Households' Food Waste Composition – Evidence from a Field Survey

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Introduction

One of the most challenging tasks of the 21st century is feeding 9 billion human beings in a world of depleting resources (Godfray *et al*., 2010). One possible solution lies in cutting food losses and food waste. According to FAO (Gustavsson *et al*., 2011), every year a third of the global food production is lost. The UN, in its New Sustainable Development Agenda (UN, 2015), set an ambitious goal to halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, by 2030. It was established that most of the food losses in the developed world occur due to the consumption habits of households (Stenmarck *et al*, 2016, Parry *et al*, 2015, Lipinski *et al*, 2013). While food losses present quite a challenge, it is still considered to be an under-researched field and efforts to measure the extent of food losses in households tend to underestimate the actual amount (Porpino, 2016).

This paper reports on results of a field survey carried in Haifa (metropolitan area), Israel. A total of 192 households participated in the study. The aim of the field survey was to determine the actual amounts of food waste produced in households and to acquire a better understanding regarding food waste composition. This will enable policy makers to set regulation based on empirical and reliable data, and monitor the effectiveness of different policy tools over time.

Methodology

Research Area

The research was conducted in the Neve Sha'anan quarter in eastern Haifa, Israel. Three neighborhoods - Neve Sha'anan, Ramat Remez and Yizraelia, consisting of lower-middle class, were chosen as a case study. During the research period, a curbside scheme for collection of mixed municipal solid waste (MSW) was operated in the three neighborhoods, along with central collection of paper and plastic bottles in each neighborhood. Ramat Remez also has a separate collection scheme for packaging waste.

Recruitment of Participants and Screening Process

Recruitment was made via - message boards, leaflets in mailboxes and social media. Participants were offered a reward of 200 NIS (~40€) for participation. Residents who were interested in taking part of the experiment were asked to write an email to the researchers or scan a QR code and fill up a short contact form.

All potential participants were contacted via phone and asked to answer a short screening questionnaire. The purpose of this questionnaire was to determine whether the subject fits the selection criteria - lives in the relevant geographical area, shares a household with family members or a spouse (singles and roommates were excluded) and considers themselves as secular or moderately religious (orthodox were excluded due to a potential bias in food management and waste practices). A frontal interview followed the phone screening questionnaire.

The frontal interview was split into three parts. First, subjects were given a short explanation regarding the purpose of the research. Then they were asked to answer a questionnaire. The interview started with three screening questions referring to who is in charge of food shopping, drawing a shopping list and food cooking. In a fourth screening question the participants were asked whether they use a composter or a garbage shredder. Those who passed the screening part were then asked to answer several demographic questions and to provide some technical details, such as building entrance code, preferred form of communication (WhatsApp, text message, e-mail). In the third part subjects were given detailed instructions regarding the course of the study.

Sampling and Sorting Procedure

Each household represented a sample unit. Samples were collected using a trailing pickup on a daily basis during seven days. Each sample was collected directly from the household doorstep. Each sample was sorted separately the same day it was collected. Only samples that were collected on Saturday night were sorted on Sunday morning. Classification was based on a unified protocol according to which each sample – one or more garbage bags carrying the same ID code, was weighted together, except for source separated waste streams (usually paper and plastic bottles), which were weighted separately. Food waste was classified using a three level scheme suggested by Lebersorger & Schneider (2011).

Results

The Total amount of MSW sampled during the trial was equal to 2,543.84 kg. Food waste accounted for 45% (1,138.86 kg) of the total sample. This result is consistent with national statistics (Seagull, 2013). Avoidable food waste was found to constitute 54% (602.35 Kg) of total food waste. Figure 1 shows the composition of avoidable food waste, according to its state of consumption. Unconsumed food and Partly consumed food components were further analyzed, according to food category, as demonstrated in Table 1.

Figure 1: Avoidable food waste composition, by state of consumption

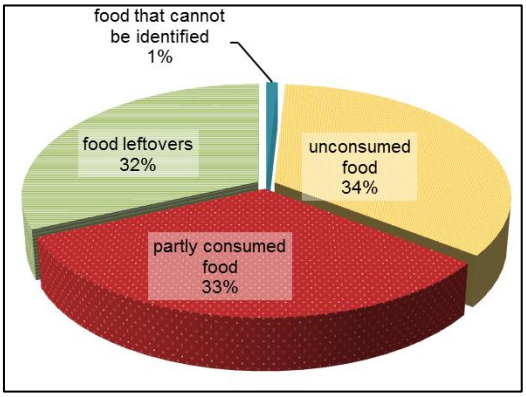

Table 1: Avoidable food waste composition, by food category

Food categories	**Weight (Kg)**	**Composition by food category (% out of avoidable food waste*)**
Vegetables and fruits	274	67%
Bread, cereals and pastry products	57	14%
Milk, milk products and eggs	31	8%
Miscellaneous food products*	24	6%
Meat, poultry and fish	13	3%
Sugar and sugar products	6	2%
Avoidable food waste*	406	100%

*Leftovers and food that cannot be identified were excluded

Discussion

In order to meet the ambitious goal of cutting food losses in half, major steps should be taken. However, an effective regulation and national milestones have to be based on empirical data. Studying food waste composition can contribute to the management of municipal solid waste at local level as well as provide valuable information for the planning process of waste treatment facilities.

Results indicate that large proportions of avoidable food waste constitute of vegetables and fruits. It also indicates that 65% of avoidable food waste is food that was partly consumed. This can suggest policy makers to focus efforts on improving public awareness and practices regarding food management, food storage, shopping planning, portion sizes etc.

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