

The EFFICIENT Protocol – An intervention-oriented FLW quantification methodology

1. Introduction

In order to stimulate Action with respect to Food Loss & Waste (FLW), Wageningen Food & Biobased Research presents the EFFICIENT (EFFectIve food Chain IntervENTions) protocol. This protocol builds on and adds to existing methodologies and connects FLW knowledge on causes to FLW reducing interventions in order to stimulate acting on reducing FLW. In this brief document we outline the main tenets of the protocol and what it adds to existing FLW quantification methodologies.

2. Design Principles

In working with numerous corporate and governmental clients in the domain of Food Loss and Waste monitoring and reduction, we identified the need for a more pragmatic quantification methodology that prioritizes the selection and implementation of targeted interventions. This is the motivation behind the EFFICIENT protocol – providing an intervention-oriented methodology that allows users (governments and private sector actors alike) to identify FLW hotspots and take actions towards implementing effective interventions. As such, the EFFICIENT protocol is designed first and foremost to support a Measure → Target → Act strategy to FLW monitoring and reduction (Lipinski et al. 2017) – in which information collection (Measure) supports the identification of FLW hotspots (Target) and informs action to reduce FLW (Act) – with an emphasis on action.

From a survey of the main existing FLW quantification methodologies we derive 5 dimensions along which one can position the design principles underpinning FLW quantification methodologies:

1. **Strategy:**
 - a. The extent to which the quantification methodology covers the complete Measure → Target → Act strategy or parts thereof (Lipinski et al. 2017). This includes measuring or collecting data (Measure), finding food loss hotspots and causes (Target), and selecting (in some user-defined context) appropriate intervention(s) (Act).
2. **Genericity:**
 - a. The applicability of the methodology for specific chain levels of analysis;
 - b. the ability to make the results comparable regarding definition and data collection method.
3. **Laboriousness:** Consisting of
 - a. the ease of reading, implementation, and interpretation of the quantification methodology the first time you want to use it;
 - b. availability of building blocks to build and adapt (a part of) your own measurement methodology, survey or questionnaire;
 - c. the execution time of the developed tools, including performing the measurements, interviews or workshops;
 - d. guidance on data analysis.
4. **Practical guidelines:**
 - a. The availability of supporting documentation, guides, interactive tools and/or templates to give users an easy start. This criterion relates to format, rather than content as criterion *Laboriousness* above.
5. **Reliability and validity:**
 - a. The extent to which the quantification methodology produces robust and reliable results. This includes the type of data collection methodology.

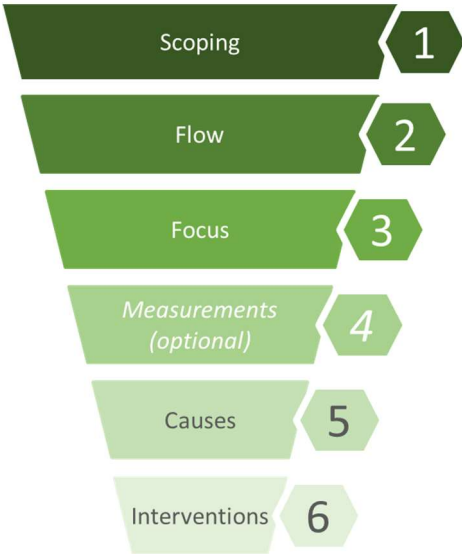
In designing a FLW quantification protocol, several tradeoffs between these criteria should be considered – e.g., balancing laboriousness of data collection and depth of insight, or balancing the scope of the strategy with perhaps more specific needs of the target audience. For the EFFICIENT protocol these design principles were specified with the needs of our target audience in mind – an expeditious workflow

towards actionable recommendations, considering the user’s specific question, scope, processes, resources, and available information.

Dimension	EFFICIENT protocol design principles
Strategy	Capture and support the full Measure → Target → Act strategy, with an emphasis on action; all elements of the protocol are designed to facilitate intervention.
Genericity	The protocol can be used by a variety of users, using information from their own processes, and with the flexibility to determine definitions, scope, and the need for primary measurements based on their goals. The protocol is product-specific, in order to address the specific causes and recommend the appropriate recommendations given product and chain characteristics.
Laboriousness	Rapid and flexible workflow is possible for the user to quickly select the appropriate interventions; the steps of the protocol can be worked through with limited cost and effort, while still allowing for the best-informed recommendations possible, given the information and resources available.
Practical guidelines	The authors provide a well-documented, structured set of templates, that the user can use flexibly (skipping or revisiting steps when their process requires this).
Reliability and validity	The protocol prioritizes the quick generation of actionable and tailored insights for specific users given the information and resources available.

6. The EFFICIENT protocol workflow

The protocol workflow is sequential, and all steps converge towards recommendations for targeted interventions. However, users can start from any phase in the workflow and work towards the intervention recommendations or iterate back to earlier steps to refine the results of the cause analysis and intervention recommendations, depending on the user’s needs, prior knowledge and available data.



