



Food Waste: A Solvable Problem

Why food waste matters, how it got this bad,
and how we can help



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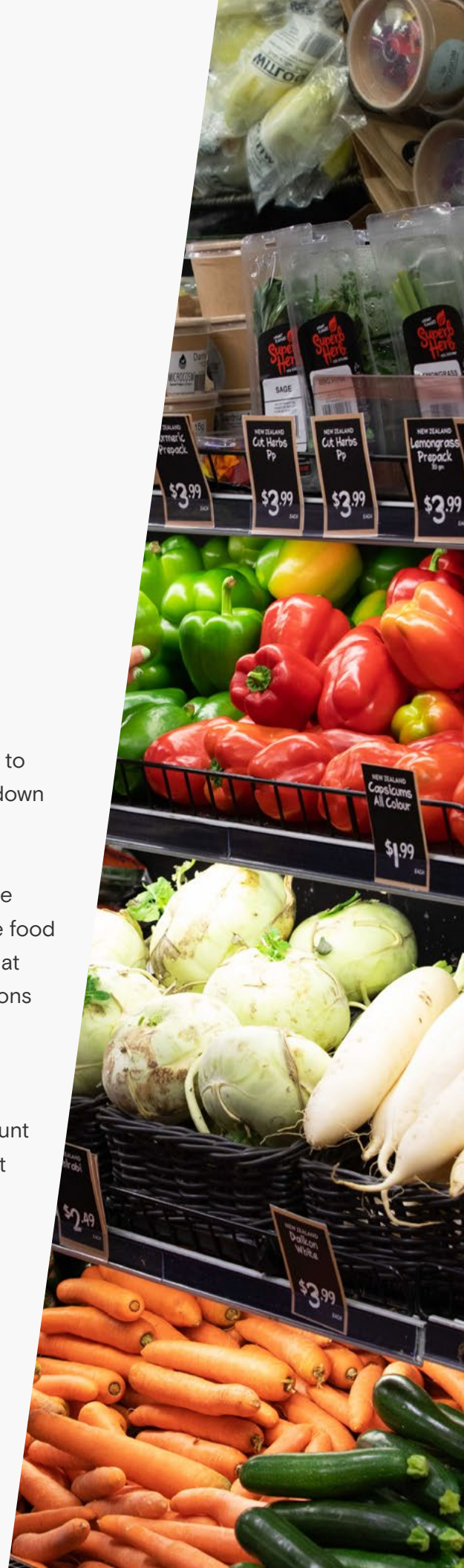


Introduction

The photos were damning. [Entire fields](#) of green beans ready to be destroyed. Piles of [squash left to rot](#). Fresh milk gushing down the drain.

The news coverage drove it home. It was Spring 2020 and the COVID-19 pandemic was raging, adding [new pressures](#) to the food supply chain. Restaurants and hotels closed and the farms that serviced them were left with surplus—causing millions of gallons of milk, hundreds of thousands of eggs, and entire fields of produce to be discarded.

The New York Times called the situation “dystopian,” the amount of waste “staggering.” “You had consumers that were so upset about what they saw as this huge amount of waste they were calling for it to be made illegal,” says Kerri L. Holland, an academic from the University of Calgary’s School of Public Policy and author of [Strengthening Canada’s Food System By Reducing Food Waste](#).



But the coverage soon moved on to other pandemic problems—there were plenty to choose from—and the outrage (or at least much of it) dissipated with it. The problem of food waste, while not forgotten, was no longer top of mind.

Yet just a couple months later, a new report by [the WWF](#) was released, compiling years worth of data. The results: 2.5 billion tons of food was being lost or wasted every year. Almost double the previous data, the new results showed that 40% of all food produced is wasted per year—numbers that could be called “staggering” by any account. But the public uproar was missing. And among those invested in the food waste crisis, it wasn’t a surprise.

A systemic and persistent issue, [food waste](#) happens everywhere across the supply chain—and it has environmental, human, and economic repercussions that are felt worldwide. But there’s good news too: better business decisions, on-the-ground nonprofits, and new technology and innovations are bringing hope that the food waste problem can be solved.

