LIFE FOSTER

Method for food waste quantification of possible benefits that the project LIFE FOSTER will use

DELIVERABLE 2

A1-0 Literature and scientific research

DELIVERABLE 1

C1- Set of indicators for project monitoring

C2- Socio-economic monitoring

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The opinions expressed in this Report are those of the authors and do not necessarily reflect the opinions of the European Commission, or any other organization mentioned. As a result, these will be verified before implementation of any of the recommendations contained herein.

CONTENTS

1. THE KEY AND UNDENAYABLE ISSUE OF FOOD WASTE QUANTIFICATION

Within the LIFE FOSTER strategy (see Deliverable 1. Action A1.0 & A.1.1) and following the principle according to which "*Only what can be measured, can be managed*", the food waste quantification (included in C1 and C2 actions) is one of the priority actions to prevent and reduce the food waste in the restaurant sector. Restaurants lack sufficient insight into how much, why, and where food and/or associated inedible parts are removed from the food supply chain. There is currently no harmonized method for measuring food waste in the EU restaurant sector. This makes it difficult for catering/food service operators and for public authorities to assess food waste extent, its economic and environmental costs, origin and evolution over time. It also undermines the possibility to develop strategies and prioritize actions to prevent food waste, and to identify the most productive use of it that does arise. Tackling the food waste measurement issue is an important step towards a better understanding of this challenge, its monitoring and communication consistent with the principles of the food waste hierarchy and the EU related policy to ensure the application of circular economy principles to food waste management according to the EU Action Plan for the Circular Economy and the revised legislative framework on waste entered into force on July 2018, that requires to set-up an EU-wide food waste reduction target by 2023, to be met in 2030.

Having said that, it is necessary to make explicit and direct reference to the Goal 12 of the Agenda 2030 "Ensure sustainable consumption and production pattern", target 3.1 "Halve for capital global food waste at retail and consumer level and reduced food losses along with production and supply chains, including post-harvest losses", but the benefits deriving from the reduction of food waste due to the achievement of Goals S 1, 2, 9, 10, 11, 13, 14 and 15 should not be overlooked. Reducing food waste is an important and complex challenge, but it is also a unique and unmissable opportunity to obtain multiple benefits (environmental, economic and social) by reaching a single goal.
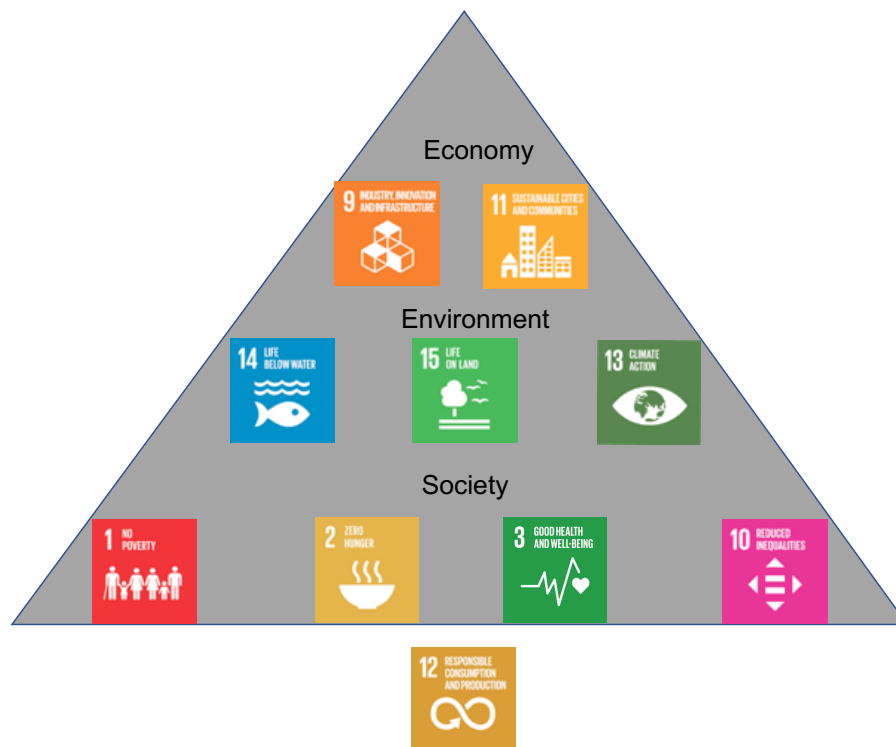
Figure 1: Representation of the cascade effect from SDG12 on the other SDGs as a consequence of food waste reduction in the restaurant sector

2. A PROPOSAL FOR THE FOOD WASTE QUANTIFICATION IN THE RESTAURANT SECTOR BASED ON AN INPUT-OUTPUT MODEL

One of the main obstacles for the quantification of waste is linked to the fact that each phase of the food chain differs significantly in terms of characteristics, sources and causes underlying their production of food waste. The production of food waste, in terms of quantity and composition, is therefore closely related to the production phase in which it occurs and to the business and organizational model of the involved food system's actors. This is why the choice of the method for quantification, cannot be carried out without an assessment of the specific characteristics of the system which is to be analyzed. In the case of the LIFE FOSTER project, it concerns, in the first instance, the organizational model of the vocational training centers and secondly the restaurants. This need is

also highlighted in the document, recently drafted (published on 30 May 2019) by the sub-group "Food waste measurement", within the EU Platform on Food losses and waste.

For all the reasons, the selection of the method of quantification could not be carried out during the preliminary activities of the project, but it needed a careful assessment of the different available methods along with the modeling of the organizational structure of the vocational training centers involved in the project. A comparative analysis between the different methods of quantification of food waste was carried out starting from the main recently published reports on food waste quantification (Box 1).

