

A systematic literature review of consuming-stage interventions in addressing food waste reduction in lower- and upper-middle-income countries

Akifa Laila Rusyda^{1*}

ABSTRACT

Introduction: Over a billion tons of food are wasted annually. There was much evidence in higher-income countries towards food waste reduction in consumption level. Conversely, some food waste volume is rising worldwide, particularly in lower- and middle-income countries. In order to improve understanding of how to minimize food waste during the consumption stage, the present literature review aimed to synthesize food-waste reduction interventions at the consumption level in lower- to upper-middle-income countries.

Methods: The study used the Google Scholar database and followed PRISMA guidelines.

Results: Three hundred sixty-five articles were retrieved from the database searched. The final round summarized 13 implemented food waste reduction interventions at the consumer stage. The finding shows also there were several main intervention types applied, including campaign (n=6), technology (n=4), policy (n=2), and others conducted in households (n=9; 70 percent), restaurants (n=2; 15 percent), and university/ college (n=2; 15 percent).

Conclusion: Policy is still a fundamental determining intervention of the effectiveness of food waste reduction at the consumption level. Furthermore, a framework suggests that community-based education may be applied as a consumption-level intervention to minimize food waste, which is appropriate for the community empowerment approach in lower- and upper-middle-income countries. Furthermore, intervention using composting eco-friendly technology also required innovation and community support.

Keywords: Consumption level; food waste; intervention; lower and middle income, review.

Cite This Article: Rusyda, A.L. 2024. A systematic literature review of consuming-stage interventions in addressing food waste reduction in lower- and upper-middle-income countries. *Journal of Community Empowerment for Health* 7(3): 163-170. DOI: 10.22146/jcoemph.96618

¹Department of Community Nutrition, Faculty of Human Ecology, IPB University, Bogor, Indonesia.

*Corresponding author:
Akifa Laila Rusyda;
Department of Community Nutrition,
Faculty of Human Ecology, IPB University,
Bogor, Indonesia;
akifa_laila@apps.ipb.ac.id

Submitted: 2024-05-30

Revised: 2024-08-06

Accepted: 2024-08-17

INTRODUCTION

Food waste is a worldwide catastrophe, with over a billion tons of wasted food annually. However, around one-third of the world's population still suffers from food insecurity, reflecting that about two billion individuals worldwide are malnourished. All nations are projected to have up to a 60% increase in food supplies to support global population demand in 2050. Low- and middle-income countries (LMICs) will have a significantly high risk on food security.¹ Households account for around 16 percent of food waste, followed by food service (26 percent) and retail (13 percent).²

Consumer behavior is the most prominent determinant of food waste.³ The vast majority of food waste at the consumer level comes from households,

retail, food services, and schools. This is frequently caused by a need for more understanding of the problem and insufficient guidelines on handling and storing food properly at home.⁴ Food waste is also driven by socio-cultural norms and attitudes that believe wasting food is acceptable and concerns about consuming food that has passed its sell-by or use-by date. Food waste is an issue globally, nevertheless, it is more prevalent in low- and middle-income countries for various causes. Reducing food waste may improve food security, address global concerns, including climate change, biodiversity loss, and pollution, and decrease the burden on waste management systems. It was a win-win situation for people, the planet, and prosperity.⁵

Food waste has a significant impact on the nutritional status of the LMIC

population, as well as the environment. In some conditions, waste reduction alone could lead to a nationally sufficient supply of fruits and vegetables and, therefore, a sufficient intake of minerals and vitamins.⁶ The cost benefits are also substantial regarding food waste reduction. For instance, reducing food waste in rural families can increase income and improve lives. Here is a staggering statistic: reducing consumer food waste by 20 to 50 percent by 2030 could save the globe between USD120 and USD300 billion annually.⁷ These savings are not just theoretical; they can be realized on both an individual and systemic level; households can cut their overall food spending by consuming more of what they buy.

Several food waste reduction goals have been established, including Sustainable Development Goal, on the

target 12.3 'Food Loss and Waste', which aims to cut per capita global food waste in half by 2030 at the retail and consumer levels, as well as minimize food losses along production and supply chains, including post-harvest losses.⁸ There are several potential strategies for each level of the food system, for instance, improved forecasting communication between retailers and agricultural producers to public information campaigns, skill-building programs at home or in the workplace, and changes in how food is packaged and sold.⁹ However, there is a lack of evidence conducting in lower- to upper-middle-income settings. Besides, within these essential interventions, policymakers and practitioners may make several decisions impacting the success of programs that reduce food waste.

