

The Role of Plastic Packaging in Reducing Food Waste

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A. Executive Summary

It is well known that food waste is a major environmental and economic concern in both developed and developing countries. What is not well known is how plastic packaging can significantly prevent additional waste and help to reduce the waste which does occur. Further, legislators generally do not recognize these benefits when considering bans on plastic packaging. This paper pulls together a variety of established research sources that illustrate ways in which relatively small amounts of packaging can minimize the negative impacts associated with relatively large amounts of foodstuffs.

B. Scope of the Problem

The large scale of the food waste problem in America is well known. The United States Department of Agriculture (USDA) estimates that approximately 40% of food produced in this country is discarded instead of being consumed.¹ This amounts to annual waste of approximately 36 million tons², worth over \$160 billion.³ Food waste also produces large environmental burden. According to the Food and Agriculture Organization of the UN, if food wastage were a country, it would be the third largest greenhouse gas emitting country in the world.⁴

It is significant to note that a large proportion of this waste is fresh food that is purchased for use at home: Up to 40% of fresh proteins (meat, fish, poultry), 44-51% of fruits and vegetables, and over 50% of dairy products are discarded before they can be consumed.⁵ (According to Dr. William Rathje, Director of The Garbage Project at The University of Arizona,, "...fresh produce is wasted at ten times or more the rate of processed fruits and vegetables, and foods that are used frequently end up in the trash much less often than foods which are used only sporadically."⁶

Adding to the problem of high levels of fresh food waste is the fact that relatively expensive fresh foodstuffs such as meats and dairy products, especially cheeses, are among the most environmentally sensitive to produce, transport and store.⁷ *Thus, items that produce the most waste economically also produce the most waste environmentally.*

C. Two Hidden Costs of Food Waste

Opportunity Cost

When food is wasted, it cannot be served to those who are in dire need of it. For reference, the USDA defines food safety as *access, at all times, to enough food for an active, healthy life for all household members*. According its latest statistics, 11%, or 13.9 million U.S. households, were not food secure.⁸

Environmental Impacts and Life Cycle Cost

Throwing away food at home or in restaurants and institutions also means that the resources used to produce that food were wasted. To better understand the full impacts of resource use and consumption during the life of a product, studies known as Life Cycle Assessments, or LCAs, are typically performed. In general terms, here is what the life cycle assessment for a typical hamburger would need to incorporate:

The bun is principally flour, which starts out as grain. Grains are grown by using water, fertilizer, pesticides, herbicides and sometimes fungicides. The seed is sown, and the grain harvested by using tractors, threshers and combines. It took plenty of raw materials and energy to manufacture these machines, and it takes fuel to keep them running. While operating, this equipment produces air pollutants and carbon dioxide, a greenhouse gas which can lead to climate change.

The grain is transported by truck or rail to storage sites, milled into flour, stored in warehouses and sent to bakeries. Milling and baking require energy to produce dough and buns, which are then wrapped and shipped to stores. Between every step, all of the transportation burns fuel and again produces pollutants.

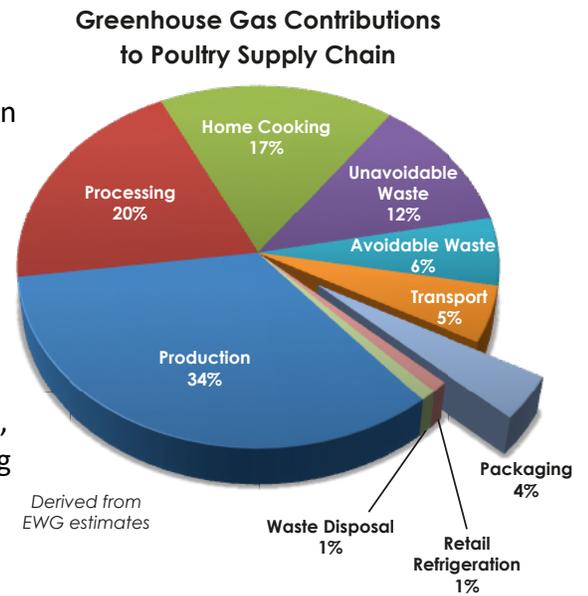
Other farm products that went into the burger include tomatoes, onions, cucumbers and lettuce. The tomatoes and cucumbers required further processing to be turned into ketchup and pickles, respectively.

