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Evaluation of the Economic Costs of Household Food Waste

Anjana P.* and Jainy Varghese**

Abstract

Food waste poses significant environmental, social, and economic challenges globally, with the household sector contributing a substantial 61% to the overall waste production, as highlighted in the Food Waste Report 2021 by UNEP and WRAP. In India alone, approximately 68.7 million tonnes of food are wasted annually, exacerbating issues of food insecurity. The economic ramifications of this wastage are staggering, amounting to an estimated 1 trillion dollars annually. However, the lack of standardised methodologies for quantifying and valuing food waste poses a significant challenge for research in this area. This study seeks to address this gap by examining various methods for quantifying and valuing household food waste economically. Drawing on secondary data from academic journals, reports, and grey literature, the study identifies direct measurement, waste composition analysis, volumetric assessment, and the diary method as prominent approaches. It elucidates the economic costs of food waste, encompassing

the potential value of wasted food sources and expenses related to disposal and management. Furthermore, the study explores the conversion of environmental impacts, such as water footprint and emissions, into economic costs to underscore the broader societal implications of food waste. Ultimately, by quantifying and evaluating household food waste, policymakers can better understand its significant impacts and devise effective strategies to address this pressing issue.

Keywords: food waste, economic cost, quantification, environmental cost

Introduction

Food waste is a serious issue for the future, and it persists despite the existence of food insecurity and malnutrition. United Nations Environment Programme, (UNEP, 2021) defined food waste as “Food and the associated inedible parts removed from the human food supply chain in the following sectors: Retail, Food service,

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Households". According to the United Nations Environment Programme's (UNEP) and Waste & Resources Action Programme's (WRAP) Food Waste Report 2021, 61% of food waste is generated in the household sector. Every year, approximately 68.7 million tonnes of food waste are generated in India's household sector (Agarwal et al., 2021). The food waste conundrum has a number of social, economic, and environmental consequences. Unscientific and negligent food waste management will exacerbate the planet's current dire conditions, including global warming, pollution, and resource depletion (Seberini, 2020). Target 3 of the United Nations 12th Sustainable Development Goals (SDGs) pledged to "by 2030, halve per capita global food waste at retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses." Aside from SDG 12.3, other sustainable goals are also linked to food waste, which is less discussed in studies (Varghese & Anjana, 2022).

Every year, about one-third of the food produced for human consumption worldwide is lost or wasted from the different stages of the food supply chain (FAO, 2013). The production value of this waste is estimated to be 1 trillion dollars, but when the environmental and social costs are included, that value rises to 2.6 trillion dollars (FAO, 2014). In India, 10% to 20% of the food served at weddings is typically wasted, amounting to roughly 14 billion dollar annually (Gupta, 2022). Putting an economic value on the associated with the environmental and social impacts

of food waste is thus an important way of bringing these issues to the attention of policymakers. Accurate data on food waste, particularly in major sectors such as households, is required to assess the impact of food waste. But the existing quantification methods are debatable (Xue et al., 2017). The Food Waste Index report for 2021, on the other hand, reveals a significant gap in accurate data of food waste. Hence the purpose of this paper is to comprehend the methods of quantification and to analyse valuation methods of economic cost of household food waste.

Methodology

To understand the major methods of quantification and to analyse the evaluation method of economic cost of household food waste, secondary data were collected and analysed. The major sources of secondary data were reports of International organisations like UNEP, FAO, WRAP, books, and peer reviewed research journal articles.

Result and Discussion

Quantifying the food waste means measuring the amount of wasted food by different methods. Quantification is very important for estimating the amount and evaluating the impact of the household food waste (CEC, 2019). After the quantification, the accurate amount of food waste is used to estimate its social, economic and environmental costs.

Quantification methods

There are different quantification methods are available to quantify food waste in each food supply chain sector



(CEC, 2019; UNEP, 2021). The analysis of secondary data shows that different quantification methods are used for different studies (Elimelech et al., 2018; Djekic et al., 2019; Amirudin & Gim, 2019; Quested et al., 2020; Ilakovac et al., 2020; Shabanali et al., 2019). According to the Food Waste Index Report (2021), there are five major methods are used to measure the amount of food waste generated from households. They are,

Direct method: Using a measuring device, direct measurement determines the amount of wasted food from a household (UNEP, 2021). It is a physical survey of waste, which measures the actual wet weight of food waste. The method can avoid the bias due to social desirability. However, age and degradability of the waste can also affect the quantity of the waste corresponding to the time of data collection (Elimelech et al., 2018). Compared to other available methods, it is expensive, time consuming and researchers need direct access to food waste (Withanage, 2021).

