



## Better ATE than never: *Reducing wasted food*

The Food and Agriculture Organization of the United Nations reports that approximately one third of all food produced in the world for human consumption every year goes uneaten<sup>1</sup>. As an example, perfectly good produce that is considered misshapen or otherwise unattractive<sup>2</sup> is regularly discarded before reaching your grocery store shelves. The problem is even more pronounced in the United States, where the Environmental Protection Agency (EPA) estimates that more food reaches landfills and incinerators than any other single material in our trash<sup>3</sup>. Uneaten food also wastes resources (water, fertilizer, pesticides, land, etc.) used in food production. At the same time, it has been estimated that over 42 million Americans are food-insecure<sup>4</sup> and could take advantage of all of this squandered food, frequently described as “wasted food.”

- 1. Just eat it!**—Create a mathematical model that a state could use to determine if it could feed its food-insecure population using the wasted food generated in that state. Demonstrate how your model works for Texas; you may choose to use provided data.
- 2. Food foolish?**—Personal choices when it comes to food consumption primarily occur at the grocery store, school cafeteria, restaurants, and at home. Create a mathematical model that can be used to determine the amount of food waste a household generates in a year based on their traits and habits. Demonstrate how your model works by evaluating it for the following households (provided data may be helpful):
  - Single parent with a toddler, annual income of \$20,500
  - Family of four (two parents, two teenage children), annual income of \$135,000
  - Elderly couple, living on retirement, annual income of \$55,000
  - Single 23-year-old, annual income of \$45,000
- 3. Hunger Game Plan?**—Communities are starting to recognize and address the opportunities associated with repurposing potentially wasted food. Think of a community that you belong to (your school, town, county, etc.) and use mathematical modeling to provide insight on which strategies they should adopt to repurpose the maximal amount of food at the minimum cost. In particular, quantify the costs and benefits associated with your strategies.

**Your submission should include a one-page executive summary with your findings, followed by your solution paper—for a maximum of 20 pages. If you choose to write code as part of your work, please include it as an appendix—those pages will not count towards your 20 page limit.**

### MORE ON REVERSE

[1] <http://www.fao.org/save-food/resources/keyfindings/en/>

[2] <https://www.azcentral.com/story/entertainment/dining/2017/12/13/ugly-fruit-and-veg-food-waste/923894001/>

[3] <https://www.epa.gov/sustainable-management-food/united-states-2030-food-loss-and-waste-reduction-goal>

[4] Food insecurity refers to a lack of access, at times, to enough food for an active, healthy life for all household members and limited or uncertain availability of nutritionally adequate foods. Food insecurity may reflect a household’s need to make trade-offs between important basic needs. <http://map.feedingamerica.org/>

[5] <http://www.refed.com/solutions?sort=economic-value-per-ton>

## DATA STATEMENT

Multiple agencies collect a wealth of data on a regular basis. A portion of this data has been compiled and provided. You are not required to use this data; that is, you may choose to use none, some, or all of this data and/or any additional data sources you may identify while working on this problem. **Be sure to cite all resources used.**

The actual data files (names below) and descriptions of each are linked to from this page:

<https://m3challenge.siam.org/node/385>.

- Texas\_food\_data
- FoodExpenditures
- ConsumerBehaviorBasedonIncome
- AverageDailyIntakeofFood

**MATLAB Users:** If you are trying to use this data in MATLAB, you can import the data by double-clicking the files in MATLAB's "Current Folder" browser or use the [Import Data Button](#) at the top of the Toolstrip. Here is a MATLAB [video tutorial](#) about importing spreadsheet data.