



Food Waste: The Next Food Revolution



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Half the food in the last year was thrown out. One billion people are hungry. The next food revolution is about what you're not eating.

By [Jesse Hirsch and Reyhan Harmanci](#) on September 30, 2013, *Modern Farmer*

Photography by [Grant Cornett](#)

How are we going to feed 9 billion people by 2050? The answer to this question — [or the lack thereof](#) — is one of the biggest issues in agriculture today. Experts estimate that we need to grow 60 percent more food than we currently produce. And as a result, there is a push to constantly create more. More miracle crops. More monocultures. More monocrops. More seeds. More food.

4 Ways to End Food Waste



Want to start ending food waste now? Here's [four simple ways you can start — today.](#)

But are we missing the point? Currently, in the U.S., almost half of our food — [40 percent of what we grow](#) — ends up in the garbage. Globally, food waste [is rising to 50 percent](#) as developing nations struggle with spoilage and Western nations simply toss edible food away. Instead of turning our food system inside out to meet that 2050 deadline, why don't we simply waste less?

Do the math. If we just get better about using the food we grow, we're already almost a quarter of the way there.

We need to start somewhere. Let's start at the farm.

Farm to Table to Landfill

In Hackettstown, New Jersey, vegetable farmer Greg Donaldson leads informal tours around his fields to show visitors a large rotting pile of mostly edible produce.

The pile is a hub for perfectly good cucumbers (bent), strawberries (overripe but delicious), tomatoes (small blemishes), peaches (bruised) and garlic (split cloves). Stalks of broccoli, ears of corn, full heads of lettuce, eggplants, pears: It's a perverse cornucopia, left to decay in the sun. At the beginning of summer, the pile fits in a dumptruck bed; By fall, it needs multiple tractor-trailers to haul it away. The sight of so much wasted produce used to eat at Donaldson, make him feel bad. But he and other farmers have learned to live with it as part and parcel of being a farmer. According to the charity [Feeding America](#), more than 6 billion pounds of fruits and vegetables go unharvested or unsold each year. It's because much of the food on a farm falls victim to aesthetic trifles: the misshapen peach, the tomato too large to fit in a three-pack. Or in an uncertain economy, a farmer grows more than he

market demands, then leaves entire fields and orchards unharvested. We are growing more food than we know what to do with.

Waste By Numbers

- \$1,252 Price of food: The average American family of four spends up to this amount per month on grocery bills. The price of food purchased for consumption at home is expected to rise 2.5% to 3.5% in 2013. (MarketWatch)
- 6% However, Americans still pay less for their food than anyone else: 6% of household income, compared to 14% spent in France and 45% in Kenya. (Gates Foundation)
- 40% Rats! Almost half of preharvest losses and spoilage in developing countries occur because of attacks by rodents and insects. (World Economic Forum)
- 50% Food waste has increased by this much in the U.S. since 1974. Simultaneously, Americans have been getting fatter. In 1962, 46% of Americans were overweight or obese; in 2010, it was 75%. More food to eat, more food to waste. (Public Library of Science)
- \$43,052,480,000 It adds up: The annual cost of food waste in American households is in the billions, according to a 2004 study. Meat, although not a high percentage of food waste, accounted for \$14,042,280,000. (The University of Arizona)

And this early-stage waste is only the beginning. From transport to processor to retailer to consumer, food waste affects every step of the supply chain between farm and fork. In developing countries, nearly 50 percent of the loss happens early in foods' life: inefficient harvesting, spoilage, inadequate processing, obsolete transport technologies and other systemic problems. In Western nations, the problems are heavily weighted toward consumer and retail waste. A [comprehensive 2012 report by the Natural Resources Defense Council \(NRDC\)](#) found that a whopping 43 billion pounds of food in the U.S. was thrown away just on the retail level in 2008. Reducing food losses by only 15 percent would be enough food to feed more than 25 million Americans each year. But supermarket food is marketed with an eye toward bulk, convincing shoppers to take home more than they can use. "There is a terrible push to make consumers buy more than they need, through family-sized packaging and buy-one-get-one-free promotions," says Tim Fox, co-author of "[Global Food: Waste Not, Want Not.](#)" a report from the Institution of Mechanical Engineers (IMEchE).

