



Fact Sheet 13 in the Series: Tough Questions about Beef Sustainability

How does food waste impact sustainability?

Greg Thoma, Ph.D.
University of Arkansas

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) recommendations⁴ (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

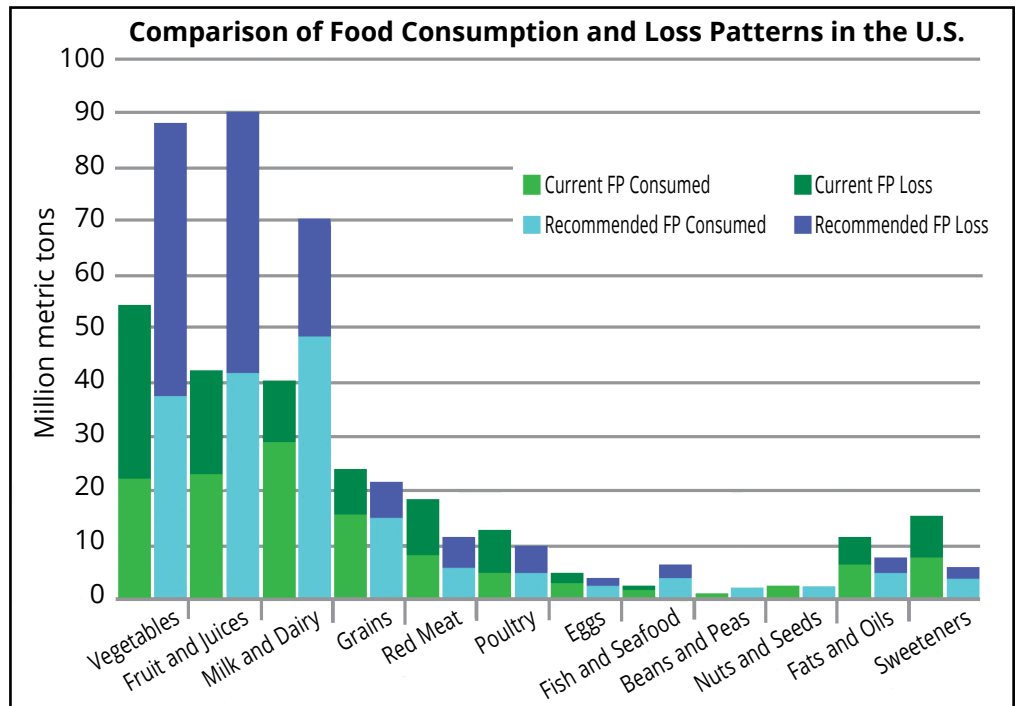


Figure 1. Food consumption and loss under current consumption pattern and CNPP-recommended pattern.

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 (CO₂e) per year (3.68 kg CO₂e capita⁻¹ day⁻¹) for current consumption, and it increases to 506 million tons CO₂e per year (4.53 kg CO₂e 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 CO₂e 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,

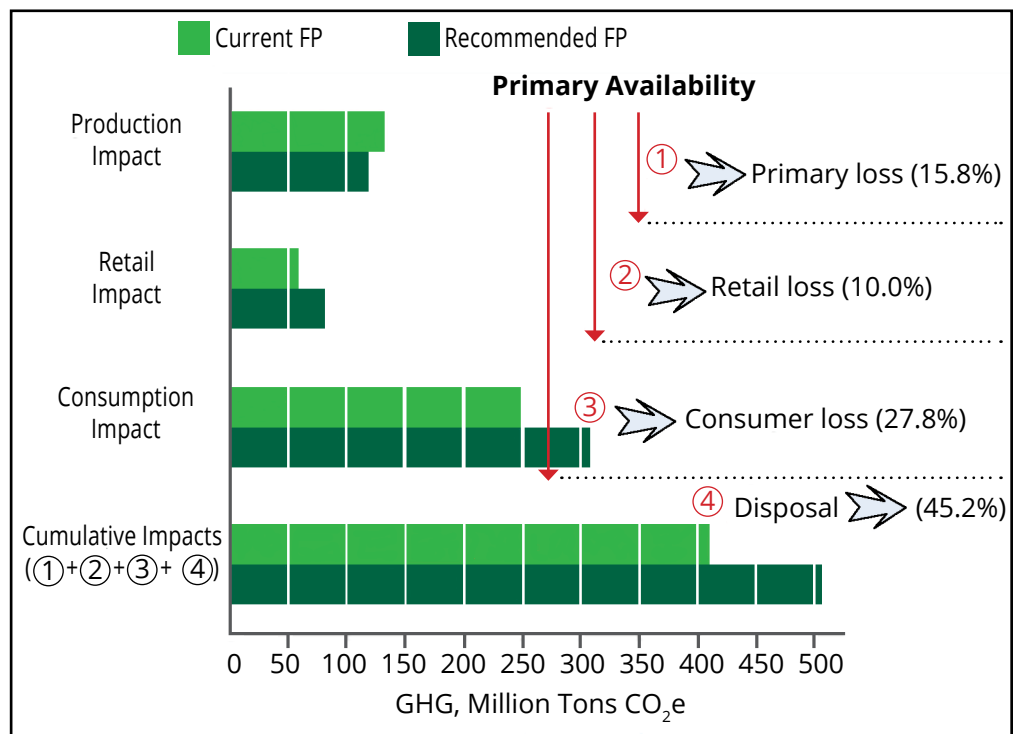


Figure 2. Supply chain model and distribution of greenhouse gas emissions due to food waste.