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BOX 1. TARGET REPORTS ABOUT FOOD WASTE QUANTIFICATION (from FOSTER A.1 action)

- *Food waste quantification manual to monitor food waste amounts and progression (FUSION REPORT, 2016)*
- *GUIDANCE ON FLW QUANTIFICATION METHODS, (The Food Loss & Waste Protocol, 2016)*
- *Guide méthodologique à destination des chefs cuisiniers, des intendants, des acheteurs, de toute personne ayant un projet (CREPAN, 2014)*
- *PERTES ET GASPILLAGES ALIMENTAIRES : L'ETAT DES LIEUX ET LEUR GESTION PAR ETAPES DE LA CHAINE ALIMENTAIRE (Étude réalisée pour le compte de l'ADEME par : INCOME consulting – AK2C Coordination, 2016)*
- *Food Loss and Waste Accounting and Reporting Standard. Exective Summary (The Food Loss & Waste Protocol, 2016)*

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It was based on the assessment of the feasibility of the implementation of the different method of food waste quantification considering the structure and management organization of VET centers (Table 1). The evaluation has been realized through direct interviews to the VET centers' operators of the kitchen section and a test drive during the preparation and food supply during a catering event. The reworking of the collected elements has favored the development and elaboration of an ad hoc methodology to be applied internally to the project, set according to an input-output logic. The methodology proposed for the LIFE FOSTER project represents a new quantification tool attributable to the family of the mass balance approach. However, unlike this, the methodology developed by UNISG does not an inferential estimate for the calculation of food waste but a direct weighing method. Through the monitoring of the food flows starting from the upstream phase of receiving the goods in the training center, it will be possible to obtain data to carry out a waste composition analysis, which will be further integrated with the observations coming from the diary-based method.

The quantitative survey will be accompanied by a descriptive one to capture all the aspects relating to the processes and practices within the training centers. The weighing, as well as the compilation of lists and registers represent practices towards which the operators of the professional training centers already have a certain familiarity within the daily routine (filling weekly purchase orders for goods, weighing for the execution of preparations). The proposed tool therefore arises from a combination and enhancement operation of the strengths recognized in the different methods analyzed and considered particularly suitable for the restaurant sector (in line with Annex 1 of the Delegated Decision establishing a common EU methodology to measure food waste as a supplement to the European Parliament and Council Directive 2008/98 / EC adopted by the European Commission on 3rd May 2019) and to the results that LIFE FOSTER aims to pursue. From what we have observed during the test, this input-output model is easy to learn and to apply in the practice of managing a VET center and a catering service, with a hours/ man[1] charges and a level of accuracy proportionate and reasonable to potentially achievable results.

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[1] Considered the amount of hours/man expected in the LIFE Foster project and in a future context of application within the restaurant sector.

Table 1: Degree of feasibility for the implementation of the different method of food waste quantification considering the structure and management organization of VET centers realized through a multi-criteria analysis

	DIRECT WEIGHTING	COUNTING	WASTE COMPOSITION ANALYSIS	DIARIES/REGISTRY	QUESTIONNAIRES INTERVIEWS	MASS BALANCE	SMART BINS
Accuracy (gather reliable data)	light green	orange	light green	yellow	yellow	light green	dark green
Time for data entry	yellow	light green	light green	light green	light green	light green	yellow
Capacity to be sensitive in the different phases of analysis (To gather data at the critical phases in food waste generation	dark green	yellow	yellow	orange	orange	dark green	yellow
Simplicity to use	dark green	dark green	dark green	dark green	dark green	yellow	green
Cost affordability	light green	light green	light green	light green	light green	light green	orange
Time for training	yellow	light green	light green	dark green	dark green	yellow	light green
Team working	dark green	orange	yellow	orange	orange	yellow	orange
Focus on the process and the whole system	light green	yellow	yellow	yellow	yellow	dark green	orange

Degree of feasibility for a VET centre

LOW   HIGH

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The method is flexible with respect to the various forms of organization so far detected in the involved training centers[2]. It has also been designed to be compatible with the different organizational models of restoration that they will participate to the project[3] and thus be used by the largest number of subjects possible against a single data entry system capable of guaranteeing the comparison of the collected data. Its application is not onerous from the point of view of the cost, as it requires the provision of one or more balances and a chronometer/timer, tools already available in the vocational training centers.

Furthermore, compared to other methods, in its implementation and way of processing and restoring the data on the amount of food waste, the input-output model gives back the overall sense of the system's operation and the concatenation effect of wrong actions / lack of adequate planning during the different work phases inside a restaurant business. This feature is consistent with the LIFE FOSTER strategy (also as a result of the analysis of the results of preliminary actions A.1.0 and A.1.1) and is of fundamental importance and indispensable for a correct management of the food flow within the entire process from purchasing to the final consumption and disposal. The proposed tool is therefore configured as a system monitoring aimed at elaborating and adopting resolutive actions in the different points where spillage and leakage effects are created in a restaurant.

Within the Life FOSTER project and considering in particular the target of vocational training centers, the design and implementation of a monitoring system can perform a double function.

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[2] During the training course, as well as during the interviews and tests that were carried out for the elaboration of the monitoring system, it has emerged clearly the need to develop a tool capable of adapting to the diversity that characterizes the vocational training centers involved in the project.

[3] During the monitoring campaigns, elements and tips will be collected to highlight the application difficulties and the correct definition of the input and output data according to the information available and requested. Therefore, the method for the entire duration of the project will be constantly subjected to a revision based on the results obtained from the experimentation.