Still, all this pre-consumed food waste doesn't let consumers off the hook. Think of your own fridge right now — the unappealing leftovers, the wilted lettuce, the expired milk and yogurt. A quarter of those items, according to the NRDC, will ultimately end up in the trash.

So, why worry about this? With nearly a billion hungry people in the world, 50 million in the U.S., the moral dimension is clear. Except that conservation doesn't go straight from A to B: Your half-eaten sandwich is not going to make it to people who need it. We need to worry because in a global commodity market, waste drives food prices up, for everyone. The United Nation's [Food and Agriculture Organization \(FAO\)](#) is currently working on a comprehensive report, scheduled to be out in October, that shows the link between how global food prices are set and the many tons of food we throw away. They know this much already: The amount of annual consumer food waste in industrialized nations is equal to an entire year's food production in sub-Saharan Africa.

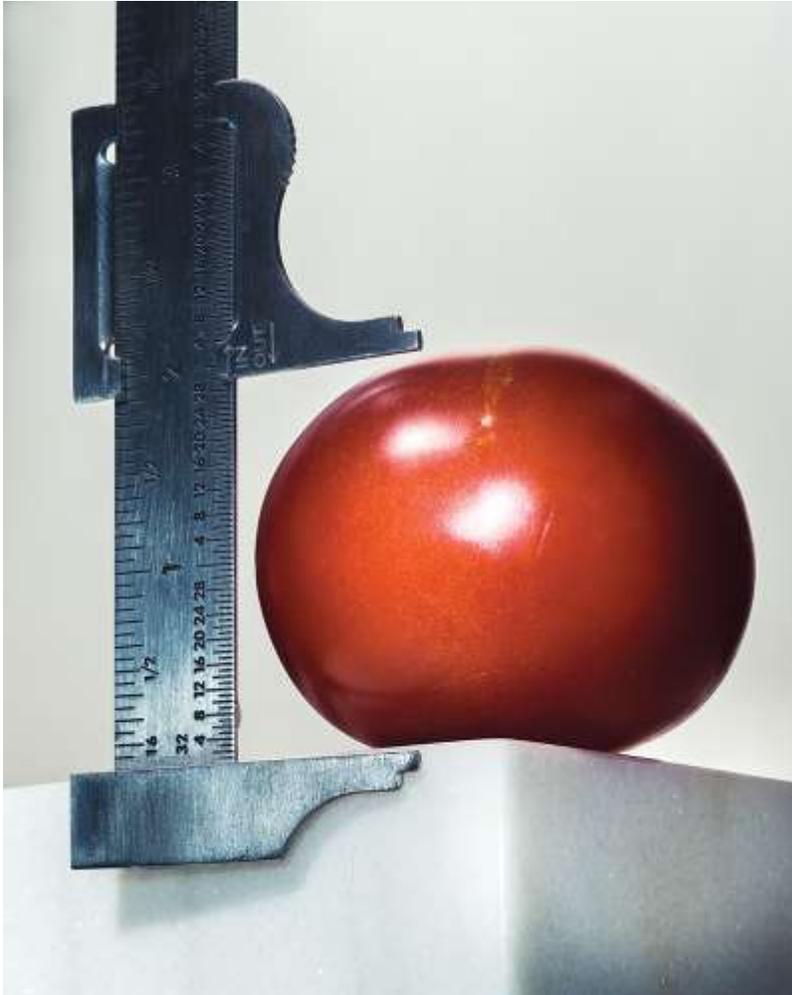
In our rush to toss dinner in the dumpster, not all food is created equal. Top of the heap, waste-wise? Cheap carbohydrates.