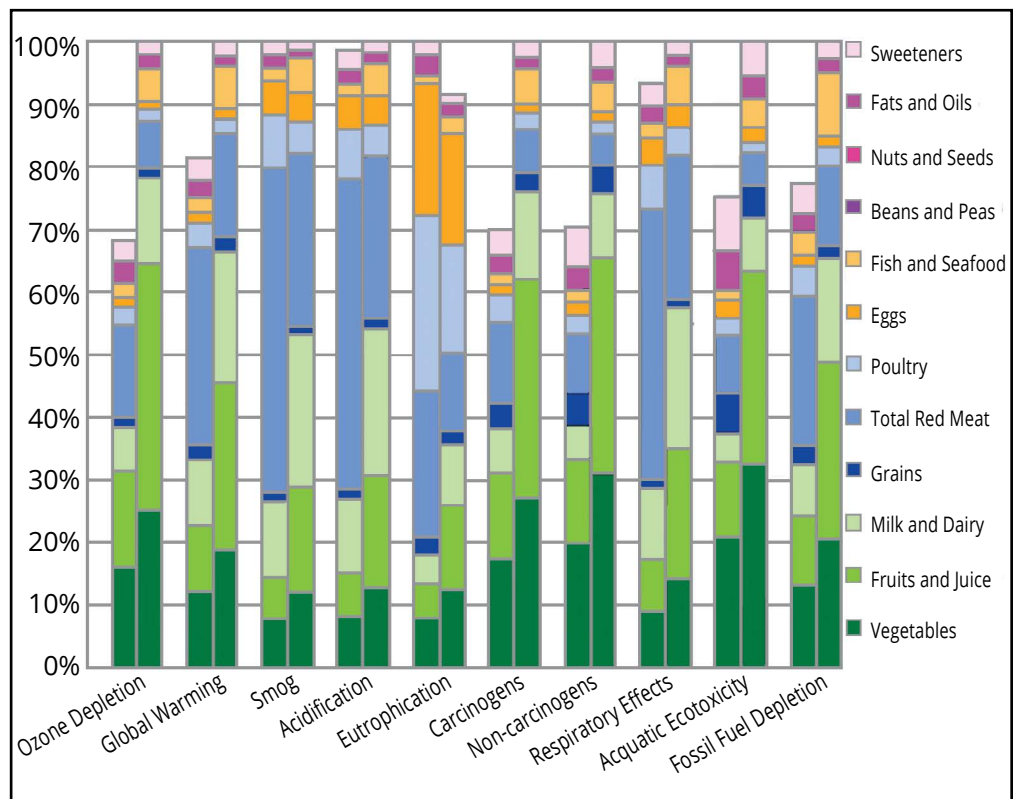


Figure 3. Relative contribution of food waste from each food group to environmental impact based on the current FP consumption (left column) and recommended FP consumption (right column). The legend at right is read from bottom to top matching the pattern.

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.

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

- ¹Gustavsson, J., Cederberg, C., Sonesson, U., van Otterdijk, R., Meybeck, A. 2011. Global food losses and food waste: extent, causes and prevention. Food and Agriculture Organization of the United Nations, Rome, Italy.
- ²Olivier Jan, C. Tostivint, A. Turbé, C. O'Connor, and P. Lavelle. 2013. Food wastage footprint. Impacts on natural resources. Summary Report. United Nations Food and Agriculture Organization, Rome, Italy.
- ³Kim, D., C. Scrafford, L. Barraj, E. Barnett, S. McNeill, K. Stackhouse-Lawson, and G. Thoma. Life cycle assessment of food loss associated with current US consumption compared to the recommended USDA Food patterns. Resour. Conserv. Recycl.
- ⁴USDA and USDHHS. 2010. Dietary Guidelines for Americans. 7th Ed., U.S. Department of Agriculture and U.S. Department of Health and Human Services, Washington, D.C.: U.S. Government Printing Office.
- ⁵Suh, S. 2005. Developing a sectoral environmental database for input-output analysis: the comprehensive environmental data archive of the US. Econ. Syst. Res. 17:449-469. Available from: <http://www.tandfonline.com/doi/abs/10.1080/09535310500284326>
- ⁶Ministry of Health of Brazil. 2014. Dietary Guidelines for the Brazilian for the Brazilian. Available from: <http://www.foodpolitics.com/wp-content/uploads/Brazilian-Dietary-Guidelines-2014.pdf>

For more information, contact:

National Cattlemen's Beef Association
Contractor to the Beef Checkoff Program
9110 East Nichols Avenue
Centennial, CO 80112
303.694.0305

Copyright© 2016 Cattlemen's Beef Board and National Cattlemen's Beef Association.
All rights reserved.