

No kale left behind: A new supple management method to limit perishable waste

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Whether it's the decomposing lettuce you bought with the best of intentions or the cheese that's not supposed to be green but is, many of

us know that sting of disappointment when we realize our fridge contents are seriously past their prime.

Imagine that on a much bigger scale, like the nearly \$54 billion in perishable retail food lost in the U.S. in 2011. That problem helped compel operations management researchers Opher Baron and Oded Berman at the University of Toronto's Rotman School of Management and their colleagues Hossein Abouee-Mehrzi of the University of Waterloo and David Chen of the Chinese University of Hong Kong, Shenzhen to devise a method for a timelier and less costly distribution of perishable inventory under simultaneous, multiple types of demands.

"There are hungry people in the world," said Prof. Baron who is a Distinguished Professor of Operations Management at the Rotman School. "To me, this waste of resources is a critical issue that makes it interesting to find out how we can better control these perishable inventories."

Suppliers of perishable products face variability in terms of the level of freshness that customers need a product to be and the lead time they have for delivering a product, complicating inventory allocation. In the case of food, restaurants tend to use their supply quickly after receiving their orders. But [grocery stores](#) may keep the same items for longer. Suppliers must also factor in variability in the time to transport products to customers at different distances away.

The researchers first came up with optimal policies for managing perishable inventory, including when and how much of a product to order; how much to hold at different ages; how to distribute product to customers with different timing and freshness demands; and for disposing of anything that hasn't been sold. The optimal model reduced costs by as much as 27 percent.

The researchers then devised a more practical and dynamic mathematical model that came within 4 percent of the cost under the optimal policies.

The single most [effective strategy](#) for cutting suppliers' costs, the study found, was shortening the lead time between receiving an order and delivering it, compared to increasing a product's shelf life or persuading customers to accept an older product.

The new method should improve on the typically simpler supply management policies many companies currently use. Prof. Baron credited more recent developments in [mathematical theory](#) for giving him and his colleagues the tools to tackle such a complex challenge.

"Thirty years ago, the mathematical machinery available couldn't solve this type of problem," he said. "Sometimes we don't understand why this 'strange math' might be relevant, but it is helping us to push the frontier of what we can do."

The paper was published in the September 2019 issue of *Production and Operations Management*. It is thought to be the first piece of research to propose optimal policies across multiple supply mechanisms, including ordering, distribution and disposal and where customers have different demands in terms of freshness.

More information: Hossein Abouee-Mehrzi et al. Managing Perishable Inventory Systems with Multiple Priority Classes, *Production and Operations Management* (2019). [DOI: 10.1111/poms.13058](https://doi.org/10.1111/poms.13058)

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