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# A Look at Emerging Inter-Disciplinary Solutions for the Long-Term Management of Food Waste

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## Introduction

Because food waste is a current and complicated issue that is widely debated across many societal areas, the world community has designated food waste reduction as a critical component of establishing a sustainable economy. However, waste management faces a number of challenges, including insufficient funding, inadequate waste treatment infrastructure, technological limitations, a lack of public awareness of proper sanitary practises and insufficient legal and regulatory frameworks. Anaerobic digestion involves a wide range of microorganisms and can be used to convert organic waste into biogas (e.g., methane) and nutrient-rich digestate. In this study, we propose collaboration between multiple disciplines, including nanotechnology, omics, and artificial intelligence and bioengineering, that uses anaerobic digestion processes to optimise the use of current scientific and technological knowledge.

According to the United Nations Environment Programme's Food Waste Index Report 2021, approximately 17% of the world's food production is lost or thrown away. Private households account for nearly 61% of this loss, food service establishments account for 26% and retail businesses account for 13%. Most food is thrown away as a result of various errors in the food supply chain, threatening food security by affecting food availability and costs. Agriculture, post-harvest management, processing, distribution/retail/service and consumer consumption comprise the food supply chain. Food losses occur more frequently in developing countries during the production and post-harvest stages than in developed countries [1].

## Description

When waste is disposed of or recycled in a safe, ethical and responsible manner, it helps to reduce its negative environmental impacts. Traditional landfills have been widely used for waste disposal, despite the negative environmental consequences they have caused, such as air pollution, leachate generation and methane emissions. Thermal conversion occurs when waste is burned at high temperatures, changing the chemical composition. However, maintaining thermal conversion technologies, such as gasification [2].

Anaerobic digestion of food waste has become increasingly popular due to its economic and environmental benefits, such as the generation of renewable energy, the recycling of nutrients and the reduction in waste volumes. As a result, most developed countries are becoming more environmentally conscious by discontinuing food waste transfer to landfills and air pollution-associated treatments such as incineration or gasification. This type of transformation would have a positive impact on the viability of sustainable food [3].

Because of the significant contributions made by various disciplines in addressing waste management issues, the current perspective comprehensively traverses disciplines such as omics, bioengineering/bioprocessing and nanotechnology by advocating for an inter/multidisciplinary approach to waste management. Indeed, by increasing the efficiency of biogas production during the anaerobic digestion process, omics techniques have provided exceptional opportunities for exploring microbial communities, genes, proteins (proteomics) and metabolites (metabolomics). In omics, cutting-edge technologies such as next-generation sequencing, mass spectrometry, in silico modelling, microarrays and others are used to generate valuable biological data on microbes and their cellular activities, as well as critical biomolecules involved in waste bioremediation [4,5].

## Conclusion

The remainder of the paper is structured as follows: Section 2 examines the literature on food waste in the global context: - this section provides an overview of the global impact of food waste on the environment, economy and natural resources. The impact of the COVID-19 pandemic on food waste generation is then discussed in Section 3: this section briefly highlights the impact of COVID-19 on global economic losses, waste management and the circular economy. Section 4 discusses food waste management, regulations and biological treatment technologies.

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