Of these low-rent carbs, potatoes are the biggest losers. In 2008, Waste and Resources Action Programme (WRAP), a British nonprofit, conducted a detailed analysis of avoidable food waste in the U.K., breaking it down into minute detail (the report includes itemized breakdowns of yogurt drink, crumpet and green onion waste). In their list of top 100 foods wasted, potatoes are No. 1, making up almost 10 percent of all food waste — over 800 million pounds are wasted annually in the U.K. alone. These stats are borne out globally, as the FAO estimates roots and tubers (aka potatoes and other starches) are wasted at three times the rate of meat. It's especially bad in the Americas, where 60 percent of all of the roots and tubers grown get tossed. (Around the world, meat and dairy are the least wasted. It's rare for countries to do away with more than 20 percent.) This waste isn't just at home: Fast-food restaurants regularly toss fries that sit around for less than 10 minutes. But this isn't just a case of throwing away half our uneaten french fries. Pests and disease destroy some potatoes before they leave the farm, some are lost during transport and storage and a huge amount — 1 million annual tons in Europe alone — are lost during processing. Even though every part of the tuber is edible, industrial production culls some of the spud's best parts. Lyle Olson, a 40-year veteran in food processing and packaging, says the industry rule of thumb is that 50 percent of every processed potato (i.e., pre-cut french fries, chips or mashed potato flakes) will be lost. There may be some hope, however. Olson devised a method for drying wastage so it can be converted into livestock feed, while Danish researchers have made strides in converting potato pulp into supplements for other food products. Someday soon, potatoes might stop being such big losers.

The Path Forward: Data

Andrew Shakman co-founded [LeanPath](#) almost a decade ago after discovering a shocking piece of information: Most restaurants and large commercial food operations had no clue how much and what kind of food they were throwing away. Even when knowing would save them money. "Food has been perceived as more affordable than labor," says Shakman, "and the lower the cost, the less people were concerned about protecting it."

The Portland, Oregon-based company is one of many using data to help change the world's waste habits. As Dana Gunders, author of the 2012 NRDC food waste study, notes, it's because of the paucity of good numbers on the topic that "food waste has not been on people's radars."



WHERE WE WASTE: PRODUCTION In developing nations. This stage sees vast amounts of wastage, often because processing facilities are lacking or nonexistent. Without, say, an adequate facility for drying rice or bottling milk, farm products may spoil before they ever make it to consumers. A study by the European Commission estimates that nearly 40% of total food loss (excluding farm-level loss), happens during manufacturing.

Shakman's system works like this: A worker weighs food about to be thrown out on a small scale and selects from labeled buttons to indicate what is being tossed. In real time, food companies are able to tabulate how and what is being wasted — without using too much employee time. Shakman is shy to give out exact numbers of what his clients are wasting but he says that his 150 or so customers (which include University of California at Berkeley dining halls and the MGM Grand Buffet in Las Vegas) have seen waste plummet by up to 80 percent after installing the system, as well as big cost savings.

“Data drives behavioral change,” Shakman says.

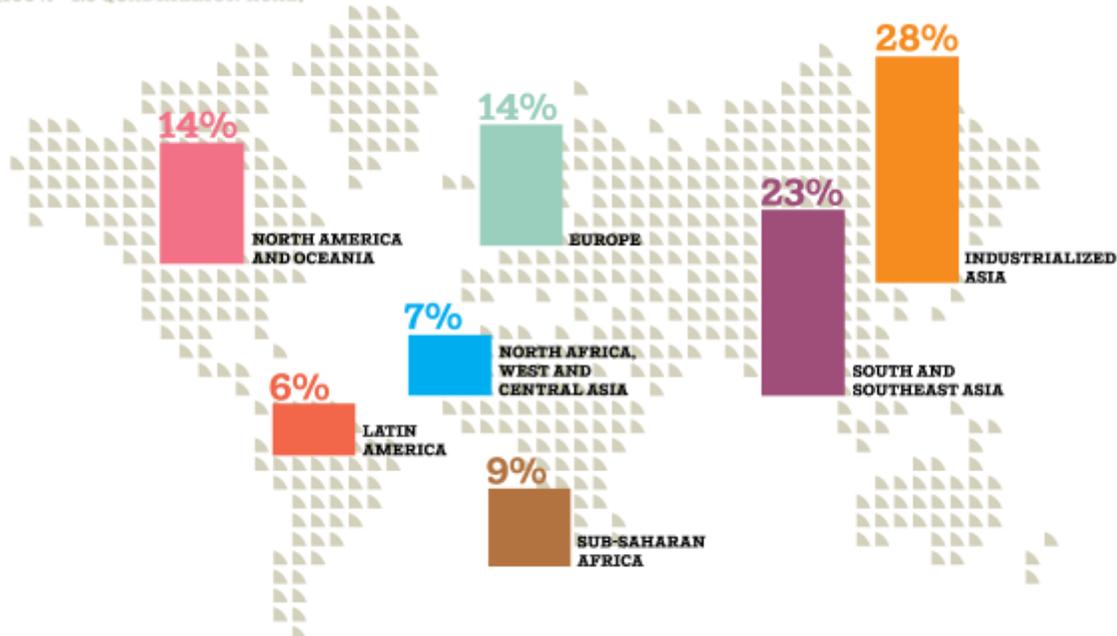
Anecdotal evidence from farmers confirms this. When Donaldson started tracking the waste created on his farm, he was shocked by some of the results. For instance, 20 percent of his strawberries were being left to rot in the field. “That used to be a loss we could withstand,” he says. “But a farmer's profit margins have gotten tighter and tighter and a 20 percent loss has become unaffordable.”