On the one hand, the tool will primarily have the function of supporting the diagnosis of the state of art of the amount of food waste in each Vet center and the understanding of where it is necessary to intervene by increasing knowledge and awareness of how and where food waste is generated. It will allow to estimate the economic and environmental value of waste. Through the use of the tool during three campaigns over the entire duration of the project it will be possible to quantify in terms of percentage the amount of waste avoided by each training center through the development of a Saved Food Quantity Indicator. From the quantification of the avoided waste it will be possible to reconstruct the economic and environmental benefit obtained as a consequence of the communication, training and education actions undertaken by the project comparing the ex-ante, in itinere and ex post situation.

On the other hand, the introduction of quantification, as an activity within the training activities in the VET centers and during the stage period, can favor the development of a culture and attention to the value (environmental, but also economic and social) of the resources that are used for the preparation of meals among the students, consumers of today, but that tomorrow will play the role of professionals in the restaurant sector.

The quantification is therefore configured as an action with potentially immediate or short-term repercussions to identify objectives aimed at optimizing the flow of material within a training center (or catering operation) and the mobilization of teaching and laboratory staff and a future investment for future professionals in the sector. As regards training, however, the consequences must not be overlooked in terms of the adoption of actions to prevent and reduce food waste in their own domestic contexts and awareness within their respective families.

3. THE FOOD FLOW BALANCE (FFB)

The model developed according to the input output method was called Food flow Balance (FfB). The Food flow Balance[4] is configured as an excel grid associated with a calculation tool, where all the operations of imputation of data and their processing are carried out in order to calculate the food flows inherent to the waste balance.

Through the compilation of the data relating to the type and quantity of goods purchased on a weekly basis, cost, weighing of the incoming and outgoing material, quantity of water and energy used, carried out by the monitoring and quantification team, it will be possible to make clear the stream of matter (plus energy and water) and calculate the amount of waste generated for the main food categories (meat, fish, fruit, vegetable, bread, pasta, cheese, eggs), across the temporal phase of storage, preparation and consumption. The calculation operations and data processing will be provided together with a graphical representation[5] of easy and immediate understanding of these flows, which will make visible where food waste is produced in relation to the different food product categories taken into consideration. To carry out all the operations of data input and their processing in order to calculate the flows of matter and energy related to food, the data entering sheets will be flanked by other worksheets with different functions: FfL scheme (Food flow Balance), definitions, unit of measurement and conversion; input masks and output masks.

3.1. FFB DIAGRAM, BOUNDARIES OF THE SYSTEM, SUB-UNIT OF ANALYSIS AND FUNCTIONAL UNIT OF THE FOOD FLOW BALANCE

The diagram sheet is the central core of the calculation tool, and in it the input data converge to be reworked and provide output data according to the logic identified in the following figure (Fig.2).

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[4] The design of the methodology and calculation tool associated with the Food Flow Balance stems from an adaptation on the issue of food waste, of the open source calculation engine LEB (Local Energy Balance) developed by the Department of Energy of the Polytechnic of Turin within the framework of Renenfor project ALCOTRA.

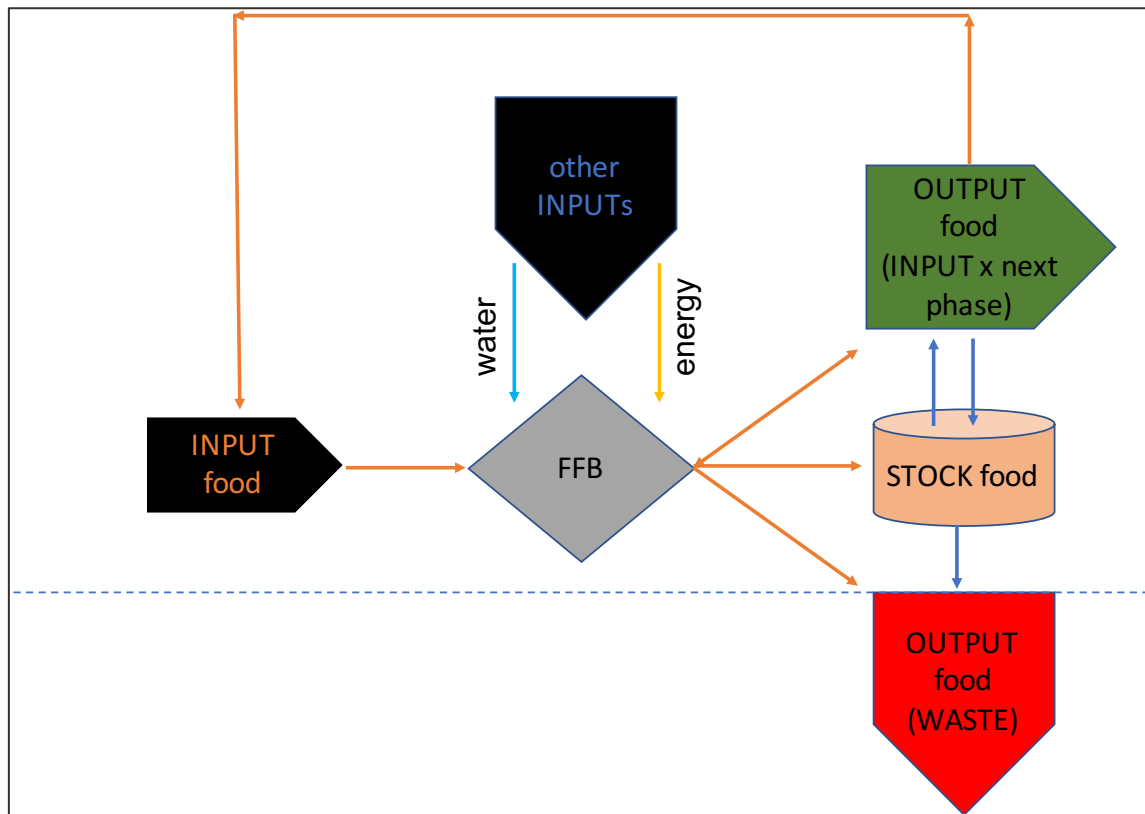[5] Through the elaboration of mosaic or flow chart

