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Food waste behaviour at the household level: A conceptual framework

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ABSTRACT

One-third of the world produced food is wasted according to FAO (2011). The aim of this paper is to have an in-depth analysis of consumers' behaviours regarding food waste in Egypt. A conceptual framework is developed that brings many factors considered in the recent literature in one model to be tested using structural equation modeling. Results indicate that the incorporated factors were found statistically significant. Additionally, the individual's perception about food waste was related with food quantities wasted at the household level. The findings suggest considering these factors when developing new policies and campaigns for food waste reduction.

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1. Introduction

A major challenge that faces the international community is to provide safe food for over 9.1 billion people by the year 2050 (Parfitt et al., 2010). While the focus is directed to increase production by 50–70 percent to reach this target, one factor that is usually ignored is to reduce food loss and waste (Hodges et al., 2011). According to FAO (2011) report, 32 percent of the world-produced food was lost or wasted in 2009; this estimate was based on the mass of loss and waste, which does not take into consideration the energy in food products. For this reason, Lipinski et al. (2013) used calories as an indicator and found that food loss and waste accounts for 24 percent of all produced food. Additionally, the authors distributed by region the share of world food loss and waste in 2009. The results showed that 28 percent of the food loss and waste occurred in industrialized Asia, 23 percent in South and Southeast Asia, 14 percent in North America and Oceana, 9 percent in Sub-Saharan Africa (SSA) and 7 percent in North Africa, West and Central Asia. Food loss and waste distribution were grouped as well based on different stages of the supply chain for different regions. For example in North Africa, West and Central Asia 34 percent of food loss and waste is at the consumption level and 18 percent at the distribution and market levels, together representing 52 percent at the downstream of the supply chain. Additionally, the authors have categorized different regions based on developed and developing countries and showed that at the level of consumption developed countries generate food waste at 28 percent compared with developing countries at 7%.

Furthermore, in light of the recent food prices spikes that the international markets have experienced, food loss and waste started to be considered as an environmental, economic, social and food security problem (Kosseva, 2013; Stuart, 2009). International initiatives to face the food loss and waste problem have been developed and have adopted strategies to tackle this challenge (see, for example, FAO, 2012, 2013; FUSIONS, 2014; HLPE, 2014; WRAP, 2011). Additionally, the UN sustainability goal 12 focused on the sustainable consumption and production patterns through reducing losses at the upstream level of the supply chain and reducing waste at the consumer level. Until now, there is no consensus on the definition of food waste; however, there are three major institutions have published their definitions (FAO, 2013; FUSIONS, 2014; HLPE, 2014). FAO, (2013) and HLPE, (2014) definitions are similar whereas FUSIONS (2014) differs since it takes into account the inedible parts of food as food waste. Reducing food loss and waste is an interdisciplinary and multi-sector task that needs to be studied from different perspectives (Elmenofi et al., 2015; Kosseva, 2013; Langley et al., 2010). Parfitt et al. (2010) indicated that investigating individual's attitudes, values, motivations toward wasting food would be of interest.

Kosseva (2013) has indicated that reducing food waste in developed countries is considered a challenge because it is related to individuals feeding behaviour and attitudes. In Sub-Saharan Africa (SSA) food is wasted with 39 percent at the production level and 37 percent at the handling and storage levels, together representing 76 percent at the upstream of the supply chain. Affognon et al. (2015) conducted a meta-analysis of post-harvest losses studies

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in Sub-Saharan Africa and profiled these studies based on different criteria including the chain level, the losses assessment methodologies and type of study. With respect to the chain level, most studies focused on the storage stage in the supply chain. While the most common losses assessment methodology used was count and weight. Finally, most studies conducted were household surveys.

Elmenofi et al. (2015) conducted an exploratory analysis about food waste in Egypt using a sample of 181 respondents. Results showed that food waste increased during the month of Ramadan (an Islamic month of fasting), which is considered a period of seasonal demand. The most wasted foods are fruits and vegetables, cereals and bakery products. Additionally, the World Bank report in 2010 showed that the subsidy program in Egypt that covers baladi bread and using ration cards for sugar, cooking oil, rice and tea directed to households suffers from leakages. These leakages represent a large part of the food subsidies that is not directed to its intended use, for examples subsidized baladi bread is used as animal and fish feed or selling subsidized food in the black market (World Bank, 2010). Investigating food waste at the household level in Egypt is important because on one hand as indicated by Lipinski et al. (2013) around 34% of food is wasted at the consumption level in North Africa and West and Central Asia. Additionally, Egypt join the highest contributing countries to food waste with 73 kilograms/year/capita according to the BCFN report in 2016, Egypt's rank is the sixteenth after Saudi Arabia who produce waste with the amount of 427 kilograms/year/capita, United Arab Emirates that produces 196 kilograms/year/capita (BCFN, 2016).