Waste composition analysis: It is also a type of physical waste survey. The difference is that this method measures the food waste by categorising or separating food waste into different types (Adelodun et al., 2021; Quested et al., 2019; Elimelech et al., 2018; Everitt et al., 2022). Waste composition Analysis is the physical separation of food waste from other materials in order to determine its mass and composition. The method is more accurate for gaining an in -depth understanding of food waste material type and categories (Everitt et al., 2022). The method is not suitable for quantifying the food waste disposed in the public disposal system

such as community waste bins in the residential areas (Withanage, 2021).

Volumetric analysis: Volumetric assessment is the process of determining the mass by measuring the physical space occupied by food waste. The method is suitable for the quantification of liquid food waste, solid food waste suspended in liquid (Tostivint et al., 2016). If the quantity of the food waste has the same composition, density will be consistent. Then the volumetric analysis was done by applying the density of the waste to the volume of the waste that occupies a given space (UNEP, 2021).

Kitchen diary/Diary method/Self reporting method: This is also known as kitchen log method in which the residents of households keep records of the amount and nature of food waste generated at their homes on a regular basis (UNEP, 2021; Williams et al., 2012; Ilakovac et al., 2020; Shabanali et al., 2019). This method can provide descriptive information that could not be captured by other methods. Besides, it captures food waste that does not go into a waste bin (Withanage, 2021). In this method, there is a possibility of manipulating the recorded data by the respondents (Williams et al., 2012; Ilakovac et al., 2020; Shabanali et al., 2019).

Survey /Interviews: The method utilises questionnaire as a tool to capture self-reported quantities and the composition of food waste generated within a respondent's household. This method can obtain data on demographic characteristics of respondents and it is applicable for larger sample size (Ponisal, 2017; Pappalardo et al., 2020;

Cronje et al., 2018; Elmenofi et al., 2015; Djekic et al., 2019; Amirudin & Gim, 2019). Here also a chance for biased responses from respondents (Elimelech et al., 2018; Elimelech et al., 2019).

Besides these, there are other minor methods such as estimation based on secondary data and extrapolation (Nahman et al., 2012; Venkat, 2012) and photograph method (Herpen and Lans, 2019) are used for the quantification of food waste.

Estimation based on secondary data and extrapolation: Here the method extrapolates the existing quantified household food waste data provided by the previous reports and studies. The method is mainly used for analysis of economic impacts of household food waste in a wider geographical area (Nahman et al., 2012; Venkat, 2012).

Photograph method: In this method, participants are instructed to take pictures of their household food waste and send them to the researcher, who then codes the types and amounts of waste that can be seen on the pictures (Herpan & Lans, 2019).

Evaluation of economic cost of household food waste

There are a number of factors that have been considered for calculating the economic costs of food waste produced by the household sector (CEC, 2019; FAO, 2014). The major factors are waste management cost, indirect environmental cost, social cost, and direct commodity value cost (Adelodun et al., 2021; Nahman et al., 2012; CEC, 2019; Venkat, 2012; FAO,

2014). Adelodun et al. (2021) calculated the economic cost of household food waste as agricultural crop by using waste management cost and direct commodity value cost. In order to calculate the waste management cost of household food waste, the amount needed for the waste disposer and the inconvenience cost of source separation of food waste were used. The study of Nahman et al. (2012), based in South Africa, assessed the economic costs of household food waste associated with two issues: the loss of a potentially valuable food source (retail value of food as commodity), and the impacts of disposing food waste to landfills (Waste management cost). Venkat (2012) used the carbon footprint (Indirect environmental cost) as a major aspect to evaluate economic cost.

The indirect social costs of food waste such as nutritional loss, related health impacts are very important for evaluating the economic costs (Varghese & Anjana, 2022; Serbini, 2020; Scherhauser et al., 2015), but studies are rarely discussed in this aspect. A Full Cost Accounting (FCA) method used by Food and Agricultural Organization (FAO) of the United Nations for estimating that the economic costs for all sector of food supply chain. The FCA considers all social, environmental and financial impacts of food waste for calculating the economic cost. FCA framework include different components such as well-being valuation to determine the social costs of natural resource degradation, market-based valuation of direct financial costs, and non-market valuation of lost ecosystem goods and



services (FAO, 2014).

Conclusion

The current paper evaluates the various quantification methods used for estimating the economic value of food waste in the household sector. The data reveals that each method has its own advantages and disadvantages. Among the seven quantification methods, self-reporting method is most popularly used. Also different aspects like Previous studies and reports reveal that there are limited studies done on the quantification and evaluation of economic costs of household food waste in India especially in Kerala.

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