Figure 2: Representation of FfB diagram

As will be better specified later in the paragraph, we can distinguish four main phases (Purchasing, C0, Storage C1-0, Production, C1-1, Consumption C1-2), highlighted in the figure below (Fig. 3), which represent key passages of the food flow within the restaurant system and which will be used as stations for direct weighing. The FfB will quantify the flow of food and the input output ratio at times of transition/passage (joint nodes) from one phase to another (from receiving goods to storage, from storage to preparation, from preparation to consumption). For the quantification of food waste within the restaurant, starting from the professional training centers, FfB will adopt a "single starting point / multiple end points" scheme (Fig 2). As starting point of the whole food flow system, it will be select the ownership of the food (weekly purchasing list). Food waste may be generated during storage (C1-0), preparation (C1-1) as well during the serving food and consumption (C1-2) phases. FFB will consider an endpoint/ each time when the food provided by the food service business will be put in a bin across C1-0, C1-1 and C1-2 phases.
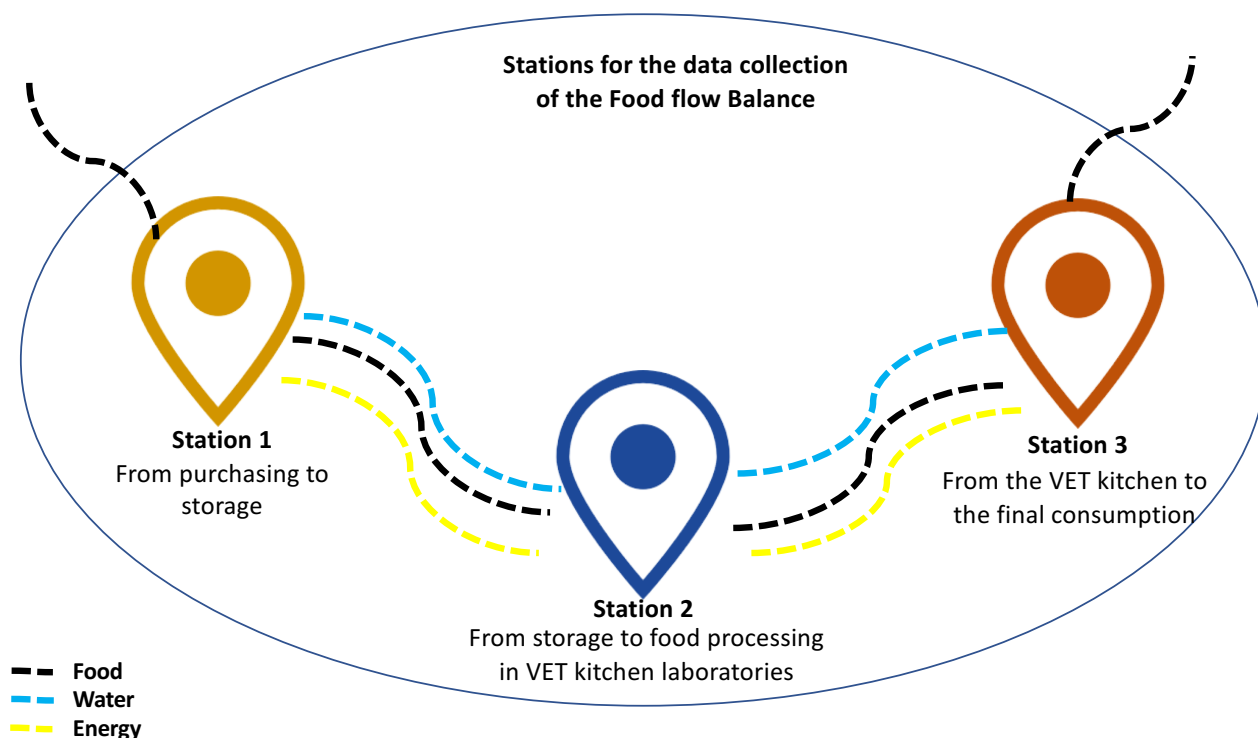
Figure 3: Representation of the moments of data collection (stations) of the FfB diagram

In each transit phase (Storage C1-0, Production, C1-1, Consumption C1-2) a quantification of the inputs used, referable to food, water and energy flows will be carried out. The food flow will be measured by a direct weighing, with the exception of the moment of food products delivery, in which the quantities expressed in the order/purchasing list will be used.