This ebook will look at all of that—exploring the ongoing food waste problem, where and how it happens, and what we can all be doing to stop it in its tracks.

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What Is Food Waste?

While we’ll be using the term “food waste” interchangeably throughout this ebook, the UN’s [Food and Agriculture Organization](#) (FAO) applies two separate definitions depending on where in the supply chain waste happens:

Food loss “occurs from post-harvest up to, but not including, the retail level.”

Food waste results “from decisions and actions by retailers, food service providers, and consumers.”

The result, though, is ultimately the same. That is, food that never fulfills the purpose it was meant for: feeding people worldwide.

PART 1

The Impact

Admit it: you're probably guilty of throwing away a little food now and again. Most of us are.

And while none of us like to do it, and all of us were probably taught early on not to, we likely don't think too much about the impact of that waste. Sure, we may briefly consider the hit to our pocketbook, but that's where it ends. After all, it's just a half-eaten hamburger or some expired spinach we're throwing away—what kind of greater impact can that really have?

Except the repercussions, as it turns out, are huge and global. And while it's not just the food we throw out at home that's contributing (we'll explore where waste happens more in the next section), it affects more than just our wallets too.

In fact, food waste impacts the world in three main ways. Let's look at each in turn.

The Environmental Impact

Whenever the main contributors of climate change are named, a familiar list of culprits emerges: industry, transportation, and energy. Deforestation is often mentioned. But food waste barely, if ever, makes the cut.

Yet food that's thrown away accounts for between [8 and 10%](#) of all global greenhouse gas emissions. Project Drawdown ranks reducing food waste as the most impactful solution for curbing global warming. Sent to landfills, discarded food produces methane gas, which is far more potent than carbon dioxide. But that's not where the environmental repercussions end. Every piece of food you toss out has a backstory.



Take that half-eaten hamburger, for example. “First of all, there was some deforestation to create the land to graze the cattle,” says Liz Goodwin, Senior Fellow and Director of the global research organization [World Resources Institute](#) (WRI), specializing in food loss and waste. “Then there was the impact of producing that cow and feeding it and fertilizing. Then finally slaughtering the cow and processing the meat and transporting it halfway around the world. And eventually, it arrives at your place. By then, it’s got quite a large environmental footprint—a lot of water was involved, a lot of land, a lot of energy. And you throw it away.” And that’s just what happens with the burger patty—not including the bun, toppings, or condiments.

In other words, when food is wasted, so is the land, water, and energy that went into producing it. About a [quarter of the water](#) that’s used in agriculture is wasted (twice as much, on average, as we use to wash or drink every year), forests are cut down to make way for agricultural lands, and the tractors and transporters required to harvest and move the results emit greenhouse gasses of their own.

“We’ve got areas of the world where there are water shortages, and yet we’re then throwing away a quarter of the water that’s used in agriculture,” Goodwin says. “And then there’s all of the deforestation that’s going on. It’s not needed.”

The Human Impact

About [811 million](#) people worldwide go hungry—almost 10% of the world’s population. The numbers are only growing too: between 2019 and 2020, the number of undernourished people increased by around 161 million globally, contributed to by issues like climate change and the COVID-19 pandemic.

Yet right now, enough food is produced to feed everyone.

**“We have more than enough food to feed people—to feed everyone on the planet today,” says Dana Gunders, Executive Director of the national nonprofit [ReFED](#).
“It is not a production issue, it’s a distribution and poverty issue.”**

And it's a problem that only promises to escalate if we don't create a more efficient food system. By 2050, the world's population is expected to grow to almost 10 billion people—people who will need to be fed. “Will that come from converting more rainforest to agriculture?” Gunders says. “Or will it come from food that we're already growing, and streamlining our food system to make the best use of that? We estimate that about 24% of the gap could be closed by cutting food loss and waste in half.”

The Economic Impact

Food waste comes with costs. Costs to the environment and the global population, as we've already seen—but also the kinds of costs that can be counted in dollars and cents.

The economic impact of global food loss and waste is estimated at [\\$940 billion](#), or more than the GDP of the Netherlands. Those costs are accrued all along the food supply chain, traveling right down to the consumer level. “Throughout the system, any waste is wrapped into the price that we're paying. It has to be,” says Gunders.

