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**Food waste: The role of date labels, package size, and product category**

Norbert L.W. Wilson, Professor  
Department of Agricultural Economics and Rural Sociology  
Auburn University  
Auburn, AL 36849

E-mail: [Norbert.Wilson@Auburn.edu](mailto:Norbert.Wilson@Auburn.edu)

Bradley J. Rickard, Assistant Professor  
Charles H. Dyson School of Applied Economics and Management  
Cornell University  
Ithaca, NY 14853

E-mail: [bjr83@cornell.edu](mailto:bjr83@cornell.edu)

Rachel Saputo, Graduate Student  
Charles H. Dyson School of Applied Economics and Management  
Cornell University  
Ithaca, NY 14853

Shuay-Tsyr Ho, Graduate Student  
Charles H. Dyson School of Applied Economics and Management  
Cornell University  
Ithaca, NY 14853

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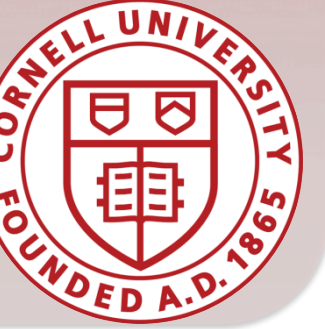
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# Food waste: The role of date labels, package size, and product category



Norbert Wilson<sup>1</sup>, Brad Rickard<sup>2</sup>, Rachel Saputo<sup>2</sup>, and Shuay-Tsyr Ho<sup>2</sup>

<sup>1</sup>Department of Agricultural Economics and Rural Sociology, Auburn University <sup>2</sup>Charles H. Dyson School of Applied Economics and Management, Cornell University



## Introduction

- In the U.S., 31% of all food is wasted, with 21% from consumers.
- Annual food waste costs in the U.S. are ~\$160 B, representing squandered natural resources and symbolizing a lost opportunity to feed the 17.5 million food insecure U.S. households.
- The UK's Waste & Resources Action Programme found **confusion over date labels may be responsible for up to 20% of household food waste.**

## Motivation

- U.S. open date labeling laws differ by state, but overall they are widely unregulated. Vague phrases including “Sell by,” “Use before,” “Best by” and “Enjoy before” are determined by the manufacturer and can be used interchangeably.
- Inconsistencies in terminology send mixed signals to consumers regarding a product's safety and quality, contributing to food waste.
- **Little empirical work exists that provides primary data to quantify food waste resulting from consumer confusion over date labels.**

## Summary of Open Date Labels

- The following are general USDA recommended guidelines for open date labels, but are not fixed standards:
  - “Sell By” conveys to the retailer how long the product can be displayed for sale. It is not an indication of a product's safety or quality.
  - “Best if Use By,” “Best Before,” or “Best By” are used to suggest the date after which the food's quality or flavor may deteriorate.
  - “Use By” recommends the last date by which the product should be consumed, but does not necessarily convey safety information.
  - “Fresh By” or “Enjoy By” indicate when a product is of peak quality.

## Key References

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Leib, E. B., Gunders, D., Ferro, J., Nielsen, A., Nosek, G., & Qu, J. (2013). The Dating Game: How Confusing Food Date Labels Lead to Food Waste in America. In, *NRDC Report: Natural Resource Defense Council.*

Newsome, R., Balestrini, C. G., Baum, M. D., Corby, J., Fisher, W., Goodburn, K., et al. (2014). Applications and Perceptions of Date Labeling of Food. *Comprehensive Reviews in Food Science and Food Safety*, 13(4), 745-769.

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## Research Questions

**Objective: Assess how consumers respond to different date labels, and how this response varies across package size and product categories.**

