

► Project *brief*

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Sustainability assessment of food waste reduction measures

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- **To identify promising food waste reduction measures, a thorough sustainability evaluation is needed to assess the effectiveness and efficiency of measures.**
- **Our evaluation framework follows the classical cost-benefit-analysis approach whereby costs and benefits are assessed across the three sustainability dimensions (economic, environmental and social).**
- **It is crucial to know beforehand – before implementing the measure - which data will be needed to evaluate that measure so that information can be collected at the moment the resource inputs and outputs occur.**

Background and aims

The German government aims to halve food waste at retail and consumer level by 2030 and reduce food losses along production and supply chains, including post-harvest losses. The last few years, several measures have been put forward to reduce food waste. For businesses and private households, applying food waste reduction measures only makes sense if the benefits from reducing food waste outweigh the costs. Besides economic benefits, there may be environmental and social benefits associated with tackling food waste.

For a measure to be promising, it has to be effective in reducing food waste. Additionally, it has to be efficient in the sense that it reduces food waste at a low cost whilst ensuring high environmental and social benefits. Information on the effectiveness or efficiency of food waste reduction measures is however not always readily available. A clear understanding of these aspects is needed to increase transparency, to identify the most promising measures and to create incentives for reducing food waste (Goossens et al., 2019). We therefore developed a framework to evaluate food waste reduction measures.

Methodological framework

To evaluate food waste reduction measures, we base ourselves on the framework put forward by the EU Joint Research Centre (Laurentiis et al. 2020, Caldeira et al. 2019, Sanchez et al. 2020), which was restructured and amended to our needs. One important addition lies in the use of a nutritional indicator.

Our resulting approach for evaluating food waste reduction measures is based on the following four steps.

Step 1. As a first step, the **effectiveness** of the measure is calculated, referring to the food waste savings achieved. Additionally, we consider the amounts of by-products that

received a higher value along the food value chain as a result of the measure.

Step 2. In a second step, a **business case** is developed to calculate the **resource efficiency**. This follows the classical cost-benefit-approach (as shown in the Figure) whereby all costs and benefits across the three dimensions of sustainability are considered: economic, environmental and social.

The costs or resource inputs include all costs, impacts or effects generated by implementing the measure. These refer to investments, workload and labour costs (incl. volunteer work), and impacts and costs related to changes in the use of packaging, materials and devices.

The benefits or resource outputs include product specific impact and cost savings associated with the food that is now no longer wasted, as this food is now no longer produced and distributed in vain, and no longer needs to be disposed of. Also considered, are changes in impacts and costs related to by-products that now receive a secondary use with a higher value along the value chain. We further also consider any other benefits inherent to the implementation of the measure itself such as resource savings, donations to charity or job creation.

By balancing the costs and benefits, the efficiency or overall net benefit can be calculated.

Step 3. Thirdly, the food waste savings from Step 1 are translated into **nutritional savings** (kilocalories).

Step 4. As a last step, benefit-to-cost ratios are calculated, representing the **efficiency KPIs** (Key Performance Indicators) of our measure. These indicate how much food waste or kilocalories can be saved per euro spent, as well as the economic, environmental and social savings achieved per euro spent.

Using this quantitative evaluation framework, the sensitivity and uncertainty of the calculations can be assessed, to see how individual parameters influence the results and which uncertainties surround the overall result.

The evaluation of the measure further includes a wide range of **qualitative elements** to be assessed, such as outreach and behavioural change, effect on working environment, willingness to implement the measure, corporate image and transferability of the measure to other companies.

Application of the framework to case studies

The evaluation framework was used to evaluate several case studies along the food chain. Within the primary production stage, a switch from cultivating raspberries and strawberries in the open to berries grown under cover was evaluated (Wegner et al., 2020). At the interface between the processing stage and food services, we investigated how procuring fish with a higher convenience grade (switch from buying entire salmon to buying filleted and portioned salmon) by the gastronomy sector affects food waste and resource efficiency (Goossens et al., 2020). Lastly, within the hotel sector, a business case was developed for using digital waste-tracking devices to measure and reduce breakfast buffet leftovers (Goossens et al., in preparation).

To evaluate each of these measures, a lot of data was needed. This was particularly the case for the resource efficiency (Step 2 of the assessment). The case studies highlighted the importance of knowing beforehand – before implementing the measure –

which data will be needed, as data is most preferably collected at the moment the resource inputs and outputs occur. If the data has to be collected post-implementation, there may be data gaps resulting in an incomplete assessment or in an evaluation based on (uncertain) assumptions. The case studies further showed the added value of considering qualitative elements complementing the quantitative evaluation.

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Resource efficiency of food waste reduction measures: a cost-benefit analysis along the three dimensions of sustainability



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Further Information

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Partners

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