

Characterization of waste materials originating from restaurants and an assessment of recycling potential

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The production of waste is a key issue for restaurants because every day tons of food are throw away. In the full service restaurants of the United States of America the percentage of food waste is 3.11% of the total amount of purchased food which represent about 22,377 tonnes of food loss every day (Jones, 2005). Restaurants in the UK produce annually 915,400 tonnes of waste, including 199,100 tonnes of food waste which represents a cost of about 923 million of euros each year (Wrap, 2015). The main reasons for generation of waste are reported in Youngs et al (1983) that referred the poor selection of food items, overbuying, poor food storage, excessive preparation losses, excessive portion sizes, service method, etc.

In Portugal about 273,000 tonnes of waste are produced per year from the sector denominated “food, drinks and tobacco” that includes the restaurants (INE, 2015). In addition to food, restaurants also produce another wastes, such as glass, paper, plastic and metal packaging. Both food waste and packaging can be re-used or recycling but in Portugal in most of cases this separation is not done by the owners of restaurants, and the waste currently produced by restaurants is disposed of in waste containers for unsorted waste or at road-side containers for recyclables.

The main purpose of the present work is to characterize (type of materials) and quantify the solid waste produced by restaurants and evaluate their re-use or recycling potential. A solid waste characterization campaign was carried out in September 2014 comprising 11 restaurants (except fast-food) in Aveiro (Portugal). Sampling comprised both the unsorted waste as well as source segregated recyclables (paper/cardboard, glass, plastic and metals packaging). Sampling took place twice at each restaurant, and each sample comprises waste produced during one whole day. The waste bags were collected door-to-door by a team of 2 people (driver + 1 waste collector) using a small waste collection vehicle. Each bag was individually identified with the date, restaurant and the type of waste (recyclables/unsorted). A total of 514 kg of unsorted waste and 197 kg of recyclables were collected, with a total weight of 711 kg. Collected bags were manually sorted by a team of 2-3 people. Sorting took place outdoors, the day after collection. The bags from each restaurant were opened, the contents spread out over a plastic linen and then divided into 10 specific categories: i) organic matter (which comprises the plate waste and raw food from the preparation of meals); ii) paper; iii) plastic; iv) glass; v) metal and vi) others from unsorted waste; and vii) plastic and metal; viii) paper/cardboard; ix) glass and x) others from source segregated waste. A Kern balance (model CH 50 K 50), with a maximum capacity of 50 kg and Tomopol scale (max: 75 kg) were used to weight waste material of each category.

The composition of unsorted and source segregated waste collected from all restaurants is presented in Fig 1. In general, the unsorted waste represents about 72% in weight of all the waste produced at the restaurants. Unsorted waste is mainly composed by organic matter (80%) followed by paper (11%) and plastic (5.1%). The source segregated waste represents 28% of all collected waste. The major fraction is glass (73% of source segregated waste), followed by paper/cardboard (21%) and plastic/metal (5%). The largest amount of material present in unsorted waste comes from organic matter which is easily decomposed by micro-organisms (ex: composting or anaerobic digestion) and if collected separately could generate a compost for agricultural applications of higher quality (less contaminants) than the compost produced currently at the biological and mechanical treatment unit. The second predominant waste material is recyclable fraction composed by paper, plastic, glass and metal. Glass is comprehensively source-segregated and appears in residual amounts in unsorted waste (1.3%). On the opposite, the amount of paper, plastic and metal in unsorted waste is higher (in mass) than the amount recovered as source-segregated waste. These materials, if clean, could be recycled. However, because they are contaminated with organic matter these recyclables will probably end up as refuse and will most likely be landfilled instead of valorized.

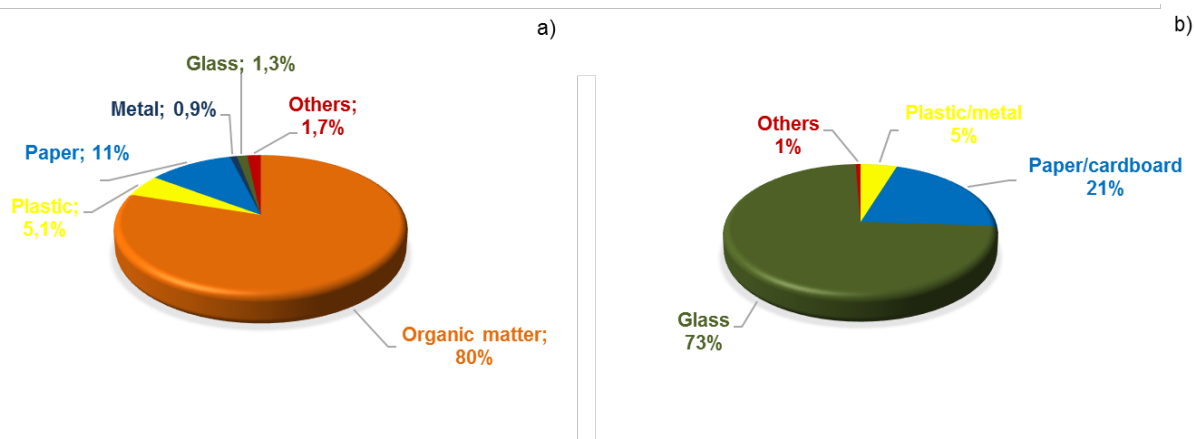


Fig 1 Material composition of waste produced at restaurants (a) unsorted waste (n= 36 samples); and (b) source segregated waste (n=24 samples)

In conclusion, the restaurant sector generates large quantities of recyclables that end up in unsorted waste and which are not valorized through recycling. In case waste management at restaurants is improved a recycling strategy could be established in order to increase the amount of recyclable material recovered and contribute to achieving the target imposed by Directive on Waste 2008/98/EC (European Parliament and Council Directive, 2008) which establishes that in 2020 the preparing for re-use and recycling of waste materials should be a minimum of 50% in weight.

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