

Transforming the Agri-Food Sector Tackling Social and Environmental Challenges Through Circular Economy Solutions

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Modern agriculture faces the dual imperative of minimizing its environmental footprint while simultaneously ensuring global food security to meet the needs of a growing population (Van Raamsdonk, et al., 2023). This paper highlights some of the key challenges facing modern agriculture and presents a selection of potential strategies to address them, including adopting circular economy approaches.

The paradox

In 2023, around 733 million individuals experienced hunger, representing one out of every eleven people worldwide and one in every five individuals in Africa (FAO et al., 2024). On the other hand, more than 1 billion people in the world are obese (WHO, 2024). In 2019, around 2 billion individuals lacked consistent access to safe, nutritious, and sufficient food while nearly 750 million people, or about one in ten globally, were subjected to severe food insecurity (FAO, 2020). Despite the astonishing percentage of people in hunger, around 17% of the food available is wasted across household (11%), food service (5%) and retail sectors (2%) (UNEP, 2021) and additionally 14% of food globally is lost between harvest and retail, this alone amounting to \$400 billion in economic losses annually (FAO, 2019).

Tackling food loss and food waste

To address food loss along the supply chain, targeted optimizations such as advanced refrigeration technologies and predictive AI for inventory management can significantly reduce waste. This is particularly crucial in developing countries, where food loss is concentrated at the production and post-harvest stages due to challenges like inadequate infrastructure, poor storage conditions, and limited transportation networks.

In the retail sector, food waste can be mitigated through various strategies, including the use of matching platforms that connect retailers with the HoReCa (Hotels, Restaurants, and Cafés) sector, offering discounts on items nearing expiration, and revising policies that mandate fully stocked shelves until closing time. A specific example includes the bakery and pastry sections in supermarkets, where policies often lead to overstocking and waste.

At the household level, food waste generation per capita is relatively consistent across income levels, underscoring the need for universal interventions (UNEP, 2021). Effective strategies could include promoting behavior change, reducing the prevalence of fresh produce pre-packed in larger amounts in retail, discontinuing promotions like “buy 2, get 1 free,” a.o. Tools such as surplus food marketplace app Too Good to Go (2024) and initiatives to redirect surplus food to food banks or community sharing programs can also play a pivotal role in saving food from waste in the food service sector.

From a policy standpoint, imposing charges on the weight of discarded organic waste by household can encourage sustainable behavior and reduce the volume of household food waste.

Tackling agricultural environmental burden

It was estimated, that the food systems are responsible for a third (34%) of global anthropogenic greenhouse gas emissions, majorly associated with agriculture and related land use and land-use change activities (Crippa et al., 2021). Food waste is associated with an estimated 8-10% of global greenhouse gas emissions. For sustainability, prioritizing grains and legumes for direct human consumption over livestock feed is an impactful strategy, as this approach optimizes caloric efficiency and reduces resource use (Ferreira et al., 2021). A global transition towards predominantly plant-based diets has also been recognized as a crucial measure in mitigating climate change. Livestock, particularly cattle, is associated with a disproportionately high carbon footprint (Poore and Nemecek, 2018). Sustainable agricultural systems, encompassing approaches such as regenerative agriculture, climate-smart agriculture, integrated and organic farming, and agroforestry represent viable strategies for producing food and other agricultural outputs with a lower environmental impact (Muhie, 2022).

Final thoughts

Challenges in the agri-food sector must be addressed promptly to ensure sustainable outcomes. Implementing readily available, high-impact solutions on a large scale is essential. Furthermore, fostering awareness, instilling a sense of urgency, and facilitating the global exchange and adaptation of innovative solutions are critical for progress.

References

1. Leo WD Van Raamsdonk., et al. "New approaches for safe use of food by-products and biowaste in the feed production chain". *Journal of Cleaner Production* 388 (2023).
2. FAO, IFAD, UNICEF, WFP and WHO. "The State of Food Security and Nutrition in the World 2024 - Financing to end hunger, food insecurity and malnutrition in all its forms". Rome (2024): 286.
3. WHO, World Health Organization. "One in eight people are now living with obesity" (2024).
4. FAO, Food and Agriculture Organization. "The State of Food Security and Nutrition in the World 2020: Transforming food systems for affordable healthy diets". Rome (2020).
5. UNEP, United Nations Environment Programme (2021). "Food Waste Index Report 2021". Nairobi (2021).
6. FAO, Food and Agriculture Organization "The State of Food and Agriculture 2019. Moving Forward on Food Loss and Waste Reduction". Rome (2019).
7. Too Good To Go (2024). <https://www.toogoodtogo.com/en-us>
8. Monica Crippa., et al. "Food systems are responsible for a third of global anthropogenic GHG emissions". *Nature Food* 2.3 (2021): 198-209.
9. Helena Ferreira., et al. "Legumes as a Cornerstone of the Transition Toward More Sustainable Agri-Food Systems and Diets in Europe". *Frontiers in Sustainable Food Systems* 5 (2021).
10. Joseph Poore and Thomas Nemecek. "Reducing food's environmental impacts through producers and consumers". *Science* 360.6392 (2018): 987-992.
11. Seid Hussein Muhie. "Novel approaches and practices to sustainable agriculture". *Journal of Agriculture and Food Research* 10 (2022): 100446.

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