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Quantification of food waste in school canteens: A mass flow analysis

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ABSTRACT

Despite the growing public, academic and government attention on food waste (FW) issue, there is still little information on the scales and patterns of school canteen food waste, particularly in developing countries such as Malaysia. This paper aims to examine the current status of FW generation by evaluating the key performance indicators (KPIs), analysing the value loss (monetary) of unconsumed food and Mass Flow Analysis (MFA) of each food item from canteens in public schools in Malaysia. The present study adopted the direct weighing FW method. It investigated the amount and patterns of FW in ten school canteens location within the Hulu Selangor municipality, Malaysia. Based on the result gathered, the total quantity of FW generated at ten school canteens is about 101.3 kg/day with a total value of unconsumed food is about RM 195.78. The study also found that the average FW in schools is 6.4 g per portion per day and 12.2 g per capita per day. Staple foods and vegetables are the most commonly wasted food items, and other types of food represent minor waste. The mass balance of food raw materials in the food production process illustrates that 82.6 per cent of the total food input is used to prepare the meals, while the remaining 17.4 per cent end up as FW. The present study empirically promotes the transparency of food waste quantification at the school level, and it can help to identify hotspots and strategies with the most significant potential for waste reduction.

1. Introduction

Food is wasted throughout the entire food supply chain, from the initial stage of agriculture production until the final consumption stage (Kasavan et al., 2019). Annually, around one-third or 1.3 billion tons of the food produced for human consumption in the world never gets eaten and end up as waste (Food and Agriculture Organization, 2011). Annually, around one-third or 1.3 billion tons of the food produced for human consumption in the world never gets eaten and end up as waste (Food and Agriculture Organisation, 2013). Such high wastage generates a tremendous negative impact on the environment, society and economic sustainability. Worldwide, issues on food waste (FW) generation have attracted significant attention from the public, academicians, industry players, non-government agencies, as well as government bodies as policymakers. In this regard, to address issues on FW and FW management, the Sustainable Development Goals (SDG 12.3) document has set a specific target for halving per capita global FW at the retail and consumer level by 2030 (United National, 2015).

From a global perspective, there is a higher generation of FW at the consumption stage in developed countries, compared to in developing countries. For example, in Europe, almost 42% of FW are produced during the final consumption stage (Monier et al., 2011). Meanwhile, in the developing countries of Southeast Asia, 33% of foods are wasted, and most of the FW is generated at the production and post-harvest handing stage due to the lack of technology, expertise in food preservation and managerial resources (Yang et al., 2016). On the other hand, such FW pattern may change if developing countries continue to urbanize, develop economies and change their eating habit structure (Thi et al., 2015). In Malaysia, FW accounts for around 63.1% of the total solid waste component (Karim Ghani et al., 2013) and an average household generates between 0.5 kg to 0.8 kg of FW per day (Chien Bong et al., 2017).

The social implication of FW is the loss of valuable caloric content, which can affect food security particularly in feeding the world's