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Review

Drivers of food waste and their implications for sustainable policy development

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ABSTRACT

There has been growing interest in establishing food waste prevention and recovery programs throughout the world. The drive to target food waste stems from increasing concerns about resource conservation, food security, food waste's environmental and economic costs, and a general trend in the waste management industry to transition to more sustainable practices. Here the drivers of residential, institutional, and commercial food waste generation in developed countries, particularly in the U.S., are explored. The impacts of food system modernization on food waste generation are examined, including impacts related to food system industrialization, urbanization, globalization, and economic growth. Socio-demographic, cultural, political, and economic drivers of food waste are described with emphasis on how food waste perspectives may vary globally. Specific behaviors and attitudes which result from many of these waste drivers are then discussed. The examination of the range of food wastage drivers are used to provide insight into the best policy approaches to sustainably manage food waste. Food waste prevention policies are placed in context of the waste generating behaviors and attitudes that they address. A review of important background information on food waste is also provided, including definitions of key terms, food waste history, quantities of food waste generated, and the importance of food waste prevention for sustainability, as this information is all critical for effective policy development.

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1. Introduction

In the U.S., food waste makes up nearly 15 percent of the disposed municipal waste stream and Americans dispose over 0.6 pounds of food waste per person per day. The amount of food waste disposed has been increasing over time (Thyberg et al., 2015). Globally, it has been estimated that one-third of the edible parts of food produced for human consumption is lost or wasted (Gustavsson et al., 2011). Wasted food is a considerable component of the world's food system challenges. The global population is quickly growing, urbanizing, and becoming wealthier, leading to a diversification of dietary patterns and an increase in demand for land, resources, and greenhouse gas intensive foods, such as meat and dairy. It is estimated that continuing population and consumption growth worldwide will lead to an increase in the global demand for food for at least 40 more years, leading to intensified use of natural resources, especially land, water, and energy (Godfray et al., 2010). These difficulties are exacerbated by the world's changing environmental conditions which cause food production to be unpredictable and increasingly difficult globally (Garnett, 2014).

It is becoming clear that the many negative environmental effects of food systems must be minimized to ensure enough food is available to feed the world's growing population in a sustainable way (Tilman et al., 2001). Shifting toward more sustainable food systems is both essential and urgent, and actions are needed throughout food systems on moderating demand, producing more food, improving governance, and reducing waste (Godfray and Garnett, 2014). By wasting edible food, all of the resources spent growing, producing, processing, and transporting that food are also wasted, resulting in potentially needless environmental impact (Gustavsson et al., 2011). Reduced food waste and proper waste management can also save economic resources, contribute to food security, and minimize negative impacts of food waste on waste management systems.

Interest in food waste prevention and recovery has grown rapidly in the U.S. and abroad, as reflected in federal and state policies (Pearson et al., 2013; Platt et al., 2014). A recent survey indicated that awareness of food waste has begun to grow among U.S. consumers (Neff et al., 2015). However, currently very little food waste is recovered (USEPA, 2014) and prevention initiatives are limited. Prevention programs aim to reduce the amount of food waste generated and recovery programs typically aim to divert food waste from disposal (landfill or incineration) and treat it with biological treatment (composting or anaerobic digestion [AD]) to capture nutrients and/or energy. Food waste prevention has the highest economic, social, and environmental benefit relative to other waste management approaches. The environmental benefits related to prevention are largely explained by avoided food production (Schott and Canovas, 2015). Prevention also enables economic and social priorities to be achieved (e.g., money saved by not purchasing food that is disposed, reallocated excess food to charity).

Effective policies for food waste prevention should address the behaviors and motivations of food waste generation. Some past work has focused on identifying behavioral causes of food waste using surveys and interviews (e.g., Graham-Rowe et al., 2015; Jorissen et al., 2015; Neff et al., 2015; Parizeau et al., 2015). Here the drivers of these behaviors are first explored to provide a broad picture of food waste generation. The impacts of food system modernization on food waste generation are examined, particularly impacts related to food system industrialization, urbanization, globalization, and economic growth. Socio-demographic, cultural, political, and economic drivers of food wastage are reviewed with emphasis on how food waste perspectives may vary globally. Next, specific behaviors which result from many of these waste drivers are discussed. This knowledge of food wastage drivers and behaviors are then used to provide insight into the best policy approaches to sustainably manage food waste. Food waste prevention policies are placed in context of the waste generating behaviors and attitudes that they address. This research can be used to guide the development and implementation of multi-faceted food waste prevention programs which address the three aspects of sustainability (economic, environmental, and social factors).

2. Background: food waste definitions, history, and quantities generated

2.1. Food waste definitions

Definitions of food waste are not universally agreed upon (Lebersorger and Schneider, 2011), which makes studying and quantifying food waste difficult (Buzby and Hyman, 2012). Different categorizations are generated based on what materials are included, means of production, and management approaches (Gjerris and Gaiani, 2013). Multiple terms have been used interchangeably, such as food loss, food waste, biowaste, and kitchen waste (Schneider, 2013a). Also, often the same terms are used, but with different meanings (Gjerris and Gaiani, 2013). This is exacerbated when reports are translated (Schneider, 2013a). Table 1 provides an overview of previously used definitions; Table 2 provides a complete definition of both food loss and food waste as used in this paper. Here focus is placed on food waste rather than food loss because in the developed world, food waste is generated in higher quantities than food loss. Therefore, the greatest potential for reduction lies with the generators of food waste (retail and consumer sectors) rather than loss (production and processing sectors) (NRDC, 2012; Papargyropoulou et al., 2014; Parfitt et al., 2010).

2.2. Food waste history

A history of food waste issues in the U.S. is given in Table 3. Examining the history of food waste provides a foundation for