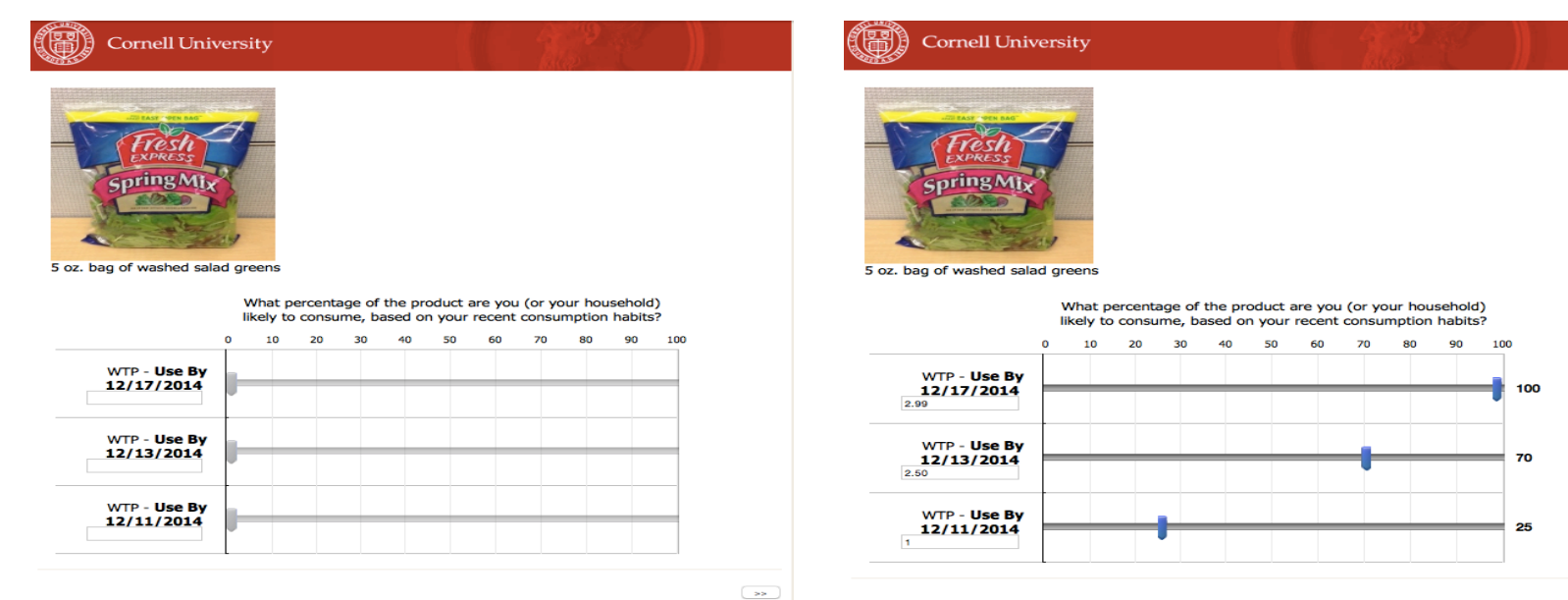
• We expect consumers intentionally waste food and have a baseline Willingness to Waste (WTW) regardless of the intent or purpose of the date label wording.

**Willingness to Waste (WTW) = WTP \* (100-% expected to consume)**

- H1: Date labels differentially affect WTW.
- H2a: The “Sell by” relative to the other treatments yields the lowest WTW.
- H2b: The “Use by” relative to the other treatments yields the highest WTW.
- H3: WTW varies by the perishability of products, date, and product size.

## Experimental Design

- Using the incentive compatible Becker-DeGroot-Marschak auction, we asked 200 non-student subjects to indicate a WTP and percentage of the food product they expected their household to consume.
- For 6 products total, including a small and large version of cereal, salad greens and yogurt, subjects stated their WTP and expected percentage of consumption for three dates (near, middle, and far).
- Subjects saw only one date label (Best by, Fresh by, Sell by or Use by), which was repeated throughout their session.



## Results & Discussion

- There is much speculation on the efficacy of various mechanisms and policies that might be used to reduce food waste, but there is little economic research examining the alternatives carefully.
- Our experiment showed subjects responded differently to the four date labels jointly and on a pairwise basis over all products, dates, and sizes, indicating on average a higher WTW under “Use by” and a lower WTW under “Sell by” treatments relative to the other treatments.

