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Evaluate environmental impacts of uneaten food in the food chain

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1. INTRODUCTION

The environmental impacts of our food system are substantial, and a great share of this can be attributed to food that is being lost and wasted (FAO, 2014, Poore and Nemecek, 2018). Reducing Food Loss and Waste (FLW) along the supply chain and at the consumer level is put forward as one of the main solutions to reduce our dietary impacts (Willett et al., 2019). To better evaluate our dietary impacts, the present paper analyses methodological approaches for assessing the environmental impact of diets and dietary scenarios, and how FLW can be considered in the calculations.

2. METHODS

The impacts of the food we eat, have to be calculated based on the premise that a higher amount of this food needs to enter the post-harvest chain in order to account for FLW. When calculating dietary impacts, decisions on which dietary data source is used to formulate a diet and which system boundaries are chosen for the assessment determine which Food Quantities (FQs) travel through the food chain, how impacts are calculated and how FLW is being included in the calculations (Table 1). The aim of this scenario analysis was to show how these decisions affect the FQs that spread along the food chain and thus affect the calculated impacts.

3. RESULTS AND DISCUSSION

As shown in the left part of Figure 1, impacts of a food availability-based diet are calculated for a FQ equal to this Food Availability Amount (FAA). In a cradle-to-retail approach, impacts are calculated for FAA at retail-gate (where usually food expenditure amounts appear). Next, if Supply Chain FLW (SC-FLW) would be considered, an additional amount of food is assumed to enter at farm-gate to obtain the FAA at retail-gate, which does not correspond to reality, resulting in too high FQs and thus an overestimation of impacts. If SC-FLW would not be considered, an amount equal to FAA enters the food chain at farm gate. However, this approach would then assign all supply chain impacts to the whole of FAA. In reality though, not all FAA reaches the retail-gate as a share of FAA ends up as SC-FLW. Those FQs that go wasted, accumulate only a share of the supply chain impacts. The moment they become FLW, an additional waste treatment impact is to be expected. Depending on where along the chain the food ends up as SC-FLW and how big the waste treatment impacts are, the calculated impacts would under-/or overestimate real impacts. Using the cradle-to-farm approach avoids this issue as it places the FAA at farm gate, right where it belongs. However, both approaches would underestimate real impacts as not all life cycle

stages are considered (left part of Figure 1). Even though the cradle-to-mouth approach would include all life cycle stages, the fact that this would place the FAA at the consumer-gate (and not at farm-gate where it belongs) would result in an over- or underestimation of the impacts.

With food intake data, the FQ for which impacts are calculated refers to the consumer-gate (case study not depicted here). Using a cradle-to-farm/retail approach would place these FQs at farm- or retail-gate resp. Using the same line of argumentation as above, only a cradle-to-mouth approach which considers Consumer FLW (Co-FLW) and SC-FLW, would result in an accurate calculation of the dietary impacts.

4. CONCLUSIONS

The environmental assessment of diets is based on a range of methodological decisions. The interplay between the dietary data sources a diet is built on, the chosen system boundary and whether or not FLW is considered in the assessment, determines for which FQs impacts are calculated and how impacts are assigned to these FQs. Only a cradle-to-mouth assessment of a diet based on food intake data and which considers both Co-FLW and SC-FLW, would result in an accurate dietary impact calculation.

5. REFERENCES

FAO, 2014. Food Wastage Footprint: Full-cost accounting: Final report. 98p. FAO, Food and Agriculture Organization of the United Nations, Rome, Italy.

Poore J, Nemecek T, 2018. Reducing food's environmental impacts through producers and consumers. Science (New York, N.Y.), 360 (6392), 987–92. doi:10.1126/science.aaq0216.

Willett W, Rockström J, Loken B, Springmann M, Lang T, Vermeulen S et al., 2019. Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. The Lancet, 393 (10170), 447–92. doi:10.1016/S0140-6736(18)31788-4.

Table 1. Dietary data sources used for defining a diet: food quantities included in each of the data sources and entry points in the food chain the total food quantity refers to.

Dietary data source	Food quantities included			Entry point along the food chain to which this food quantity refers to
	Food that is eaten	Food that is lost and wasted at the consumer (Consumer FLW)	Food that is lost and wasted along the supply chain (Supply chain FLW)	
Food availability data	x	x	x	Farm-gate = the food quantity entering the post-harvest chain
Food expenditure data	x	x		Retail gate = the food quantity entering the consumer stage
Food intake data	x			Consumer-gate = the food quantity entering the consumer mouth

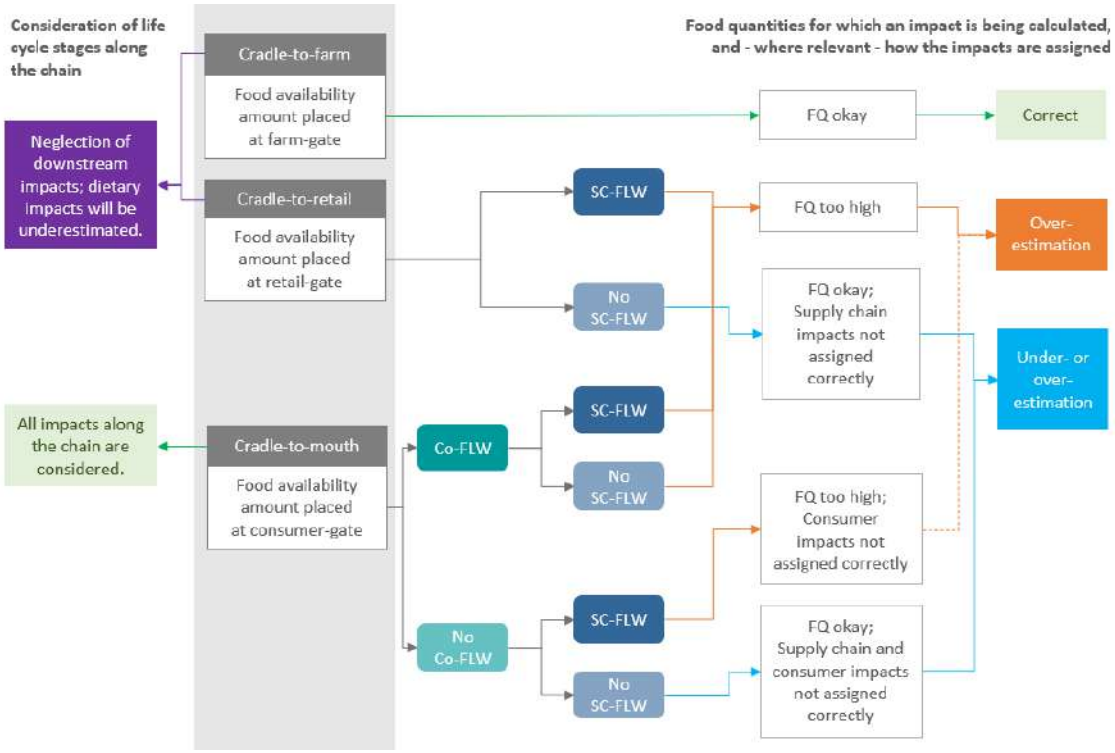

Figure 1. Case study of using food availability data to formulate a diet: flow of food quantities (FQ) for each of the three system boundary choices and for each choice of inclusion of supply chain or consumer FLW (resp. SC-FLW and Co-FLW) in the assessment. Dotted arow lines hereby stand for likely consequences, for which the outcome is not certain.