Understanding how to influence food waste reduction during the consuming phase, particularly in communities where a substantial amount of food is consumed and wasted, is critical for making a significant influence.¹⁰ Therefore, the present review initiated to synthesize food-waste reduction interventions at the consumption level in lower- to upper-middle-income countries.

METHODS

The present study performed a systematic literature review to identify interventions in food waste reduction at the consumption stage across lower- to upper-middle-income countries. The systematic literature review is a valuable method since it maps, evaluates, and synthesizes material to generate an understanding of a determined topic, allowing for the identification of research gaps and the development of new research agendas.¹¹⁻¹³ The review collects and synthesizes information, with the ability to closely adhere to scientific methods and limit bias, with the goal of producing a methodological synopsis of research in a specific field study and identifying research or knowledge gaps and areas for future studies.

The study mainly maps *what kind of intervention* to reduce food waste at the consumption level is conducted in lower and upper-middle-income countries.

Hence, it may be used as an essential strategy and better future approaches. Due to the requirement that the present review is not a systematic review, it was not submitted to the International Prospective Register of Systematic Reviews (PROSPERO).

The Google Scholar database was used to identify relevant papers using combinations of the following terms: "food waste," "household," "consumption," "behavior change," and "low and middle income." The search has no start date selected to include as much scientific literature in English as possible. The present review requires the following inclusion criteria: (1) Full-text available for review; (2) Peer-review published literature; (3) Conducted in LMICs (LMICs divided into low-income economies are defined as those with GNI (gross national income) per capita of \$1,135 or less in 2022; lower-middle-income economies (GNI per capita: \$1,136 and \$4,465); upper-middle-income economies (GNI per capita: \$4,466 and \$13,845)).¹⁴ Studies that met the following exclusion criteria were excluded: (1) Unpublished results, (2) The absence of a peer-review process, (3) review, protocols, conference abstracts/presentations/posters, book chapters, editorials, and commentary or opinions, (4) Did not include outcome(s) or measure(s) related to food waste intervention at consuming-stage in LMICs, (5) Conducted in high-income country (GNI per capita was over \$13,205).¹⁴

The retrieved articles have been uploaded to Rayyan Intelligent Systematic Review®. For inclusion criteria, all titles, abstracts, and, subsequently, full-texts were reviewed and screened. For selecting compatible articles, the Preferred Reporting for Systematic Reviews and Meta-Analysis (PRISMA) guidelines were employed for systematic identification and assessment of approaches and to ensure a consistent and complete presentation of methods.¹⁵ Extracted data was organized into tables to present the general criteria of each included study. The result was applied by identifying food-waste reduction interventions at the consumption stage or level.

RESULT

Characteristics of Included Studies

The database search retrieved 365 articles. There were 103 articles excluded regarding restricted full-text availability and type of study such as proceeding, book chapter, review, and editorial. The initial round of the title and abstract submissions attained 262 Articles. A further round of full-text screening yielded 21 eligible articles. Finally, 13 relevant publications were selected using the inclusion criteria. The flow diagram of the present review using PRISMA guideline was presented in Figure 1.

Table 1 summarizes the review of the included article. There are 13 eligible articles in the present systematic literature review after screening from 21 retrieved articles. Excluded articles (n=8) did not meet the criteria of the study for the reason that these studies were conducted in high-income countries. Each article was described by reference, study location (country), GNI data at each country, study setting, methods, type of intervention, and key findings.

Type of Interventions and Study Settings

Interventions are defined as one or several specific actions implemented to reduce food waste at the consumption level. The thirteen articles focusing on downstream food waste reduction intervention were first categorized by the main intervention types that were applied: campaign (n=6), technology (n=4), policy (n=2), and others. The finding in lower- and upper-middle-income countries is lower than the preceding review, mainly in high-income countries and global settings.⁹ The study setting varied based on the household (n= 9; 70 percent), restaurant (n= 2; 15 percent), and university/ college (n= 2; 15 percent). In addition, most of study was conducted in Asia region (n=10; 77 percent). Figure 2 illustrates the type of interventions and study settings for included articles in the present systematic review.

