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The dark side of retail food waste: Evidences from in-store data

Clara Cicatiello^{a,*}, Silvio Franco^b, Barbara Pancino^b, Emanuele Blasi^a, Luca Falasconi^c^a Department of Innovation in Biological Systems, Food and Forestry, Università degli Studi della Tuscia, via San Camillo de Lellis snc, 01100, Viterbo, Italy^b Department of Economics and Management, Università degli Studi della Tuscia, via del Paradiso 47, 01100, Viterbo, Italy^c Department of Agricultural and Food Sciences, Alma Mater Studiorum Università di Bologna, Viale Fanin 50, 40127, Bologna, Italy

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ABSTRACT

This study tackles the quantification of in-store food waste, with a specific focus on the distinction between the edible and inedible fraction. A meta-analysis of the studies dealing with retail food waste quantification is provided to identify the results obtained so far. Then, the mass and value of food waste produced in 2015 at one retail store in Italy is analysed, basing on the store's food waste records and on the reports of a redistribution initiative involving the edible fraction of the food waste produced. In one year, 70.6 tons of food (for a value of nearly 170,000 €) are wasted, mostly bread and fresh fruit and vegetables. The edible fraction accounts for 35% of the total food waste, mostly from fresh meat and bakery departments. Results also disclose a significant amount of unrecorded food waste, confirming that many gaps exist in the food waste recording procedure at retail stores.

1. Introduction

Food waste is a major social, nutritional and environmental issue affecting the sustainability of the food chain (Parfitt et al., 2010; Kummu et al., 2012; Abeliotis et al., 2015; Scherhauer et al., 2015; De Laurentiis et al., 2016). It is caused by climate and biological factors as well as by the behaviours of food chain actors, which are linked to different socio-economic factors (Buzby and Hyman, 2012; Aschemann-Witzel et al., 2015; Setti et al., 2016; Canali et al., 2016).

Food waste is generated in all stages of the supply chain, with different features and motivations. According to a comprehensive study conducted in 2012, retail food waste is estimated as 4.6 million tons in 2012, i.e. about 5% of the total food wasted along the supply chain (Stenmarck et al., 2016), much less than the other stages of the supply chain. However, there are several reasons why the study of retail food waste is particularly important (Gruber et al., 2016): (i) retailers have a great influence in shaping both the features of food production and the preferences of consumers; (ii) the absolute quantities of food waste generated at retail stores are very significant with respect to the much more scattered food waste production at other stages of the food chain, e.g. at households; (iii) retail stores are the place where several different food chain actors intersect. Moreover, the public opinion is

recently pushing for a greater consideration of the retail food waste issue. Movements against food waste are emerging, asking the food chain actors, particularly those operating at retail stage, for specific interventions to face this phenomenon. In Denmark, the activity of the Stop Wasting Food movement (Stop Spild Af Mad; www.stopspildafmad.dk) led to the adoption by all Danish retailers of a food waste reduction strategy. In France, it is worth mentioning the awareness campaign of Intermarché “Inglorious fruits and vegetables”, and the recent regulation that compels all supermarkets with a sales area exceeding 400 m² to establish agreements with charities with the purpose of donating them the unsold food.¹ In Italy as well, a law dealing with food waste redistribution initiatives at different stages of the chain has been released in 2016.²

Nonetheless, the study of food waste in the retail has long been neglected. In the retail management disciplines, the issue of retail food waste has only been touched in connection with the rate of “shrinkage”, which represents the gap between inventories and sales and is commonly used as an indicator of performance of retail stores (Avery et al., 2012; Buzby et al., 2015; Buzby et al., 2016). In other papers, the issue of retail food waste is tackled in connection to food security concerns (Parfitt et al., 2010) or environmental issues linked to waste management as well as resources consumption for food production (Gustavsson

* Corresponding author.

E-mail address: cicatiello@unitus.it (C. Cicatiello).¹ Loi n° 2016-138 du 11 février 2016 relative à la lutte contre le gaspillage alimentaire (law n° 2016-138 concerning the fight against food waste). The law has been published on February 12th, 2016 on the Official Journal n°36.² Legge n°166 del 19 agosto 2016 “Disposizioni concernenti la donazione e la distribuzione di prodotti alimentari e farmaceutici a fini di solidarietà sociale e per la limitazione degli sprechi” (regulation concerning the donation and distribution of food and pharmaceutical products for solidarity purposes and the limitation of waste). The law has been published on August 30th, 2016 on the Official Journal n°202.

and Stage, 2011; Beretta et al., 2013). It is only very recently that the literature dealing with the actual quantification of food waste at the retail stage have started flourishing.

The first studies dealing with the quantification of food waste at retail stores have been conducted in Sweden (Gustavsson and Stage, 2011; Eriksson et al., 2012). The interest on retail food waste has rapidly increased as some studies suggested that, contrarily to what happens in other steps of the chain, a significant share of the products considered unsalable by the retailers (e.g. products approaching the expirations date or bearing minor packaging defects) is still perfectly suitable for human consumption. Such products can be re-used, e.g. by redistribution initiatives targeting to the people in need (Segrè et al., 2009; Lebersorger and Schneider, 2014; Cicatiello et al., 2016; Garrone et al., 2014b; Aiello et al., 2014), or offered to customers at a reduced price, with interesting and still under-investigated implications on the amount of food waste produced (Aschemann-Witzel et al., 2015). The incidence of edible items over the total food waste produced in the retail is still unknown, although some redistribution initiatives operating in Italy suggest that it can reach up to 60 tons of food per store each year (Segrè et al., 2009). This means that at the retail stage the real extent of “food waste”, i.e. the amount of products discarded from the chain that become unfit for human consumption (Papargyropoulou et al., 2014), may be much lower than expected.

