



Food losses and waste: Navigating the inconsistencies



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ABSTRACT

In recent years, the question of food losses and waste (FLW) has been the subject of much debate. When it comes to food security, the preservation of natural resources and potential economic benefits, the general public, scientists and politicians all agree that FLW needs to be reduced. However, there are numerous inconsistencies in terms of how the problem of FLW has been presented and analysed. This article aims to highlight these inconsistencies and help identify the areas of research that could contribute to a more effective handling of FLW issues. The article examines: (i) whether the choice of definition(s) adopted are consistent with the problem(s) targeted; (ii) the efficiency of the methodologies used to address the issues raised, and (iii) the relevance of arguments put forward concerning FLW reduction.

1. Introduction

According to the FAO, one third of world food production is lost or wasted along the food supply chain (FSC) (Gustavsson et al., 2011). The reduction of food losses and waste (FLW) has been identified as an essential means to enhance food security while reducing pressure on natural resources (Smith, 2013; Timmermans et al., 2014; FAO, 2013; Lundqvist et al., 2008). Other studies suggest that households and firms would also economically benefit from FLW reduction (Buzby and Hyman, 2012; Lipinski et al., 2013; Parry et al., 2015). There is a consensus that FLW must be reduced and numerous action plans have been announced in recent years (e.g., Save Food, French National Pact to fight against food waste, The European Union action plan for the Circular Economy, etc).

Despite this consensus, there are several inconsistencies in the way that the FLW problem has been presented and analysed. The objective of this article is to highlight and discuss these inconsistencies, suggest how they could be overcome, and identify areas of future research. To this end, the article first discusses the definition(s) used for FLW and their relevance to specific issues targeted (Section 2). It then considers whether the methodologies used to analyse the FLW problem are efficient (Section 3). Finally, the article examines the relevance of the arguments that have been put forward about food security, environmental sustainability and economic benefits in relation to reducing FLW (Section 4).

2. Inconsistency between definitions and target issues

2.1. Complexity of definitions

There is no single definition of FLW. To facilitate understanding of the multiple definitions that exist, we developed a framework of analysis (see Chart 1). Similarities and differences between definitions are presented below, with the numbered paragraphs referring to key elements in Chart 1.

With regard to (1) timing and (2) scope, existing definitions are similar:

- (1) FLW is only taken into account from the moment crops are ready for harvest (Fusions, 2014) or after harvest (FAO, 1981). Non-yields¹ from pre-harvest stages are not taken into consideration, i.e., FLW from resources used in agricultural production are excluded.²
 - (2) Only agricultural products originally and directly intended for human consumption are considered (FAO, 2014; Fusions, 2014). Agricultural products intended for animal feed or non-food use (bioenergy, biomaterial and industrial systems, etc.) are overlooked.
- The definitions diverge, however, when it comes to the (3) terminology used, (4) criteria considered, (5) perspectives adopted, and (6) type of FLW considered. These points are discussed individually below.
- (3) For a given definition of FLW, the terminology used may differ

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¹ The difference between the expected or optimal yield and the yield obtained.

² Starting from the point of view of FLW, there is a risk of neglecting non-yields in pre-harvest stages. The pre and post-harvest approach may help overcome this limitation.