DISCUSSION

Campaigns or community-based education are the most applicable

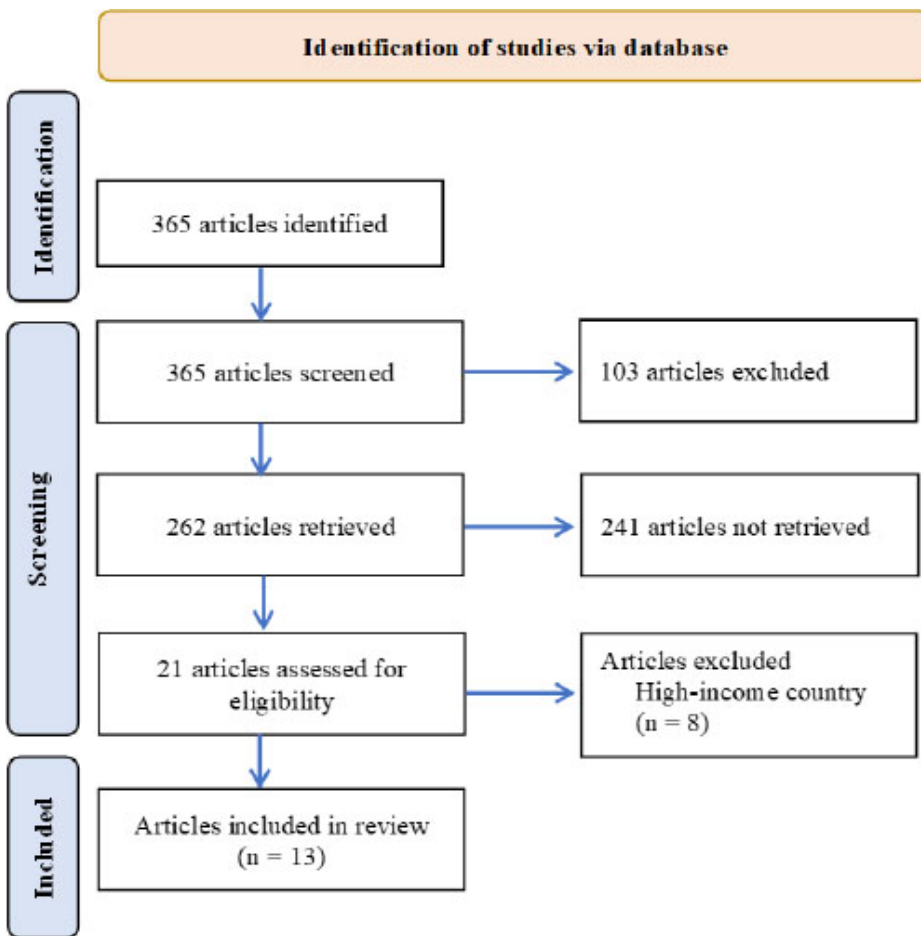


Figure 1. PRISMA flow diagram for a systematic literature review.

interventions in reducing food waste at the consumption level, including households, restaurants, and universities. Previous reviews also showed that informational campaigns had up to 28 percent reduction in food waste worldwide. The informative campaign may change the behavior of the targeted group of communities, students, hotel managers, and restaurant guests.^{17,19,25} Various delivery methods were used, including informative campaigns using banners, slogans, stickers, and training programs. However, one of the studies in China found that the campaign “*Clean Your Plate*” had no substantial effect on the weight of plate waste.²³ Therefore, to improve the effectiveness of the campaigns, the joint participation of the government, social organizations, and the public is necessary.

There was one purpose of the campaign but in different terminology found, for instance “*Clean Your Plate*”, “*No Dish Left*”, “*No Rice Left*”, “*Safe Food*”, “*Waste No Food*.” The *Clean Plate* campaign

emphasizes the importance of reducing food waste by creating awareness of the environmental and societal impact of food waste. It encourages schoolchildren and the general public to practice mindful eating by completing each meal with a clear plate. This campaign may be suitable and applicable in lower- and middle-income countries.

Technological solutions entail introducing or modifying technology and items to change food waste reduction habits. Applying such technologies to food waste management systems has become a significant concern in low- to middle-income countries.^{21,22} The technology employed in the research presented in this review is often simpler and requires active community engagement. Instead of high-tech solutions, fundamental interventions involve common food waste composting procedures that are simple to implement. Adekunle et al. reported that composting may reduce 40 to 65 percent of household waste, including kitchen

waste, food remnants, and vegetable matter.¹⁶ Composting is a process in which recyclables decompose naturally under aerobic or anaerobic conditions aided by microbial activity, and there are several techniques for accomplishing this. Several factors contribute to composting’s global acceptability, including the higher expense of secured sanitary landfill construction and accompanying greenhouse gas emissions and increasing demands for resource recovery from solid waste products.^{16,29} Composting is becoming increasingly appealing to developing countries due to the possibility of affordable costs and the beneficial usage of end products such as food.