It's no wonder, then, that the average American spends [over \\$1,300](#) every year on food that's ultimately wasted—more than they spend on heating and electricity.

As consumers, then, we should all be interested in the waste that happens at every stage of the supply chain—and how to stop it. So let's break it down.

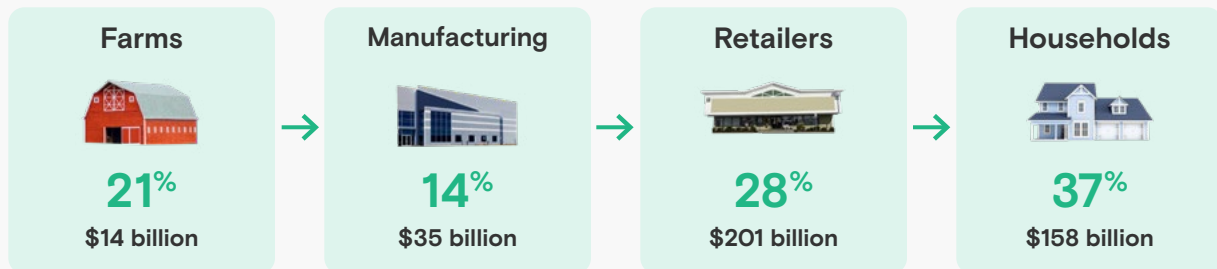
The average American spends over **\$1,300** every year on food that's ultimately wasted—more than they spend on heating and electricity.

PART 2

The Source

Remember those fields of green beans left unpicked during the COVID-19 pandemic? Or the hypothetical half-eaten hamburger you might have thrown out sometime in the past? Those are just two different types of waste that happen in two different parts of the food supply chain. And there are countless other examples of food waste happening every day at all points along the way.

On its way to the grocery store, restaurant, and end consumer, food—even fresh, unprocessed food like fruits and vegetables, eggs, and dairy—has several stops to make. Each contributes its own type of waste. In the US, that equals out to 40 million tons of food wasted, or [30 to 40% of all food](#) produced. Here’s a snapshot of where it happens and how much it costs, with that cost adding up the further you travel down the food supply chain:



*Source: [ReFED](#)

Let’s break that down, and explore the factors that contribute to the way food is wasted at every step.

The Farm

There’s a habit some of us have of picturing farms as idyllic family-run businesses, complete with roosters cock-a-doodle-dooing to start the new day. But most of us know that isn’t the case. Farming is a business—one that comes with [tight profit margins](#) and difficult business decisions.

In some cases, those business decisions mean food is wasted. Produce may be purposely left unharvested, rotting on the field, because food prices are so low that it will cost more in labor to harvest than can be earned back. Other times, food is wasted because the harvest itself doesn't measure up to the exacting requirements put to it. "There are specifications around each type of produce—a whole set of specifications around size, color, shape, ripeness, and sugar content," Gunders explains. "[For example,] you may have a requirement that broccoli needs three weeks of shelf life. If your broccoli only has two weeks left then it's not getting harvested."

To add to the issue, most farms grow more than the market calls for as insurance in case anything does go wrong. So when the season goes well, farmers are left with surplus food. And either way, the potential for more food waste emerges.

The Manufacturer

Produce needs to be trimmed and meat cut into parts—which means, even when you're talking about fresh foods instead of their processed counterparts, there's a manufacturing stage involved. And during this stage, edible byproducts with no potential market are created too. Kerri L. Holland, who studies food waste in Canada, holds up the beef industry as an example. "There are certain parts of an animal carcass that most [consumers in countries like Canada] will not eat," she says. "A lot of those products tend to go for export and into some niche markets. But if there's no market for those, they're just being disposed of."

There's also food lost on the production line or rejected by buyers for perceived imperfections. Again, all of that means food is wasted.

Transportation and Distribution

Consider a perishable food item that spends too much time waiting for a buyer, or goes bad because of improper refrigeration or storage before it gets to its destination. That's another source of food waste, especially in locations outside of North America.

