Fact Sheet: Tough Questions about Beef Sustainability

Project Title: How Does Food Waste Impact Sustainability?

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Global food security and sustainability are emerging challenges for policy makers, producers, manufacturing companies, retailers, and consumers. Globally, about 1.3 billion tons of food per year is lost.[1] When compared to national greenhouse gas (GHG) emissions, the carbon footprint of lost food would be third behind the total emissions of China and the United States.[2] Food is lost or wasted throughout the entire life cycle, from agricultural production to final household consumption, resulting in avoidable economic and environmental impacts. Therefore, a fuller characterization of food loss in each supply chain stage, as a function of consumption patterns associated with different rates of loss for different commodities, coupled with an assessment of the potential environmental impacts of food loss will help to identify opportunities to improve resource efficiency.

A tiered, hybrid, input-output (IO)-based life cycle assessment (LCA)[3] was conducted to quantify the potential environmental impacts of food loss associated with current food consumption patterns and USDA Center for Nutrition Policy and Promotion (CNPP) Food Pattern (FP) recommendations[4] (Figure 1). Each food group was modeled using a sectoral analysis based on the U.S. Department of Commerce, Bureau of Economic Analysis (BEA) commodity groups with environmentally extended IO (EEIO)[5] coupled with process models for the post-production distribution and management of the food waste.

Important Findings

The total avoidable and unavoidable U.S. food losses over the whole life cycle of each food group at the primary, retail, and consumer levels aggregates to 105 million tons (232 billion pounds) per year under current consumption patterns, and represents 45.2% (overall breakdown shown in Figure 1) of annual U.S. food production by weight. It increases to 148 million tons (326 billion pounds) of projected food loss per year if all U.S. citizens adopted the USDA dietary guidelines, assuming the same fractional loss rates for each food category in both scenarios. The full life cycle estimation of the lost food results in total GHG emissions of 410 million tons of carbon dioxide equivalents (CO_2e) per year (3.68 kg CO_2e capita^{1} day^{-1}) for current consumption, and it increases to 506 million tons CO_2e per year (4.53 kg CO_2e capita^{-1} day^{1}) for USDA recommendations (Figure 2). Under current consumption patterns, food loss by the total red meat group including unavoidable loss is the single largest GHG emissions contributor, representing 38.6% (158 million tons CO_2e emissions per year) of the total. Based on the USDA-recommended FP, food losses by the fruit/juices (26.7%) and milk/dairy (21.3%) groups become the two major GHG emissions contributors followed by vegetables (18.6%). Similar changes were observed for several other impact categories. Smog formation and acidification show no difference between the two scenarios and eutrophication is the only category for which impacts of food loss for the recommended diet has a lower impact, as shown by the contribution analysis in Figure 3. Shifting dietary patterns towards the USDA dietary guidelines results in an increase of 23.2% in GHG emissions and increases in other environmental impact categories. The recommended reductions in red meat, poultry, grains, eggs, fats/oils and sweeteners consumption and associated losses decrease GHG emissions, but this is offset by increases in vegetables, fruit/juices, and milk/dairy consumption and emissions associated with those losses.