Re-sizing portions to reduce food plates may reduce food waste in restaurant or food service settings as a restaurant prevention strategy.^{17,30} Portion size control is even more important in reducing food waste since the service staff has no direct control over portion size.³¹ The findings differed because the present review was limited to lower- and middle-income countries. Thus, the food portions may be related to household socioeconomic determinants.^{32,33}

The uneaten meal is the primary cause of food waste during consumption. To encourage more responsible eating, portion control can be used to create ‘ideal’ meal sizes.³⁴ Alternatively, consumers can select the portion size that is ‘appropriate’ for them.³⁵ Furthermore, consumer food choice can be constructed by, for example, reducing plate size, charging customers by the weight of the food they order rather than by portion, and encouraging restaurant guests to order less food at once but more frequently (so-called downsizing).³¹

Consumer choice construction is particularly essential for food services because it could significantly reduce plate waste incidence in settings such as all-inclusive and wasteful food consumption experiences. If consumer persuasion does not work, plate waste might be discouraged by charging for incomplete meals.¹⁷ If this is improper, repurposed leftovers can be provided to restaurant patrons in takeaway boxes for later consumption.³⁶ Significantly, it is stated that foodservice operators should implement all of these

strategies to educate consumers about the adverse effects of food waste. While educational programs on food waste may not be successful in the short term, they may have a long-term impact on consumer behavior.¹⁷

Food waste in restaurant settings

may also be prevented by other restaurant managements, including the 3R (reduce-reuse-recycle) food waste hierarchy; food purchasing, preparation, storage, and handling can also be monitored to prevent food deterioration, and cautiously monitoring food waste on customer plate

and listening feedback can reduce food waste.¹⁸ Spoilage-reducing strategies include enhanced control of spoilage microorganisms in supply chains and environmental sources, for example, on products and packaging.³⁷

Shorting or recycling food waste

Table 1. Summarize of included article on the present systematic literature review

Location(s)	Setting	Methods	Type of intervention(s)	Key finding(s)	Reference
Nigeria	Household	- Survey: oral interview and waste generation survey. - Composting: microbial analysis of decomposing organic waste and matured compost	Composting	Composting may reduce 40 to 65 percent of household waste, including kitchen waste, food remnants, and vegetable matters	Adekunle et al. ¹⁶
China	Restaurant	Qualitative study, data was collected using interviews with 22 subjects	1) Repurpose leftover or excess ingredients 2) Excess food is given to staff 3) Campaign: “No Rice Left, No Dish Left” 4) Provide smaller portion	- There was 68 percent of informants said that to reduce food waste, the majority took advantage of ingredient repurposing. - A significant number of informants (45 percent) claimed to play with the portion size to mitigate food waste occurring on customer plates. - Raise consumer awareness would change the behaviors towards reducing food waste (mentioned by 50 percent of informants)	Filimonau et al. ¹⁷
Taiwan	Restaurant	In-depth interview and focus group comprising 15 managers, chefs, and front-line employees	1) Standard procurement and stock management system 2) Accurate forecasting of food demand 3) Open kitchen design 4) Campaign	- The 3R (reduce-reuse-recycle) food waste hierarchy is also developed to encourage restaurant practitioners to design appropriate food waste mitigations. - Food purchasing, preparation, storage, and handling can also be monitored to prevent food deterioration. - Monitoring food waste on customer plates and listening to feedback can reduce food waste. - The campaign may also influence consumer behavior related to reducing food waste in restaurants.	Wu and Teng ¹⁸
Thailand	University/ college	- Action research using an awareness campaign - The collection of visual data was based on systematic sampling	Campaign: using banners and stickers “ <i>Safed Food</i> ”, “ <i>Waste No Food</i> ”	The campaign significantly reduced food waste from baseline ($Chi-square=26.284$, $df=5$, $p=0.000$)	Manomaivibool et al. ¹⁹