In developing countries like [Uganda](#), for example, 95% of food waste happens during the production and distribution stages, in large part because of a lack of appropriate storage facilities and poor infrastructure. "You see high levels of loss as a result," says Goodwin.

The Grocery Store

It may not be good business to regularly throw out a portion of your retail product, but it is good business to have the products in stock your consumers want to buy, when they want to buy them. Getting that right is one of the biggest challenges grocery stores face, and one of the reasons they're throwing out [10.5M tons](#) of food every year in the US alone.

“You walk into a grocery store and your expectation is that it is full, and that everything looks fresh,” says Kari Armburster, Project Manager for the [Zero Hunger | Zero Waste](#) project for grocery chain The Kroger Company. “Part of the journey, I think, for the industry in the United States is just shifting retail expectations for ourselves as well as our customers.”

Because of the way the grocery store influences every other part of the food supply chain—both those that come before and after—we'll be digging deeper into this stop of the supply chain in Part 3.

The Foodservice Industry

It's hard not to spot the half-eaten meal left on the table beside yours, or the food still sitting on the counter, unsold, when you grab a late night coffee. Which is why, in many ways, waste in restaurants and the foodservice industry—about 12.7M tons of it, according to ReFED—is some of the most visible.

There are two different types of waste at this level:

- Pre-consumer waste is food that's thrown out before it gets to the customer (e.g., spoiled food or kitchen scraps). [Twelve percent](#) of all food in restaurants is wasted this way.
- Post-consumer waste is thrown out after it gets to the consumer (e.g., uneaten food that gets left behind). This is how [22% of restaurant food](#) is wasted.

Financially, pre-consumer waste hits restaurants the hardest, but all of that waste has both an environmental and human impact. “When we think about who's making this food...it's people who are maybe not necessarily making a living wage,” says Regina Anderson,

Executive Director of the nonprofit [Food Recovery Network](#). “We are asking them to spend their whole shift making this beautiful, delicious food. And at the end of that same shift, we are now asking that same person to throw that food away.”


The Consumer

Since we’re all consumers, we’re all at least somewhat aware of how food waste happens at this level. Your avocados go bad before you get a hankering for guacamole. The bag of spinach gets pushed to the back of the fridge and by the time you remember it’s there it’s one step away from liquefaction. You go grocery shopping without a list and buy too many tomatoes but forget the cucumber, so the tomatoes go bad.

In the US, an average family of four wastes [1,160 pounds](#) of food every year. But making changes at the consumer level can be challenging. In the US, food costs represent, on average, just [8.6% of disposable personal income](#), a small investment compared to other costs of living. As such, cutting waste for financial reasons alone doesn’t always get prioritized like it should.

Changing behaviors, then, means building awareness on all of the impacts of food waste. “We need some mechanism for bringing home to people how big an issue it is,” Goodwin says. “That it’s personal and there is something they can do about it.”

Playing a potentially pivotal role in that—as it does for many of the decisions made throughout the supply chain—is the grocery store.



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PART 3

The Retailer

“What’s really interesting about the food waste problem in general is that waste at one level drives waste at other levels. It’s so interconnected,” says Holland.

Nothing offers proof of that more than the grocery store. The decisions grocers make as they fill their stores dictate the foods that will be grown and processed at every step before them. And the fresher those foods are at the supermarket, the fresher they’ll be at home— affecting downstream waste as well. But how retailers display, advertise, and price foods [impact consumers’ choices](#) too—decisions that can just as easily bleed into how those same consumers approach the restaurant and foodservice industry as well.

As much as food waste happens throughout the entire supply chain, the grocery store is the cog that keeps it moving, which makes it a good place to dive deeper to see how simple changes can reverberate—and start solving the food waste problem.

How Supermarkets Waste

As we’ve already seen, grocery stores throw out an estimated [10.5M tons](#) of food every year.

That’s a lot of waste, for sure. But consider the fact that supermarkets, [on average](#), carry 31,119 items across 48,466 square feet of space and you’ll better understand the logistical issues involved with keeping those shelves fully stocked, while also predicting future needs, and managing best-before dates and freshness levels. Grocers have done a good job keeping up so far, but if they want to make food waste a thing of the past, they’ll have to do better. These are some of the issues getting in the way:

Grocery stores throw out an estimated **10.5M** tons of food every year.