To produce the burger itself, vast amounts of food and water are fed to cattle. When ready for market, cattle are transported to stockyards for sale, and then shipped to processing plants where they are slaughtered and rendered. The beef is cut, packaged, cooled and shipped to warehouses in energy-intensive refrigerator cars and trucks.

Then the meat is aged, ground into patties, packaged, refrigerated or frozen, and stored. It is then shipped in refrigerated or freezer trucks to grocery stores or restaurants where it is kept cold until ready to cook (with energy, of course). At this point, the bun, patty, condiments and packaging all come together to create the final product.

Thus, it should be very apparent that the resources used, and waste generated from farm to fork, are far greater than those put into the home or restaurant trash bin. In fact, ecologists generally agree that each link in the food chain increases resource use by a factor of 10.⁹

As an example of both the effectiveness and efficiency of packaging in protecting food and/or reducing waste, the Environmental Research Group (ERG) examined the greenhouse gas (GHG) contributions of the various factors in the poultry supply chain. As shown in the chart to the right, the majority of GHG emissions occur during production, processing and cooking, while only 4% is due to the packaging used during the entire process.¹⁰



These results are very similar to those in a landmark energy consumption study performed by INCPEN, the Industry Council for Packaging and the Environment (UK). When analyzing the percentage of energy consumption during the full lifecycle of home food consumption, the study found that packaging accounted for only 4% of total energy related to at home per capita meat consumption, 5% of per capita cheese or bread consumption, and 6% for tea and coffee consumption.¹¹

Finally, the value of packaging in reducing food waste is both highlighted and confirmed in a study issued by ReFED. Led by a collaboration of industry, government and charitable foundations, the study identified packaging optimization as one of the top three most effective solutions to reducing food waste in America.¹²

D. Primary Reasons for Food Waste

Because of differences in supply chain efficiency, food waste in the lesser developed world occurs far earlier in the value chain than it does in higher developed nations. Most food waste in lower income regions occurs during harvesting, storing and shipping, before it reaches consumers. *The major concern in these areas is getting food to market.*

On the other hand, in high income areas such as North America and Europe, the food supply chain is much more efficient, and much early supply chain waste is eliminated.¹³ *Most waste in the developed world thus occurs after food is purchased for direct consumption.*

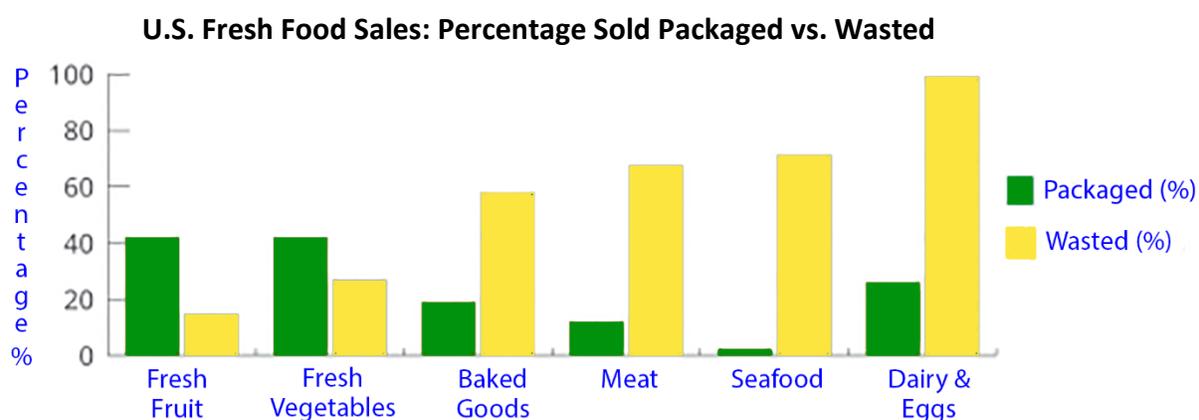
The primary reasons for food waste in higher income regions, including the United States, are:

- Spoilage from not being used on time (67%)¹⁴
- Cooking or serving more than can be eaten during a meal (33%)¹⁴

E. Packaging's Relationship to Food Waste

The inter-relationship between packaging and food waste is complex. Cultural and geographical differences; along with seasonal availability, presence of in-store and at-home refrigeration and freezer space; available discretionary income; the desire for convenience; and dietary needs all play roles in determining consumer purchase, usage, and disposal behavior.

When studying U.S. trends, it is interesting to note that Euromonitor International and ReFed point to an apparent inverse correlation between packaging and food waste. As shown in the graph below, *waste is generally greater for foods with lesser amounts of packaging.*¹⁵



Adopted by AMERIPEN from Euromonitor International 2017 & ReFED 2016

Reasons why packaging reduces food waste include a.) the ability of packaging to enhance reuse and portion control; b.) protection of nutritional value; freshness and safety; c.) provision of critical usage and storage information; and d.) convenience. Each of these areas is discussed below.

Resealability and Portion Control

Individually wrapped chicken breasts, squeezable yogurt tubes, and resealable bags of carrots are very convenient, thus increasing use-up rates and reducing waste. These packages also help to reduce food waste by ensuring that the portions not eaten remain fresh, protected, and ready for use at a later date. Just as importantly, they also help from inadvertently serving too much food at one time, which as stated earlier, is a leading cause of wasted food.

Consumers appreciate these benefits. For reference, research indicates that 81% of consumers say they would choose resealable packaging over non-resealable packaging, and more than half (54%) would pay more for packaging with added features such as being resealable or providing portion control.¹⁶

Maintaining Nutritional Value, Freshness, Safety, & Security

Packaging does more than simply “wrap up” foods. It maintains freshness so that the nutritional value, taste, and shelf life are prolonged. For example, most modern fresh food packages act as moisture and oxygen barriers which maximize freshness while reducing spoilage, bacteria, and mold formation. The latest plastic innovations even include technologies that prevent or reduce contaminants, increasing shelf life while maintaining nutritional value, potentially reducing food waste by 20%.¹⁷

Providing Necessary Usage and Storage Information

How should pecorino, gouda, and other cheeses be stored to keep them fresh and tasty? How long before a lamb chop becomes inedible? Can this fish be frozen for later use? What can be added to these salad greens to make for a complete, nutritious and tasty meal?

Much of this information is available on the package. By ensuring that consumers have the knowledge needed to serve fresh food at the peak of flavor and nutritive value, packaging helps reduce waste by increasing the amount of purchased food that is actually eaten.

Delivers the Convenience Which Meets Consumer Demand and Thus Reduces Waste

Consider peeled shrimp, shredded lettuce, or cut carrots in bags; or ready-to-serve fruit pieces in trays. Besides providing protection, packaging reduces waste by delivering only the parts of these products that are ready to eat. There is no need to dispose of the inedible stems, stalks, husks, and peels - up to 85% of the plants.¹⁸ Instead, these parts are ground into animal feed, converted into energy, or composted by farmers and food processors prior to packaging, creating natural fertilizers, soil conditioners, and moisture barriers.