Location(s)	Setting	Methods	Type of intervention(s)	Key finding(s)	Reference
Costa Rica	Household	<ul style="list-style-type: none"> - An online questionnaire was conducted on 684 subjects. - In-depth interviews with local stakeholders to obtain existing food waste policy information 	<ol style="list-style-type: none"> 1) Own waste sorting 2) Local government waste sorting 3) Policy 	<p>The intervention held the highest influence in the model of food waste reduction ($p=0.009$).</p> <p>It was necessary to address the lack of awareness and knowledge to improve the quality of individuals in managing food waste in the household level.</p>	Montero-Vega et al. ²⁰
India	Household	<ul style="list-style-type: none"> - Segregation and anaerobic digestion process - Economic analysis using net benefit calculation 	Eco-friendly technology: a waste-to-energy plant	The biogas plant is established to reduce 500 kilograms of food waste daily (95 percent), with a payback period of around 2.1 years.	Babu and Kumar ²¹
China	Household	Survey case projects and economic and sustainability analysis	Technology: Anaerobic digestion plant	Anaerobic digestion plant reduced 70 percent of food waste in Suzhou City, China.	Wen et al. ²²
China	University/ college	A national survey in 2028 involved 30 provinces (municipalities and autonomous regions)	Campaign: "Clean Your Plate"	<ul style="list-style-type: none"> - The campaign had no substantial effect on the weight of plate waste. - Compared to standard posters, slogans, and signs, watching food-saving videos recently exacerbated the unfavorable association between the awareness campaign and the probability of wasting. 	Qian et al. ²³
Indonesia	Household	<ul style="list-style-type: none"> - One single case study concerned with how city-to-city level cooperation could directly promote the technological adaptation. - Longitudinal study: policy analysis, literature review, and survey (40 local stakeholders) 	<i>Takura Portable Compost Boxes</i> : recycling technology	<ul style="list-style-type: none"> - Takakura was implemented in about 40,000 households in Surabaya, Indonesia. - The study demonstrated a substantial improvement in the municipal solid waste management by reducing the volume of organic waste generation at disposal sites by 30%, including foods. 	Kurniawan et al. ²⁴
China	Household	Direct weighing method and survey of 3,557 tables and 195 restaurants in 4 case cities	Campaign: "Clean Your Plate"	<ul style="list-style-type: none"> - The campaign in China relied more on personal virtue and lacked incentives. - To improve the effectiveness of the campaigns, the joint participation of the government, social organizations, and the public is necessary. 	Wang et al. ²⁵

Location(s)	Setting	Methods	Type of intervention(s)	Key finding(s)	Reference
Nairobi and Dhaka	Household	Quantifying and understanding possible drivers of household food waste using the survey in 774 households	1) Technology 2) Best practices 3) Campaign 4) Policy	<ul style="list-style-type: none"> - It was necessary to use more feasible low- and mid-technology investments, such as packing products - The development of product-specific-SPOs can reduce food waste by improving quality awareness, standardization, market alignment, and options for extension and gradual technology uptake - Aware of the food label (expired date) - Education intervention or campaign also refers to training programs for improving product management - Multiple stakeholder coordination may promote all the intervention schemes 	Pedrotti et al. ²⁶
China	Household	Direct measures were made of the weights of the household waste disposed of by all of the residents in the community (N=432 households)	Shorting (recycling)	<ul style="list-style-type: none"> - The program produced a 70 percent food waste capture rate, slowly decreasing to 45 percent (54 weeks), with <1 percent contamination. - The successful program was found to be related to the responsibility and roles of 'broker' (NGO and other stakeholders). 	Xu et al. ²⁷
Indonesia	Household	<ul style="list-style-type: none"> - A case study involving qualitative and quantitative analysis of six waste bank project - A Linkert scale was applied for the variable 	Foodbank	<ul style="list-style-type: none"> - The waste banks are a viable option to manage food waste in Pangandaran, Indonesia (80 percent) and have created employment opportunities and raised awareness among the community to manage waste. - Community-based projects may provide engagement-generating value to communities and can be sustainably run by the community independently and in the long term. 	Ismiraj et al. ²⁸

produced a 70 percent capture rate, gradually decreasing to 45 percent (54 weeks), with less than one percent contamination.²⁷ Another study also shows that the shorting program strongly influences households, including own and local government programs, in the food waste reduction model ($p=0.009$).²⁰ Even though the country's waste-sorting systems have evolved in the past decade

if more effective external factors (local government facilities and management) were available, we could expect a waste reduction, or at the very least a better sorting system, with a lower volume of food waste being disposed of and a higher chance of it being recycled. Another approach intervention, for instance, indicated households with access to a waste-sorting procedure had much lower

final food waste disposal numbers than those without such a system.²⁰

The community-based waste management strategy is built on the notion of cooperation. It aims to improve communal solid waste management through source segregation, recyclable material recovery, and storage prior to collection.²⁸ A waste bank's principal activity is to act as a depository for