Foodstuffs will also be classified according to the product class (fruit, vegetables, meat, fish, bread, pasta and flour, eggs ...). After the storage, production and consumption operations, a second measurement will be made of the quantity of output produced and how this in turn becomes input for the subsequent process (with the exception of the consumption section where the flow will end), is kept as stock or become food waste.
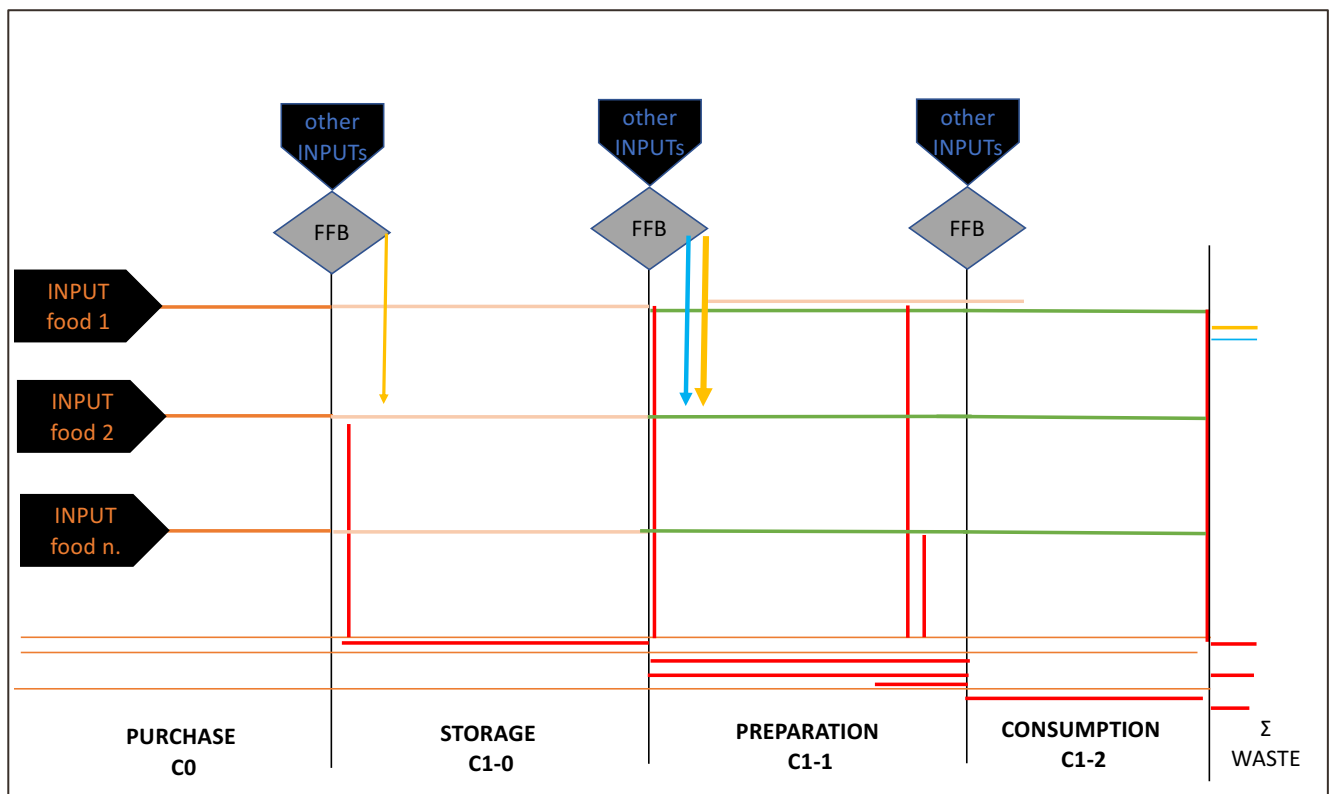
Figure 4: Schema of the boundaries, sub-unit of analysis for the measurement of the input / output ratio of the FfB method

The traceability of the individual products inside the system will be guaranteed through the assignment of certain codes, which will therefore allow aggregate processing to be carried out by product class, as well as by single foodstuff. FfB is flexible and it will allow to measure changes over time and changes in stocks of material held at various points in the process. FfB can be applied at either a product/ingredient level at station 1 (from purchasing to storage) and 2 (from storage to preparation) or a single preparation (recipe for a laboratory in VET center/plate from a menu in the restaurant.). In the storage phase data will be collected and organized for food products (functional units) according to the typology. In the preparation the function unit will be the recipe/preparation and finally in the consumption, the portion plate prepared and that can be ordered from the menu.

After the first tests, the hypothesis of collecting data over an entire week was recalibrated on the creation of a menu. This is to facilitate data collection operations and to increase the comparative rate between centers and in the future with restaurants

Each data collection/survey (will be carried out starting from the elaboration of a menu, thus composed:

- Starter/Appetizer
- First course (es. Pasta, soup, risotto)
- Main course with vegetables (es. Meat or fish with vegetables)
- Dessert

The choice was made to improve the internal comparability of the measurements within the single center, among the different centers and in the future also with the data coming from the restaurant. The menu elaborated in the VET centers for the monitoring laboratory is in fact made up of a number of courses that are equivalent to those proposed by a menu in a restaurant. Comparability will also be possible, because each survey will be traced back to the product categories used for the preparation of the dishes that make up the menu.

The quantification and monitoring system will be applied in the first instance to the vocational training centers. Precisely for this reason it is necessary to point out some specificities that concern the specific sector and which will be appropriately considered in the data analysis and evaluation phase. In particular, it must be emphasized that since these are centers whose mission is training, a physiological portion of error in the preparation / administration phase is part of the learning process. That does not mean that the behaviors and habits that contribute to the creation of food waste must be highlighted and adequately corrected. The realization of the laboratories is also very variable during the year with respect to the themes and preparations that must be learned in the different levels of training, also considering the different specificities of the training for students or adults.

3.2. DEFINITIONS OF FOOD AND FOOD WASTE, FLOW, UNIT OF MEASUREMENT AND CONVERSIONS

A clear understanding of how food waste in the food service sector is defined in needed before a quantification study is undertaken (Fusion report, p.93)

The balance structure and the related calculation tool have been elaborated on the basis of the definition of food waste, now included in the revised waste framework directive of 2018 starting from

the definition of food referred to in the regulation (CE) n. 178/2002[6]. The structure of the worksheet and the definitions used are therefore generally consistent with what is reported within the definition of food and food waste with respect to the above-indicated directives and regulations. As reported in the Delegated Decision establishing a common EU methodology to measure food waste (2019 to supplement Directive 2008/98/CE of the European Parliament and Council) adopted by the European Commission on 3rd May 2019 and now subject to the scrutiny of the European Parliament and the Council[7] the definition of food waste includes, in addition to the parts of food destined to be ingested, also the parts of food not destined to be ingested (the inedible).