Unclear Date Labeling

“Concerns or confusion” over freshness labels cause almost half of waste at the grocery store level, [according to ReFED](#). Best-before labels are often read as expiration dates, which means perfectly good food is often overlooked. “If date codes on products are getting close to or slightly past the best-before date, we see that consumers don’t want to buy them, so the grocery stores dispose of them,” says Holland.

Consumer Expectations

Date codes aside, modern expectations—at least in Western countries—mean consumers visit the grocery store expecting to see an overflow of food on the shelves, and often won’t buy if they don’t see it. That culture of abundance opens up even more possibilities for waste. “If there’s only one watermelon sitting on the shelf, consumers are more apt to think ‘what’s wrong with that, I don’t really want to buy that,’” says Holland. “But if they see 40 watermelons ... they’re more apt to buy it.”

Spoilage

Food does go bad, of course—especially in the more changeable fresh aisles, where nearly [42%](#) of all food waste from retailers happens. That adds to the food waste issue, especially when combined with that need for abundance. “We see that some grocery stores are starting to get really creative with how they’re stocking shelves, especially with produce. Because they want it to look abundant, but they also realize that if they’re stacking produce on top of produce a lot of that produce at the bottom becomes really bruised,” says Holland.

Labor Shortages

Accurately keeping track of all of the variables involved—including the amount of food on the shelves, freshness levels, and best-before dates—requires a lot of data. It’s an incredibly complex task and most employees don’t have the tools they need to make fully informed decisions.

The knowledge it takes to build a perfect order is gained over decades and most of that data either isn’t documented for new team members or doesn’t get updated as demand shifts. So when almost anyone places an order, there’s a high likelihood that the next delivery will have too much of some items and too little of others. That leads to a cascade of problems like crowded backrooms, empty shelves, dissatisfied customers, and excess food waste.

Inaccurate Data and Measurement

Right now, most grocery stores rely on manual calculations or static data to write orders, and the inaccuracies of that are a huge part of the food waste problem. Machine learning, forecasting, and continual measurement are pivotal to reducing waste. “It’s really important for us to predict how much food we need in stock,” Armbruster says. “And that’s all going to run through algorithms. Historically, that was all done with spreadsheets and pens.”

The Wrong Tech Investments

For years, flashier transformations like digitizing customer experiences have taken precedence over order optimization, especially as customers shifted to omnichannel shopping during the pandemic. What’s been left to waste is the whole reason people shop at a store: What’s in stock when they need it. For the employees left to make decisions for multimillion dollar departments, better technology and tools that apply machine learning techniques can help.