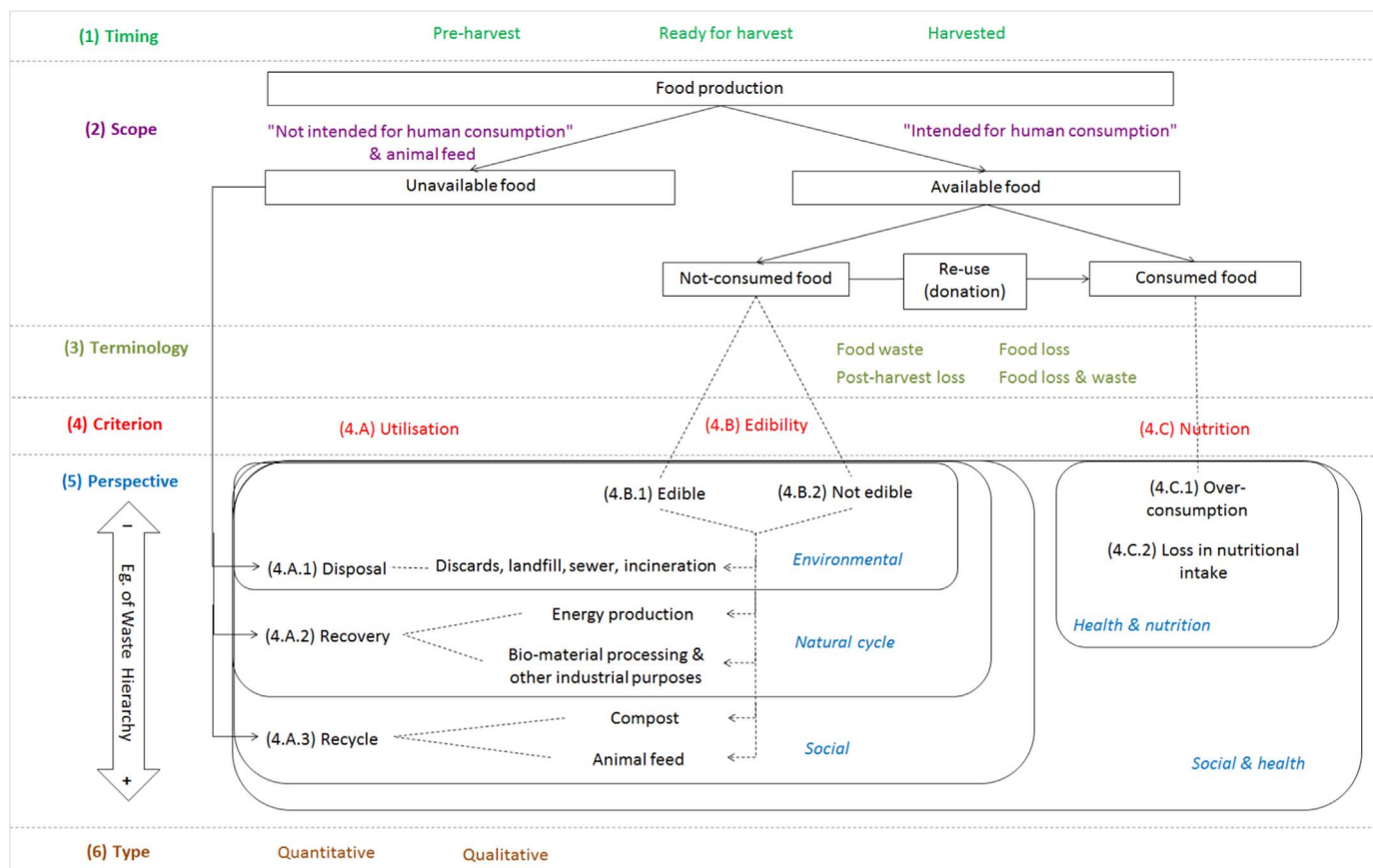


Chart 1. FLW framework: flows and definitions. Source: developed by the authors

(food waste, FLW, etc.). A single term may have different meanings (FAO, 2014). For example, the Fusions project uses the term “food waste” for all stages of the FSC (Fusions, 2014), whereas the FAO uses this term only in relation to the distribution and consumption stages (Gustavsson et al., 2011).

(4) FLW are interpreted in various ways based on three criteria: (4. A) the use and destination of food products, (4. B) the edible aspect of food products, and (4. C) the nutritional value of FLW.

(4.A) Some definitions describe FLW as all products originally intended for human consumption but not consumed, even when products have other final uses (e.g., animal feed or non-food use) (Gustavsson et al., 2011). However, to differentiate between FLW and non-FLW, other definitions consider the use and destination of food that is not consumed (e.g., landfill, energy production, bio-material processing, animal feed, compost, etc.) (Garrone et al., 2014; Papargyropoulou et al., 2014). For example, in some definitions food not consumed and redirected for animal feed or other industrial processes is not regarded as FLW (Fusions, 2014).

(4.B) Some definitions of FLW consider the edible and potentially edible parts of food products (e.g., peels) (Gustavsson et al., 2011; Ventour, 2008). Other definitions do not distinguish between edible and inedible parts of food products (Fusions, 2014).

(4.C) The definitions also may take nutritional value into account. Some authors refer to over-consumption as a form of FLW. As a result, it is the positive difference between the number of calories ingested and the recommended calorie intake (Smil, 2004). Other authors consider a decrease in the nutritional value of food products or the non-optimal use of food products in relation to their

nutritional potential as FLW (Kling, 1943).

- (5) In principle, it may be assumed that the different definitions of FLW reflect the different problems that stakeholders and/or institutions associate with FLW (Rutten, 2013). Chart 1 indicates several examples of these perspectives. One definition is based on an environmental perspective (Garrone et al., 2014): the social cost of waste treatment. Here, FLW is defined as all food surplus that is discarded. Another definition that favours a social perspective defines FLW as all food not consumed (Garrone et al., 2014; Rutten, 2013). Other dimensions may be added, such as health and nutrition or food safety. The measure of FLW changes according to the target problem and the definition adopted. For example, the quantity of food referred to as FLW is greater when a social rather than an environmental perspective is adopted.
- (6) The definition may change depending on which type of FLW is considered, quantitative or qualitative. “Quantitative” refers to volume and mass. “Qualitative” refers to an alteration in the physical-chemical and/or organoleptic characteristics of a product (FAO, 2014). Both quantitative and qualitative FLW can lead to an economic loss and possibly, in the case of qualitative FLW, nutritional loss.

2.2. Origin of definitions and issues raised by institutions

As part of a programme for the prevention of post-harvest losses launched in 1977 (Hodges et al., 2010), the FAO (1981) defines the terms “post-harvest”, “food product” and “loss”, which indirectly define post-harvest losses:

- The post-harvest stage starts from the moment a product is

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