Food Waste: There's an App for That

- Green Egg Shopper This application helps you track your food purchases by how soon they will spoil. Items are split into levels of perishability (short, medium, long) and alerts are sent when foods are nearing expiration. greeneggshopper.com
- Love Food, Hate Waste Based on the British campaign of the same name, this Scottish app provides portion planners and helps find recipes for all the ingredients you have on hand. lovefoodhatewaste.com
- 222 Million Tons Named for the amount of food wasted in industrialized nations each year, this application gives you templates based on how many people you're shopping for and what they like, then helps you shop smarter. 222milliontons.com

Once Donaldson saw the data, he instantly became proactive, putting his overripe or blemished berries into jams and jellies that he packages for sale. Faced with similar losses on garlic and tomatoes, he started producing a line of tomato sauce. Bruised peaches and peppers go into a line of peach salsa. Now the items Donaldson was tracking as a net loss have been converted to a gain.

TOTAL SHARE OF GLOBAL FOOD LOSS AND WASTE, 2009
(100% = 1.5 QUADRILLION KCAL)



SOURCE: WORLD RESOURCES INSTITUTE, UNDER "REDUCING FOOD LOSS AND WASTE," JUNE 2013

But how do you change the behavior of supermarkets, which still believe that the appearance of abundance outweighs lost revenue?

Data can even help mitigate that loss. A combined task force of the National Restaurant Association, the Grocery Manufacturers Association and the Food Marketing Institute just released its [first-ever self-generated report](#) on food waste. Laura Abshire, sustainability director for the National Restaurant Association, notes that the knowledge that the retail sector produces over 4 billion pounds of food waste annually incites a call for action.

“As our members learn the cost of wasting, they are changing their practices,” she says.

How We Waste

Time to Toss Expiration Dates

On milk cartons, on pre-cut carrots, hell, even on Twinkies, grocers around the world affix expiration dates. But what does “best by” mean? Does “sell by” impart any safety information? Should you be paying attention?

According to a recently-published study by Harvard University and the NRDC, not really. The study began as a private bit of legal research for former supermarket executive, Doug Rauch, who was looking to start the Boston expired foods market. But researchers expanded the study after realizing “this was an area of law leading to more food waste,” says Emily Broad Leib, director of the Food Law and Policy Clinic at Harvard Law School. “The legal constructs are causing people to throw away countless amounts of healthy safe foods.” Why? For starters, there is no federal law regulating expiration dates on, say, dairy: Congress attempted to pass one in the ’70s, but it was shut down. So every state has different rules on what needs to be marked — and different verbiage on the stickers. Massachusetts, for instance, has strict rules about perishable or semi-perishable foods needing to be marked, while New York has no expiration laws at all. Additionally, supermarket chains (and stores like Walmart) have taken it upon themselves to do their own “sell by” markings. Leib’s advice to consumers is to take expiration dates with a pound of salt. Food safety is rarely, if ever, impacted by those dates. “Foodborne illnesses are already on the food,” she says, listeria being a special case since it can grow even while refrigerated. The dates can be related to food quality (flavor, appearance) but many expiration notes, like “sell by” in particular, really should only be seen by grocery stockers rotating goods on shelves. The bottom line: Until policymakers set clear guidelines for expiration labeling, please don’t toss otherwise edible goods just because the sticker says so.