Moving from this state of the art, in this paper we aim to investigate the quantity and quality of food waste in retail stores, with a specific focus on the distinction between the edible and inedible fraction. To this purpose, we first examine, through a *meta-analysis*, the studies dealing with retail food waste quantification published so far; then, we analyse in-store food waste data retrieved for one year in one Italian outlet.

2. Meta-analysis of studies on retail food waste quantification

The generation of food waste in the retail is linked to food stocks management practices as well as to the purchasing behaviour of the customers (Gustavsson et al., 2011; Gunders, 2012). Food items can be discarded due to damaged packaging linked to improper stock management (Parfitt et al., 2010) or to technical malfunctions during the storage (Ziegler and Floros, 2011; Choudhury, 2006). Overstocking linked to the difficulty in predicting the number of products purchased by the customers is also reported as a possible cause of food waste in the retail (Stuart, 2009; Gunders, 2012), although take-back agreements with suppliers may hide part of such waste (Eriksson et al., 2017). Customer behaviours and preferences at the store are a strong driver of food waste generation (Gunders, 2012; Gustavsson et al., 2011; Parfitt et al., 2010; Stuart, 2009): sub-standard products are often rejected by consumers, therefore they are very likely to remain unsold and be wasted; the waste of holiday foods is also very common, as their purchase is concentrated in a limited period. In general, all these behaviours depend on a range of personal and social factors, which may also include the features of the shopping environment, i.e. the experience that the store is able to provide to customers (Cicatiello et al., 2015).

Investigating the extent of food waste in the retail is a complex task, as the way discarded food is registered depends on the retailers' internal organization and on the influences of local policies (Parfitt et al., 2010). With the aim of providing a synthesis of the methodologies and main results of the empirical studies tackling retail food waste quantification, we carried out a *meta-analysis* of the available papers indexed in Scopus. Namely, we selected all the documents where the keywords “food waste” OR “food loss” appeared in the title, abstract or keywords in combination with “retail” OR “supermarket”. Out of 121 resulting documents, only the 86 journal articles were considered. Their abstracts were screened to check whether in each paper an actual quantification

of retail food waste was performed, as this is the focus of our research. Table 1 reports the list of the 16 papers selected according to this criteria, as well as the following information for each of them: main focus of the paper, country where the food waste quantification was carried out, type of case study, type and source of data used in the study, food categories concerned, main results on the assessment of retail food waste.

Seven articles refer to studies conducted in Sweden. Indeed, the Nordic countries are those where the knowledge on retail food waste is most developed, also thanks to some reports of projects and national initiatives published in grey literature (e.g. Stenmark et al., 2011; Hanssen and Møller, 2013).

Some of these studies have a very broad objective (e.g. to study the total extent of food waste along the food chain), so that the data reported on retail food waste only represent a minor part of the results. Secondary data at the country level was used in Ju et al. (2017), Buzby and Hyman (2012) and Love et al. (2015), while qualitative data were collected in Mena et al. (2011). Twelve studies involved quantitative data retrieval on food waste at stores (although five of them refer to the same project, developed in Sweden on 6 stores), mostly relying on data collected through the regular waste recording process of the stores. This process, which has a key role in providing data on the extent of food waste at stores, typically entails a daily collection of the unsaleable food items, whose bar code is electronically recorded by the staff, thus generating a database by item.

Among the several product categories analysed in the literature, fruit and vegetables, dairy products, meat and bread show a higher waste. Namely, the waste of bread has an incidence of up to 6–7% with respect to the quantity delivered by suppliers (Mena et al., 2011; Gustavsson and Stage, 2011; Lebersorger and Schneider, 2014), and represents the largest fraction of the total food waste (Brancoli et al., 2017; Cicatiello et al., 2016), although this data may be biased by the extent of returns to supplier, which are not accounted in the stores' food waste records (Eriksson et al., 2017). For fruit and vegetables, different figures are reported in the literature (3–7% in Mena et al., 2011; up to 6%, depending on the type of vegetables, in Gustavsson and Stage, 2011; 4.3% in Eriksson et al., 2012; 8–9% in Beretta et al., 2013), but most studies do not consider take-back agreements, so these figures may be underestimated (Eriksson et al., 2017).

Eriksson et al. (2014) demonstrated that waste is higher for organic than for conventional products, suggesting that the rate of waste is closely linked to the sales and turnover of the different retail departments. In the few studies where the extent of waste was studied in stores of different dimension, small stores were found to produce more food waste than large stores (Gustavsson and Stage, 2011; Beretta et al., 2013).

Concerning the characteristics of retail food waste and its potential uses, several studies suggest that some of the food discarded at the retail stage may still be fit for human consumption. Indeed, most causes of food waste do not imply that food is no longer edible, e.g. when food items are discarded because they are approaching the expiration date, have little damages on the packaging, or are visually imperfect (Cicatiello et al., 2016). Aschemann-Witzel et al. (2015) refers at these products as “suboptimal”. Such items may be reused for human consumption, by sale at a reduced price (Aschemann-Witzel et al., 2015) or redistribution for social purposes (Falasconi et al., 2015; Segrè et al., 2009; Alexander and Smaje, 2008; Cicatiello et al., 2016). This means that only part of the total food products discarded at the retail stage – the “food surplus”, according to the framework provided by Papargyropoulou et al. (2014) – can be considered a waste, because it becomes unfit for human consumption (Papargyropoulou et al., 2014).

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