This definition, also in line with the recommendations provided in 2016 by the FUSION program and with the definition of food waste[8] on the "Food waste quantification manual to monitor food waste amounts and progression" [9] (Fusion 2016), extends the perimeter of what you consider food waste in other existing definitions and deals with a key topic in the restaurant sector (as it emerged from the analysis of the literature Action A1.0 and the critical reading of the Action A.1.1 interviews as a result of the preliminary activities of the LIFE FOSTER project), both as regards the theme of food cost, the cultural definition of what is edible or not together with the recent experiments of the circular kitchen.

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[6] The Regulation (EC) n. 178/2002 of the European Parliament and of the Council of 28 January 2002, establishes the general principles and requirements of food legislation, establishes the European Food Safety Authority and establishes the procedures in the field of food safety (OJ L 31 of 1.2. 2002, page 1)

[7] If no objection is raised, the delegated act will be published and enter into force in autumn 2019.

[8] "Any food, and inedible parts of food, removed from the food supply chain to be recovered or disposed (including composted, crops ploughed in/not harvested, anaerobic digestion, bio-energy production, co-generation, incineration, disposal to sewer, landfill or discarded to sea)". Drink and liquid waste, fish discarded to sea and waste of any materials that are ready for harvest, but which are not harvested, are included in FUSIONS's definition of food waste. FUSIONS definition also considers inedible parts of food (e.g. skin, bones…) as food waste in order to support the development of resource efficient and sustainable food systems in the EU.

[9] The elaboration of the document of the Commission Decision to set-up common methodology to measure food waste is in continuity with the results of the FUSIONS research program of the EU 7th FP, which analyzed different monitoring options food waste and issued a recommendation for Member States on the measurement of food waste.

The adoption of the food waste's definition according to the revised legislative framework on waste entered into force in July 2018 will make it possible to have a comparable and homogeneous database on which to make comparisons or in-depth studies regarding the restaurant sector, to contribute to the setting up of an EU-wide food waste reduction target (to be met in 2030) for the restaurant sector. It will also foster the definition of a common methodology and indicators, as well minimum quality requirements for uniform measurement of food waste levels[10], also with respect to the work and progress of the work group about quantification of the EU Platform on Food Losses and Waste and the exchange within the community of experts of the REFRESH project consistently and in support of what is indicated for food waste within the scope of the Report[11] from The Commission To The European Parliament, The Council, The European Economic And Social Committee And The Committee Of The Regions on the implementation of the Circular Economy Action Plan del 04/03/2019.

In the worksheet (called Definitions), next to the definitions of food and food waste, they will be hosted the codes associated with each type of product for which the flow will be traced. For each product the data present in the literature about the inedible part will be inserted, for the quantification of the fixed amount of waste to be considered unavoidable.

For each flow, as defined in the "Definitions" worksheet, in a second worksheet (called Conversions), the units of measurement will be defined. Each food flow will be associated with the measurement value of its mass expressed in kg, obtained thanks to the conversion units shown in the "Conversions" sheet.

3.3. DATA ENTRY MASKS

The tool was designed to capture the effect of the LIFE FOSTER project's activities in terms of reducing food waste, quantifying the results in economic and environmental terms. For this reason, along with the data on the mass of food entering and leaving according to the functional unit considered in the

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[11] https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1551871245356&uri=CELEX:52019SC0090

various phases, data about the food cost as well the amount and cost of resources used (water, energy) will be collected through specific data entry lines.

For persons in charge of data entry in the various sections, refer to section 3.6.

The data entry masks can be divided into the following sections for each measurement station (see Table xx, Data Entry).

The fields in which the data are contained will be indicated:

• in red color where the data is to be inserted,
• in black where the data is automatically calculated by the system or taken from other input sheets.

The consumer category will not directly participate in the weighing and data entry operations. To understand the reasons related to waste and food scraps, sensitivity to the issue of waste and awareness of what may have been left on the plate, consumers will be administered a short questionnaire.

STATION	DATA ENTRY SECTION
C1-0	DATA ENTRY 0 – Storage equipment (list of appliance and electric power) ONLY FOR THE FIRST CAMPAIGN
	DATA ENTRY 1 - Quantity of food product purchased (input)
	DATA ENTRY 2 – Cost for each food product (input)
	DATA ENTRY 3 - Quantity of food product wasted during at the moment of reception (output)
	DATA ENTRY 4 – Typology of storage (cold or dry) for each product
	DATA ENTRY 5 - Quantity of food product wasted during the storage phase (output) (sum of quantification during the week)
C1-1	DATA ENTRY 0 – Kitchen equipment (list of appliance and electric power) ONLY FOR THE FIRST CAMPAIGN
	DATA ENTRY 1 – List of every single preparation and sub-preparation for day (input)
	DATA ENTRY 2 – List of ingredients used (input)
	DATA ENTRY 3 – Quantity of each ingredient (input)
	DATA ENTRY 4 – Number of planned portions (input)
	DATA entry 5 – Quantity of water for cleaning operations (input)
	DATA ENTRY 6 – Quantity of food waste for each ingredient after the cleaning operation (output)