The Path Forward: Technology

Refrigerators that tell you when your food is going bad. Giant vats of organic waste using the same process as the human stomach to make energy. Mobile apps that help you shop more efficiently. As more people become aware of food waste as a problem, technology makers are busy coming up with solutions.

For example, there’s a host of apps that help shoppers plan meals better to avoid overbuying perishable items, or calculate the shelf life of different groceries. In the home, [smart fridges](#) now give consumers even more information about their food. These fridges, pioneered by LG and Samsung, help keep track of your perishables, alert you when something is about to spoil and use Internet connectivity to help devise recipes. At this point, you still have to input all the items you buy; the next-generation smart fridge promises to automatically scan its own contents.



WHERE WE WASTE: IN STORES The price of food has a lot to do with who wastes. In Western nations food is historically cheap, and food operations have little incentive to conserve. One U.S. study from the University of Arizona found that, in retail, convenience stores had the highest levels of waste (26.3% of the total) — mostly cheap cooked food that often goes into the trash.

Abroad and in the U.S., waste operators and big food retailers have been using anaerobic digesters, giant sealed containers where bacteria breaks food waste down into biogas, a renewable energy source that comes from organic material fermenting without oxygen, to make energy from compostable food.

How to Stop Wasting (Yes, You!)

1. If your produce starts to go soft, put it in a cup of cold water for an hour and it'll regain much of its life.
2. Keep a whiteboard on the fridge. Put the perishable items on there (produce, dairy, meat) and erase each one when it's gone.
3. Stir-frying is a great way to use up a jumble of mismatched ingredients.
4. Rearrange your fridge so the most perishable items are most visible. You can even remove produce from the crisper, replacing it with, say, condiments.
5. You can add a couple of weeks to fresh herbs by putting them in a knotted plastic bag with 1 to 2 tablespoons of fresh water. This also works with kale and Swiss chard.
6. Freeze items if you know you won't have time to use them.
7. Plan out your meals in advance, with an eye to utilizing the most ingredients.
8. Use meat and fish scraps to make stock. The carcasses will freeze if you don't have time to make stock right away.
9. Shop as small as possible, even if sales are for jumbo sizes.
10. Baking can use up fruits and dairy on the verge of expiration.
11. Keep portion sizes reasonable. You can't control what you're served at a restaurant, but you can at home.

12. (Thanks to readers of the food blog The Kitchn, who provided many of these tips on cutting down home food waste. thekitchn.com)

In South Central Los Angeles this past year, [the supermarket chain Kroger built a new digester](#) that serves 369 Southern California stores: Annually it will create 13 million kilowatt hours, or enough to power 2,000 homes for a year while saving 150 tons of food a day that would normally be hauled to landfills. The company that invented this behemoth, Boston-based [Feed Resource Recovery](#), was started by a pair of business school graduates in 2007. “The hardest thing,” according to co-founder Nick Whitman, was figuring out how to make this “closed loop” system of waste management economically attractive to clients.

As it turns out, not having to haul garbage to landfills is actually a huge cost-saver. “It has a significant upside of saving millions in waste-removal costs,” Whitman says, speaking of the Kroger plant. His company now has a number of other projects in the pipeline, not all of them for supermarkets.

Of course, the ideal situation is for food to be digested by humans, not anaerobics. Studies show that most restaurants and supermarkets still are not getting the majority of their edible food waste to food banks or other organizations before it spoils.

Emptying the Landfill

Who Is Composting (And Why)

Composting is almost as old as food waste itself — Pliny the Elder wrote about its agricultural applications way back in the first century.