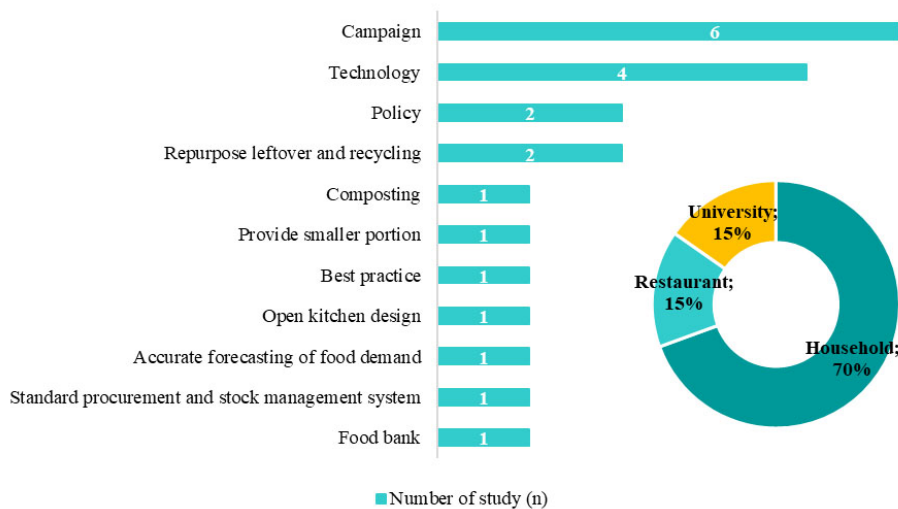


Figure 2. Type of interventions (*bar chart*) and study settings (*doughnut chart*).

collecting and managing solid waste produced by consumers, which is subsequently sold to recycling after an agreed-upon amount has been achieved between the waste bank and recycling. As a result, the revenue earned by the sale to recycling is an income source for the waste bank, which may subsequently be given to consumers at a pre-determined period.^{28,38}

The waste bank concept was first established in Thailand in 2006.³⁹ Using this technique, a community initiative may foster a feeling of connection among participants while also addressing common environmental issues in the local area. The research initiatives eliminated significant waste littering while improving community solid waste management, slum health issues, and a better living environment. In terms of economic advantages, the initiative has the potential to produce employment and more revenue in the community while also lowering municipal expenditures for solid waste treatment and disposal.

According to the present review, despite the shortage of downstream intervention studies, several evaluated interventions still have good potential for use in a broader context. The policy is still a determining indicator of the effectiveness of reducing food waste in households, universities, and food service settings. Another applicable intervention is shown as best practice, such as cross-stakeholder coordination, which reduces household food waste by ensuring compost

equipment availability and promoting campaigns. More extensive campaigns are necessary, although it is difficult to estimate the impact of individual components of the overall campaign. With multiple approaches to interventions and actors at the local level, this measure should have good potential, given the necessary resources and commitment. The present literature review identifies types of food waste reduction interventions at the consumption level. However, it does not assess the statistical significance of the effectiveness of food waste interventions for all included studies. Therefore, it is necessary to conduct a longitudinal study to analyze the effectiveness of interventions to reduce food waste at the consumption level.

CONCLUSION

The present review summarizes 13 implemented food waste prevention strategies at the consumption stage in low- and middle-income countries. This generated the identification of interventions that may be effectively implemented at scale in the household, food service, and educational settings. Policy remains an essential approach to the efficacy of food waste reduction at the consumer level. Furthermore, a framework suggests that community-based education may be applied as a household-level intervention to minimize food waste, which is appropriate for community implementation in LMICs. Aside from

that, another intervention is to use composting technology, which requires innovation and community support. For further study, it is necessary to analyze the effectiveness of each intervention at the consumption level.

ACKNOWLEDGMENT

Not applicable.

CONFLICT OF INTERESTS

The author has no conflict of interest to declare.

RESEARCH FUNDING

This study did not receive specific grants from funding agencies in the public sector, commercial, or non-profit section.

AUTHOR CONTRIBUTION

The author contributes to conceptualization, data extraction and synthesis, resourcing, writing original draft, review and editing.

REFERENCES

- Lopez Barrera E, Hertel T. Global food waste across the income spectrum: Implications for food prices, production and resource use. *Food Policy*. 2021;98:101874. doi:10.1016/j.foodpol.2020.101874
- Porter SD, Reay DS, Higgins P, Bomberg E. A half-century of production-phase greenhouse gas emissions from food loss & waste in the global food supply chain. *Science of The Total Environment*. 2016;571:721-729. doi:10.1016/j.scitotenv.2016.07.041
- Casonato C, García-Herrero L, Caldeira C, Sala S. What a waste! Evidence of consumer food waste prevention and its effectiveness. *Sustain Prod Consum*. 2023;41:305-319. doi:10.1016/j.spc.2023.08.002
- Ishangulyev R, Kim S, Lee SH. Understanding food loss and waste-why are we losing and wasting food? *Foods*. 2019;8(8). doi:10.3390/foods8080297
- Kuiper M, Cui HD. Using food loss reduction to reach food security and environmental objectives – A search for promising leverage points. *Food Policy*. 2021;98:101915. doi:10.1016/j.foodpol.2020.101915
- Brennan A, Browne S. Food waste and nutrition quality in the context of public health: a scoping review. *Int J Environ Res Public Health*. 2021;18(10). doi:10.3390/ijerph18105379
- The World Bank. *Addressing Food Loss and Waste: A Global Problem with Local Solutions*. The World Bank; 2020.
- Monica S, Maximo T. Toward a sustainable food system reducing food loss and waste. In: Global