F. Two Critical Final Points

When it comes to food waste, there is both a public and legislative tendency to “shoot the messenger” rather than to understand and attack the root causes of the problem. In many cases that messenger is packaging – specifically plastic packaging. Besides the research listed above, which points to the value of packaging in reducing food waste, please consider two additional factors when packaging bans or elimination of specific materials are being discussed:

Encourage recycling and recyclability, not bans, of plastic packaging

The most recent Packaging Efficiency Study¹⁹ published by *The ULS Report* found that in many instances, plastic packaging significantly reduces landfill discards versus other types of packaging for which recycling rates are significantly higher. As shown in the chart below, net discards per 1000 pounds of delivered product are significantly lower for plastic packages than for other packaging materials with far greater recycling rates.

This is due to the fact that plastics are far lighter and/or stronger than materials such as glass, paper, and metal. Even after factoring in much higher recycling rates for these competitive materials, net discards going to landfills for plastic packages vs. the others are significantly lower, between 75-88% less.

For example, as shown in the table below, switching from baby food packed in flexible pouches to baby food packaged in glass jars would increase landfill discards by 500 pounds per every 1000 pounds of food that is sold. Keep in mind that these numbers already include credit for glass recycling!

**The Role of Plastics in Reducing Packaging Waste
(Per 1000 Lbs. of Product)**

Category	Plastic			Other			Diff. in Net Discards	
	Container	Recycl. Rate	Net Discards	Container	Recycl. Rate	Net Discards	Lbs.	%
Baby Food	Pouch	0%	75.3 lbs.	Glass Jar	15%	575.0 lbs.	-499.7 lbs.	87%
Ground Beef	Tube	0%	7.0 lbs.	Paperboard Box	28%	60.9 lbs.	-53.9 lbs.	88%
Nuts	Bag	0%	19.5 lbs.	Metal Can	79%	78.9 lbs.	-59.4 lbs.	75%

The value of source reduction is far reaching. For example, Environmental Protection Agency (EPA) data indicates that between 1994 and 2012, total municipal solid waste grew by 20%. Yet, solid waste due to packaging during this time period grew by less than 1%, with the percentage of due to packaging dropping from 36% to 30% of the total. The EPA pointed out that these reductions were due to a combination of increased light-weighting and recyclability.²⁰

Thus, enhancing the environmental value of materials that are already highly efficient will produce better results than removing them and substituting less efficient materials, regardless of their higher recycling rates. *The key to reducing the environmental impact of plastic packaging is therefore not to ban it, but rather to further increase recycling rates and the use of recyclable materials.*

Recognize that small amounts of packaging reduce or prevent large amounts of food waste.

In fact, when it comes to alleviating spoilage and other forms of food waste, packaging is so critical that Helén Williams and Fredrik Wikström, life cycle assessment researchers at Karlstad University in Sweden, state that, *“Packaging that is altered in order to reduce food losses can lessen the total environmental impact and lead to large environmental gains, even if it is necessary to increase the environmental impact from the packaging itself.”*²¹

F. In Conclusion

Plastic packaging provides many different features and benefits that help to reduce food waste. These include a.) extended shelf life to ensure appetite appeal and nutritional value; b.) product protection; c.) delivery of storage, serving and usage information; d.) portion control; and e.) enhanced convenience.

Further, plastic packaging performs these functions very efficiently, thanks to relatively high levels of strength versus low levels of material use. This source reduction benefit, which is at the top of the EPA’s “reduce, reuse and recycle” hierarchy, helped drive much of the growth of

plastic packaging over the last 50 years. *Having achieved this first and frankly most important environmental objective, it is now time for industry, public, and legislative focus to move to the next level in the EPA's solid waste hierarchy, with emphasis shifting to increased recycling and reuse rates of plastic packaging.*

Finally, increasing the rates at which plastics packaging is recycled will not only keep materials in a closed loop system, *it will also continue to leverage the inherent source reduction value that plastics are known to provide.* Thus, while it may be well-meaning, legislation aimed at banning plastic packaging will most likely increase both food waste and packaging waste -- and do so at unacceptably high levels. For reference, EPA data indicates that this increase in waste would be on the order of 20-25%, equivalent to 15-20 million tons of additional waste annually.²²

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