In Phases 2 (Food Flow) and 4 (Measurements, optional), information is collected and interpreted on volumes and losses (Measure). In Phases 1 (Scoping) and 3 (Focus), loss hotspots are identified, and the scope of the study is determined, and in Phase 5 users gain insight in causes of FLW (Target). Last, in Phase 6 (Interventions) the protocol guides users through a structured process towards intervention selection and implementation considerations (Act). The EFFICIENT protocol emphasizes the ‘Act’ part of the strategy; the other protocol phases focusing on ‘Measure’ and ‘Target’ are designed for time and resource efficiency in order to support quick action.

Furthermore, the EFFICIENT Protocol supports the user in as much detail as possible with all steps to take, guiding the user in which questions to ask and how to process it in each phase. This workflow is designed for the user to complete it in a limited timeframe, recommending to anticipate two working days to go through all phases, or less when you skip phases and start at phase 2, 3, 5 or 6. The total

execution time is estimated at 2 working weeks, since multiple (expert)meetings and interviews should be planned. The EFFICIENT protocol does not recommend taking FLW measurements for all parts of the supply chain but limits the work time and resources requirement by identifying FLW hotspots before employing measurements, which is a significant contribution to the reduction in cost and execution time of the protocol.

The EFFICIENT protocol is designed to be product-specific: For example, the EFFICIENT protocol cannot analyze FLW in the Netherlands as a country but can analyze the tomato value chain in the Netherlands. This product specific quantification methodology has the advantage that product- and chain-specific interventions can be selected. An intervention that decreases FLW for one product may not be appropriate for another product. For example, drying can be suitable for rice, but is not appropriate for fresh tomatoes. The other way around, cooling preserves apples, but is not needed for wheat. In this trade-off between genericity and specificity, the EFFICIENT protocol favors specificity in order to support selection of the most appropriate intervention for a given situation. Nevertheless, it should be noted that certain interventions might support FLW reduction across chains and products, such as improving infrastructure (e.g., roads, port facilities). Studies conducted with use of the EFFICIENT protocol can be made comparable, but comparability is not prioritized in the protocol design.

The EFFICIENT protocol further provides templates and tailored interactive tools to assist the user in implementing the methodology. A good example is the 'Cause Tree Tool' (link and guidance available in the protocol). This tool guides the user in finding the root causes of FLW. When including causes, for example those mentioned by actors in the supply chain, the tool automatically visualizes a complete cause tree with the root causes.

7. Unique selling points

The EFFICIENT protocol provides users with the following unique selling points:

1. Users do not only have a need for FLW quantification but are especially looking to take action to reduce FLW – the EFFICIENT protocol supports this full process in an efficient way. The protocol has a strong emphasis on the 'Act' part. The interventions are product-specific, and selected and implemented based on the quantification of FLW, hotspots and causes of FLW, and are therefore well-founded and appropriate for the user;
2. The EFFICIENT protocol is designed to be implemented with limited time and resources. Users do not measure FLW in all parts of the supply chain, but the protocol helps them efficiently identify FLW hotspots as potential leverage points for interventions. Data collection is less time consuming than alternative protocols available, because it is based on estimates. Due to the combination of selecting the right estimates with expert group discussions, the estimates will be reliable enough to identify the hotspots and to make a well-founded decision on FLW-reducing interventions;
3. The user does not have to be an expert in FLW data collection and data analysis because the EFFICIENT protocol provides a step-by-step approach and guides the user through every phase of the protocol with the use of templates, building blocks, questions and examples, while also giving users the flexibility to adapt the workflow to their needs and circumstances. Users can execute the different phases as stand-alone exercises;
4. The built-in 'Cause Tree Tool' is a unique interactive tool that allows users to easily gather insights on root causes of FLW to ensure that interventions provide structural improvements.

8. Adding the EFFICIENT protocol to the present toolkit of FLW quantification

The EFFICIENT protocol does not (intend to) replace any of the existing methodologies but is an addition to already existing work. What is considered a suitable methodology therefore depends on the aim of the user. Generally, FLW quantification methodologies serve two goals to differing degrees: 1) improve data collection, and 2) taking action against FLW. The EFFICIENT protocol predominantly aims to support action against FLW. The EFFICIENT protocol provides a methodology to gather reliable data with limited time and resources (for example via expert interviews and secondary data analysis). However, when the data is not trusted and physical measurements are needed, the protocol refers to other FLW

quantification methodologies with a stronger measurement focus. Likewise, if the user's aim is to quantify FLW thoroughly in the supply chain or on the national level via measurements, other quantification methodologies are more suitable, and are referenced in the EFFICIENT protocol documentation.

The EFFICIENT protocol is a step-by-step approach to guide the user through minimum effort necessary to get to action and therefore suits users best that are requiring a pragmatic, flexible, intervention-oriented approach to quantifying and mitigating FLW. The EFFICIENT protocol's focus is not to gather the best data as possible, but to efficiently collect, structure, and interpret relevant, reliable, and actionable information that supports action in the form of implementation of FLW reducing interventions.