- Food Policy Report. Washington DC; 2016. doi:[10.2499/9780896295827_03](https://doi.org/10.2499/9780896295827_03)
9. Reynolds C, Goucher L, Qusted T, et al. Review: consumption-stage food waste reduction interventions – what works and how to design better interventions. *Food Policy*. 2019;83:7-27. doi:[10.1016/j.foodpol.2019.01.009](https://doi.org/10.1016/j.foodpol.2019.01.009)
 10. Porpino G. Household food waste behavior: avenues for future research. *J Assoc Consum Res*. 2016;1(1):41-51. doi:[10.1086/684528](https://doi.org/10.1086/684528)
 11. Moraes NV, Lermen FH, Echeveste MES. A systematic literature review on food waste/loss prevention and minimization methods. *J Environ Manage*. 2021;286:112268. doi:[10.1016/j.jenvman.2021.112268](https://doi.org/10.1016/j.jenvman.2021.112268)
 12. Tranfield D, Denyer D, Smart P. Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management*. 2003;14(3):207-222. doi:[10.1111/1467-8551.00375](https://doi.org/10.1111/1467-8551.00375)
 13. Munaro MR, Tavares SF, Bragança L. Towards circular and more sustainable buildings: A systematic literature review on the circular economy in the built environment. *J Clean Prod*. 2020;260:121134. doi:[10.1016/j.jclepro.2020.121134](https://doi.org/10.1016/j.jclepro.2020.121134)
 14. World Bank Group. World Bank Group country classifications by income level for FY24.
 15. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: The PRISMA Statement. *PLoS Med*. 2009;6(7):e1000097. doi:[10.1371/journal.pmed.1000097](https://doi.org/10.1371/journal.pmed.1000097)
 16. Adekunle IM, Adekunle AA, Akintokun AK, Akintokun PO, Arowolo TA. Recycling of organic wastes through composting for land applications: a Nigerian experience. *Waste Management & Research: The Journal for a Sustainable Circular Economy*. 2011;29(6):582-593. doi:[10.1177/0734242X10387312](https://doi.org/10.1177/0734242X10387312)
 17. Filimonau V, Zhang H, Wang L. Food waste management in Shanghai full-service restaurants: A senior managers' perspective. *J Clean Prod*. 2020;258:120975. doi:[10.1016/j.jclepro.2020.120975](https://doi.org/10.1016/j.jclepro.2020.120975)
 18. Wu CME, Teng CC. Reducing food waste in buffet restaurants: a corporate management approach. *Foods*. 2022;12(1):162. doi:[10.3390/foods12010162](https://doi.org/10.3390/foods12010162)
 19. Manomaivibool P, Chart-asa C, Unroj P. Measuring the impacts of a save food campaign to reduce food waste on campus in Thailand. *Applied Environmental Research*. 2016;38(2):13-22.
 20. Montero-Vega M, Brenes-Peralta LP, Baltodano-Zúñiga D, García-Barquero ME. Which factors determine food waste-related behavior? Perspectives from households for local policymaking in developing countries. *Cogent Food Agric*. 2024;10(1). doi:[10.1080/23311932.2024.2341551](https://doi.org/10.1080/23311932.2024.2341551)
 21. Babu GR, Kumar GM. An eco-friendly solution to the food waste disposal. In: ; 2017:020068. doi:[10.1063/1.4990221](https://doi.org/10.1063/1.4990221)
 22. Wen Z, Wang Y, De Clercq D. What is the true value of food waste? A case study of technology integration in urban food waste treatment in Suzhou City, China. *J Clean Prod*. 2016;118:88-96. doi:[10.1016/j.jclepro.2015.12.087](https://doi.org/10.1016/j.jclepro.2015.12.087)
 23. Qian L, Zhao X, Liu G. The association between the awareness campaign and food waste among university students in China. *Resour Conserv Recycl*. 2024;202:107361. doi:[10.1016/j.resconrec.2023.107361](https://doi.org/10.1016/j.resconrec.2023.107361)
 24. Kurniawan TA, Puppim de Oliveira J, Premakumara DGJ, Nagaishi M. City-to-city level cooperation for generating urban co-benefits: the case of technological cooperation in the waste sector between Surabaya (Indonesia) and Kitakyushu (Japan). *J Clean Prod*. 2013;58:43-50. doi:[10.1016/j.jclepro.2013.08.002](https://doi.org/10.1016/j.jclepro.2013.08.002)
 25. Wang L, Yang Y, Wang G. The Clean Your Plate Campaign: Resisting table food waste in an unstable world. *Sustainability*. 2022;14(8):4699. doi:[10.3390/su14084699](https://doi.org/10.3390/su14084699)
