

Food Waste Reduction Project

Case Study: Montana State University Culinary Services



Company Background

Montana State University Culinary Services independently manages all on-campus dining, which includes two dining halls (Miller and Rendezvous), retail locations, campus catering, bakery, and so on. Serving over 12,000 meals daily, they aim to offer students the highest quality food and service, with a diverse range of cuisines, while embracing social, nutritional, and financial responsibilities. MSU culinary services is dedicated to creating a welcoming and comfortable environment where students can connect with friends, study, or simply relax.

Project Background

Food waste is a significant issue that impacts both the environment and the economy, particularly within large institutions like universities. At Montana State University (MSU), the Culinary Center serves thousands of meals daily, making efficient food management essential to reducing waste. Excess food production not only leads to unnecessary resource consumption but also generates considerable waste, which contributes to environmental degradation and increased operational costs.



Full pans of food discarded during meal transitions

The problem we intend to solve is the inefficiency in food production and consumption at the MSU Culinary Center, which results in substantial food waste. Despite the best efforts of the dining services, there is often a mismatch between the amount of food prepared and the actual demand from students. The discrepancy leads to overproduction, where surplus food is left unconsumed. Our goal is to address this issue by developing a data-driven approach that optimizes food production and minimizes cost and waste, ultimately contributing to a more efficient dining operation at MSU.

Attempts and Proposed Solution

For our project, we focused on leveraging data analysis and mathematical modeling techniques to address the critical issue of pre-consumer food waste, using the MSU Dining Halls as our case study. We specifically gathered data from the MSU Rendezvous dining facility, which served as the basis for our analysis. Our approach involved a multi-faceted strategy:

Data Analysis: We conducted an in-depth analysis of the food consumption patterns and waste data from the Rendezvous facility. This involved examining various factors, such as total cost of waste for each month, total amount of waste for each month, comparing the pre- and post-consumer waste from each dining halls, comparing pre consumer waste from each station in Rendezvous, to identify trends and patterns that contribute to food waste.

Consumer Behavior Analysis: Understanding consumer behavior was a crucial part of our strategy. we conducted survey questionnaires and distributed among diners to gather insights on their dining preferences and consumption habits. This qualitative data provided valuable context, allowing us to adjust our model and help us with more precise demand prediction.

Proposed Mathematical Model: We developed a mathematical model using linear programming to optimize food production for any food items served by minimizing the objective cost function. The goal was to align the supply of meals more closely with actual demand, thereby reducing excess food production.

Recommended P2 Actions	% Reduction in Waste	One-time Cost (\$)	Annual Savings (\$)	Barrier to Implement
Math model for optimizing production	25-30%	\$4,000	\$34,000	Requires initial training and adjustment period for staff
More batch cooking	10-15%		\$17,000	Might cause delays during peak meal times.
Smaller serving pans	15-20%	\$2,000	\$22,600	May require more frequent refills, increasing workload for staff.
Keep tracking of waste and serving amounts	5-10%		\$11,300	Requires ongoing effort from staff to track data consistently.
Collaborating with food bank	5-10%			Coordination challenges and restriction on some rules
Post-Consumer recommendations				
Educational signage for	5-10%	\$400	\$1,300	
Menu adjustment based on feedback	5-10%			Difficulty in adjusting recipes or food options

Interns:

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