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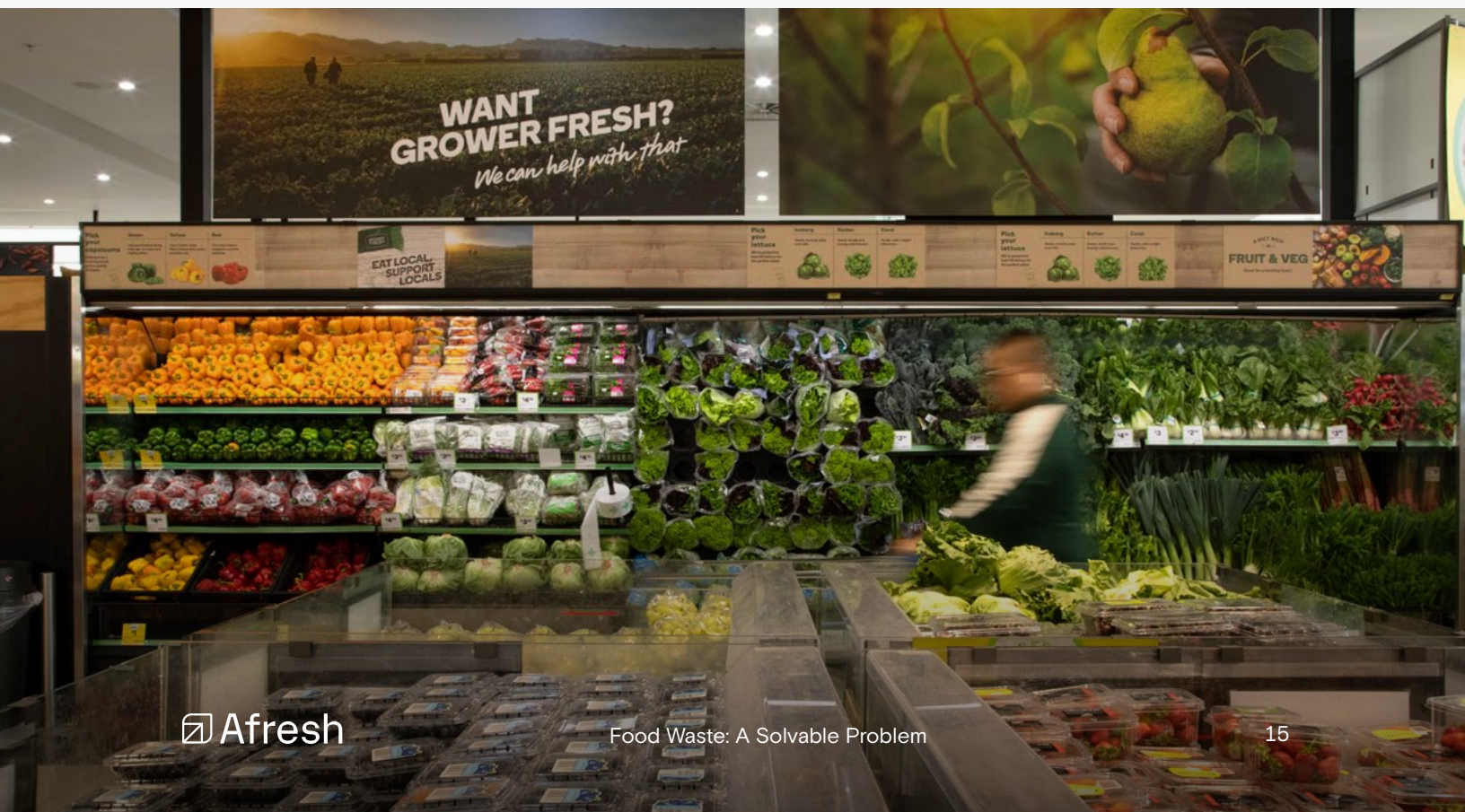
How Retailers Can Make a Difference

“Decisions made by a retailer have massive implications all the way down the supply chain,” Goodwin says. Which is why the solutions introduced there are critical to creating lasting changes. But for that to happen, she adds, transparency is key.

Transparency starts with not only sharing data across the supply chain, but also sharing data with other levels in the food process. “People are quite proprietary about their waste data,” Gunders says. “So even when [grocers] find solutions that are working ... there’s not a very collaborative atmosphere around sharing data that could really help highlight opportunities.”

Thankfully, grocery stores are beginning to understand the need to work together, and technology has evolved to help them move beyond “best guesses” to make smarter ordering decisions that can lead to less waste throughout the supply chain. And that’s just the start of the promising solutions emerging around the food waste problem.

A combination of innovation, greater awareness, corporate activism, and grassroots initiatives are coming together to tackle food waste head on.



PART 4

The Solution

It's clear that food waste is a serious problem that only promises to get worse if we don't do anything about it. The good news? There are people, nonprofits, and businesses around the globe dedicated to doing everything they can to stop it.

The result: innovation, activism, and better business practices—all designed to make sure less food is wasted at all levels of the supply chain. As they do, they're also building awareness that will hopefully encourage everyone to start doing their part.

"I really hope that people can see themselves as being part of the solution by doing very small things," Anderson says. "Very, very small things so that we can change the dialogue from food waste to food recovery."

Changing the Dialogue

In September 2015, the US Department of Agriculture (USDA) and Environmental Protection Agency (EPA) announced a new goal: cut food waste in half by 2030. The initiative follows one of the United Nations' [Sustainable Development Goals](#), which focuses on cutting food loss throughout the supply chain and halving per capita global food waste at the retail and consumer levels by 2030.