On the other hand, the challenging macroeconomic situation where the Egyptian pound was depreciated dramatically after freeing the exchange rate. The high inflation rate and the rising food prices taking into account that Egypt is a net importing country (e.g. around 55 percent of wheat consumption is imported) which makes it vulnerable to price volatilities of the international markets (IFPRI-WFP, 2013). The increasing food gap of strategic crops including cereal and oil crops, which as well experience a large amount of losses and wastes across the supply chain. For example, according to the Egyptian food balance sheet reported by FAOSTAT (2016), in 2013, food loss and waste in different food groups take large percentages along the supply chain. The largest food groups are cereals, about 10% of 38 million tons total domestic supply are losses. For the case of vegetables (fruits), around 10% (11%) of 17 (9.5) million tons are losses. Regarding milk, around 4.5% of 6.1 million tons are losses. Furthermore, the high growth rate of the population, which is 2.1 in 2015 with the limited amount of natural resources specially water highlights a demand for efficient food supply chains.

The current study focuses on the metropolitan area of Cairo. It is one of the most populated areas in Africa, with a population size of 9.27 million in 2015, whose 42.8% is urbanized (CAPMASS, 2015). No food loss and waste quantification studies are currently available at the national level. The objective of this work is to identify the factors influencing the individuals' food waste decisions, as well as studying the effect of these factors on food waste behaviour. The contribution of the current work is trifold. First, develop a conceptual model that characterizes the decision-making process taking into account factors like waste minimization, reuse and recycling, food habits like expenditures, and food choice, environmental awareness, knowledge about food waste problem, materialistic values, personal characteristics, and cultural characteristics such as the effect of religion. The contribution of this study is the first to include religion in the conceptual model. Culture is considered a relevant factor to be included in the conceptual model that affect consumers' food waste (Stuart, 2009). Second, relating individuals' food waste behaviour with perceptions. Third, this study contributes to the scarce literature on the household level in a

North African metropolitan area, as a case to investigate food waste issue.

The paper is organized as follows. Next section develops a conceptual model that explains citizens' food waste decision-making process. The third section explains the data and method of analysis. The fourth section reports the main results of the study. The last section presents the conclusions and policy implications.

2. The conceptual model

Many studies have investigated the food waste behaviour using the Theory of Planned Behaviour (TPB) (see, for example, Barr, 2007; Godfrey et al., 2012; Karim et al., 2013; Stefan et al., 2013; Tonglet et al., 2004). However, these studies had a modest explanatory power of their estimated models ranging from 70 to 80% not explained. This can be attributed to the multidisciplinary nature of the food waste issue (Marangon at et al., 2014). The literature has indicated many factors to incorporate, such as Quested et al. (2013) and WRAP (2011) have shown that food loss and waste is not only a food issue but as well factors like waste management skills are needed to be considered. Díaz-Ruiz et al. (2015) have developed a conceptual model that takes into account six different factors affecting food waste, which are environmental awareness, materialism, purchasing behaviour, diet choice, waste recycling, and waste prevention. In this work, a model is developed that extends Díaz-Ruiz et al. (2015) work by adding three more factors which are knowledge of the food waste problem, religion that is one of the main contributions of this work, and personality traits. The conceptual model is developed based bringing together factors that were considered in recent literature on behaviours toward food waste, and relations among these factors are represented in one framework that is proposed in Fig. 1. The conceptual framework model in Fig. 1 is tested using the Structural Equation modeling (SEM) technique with the following hypothesis:

- H1: Respondents that are more concerned about food expenditures are expected to produce less food waste.
- H2: Respondents that are more concerned about their food choices of healthy and safe food are expected to produce more food waste.

The first and second hypotheses are constructed based on the previous literature that indicated food waste of households is a result of inefficient food consumption patterns. This literature has categorized five types of behaviours that are the main cause of household food waste including food purchasing, storing, preparing, consuming and a particular lifestyle (Buzby and Hyman, 2012; HLPE, 2014; Parfitt et al., 2010; WRAP, 2007, 2009). Stefan et al. (2013) have indicated that shopping routines and planning describe the food waste behaviour in Romania. Furthermore, other studies have found a noticeable conceptual link between food waste and other food related issues such as food safety and nutrition. Quested et al. (2011) provided insights about households' behaviours, such as keeping fruits in a fruit bowl to encourage family members to eat more fruits and seen as having a healthy lifestyle instead of leaving it in a fridge to maximize its life. This is affected as well by the fridge space and the storage guidance on the packaging.

- H3: Respondents that show more positive waste minimization behaviour are expected to produce less food waste.
- H4: Respondents that show a more positive reuse behaviour are expected to produce less food waste.
- H5: Respondents that show a more positive recycling behaviour are expected to produce less food waste.