But recently, composting has been revisited with a renewed urgency. Many of our landfills are reaching capacity and rotting food waste is producing large amounts of harmful methane, a gas 20 times more damaging to the atmosphere than carbon dioxide. Where has composting taken off? In Canada, the province of Nova Scotia banned organic food from its landfills in the '90s; Ontario is now stepping up its own composting program and other provinces may soon follow suit. Europe, Austria, Belgium, Germany and the Netherlands all have undertaken strong national compost campaigns. In India, there are 56 composting plants in more than 43 cities. The Dutch firm Soil & More International has been installing large-scale composting facilities in countries around the world, including South Africa, Mexico, Egypt and Brazil. Currently more than 150 American cities offer curbside municipal compost pickup, but some places are taking the initiative even further. In 2009, San Francisco became the first city in the U.S. to mandate composting, with a goal of virtually zero landfill waste by 2020. Seattle followed suit in 2010, and Austin is gearing up to institute mandatory composting for food businesses. Recently Mayor Michael Bloomberg blew a lot of minds with his proposal to mandate composting in New York City by 2016, calling it “New York City’s final recycling frontier.” San Francisco now collects 600 tons of compost on a daily basis; Seattle collected 90,000 tons in the first year of its program. New York is many times the size of these smaller cities. If Bloomberg’s initiative succeeds, the amount of waste diverted from landfills could be staggering — city planners are hoping to give landfills 30 percent less garbage by 2017.

The Path Forward: Propaganda

If all goes well, by the end of the year, the eight pigs tucked away in a corner of Stepney City Farm in East London will be the most famous porcine beasts in all of England. As part of "[The Pig Idea](#)," a 2013 campaign against the 2002 European ban on the feeding of catering waste to pigs, food waste activist Tristram Stuart's organization [Feeding the 5000](#) is partnering with the Mexican restaurant chain Wahaca to rear the hogs entirely on legally permissible food waste. Campaign coordinator Edd Colbert says that after seven months, the pigs will be "turned into pork" and fed to 5,000 people in London's Trafalgar Square in a huge feast.

"They don't seem too hungry," Colbert says with disappointment as we enter the pen, explaining apologetically that Modern Farmer has arrived on the heels of a radio team. "Everyone wants to see them eating," he says of the barrage of journalists that has come to view the pigs.

This public campaign, complete with cool logos and social media blasts, is one of dozens launched in the U.K. over the past few years. The island nation was one of the biggest per-capita food wasters on the planet, but thanks to over a decade of sustained governmental, business and nonprofit research and programming, it's becoming a global leader on the issue.

England's magic trick? Applying savvy public relations to the subject.

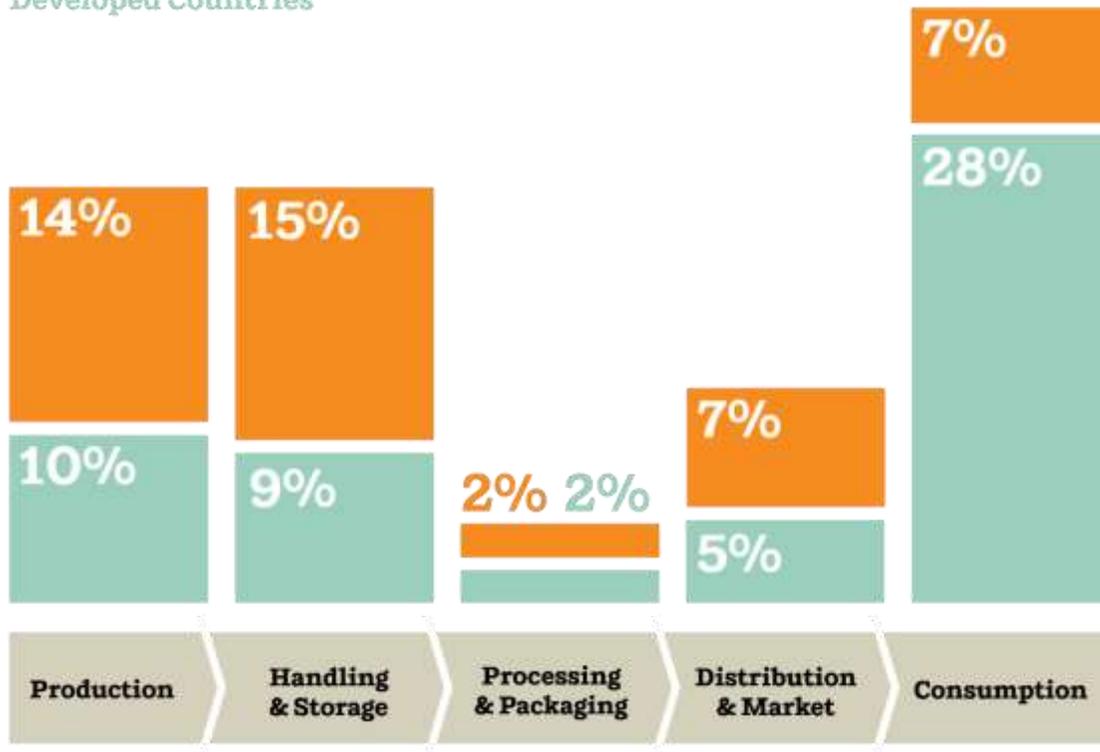
The country's interest in food waste has its roots in a 1999 European Union initiative to severely cap landfills. In response, the government helped found public-private partnership [WRAP](#), which has found great success in putting out headline-grabbing research about how much food is wasted as well as engineering public awareness projects.