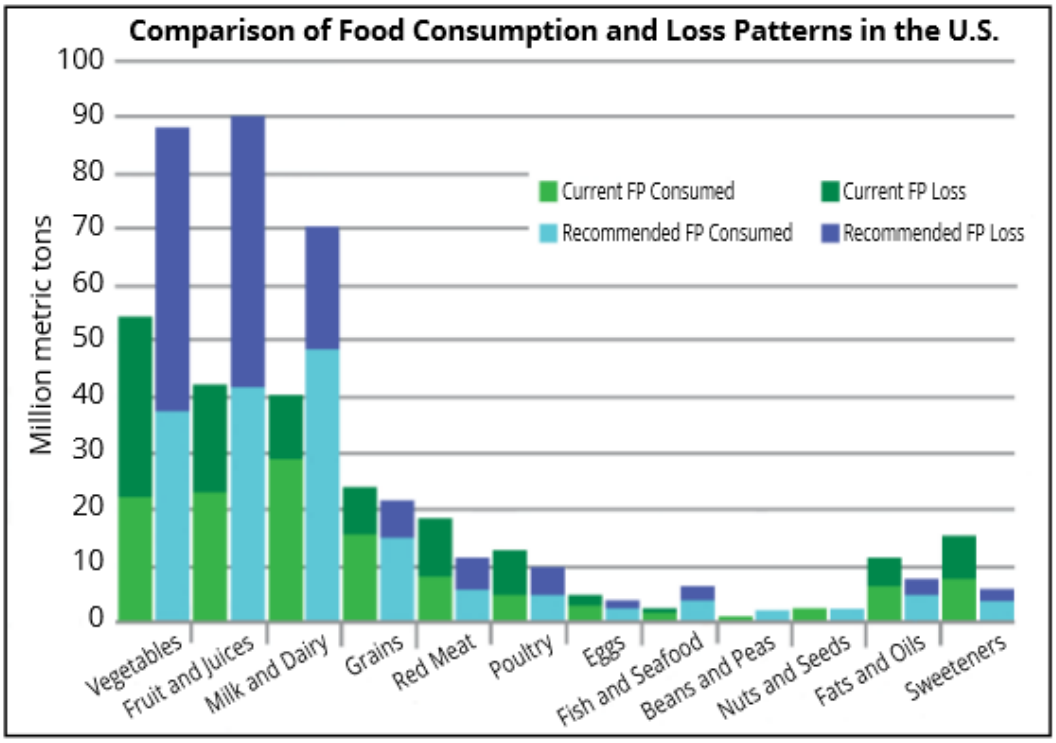

Figure 1. Food consumption and loss under current consumption pattern and CNPP-recommended pattern.