	DATA entry 7 – Quantity of water for cooking operation (input)
	DATA entry 8 – Method and time of cooking (input)
	DATA ENTRY 9 – Quantity of food waste during the processing phase (overcooking, burnt, mistakes) for the ingredients or for the preparation (output)
	DATA ENTRY 10- Quantity of stored food during preparation operations (es. Surplus of mayonnaise stored in fridge, frozen food)
	DATA ENTRY 11 – Number of realized portions (output)
C1-2	DATA ENTRY 1 – Average weight for each plate portions (id. Pasta, meat with beans) (input)
	DATA ENTRY 2 – Number of forecasted clients (input)
	DATA ENTRY 3 – Real number of clients (output)
	DATA ENTRY 4 – Orders for each kind of plates (output)
	DATA ENTRY 5 – Sum of the mass ("weight") for the food scraps for each kind of plate (output)
	DATA ENTRY 6– Number of clients ask for a doggie bag or for animal feed (output)
	DATA ENTRY 7– Food surplus destination for each typology of plate (output)
	DATAENTRY 8 – Food waste final destination

Table 2: List of data entry according to the different station of data collection

3.4. MASKS FOR DATA-RESTITUTION

Starting from the information entered in the FfB, it will be possible to perform different extractions and output masks. Some examples of output masks are proposed, which can be customized according to the needs and results of interest.

Some examples of data restitution output for each vocational training center, relative to the period of analysis:

- DATA RESTITUTION 1 – Analysis of the flow and the amount of waste for single food product
- DATA RESTITUTION 2 – Analysis of the flow and the amount of waste for food product category (es. fruit, meat, bread)
- DATA RESTITUTION 3 – Analysis of the flow and the amount of total food waste
- DATA RESTITUTION 4 – Analysis of the flow and the amount of waste for single food product for each phase (C1-0, C1-1, C1-2)
- DATA RESTITUTION 5 Analysis of the flow and the amount of waste for food product category (es. fruit, meat, bread) for each phase (C1-0, C1-1, C1-2)

- DATA RESTITUTION 6 – Mapping of critical points, alert signaling where the percentage of waste realized is 10% higher than the fraction of inedible food in the waste per phase (C1-0, C1-1, C1-2)

- DATA RESTITUTION 7 – Quantification of the percentage of avoidable waste on the inevitable quota (inedibile)

- DATA RESTITUTION 8 – Quantification of the economic value of food waste

- DATA RESTITUTION 9 – Quantification of the economic value of waste for each food product category

- DATA RESTITUTION 10 – Quantification of the overall economic value of food waste for the monitoring period

- DATA RESTITUTION 11 – Quantification of the amount of water wasted with the production of food waste

- DATA RESTITUTION 12 – Quantification of the economic value of water wasted with the production of food waste

- DATA RESTITUTION 13 – Quantification of energy wasted with food waste production

- DATA RESTITUTION 14 – Quantification of the economic value of the energy wasted with the production of food waste

- DATA RESTITUTION 15 – Percentage of waste produced on the total food of the system (for food product, product category, food in the system)

These data, with the appropriate methodological conditions, may be presented as a summation. It will therefore be possible to have a picture of food waste generated by the vocational training centers taken into consideration.

The comparison between the data collections of the different campaigns will make it possible to make an assessment of the trend of the waste rate and how much this has been avoided by adopting improvements in the management of the flows of material, water and energy within the VET center following the training and education activities of the LIFE FOSTER project. Furthermore, by quantifying the hours and the hourly cost dedicated to this activity, it will be possible to calculate the revenue value of the quantification activity for each training center.

3.5. MONITORING CAMPAIGN AND FFB CALIBRATING

Data collection is foreseen in three moments of the project:

1. ex ante collection: from October 2019 to February 2020, 3 surveys for each involved center. In this phase, data will be collected without the adoption of measures to avoid food waste except for those already adopted in the center or by the reference teacher;

2. in itinere collection: from March 2020 to December 2020. 6 surveys for each involved center (3 from March-July 2020; 3 from August-December 2020). In this phase we will quantify how the adoption of preventive and reduction measures starting from training translates into a reduction of the food waste quantity;

3. final collection: January-May 2021, 3 surveys for each involved center. In this phase we will quantify how the adoption of preventive and reduction measures starting from training has translated into a reduction of the wasted quantity.

	Ex ante	In itinere	Final
Menu repetition for each vet center according to the different phase of data collection	3	6	3

Table 3: Data collection repetition for each VET center.

During the first monitoring campaign that will be carried out in the period autumn 2019 - winter 2020, in conjunction with the start of the training campaign for students and the adoption of actions to prevent and reduce waste by VET centers, it will be possible to trace a baseline, starting from which progress and training results will be monitored. The first campaign will also be useful for assessing and calibrating the actual potential for reducing waste for each VET center. According to the project KPI, the aim is to reach a reduction of 450 kg/year for 13 centers involved in the first phase of the project (on average 34,6 kg/year for each center). In percentage terms it means to reach a value between 5.1% to 14% for each center involved in the project and at least an average value of 9.1%. As described in the Technical Application Form in relation to Action B2, these values are indicative and have been derived from an in-depth research into scientific literature and on major projects on the issue of food waste at European level. Each project has indicated a value in percentage terms, while the punctual value has not been defined as it will depend on the centers involved and baseline construction. As

emerged during the training and from the first interviews with the operators of the training centers, which will be involved in the quantification and monitoring actions, the reference structures are very different for the number of laboratories/activities and number of students/adults involved in the training courses. Some centers, in addition to professional training activities, organize catering (also here with a frequency that varies on a case by case basis) and sporadic or permanent in-house catering activities (canteen service for students or canteen for the poor) and / or towards external (catering for external users). During the subsequent data collection campaigns to be carried out in 2019, 2020 and 2021, of which a calendar proposal is presented in Table 3, it will be possible to collect data regarding the presence or absence of progress in terms of percentage reduction of waste food in every training center. Again, during the subsequent campaigns, feedback will be collected from the various training centers involved with respect to the application difficulties and the correct definition of the input and output data according to the available and requested information. Considering the qualitative nature of a social impact measurement, compared to the quantitative one on the economic and environmental dimensions, a questionnaire is going to be prepared for the managers of the kitchen laboratories where the Food Flow Balance is used. This questionnaire aims to understand the social implication of food waste management for the local communities. The questionnaire will be administered in conjunction with the collection of FfB usage feedbacks. The questionnaire on the social dimension will be further administered during the in itinere and final data collection.

