Chapter 6
Food Loss and Waste:
A Sustainable Supply Chain Perspective

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ABSTRACT

Sustainable production and consumption of food are vital for sustainable development. About one-third of all food produced for humans are either lost or wasted causing increased food insecurity and immense economic and social costs. In a world where famine has been an alarming issue, any action to reduce food loss and waste (FLW) is crucial. This chapter reviews, from a sustainable supply chain perspective, the extant literature on food supply chains and discusses FLW issues, especially within the context of sustainable consumption of fruits and vegetables. A framework for sustainable food supply chains (SFSCs) from both production and consumption ends are discussed. In doing so, such current disruptive intelligent technologies as blockchain and the internet of things are emphasized as potential enablers for SFSCs. Mainly driven by consumers' awareness of the pressing issues in the world and consumption behaviour, mitigating FLW in SFSCs would not only result in efficient land and water use but also positively impact climate change and livelihoods towards sustainable development.

INTRODUCTION

Thanks to the growing global population, climate change, deteriorating natural resources, urbanization at an unsustainable rate and widening inequities in food accessibility, hunger in the world is on the rise. Although public and corporate awareness of Food Loss and Waste (FLW) has increased, much needs to be done. According to the Food and Agriculture Organization of the United Nations (FAO), about one-third of all food produced globally is either lost or wasted and almost 690 million people are on the verge of starvation. To that end, Goal # 12 (Sustainable Production and Consumption) of the United

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Nations Sustainable Development Goals (SDGs, hereafter), among others, aims to develop policies by which producers grow sustainably and efficiently and consumers shift to nutritious and safe diets with lower environmental footprints (FAO, 2021a).

From farming and production to packaging and distribution to retail and catering to the valorization of lost or wasted food, the food industry is an extremely complex Supply Chain (SC) networks of local and global small business entities ranging from small farm producers to giant retail stores. Add to this, the food industry is rife with disinformation such as "green-washing" that impede consumers from better transition to truly sustainable ways of food consumption and lifestyles.

There is a delineation between Food Loss (FL) and Food Waste (FW). As defined in FAO (2021b), FL is "the decrease in the quantity or quality of food resulting from decisions and actions by food suppliers in the chain, excluding retailers, food service providers and consumers. Empirically, it refers to any food that is discarded, incinerated or otherwise disposed of along the food supply chain from harvest/slaughter/catch up to, but excluding the retail level, and does not re-enter in any other productive utilization, such as feed or seed." And FW "refers to the decrease in the quantity or quality of food resulting from decisions and actions by retailers, food service providers and consumers." That is, FW happens when *edible* food is discarded prematurely or unnecessarily; and FL happens when food is damaged or destroyed before it reaches the consumer.

As reported by the World Food Program USA (WFPUSA, 2021), global hunger is not due to a lack of food but rather inefficiencies in the food system; roughly 1.3 billion tons of food worth about $1 trillion is lost or wasted each year. Interestingly, FW is found to be more prevalent in high-income countries, whereas FL happens more in low-income countries. It turns out that an average US citizen wastes about 110 kgs of food each year, while farmers in Africa lose about 40% of all the food they grow. These striking facts let alone point to the need to distinguish FL and FW and how appropriate mitigation strategies and actions should be taken for each, from the sustainability angle.

Having gained more interest since the late 20th century, the concepts of "sustainability" and "sustainable development" continue to evolve by including equity and justice in their scopes. Because of regulatory and consumer pressures and climate change, more and more companies seem to adopt these "buzz words" in their missions statements. On the other hand, an increasing amount of research effort has been directed to the study of sustainable supply chain management (e.g., Khan et al., 2020). One of the sustainability goals is to achieve a minimum level of well-being that depends on people's ability to adequately deal with inefficiencies that can lead them to poverty (Jackson, 2014). Ensuring that this goal is attainable for all humanity and mitigating food insecurity should be demonstrated primarily with food justice. In this period when production is gradually decreasing, the inverse rate increase in consumption does not provide equal opportunities for all individuals over the globe. Our materialistic world goes all the way into our fridges and disappears at the bottom of the garbage. Parfitt et al. (2010) reported that "As much as half of all food grown is lost or wasted before and after it reaches the consumer." Therefore, FLW must be eliminated by all means to alleviate hunger in the world.

As human beings consume more than they produce, the effective proof of this consumption is transformed into the most unconscious conduct. For example, 230 million tons of net production in Sub-Saharan Africa and 222 million tons of FLW in industrialized countries are almost equivalent to each other (Ishangulyyev et al., 2019). On the other hand, United Nations (2021b) reports that the agricultural supply needs to be increased by 70% to meet demand in 2050.

Any sustainability initiative should align with United Nations' Sustainable Development Goals (UN-SDGs). More than 700 million people, 10% of the world population, still cannot meet their basic needs