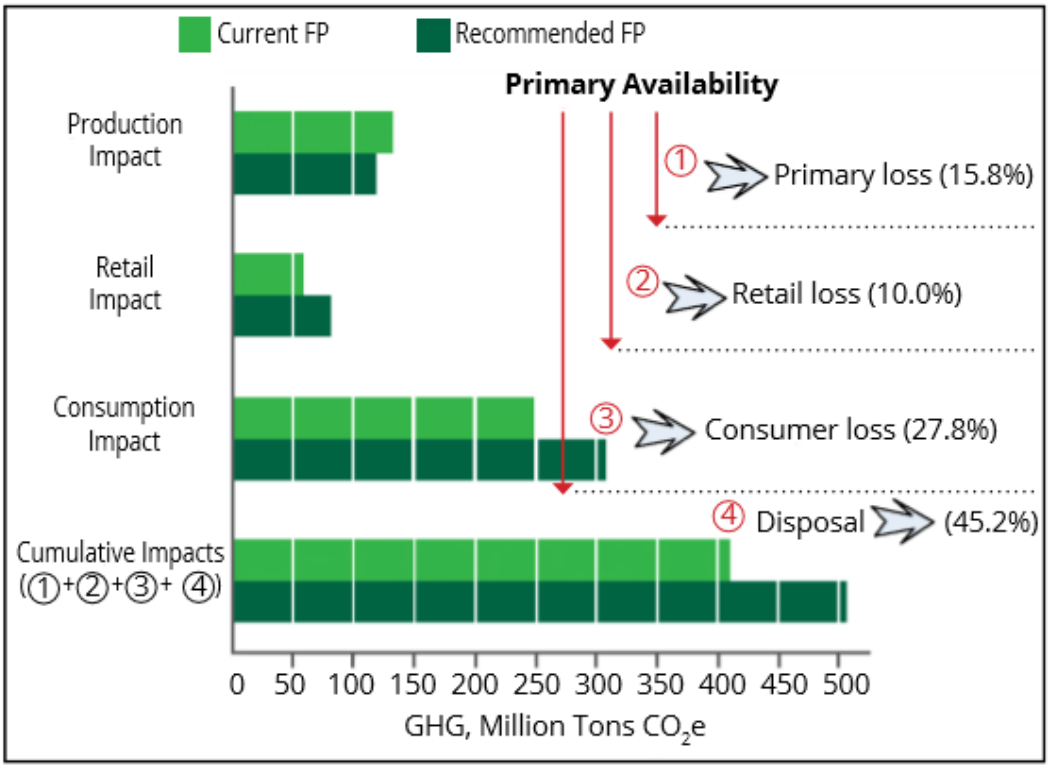

Figure 2. Supply chain model and distribution of greenhouse gas emissions due to food waste.

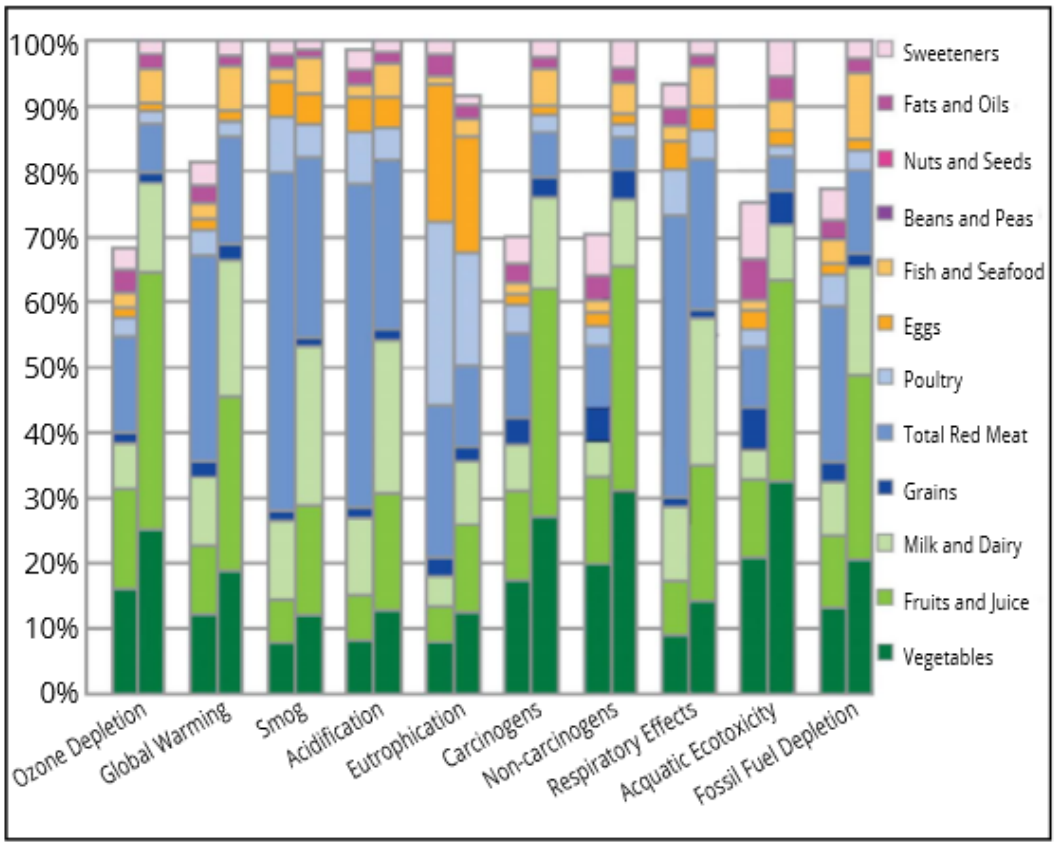

Figure 3. Relative contribution of food waste from each food group to environmental impact based on the current FP consumption (left column) and recommended FP consumption (right column). The legend at right is read from bottom to top matching the pattern.

Bottom line: Due to the tremendous impacts associated with food waste, and as sustainability becomes a topic considered in dietary recommendations,[6] the incorporation of a full life cycle perspective of the diet into these considerations is essential.

Literature Cited

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