sustainable food systems.
- Energy Star: Provides information on energy-efficient appliances and practices.
- Local Harvest: Connects consumers with local farmers and food producers.

Organizations:

- Slow Food: Advocates for sustainable and local food traditions.
- The Ellen MacArthur Foundation: Promotes the circular economy and its applications in various industries, including food.
- Food Tank: A think tank focused on sustainable agriculture and food systems.

Videos:

- TED Talks on Food: Features a collection of TED Talks on various food-related topics, including sustainability.
- Food, Inc. (Documentary): A powerful documentary that explores the modern food industry and its impact.

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5.4 Acknowledgment

I would like to express my sincere gratitude to the individuals and institutions whose support and contributions have been invaluable in the creation of this module. First, I want to send a special thank you to my teamwork colleges from EPATV, Clara Sousa and Rui Silva, who participated with me in this project. I extend my appreciation to Jeremiah Lahesa for his total availability and guidance throughout the process of creating the manual. Heartfelt thanks to the whole team and partners of the SSPICE-IT! Project, thanks to your feedback and comments, I could make the reformulations and adaptations needed to finish this manual.

I also appreciate the enthusiasm and dedication of all the students who actively engaged in the learning process. Your passion has been inspiring.

This module would not have been possible without the collaborative efforts of each person mentioned above. Your commitment to excellence has undoubtedly enhanced the educational experience for everyone involved.

Thank you for your support and contributions.

Sincerely,

Rodolfo Meléndrez Rodriguez

Chef / Cooking Techniques Course Coordinator

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