 26. Pedrotti M, Fattibene D, Antonelli M, Castelein B. Approaching urban food waste in low- and middle-income countries: a framework and evidence from case studies in Kibera (Nairobi) and Dhaka. *Sustainability*. 2023;15(4):3293. doi:[10.3390/su15043293](https://doi.org/10.3390/su15043293)
 27. Xu DY, Lin ZY, Gordon MPR, Robinson NKL, Harder MK. Perceived key elements of a successful residential food waste sorting program in urban apartments: stakeholder views. *J Clean Prod*. 2016;134:362-370. doi:[10.1016/j.jclepro.2015.12.107](https://doi.org/10.1016/j.jclepro.2015.12.107)
 28. Ismiraj MR, Wulansari A, Setiadi Y, Pratama A, Mayasari N. Perceptions of community-based waste bank operators and customers on its establishment and operationalization: cases in Pangandaran, Indonesia. *Sustainability*. 2023;15(14):11052. doi:[10.3390/su151411052](https://doi.org/10.3390/su151411052)
 29. Barker A V, Bryson GM. Bioremediation of heavy metals and organic toxicants by composting. *The Scientific World JOURNAL*. 2002;2:407-420. doi:[10.1100/tsw.2002.91](https://doi.org/10.1100/tsw.2002.91)
 30. Orr L, Goossens Y. Trimming the Plate: A comprehensive case study on effective food waste reduction strategies in corporate canteens. *Sustainability*. 2024;16(2):785. doi:[10.3390/su16020785](https://doi.org/10.3390/su16020785)
 31. Kallbekken S, Sælen H. 'Nudging' hotel guests to reduce food waste as a win-win environmental measure. *Econ Lett*. 2013;119(3):325-327. doi:[10.1016/j.econlet.2013.03.019](https://doi.org/10.1016/j.econlet.2013.03.019)
 32. Langfield T, Clarke K, Marty L, Jones A, Robinson E. Socioeconomic position and the influence of food portion size on daily energy intake in adult females: two randomized controlled trials. *International Journal of Behavioral Nutrition and Physical Activity*. 2023;20(1):53. doi:[10.1186/s12966-023-01453-x](https://doi.org/10.1186/s12966-023-01453-x)
 33. Rosegrant MW, Sulser TB, Dunston S, et al. Food and nutrition security under changing climate and socioeconomic conditions. *Glob Food Sec*. 2024;41:100755. doi:[10.1016/j.gfs.2024.100755](https://doi.org/10.1016/j.gfs.2024.100755)
 34. Principato L, Pratesi CA, Secondi L. Towards zero waste: an exploratory study on restaurant managers. *Int J Hosp Manag*. 2018;74:130-137. doi:[10.1016/j.ijhm.2018.02.022](https://doi.org/10.1016/j.ijhm.2018.02.022)
 35. Betz A, Buchli J, Göbel C, Müller C. Food waste in the Swiss food service industry – Magnitude and potential for reduction. *Waste Management*. 2015;35:218-226. doi:[10.1016/j.wasman.2014.09.015](https://doi.org/10.1016/j.wasman.2014.09.015)
 36. Sirieix L, Låla J, Kocmanová K. Understanding the antecedents of consumers' attitudes towards doggy bags in restaurants: Concern about food waste, culture, norms and emotions. *Journal of Retailing and Consumer Services*. 2017;34:153-158. doi:[10.1016/j.jretconser.2016.10.004](https://doi.org/10.1016/j.jretconser.2016.10.004)
 37. Snyder AB, Martin N, Wiedmann M. Microbial food spoilage: impact, causative agents and control strategies. *Nat Rev Microbiol*. Published online April 3, 2024. doi:[10.1038/s41579-024-01037-x](https://doi.org/10.1038/s41579-024-01037-x)
 38. Setiyaningrum IF, Wati A, Suryati S. The existence of waste bank management and the impact on the environment and trends of community consumption (Case study of the Ngudi Resik Waste Bank, Krecekan, Wironanggan, Sukoharjo). *Journal on Biology and Instruction*. 2022;2(1). doi:[10.26555/joubins.v2i1.6074](https://doi.org/10.26555/joubins.v2i1.6074)
 39. Wijayanti DR, Suryani S. Waste bank as community-based environmental governance: a lesson learned from Surabaya. *Procedia Soc Behav Sci*. 2015;184:171-179. doi:[10.1016/j.sbspro.2015.05.077](https://doi.org/10.1016/j.sbspro.2015.05.077)



This work is licensed under a [Creative Commons Attribution-ShareAlike 4.0 International License](https://creativecommons.org/licenses/by-sa/4.0/).