"They've basically done a huge amount of campaigning work," says Dr. David Evans, sociologist at the University of Manchester, who recently completed a nine-month ethnography of how food gets wasted in households in Manchester. "So it's not activism in the sense of dumpster-diving or marginal activity or social movements; they've really kind of pushed the issue up the agenda."

SHARE OF TOTAL FOOD LOSS AND WASTE BY STAGE IN THE VALUE CHAIN, 2009 (100% = 1.5 QUADRILLION KCAL)

Developing Countries

Developed Countries



The public support of WRAP extends to the business community. [The Courtauld Commitment](#), a government-funded U.K. initiative in conjunction with over 50 grocery retailers and food manufacturers, kicked off in 2005. Companies including Coca-Cola, Kellogg's, Nestlé, Heinz and Asda (part of Walmart Corporation) pledged to voluntarily cut down on their food and food packaging waste. Results have already been impressive, with an 8.8 percent reduction in supply chain waste (well higher than the 5 percent target).

Perhaps more important, reducing food waste in the U.K. has become, well, cool. Now, meals prepared from dumpster-diving have a certain glamour unimaginable in the States, where there is a stigma attached to this kind of activity. Stuart, a handsome poster boy for the movement, has made public dinners from would-be garbage a global phenomenon after years of events in England. His organization, along with help from other nonprofits, recently took its act to Amsterdam, where the "[Damn Food Waste](#)" lunch fed thousands in a public square in late June. It recently did an event in New York City.



WHERE WE WASTE: ON THE FARM See these lovely vegetables? Totally ripe, tasty ... and unlikely to reach your plate. Produce with aesthetic abnormalities is regularly culled from farms, as food retailers have stringent rules about what they sell. The NRDC estimates that 20% of fruits and vegetables are lost on the farm, but only 2% of grains and 3% of meat. Other factors, like bad weather, also contribute to crop loss.

Why do the British public relations programs work? Probably because the British focus on solutions rather than judgments. "I think it's one of the few areas where I think the activists aren't particularly moralistic. They are very pragmatic, and frankly I find it hugely refreshing," says Evans.

The movement is spreading. Even China, a country not known for conservationism or Earth-friendly policies, has begun public programs aimed at reducing waste. The "[Clean Your Plate](#)" campaign, started earlier this year by young activists, and "[Operation Empty Plate](#)," started in April of last year, have made great strides in convincing young people that a clear plate is a cool plate. China also has a president who has taken an unusually strong stance against food waste. It's early for any solid stats on how much these efforts have reduced China's waste, but the Chinese government is already reporting a reduction in wasteful banquets and unneeded luxury food purchases.

But back to those 9 billion people. Can wasting less food really solve the problem? The data suggests it could greatly help. The World Resources Institute [released a paper in June 2013](#) estimating that if food waste is cut in half — from 24 percent to 12 percent globally — that saving would also cut the number of additional calories needed by 2050 by 22 percent.

In other words, by just not wasting edible food, we could get about a quarter of the way to feeding the projected population. Like recycling, it's going to take a coalition of governments, private companies, nonprofit organizations and committed researchers to change our bad habits and inefficient processes, but there's no time to lose. Let's stop throwing our future away.