

Abstract

Food Security via Food Waste Prevention: Categorization of Household Food Waste for Artificial Intelligence-Driven Interventions [†]

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Global food waste, around 1.3 billion tons yearly, presents significant implications, notably aggravating food insecurity for approximately 768 million people. Households contribute 61% of this waste, underlining the potential to increase food availability. Despite the significance of household food waste (HFW), the lack of standardized categorization poses challenges in addressing this issue effectively. This study establishes a comprehensive framework for understanding HFW within the food supply chain, aiming to enable targeted interventions to reduce specific waste categories. A systematic review of existing food waste and categorization literature is conducted to provide a background on the global food waste problem and the specific reasons why household food waste occurs. A framework that implements a nine-stage categorization process for HFW (see Figure 1) is described, resulting in 37 distinct food waste categories stemming from domestic environments. Results indicate that a significant proportion of HFW consists of edible and avoidable food waste, emphasizing the need for interventions that target these specific waste streams. By utilizing this framework, much-improved clarity about the types of food waste could be gained from consumer-focused studies. This improved data granularity would then enable far more targeted interventions to be conceived and developed to address the most prolific or problematic (e.g., highest cost or environmental impact) HFW streams. Due to increased data requirements, we proposed and discussed the suitability of this framework for implementation using intelligent systems. And the current research is discussed in the context of AI-driven customized food waste prevention capabilities. Ongoing work is addressing structured reasoning for household food waste according to household food management stages and the well-known COM-B model (capability, opportunity, motivation, behavior change). In conclusion, this study emphasizes the need for a standardized categorization to understand HFW and design effective data-driven, AI-assisted interventions based on the COM-B behavioral change model. By addressing the categorization challenges and offering practical recommendations, this study provides valuable insights for policymakers, researchers, and practitioners to reduce HFW, promote sustainable consumption practices, and increase global food security.



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1	Edibility	
	Edible	Inedible
2	Dietary Requirement	
	Required by diets	Over consumptions
3	State	
	Eatable	Not Eatable
	Not eatable by humans, eatable by animals	
4	Inedible conversion	
	Edible if processed	Never edible
	Not edible for humans, edible for animals	
5	Avoidability	
	Avoidable	Potentially avoidable
6	Viable for conversion	
	Economically, socially, culturally acceptable	
	Not viable	
7	Origin	
	Animal-based	Plant-based
8	Animal product presence	
	Meat	Animal product
	Not in contact with or mixed with meat, animal products or by products	In contact with or mixed with meat, animal products or by products
9	Treatment	
	Cooked	Uncooked

Figure 1. Indicators to categorize food waste.

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