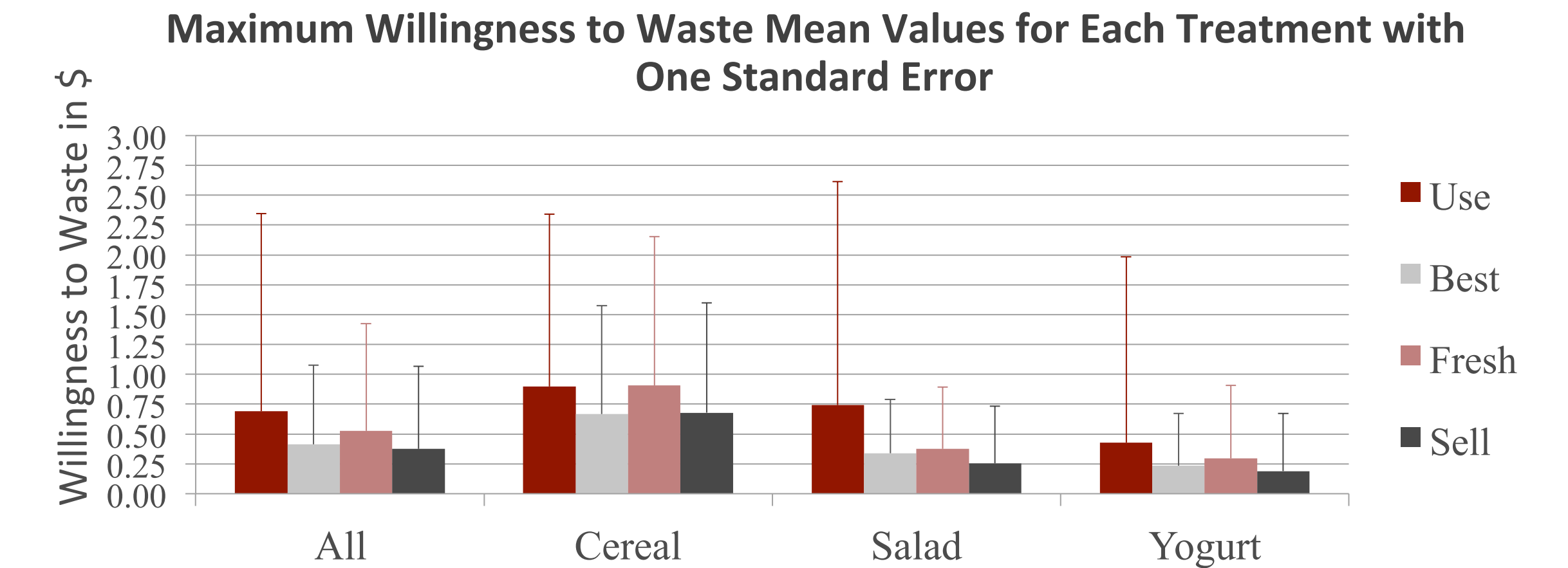


Table 1. Nonparametric Comparisons of Date Labels

Treatments	Rank Sum z-value (p-value)			
	All	Cereal	Salad	Yogurt
Best v. Fresh	-2.269* (0.0233)	-2.437* (0.0148)	-0.383 (0.702)	-0.991 (0.322)
Best vs. Sell	0.026 (0.079)	1.316 (0.188)	3.371*** (0.0007)	2.206* (0.0274)
Best vs. Use	3.153** (0.0016)	0.331 (0.741)	2.372* (0.0177)	-0.980 (0.327)
Fresh vs. Sell	5.022*** (0.000)	2.586** (0.0097)	3.399*** (0.0007)	3.008** (0.0026)
Fresh vs. Use	-1.606 (0.1084)	-2.702** (0.0069)	1.828 (0.0676)	-1.803 (0.0714)
Sell vs. Use	3.053** (0.0023)	-0.242 (0.809)	4.982*** (0.000)	0.942 (0.355)

p<0.001=\*\*\*, p<0.01=\*\*, p<0.05=\*

Table 2. Nonparametric Pairwise Comparisons of Date Labels

Treatments	Rank Sum z-value (p-value)				
	Dates			Sizes	
	Far	Middle	Near	Small	Large
Best v. Fresh	-1.37 (0.17)	-0.88 (0.38)	-1.63 (0.10)	-1.74 (0.082)	-1.60 (0.110)
Best vs. Sell	2.342* (0.019)	1.162 (0.25)	2.15* (0.032)	2.47* (0.014)	2.15* (0.032)
Best vs. Use	-0.259 (0.80)	0.110 (0.91)	0.95 (0.34)	0.366 (0.71)	0.30 (0.77)
Fresh vs. Sell	3.34*** (0.00)	1.885 (0.059)	3.60*** (0.00)	3.90*** (0.00)	3.444*** (0.00)
Fresh vs. Use	-1.41 (0.16)	-0.67 (0.50)	-0.553 (0.58)	-1.18 (0.24)	-1.15 (0.25)
Sell vs. Use	1.83 (0.067)	1.03 (0.30)	2.66*** (0.008)	2.45* (0.014)	2.027* (0.043)

p<0.001=\*\*\*, p<0.01=\*\*, p<0.05=\*