Table 3: Calendar for the monitoring campaigns (in progress)

DATA COLLECTION			EX ANTE DATA COLLECTION (3 SURVEYS FOR VET CENTER)					IN ITINERE DATA COLLECTION (6 SURVEYS FOR VET CENTER)										FINAL DATA COLLECTION (3 SURVEYS FOR VET CENTER)				
Country	Name of the VET centre	Reference person for the monitoring data collection	Oct 19	Nov 19	Dec 19	Jan 20	Feb 20	Mar 20	Avr 20	May 20	Jun 20	Jul 20	Aug 20	Sep 20	Oct 20	Nov 20	Dec 20	Jan 21	Feb 21	Mar 21	Avr 21	May 21
Italy	VENETO: Bassano del Grappa	Andrea Berti			6/12 11/12	20/01																
	VENETO: Conegliano	Marco D'Ambrosi				27/01 30/01	03/02 06/02															
	VENETO: Feltre	Rodolfo Bof				10/01 20/01 29/01																
	VENETO: Isola della Scala	Elisa Tirelli			10/12 17/12	14/01																
	VENETO: Longarone	Luigi Peverelli			14/12	09/01 11/01																

	Location	Name						
	VENETO: Noale	Alessandro Fusco				29/01	05/02	02/03 09/03
	VENETO: Padova	Davide Saretto		20/11		Ultima settimana gen. 3 lab		
	VENETO: Porto Viro	Stefano Fregnan				07/01 08/01 10/01 14/01: 2 lab 15/01 17-21-24/01 16-23-27/01	13-20-27/02 Sono gruppi di 3 laboratori	
	LOMBARDIA: Busto Arsizio	Giovanni Cucchetti		11/11			10/02 17/02	
	LOMBARDIA: Vimercate	Paolo Ravasi					10/02 17/02 24/02	
	PIEMONTE: Acqui Terme (to be confirmed)	....						

Country	Location	Name																					
France	Rennes (Chef in collective restaurant)	Yannick Gourié					4,5,6		2,3,4					6,7,8								
	Stains (Catering agent, commis chef in collective restaurant9	Emmanuel Chervet Frédérick Chazard					4,5,6		2,3,4					6,7,8								
	Champs (Cook)	Emmanuel Lemoine					4,5,6		2,3,4					6,7,8								
	Brive Cook	Christophe Vallé Fabien Crochard					4,5,6		2,3,4					6,7,8								
	Auray (Cook)	Franck Chick					4,5,6		2,3,4					6,7,8								
	Colmar (Cook)	Vincent Guisoffle					4,5,6		2,3,4					6,7,8								
Malta	Hal Luqa	Ronald Briffa	15/11	10/12		5/2	11/12/13		13/14/15			7/8/9											
Spain	……….																						
	……….																						

3.6. MONITORING TEA

One of the peculiarities of the FfB and in our opinion and one of its added values compared to other food waste quantification tools is its ability to return a picture of the entire process within the restaurant system. This will be possible through the involvement in the various phases of data collection of the professional figures responsible for the specific phase (station). Each monitoring team must therefore include and collect the information coming from the person in charge of the purchases, the warehouse, the kitchen and bar laboratories, the canteen / restaurant and catering preparations, the administration service, the phase of disposal after the consumption. As highlighted in the first section of the Deliverable "Report on best important projects related to food waste", the creation of food waste is given by the sum of procedural errors during the entire system. For this reason, it is necessary to raise awareness of each operator (node of the restaurant system) and make it aware of its role in relation to that of its colleagues. A system error, as presented in the section 1.3.2 (pag. 31) about the LIFE FOSTER project strategy, can be faced with a system action and a team work.

The centrality of the team work and the awareness of the whole team for the prevention and reduction of food waste has been one of the themes of the training of the trainers of Conegliano where the trainers, through some practical activities, have experienced the importance of coordination and collaboration among the parts, of pooling knowledge and skills, of finding peers to emulate, of tackling

3.7. SUPPORTING TOOL AND THE DEVELOPMENT OF A WEB APPLICATION OF THE FFB

During the first tests and data collection activities it became evident that the quantification of food waste represents a strong contribution in relation to the theme of education and awareness. It has become evident that the monitoring and quantification of the environmental and economic value of waste is fully part of the LIFE FOSTER project strategy.

However, the first tests also said us that it is quite complex to fill the data entry with a compute during kitchen lessons both for time constrictions and the class management. In order to facilitate the data collection in the kitchen lab, UNISG has elaborated with the collaboration of the trainers of ENAIP Veneto that have started to test the FfB, a sheet to fill manually and then to be transferred on the excel. Once the first phase of data collection will be completed, UNISG is going start to elaborate a first demo version of a web application to facilitate the operation of data entry through the possibility of direct interaction with the excel grid by means of an intuitive user experience and the display of the results by tabular and graphic aggregation.