Today, people, organizations, and innovators across the world are doing their part to try to meet that goal and tackle the food waste issue in general.

10x20x30

We've already seen how food waste can reverberate through the entire supply chain, with decisions at the grocery store level exacerbating waste that happens at each level before it. The [10x20x30 initiative](#) uses that to its advantage. The program has gathered 10 retailers, each of whom have brought 20 key suppliers, to pledge to cut their food waste in half by 2030.

"There's a lot of opportunity for leadership and there's a lot of opportunity for industry movement," says Armbruster. Her own employer, Kroger, is part of the program, as are familiar names like Tesco, Walmart, McCain, and Kellogg Company.

Food Diversion Programs

There are many nonprofit groups and grassroots efforts dedicated to reducing the impact of food waste by diverting it to those in need—from [SecondBite](#) in Australia and the global [Robin Hood Army](#), to Denmark’s [Stop Wasting Food](#), and the US-based [Food Recovery Network](#) (FRN).

“The whole effort of our bedrock work is to ensure perfectly good food is never thrown away, that if you have extra food there is a plan in place for that food,” says Regina Anderson of FRN, which started in 2011 by donating leftover food from college dining halls to nonprofits dedicated to feeding the hungry. Today, their mission is the same but their reach has grown: they advocate and build awareness as well as divert food from dining halls, foodservice establishments, and events, and pay to harvest produce at the farm level that would otherwise be left on the fields.

Technology and Innovation

Innovation and technology are making it easier for players throughout the supply chain to reduce food waste and loss, and minimize the environmental, human, and economic impacts felt every day. Consider just a few of the innovative solutions making a difference:

- Food waste apps: Matching need with surplus goes beyond putting excess food in front of people going hungry. It might also include consumers looking for a deal, happy to buy food close to the best-before date and just needing a way to find it. Or diners hoping for a night out at a discount, looking for restaurants willing to offer a reduced price on end-of-night meals. Apps like [Too Good To Go](#), [Olio](#), [Flashfood](#), and [Food For All](#) bridge those gaps.
- Food delivery services: So-called “ugly” produce is rejected by grocery stores because they know consumers won’t pick them—even when there’s nothing wrong outside of cosmetic imperfections. Yet a misshapen carrot tastes just as good as any other, something food delivery services like [Imperfect Foods](#) understand well, delivering those foods—as well as any that would otherwise be considered surplus harvest—to customers’ doors.
- Freshness protectors: Prolonging the freshness of foods doesn’t just mean they can stay on grocery store shelves longer—it also gives consumers more time to use them once they get home. And innovative products like [Apeel](#) and [Mori](#) help, extending the shelf life of fruits, vegetables, meat, and seafood with natural protective coatings applied to help them stay fresh longer.

What More Can Be Done

While companies, initiatives, and nonprofits like the ones listed above may be slowly building momentum to help solve the food waste problem, it's still not enough. To truly tackle the food waste problem we need to go beyond just “building momentum” and start eliciting real change as soon as possible—and for that, we can't leave any stone (fruit) unturned. Which means more needs to be done, and companies and individuals everywhere need to start to truly understand the consequences of not taking action. A few things would help:

Increased Consumer Awareness

Not only does 37% of food waste in the US happen at the consumer level, but we also have the power to drive change at other stages of the food supply chain simply through the buying decisions we make. This means that increasing awareness at the customer level is imperative if we're going to bring food waste to an end. Better educating the public on date codes, providing tools and information around meal planning, and helping consumers envision the environmental, human, and economic changes that are possible can all go a long way toward putting things on the right track. In a [2021 consumer survey](#) conducted by Afresh, more than two-thirds of respondents didn't know the scale of grocery store waste. But 72% said, once they saw it, they'd start shopping at a store committed to reducing food waste.

More Government Involvement

When leaders from around the globe met in Glasgow in the fall of 2021 for the 26th UN Climate Change Conference ([COP26](#)), their goal was to talk about all things climate change—and more specifically, how each country would contribute to stopping it. Yet food waste, for the most part, was left off the table. In fact, only [11 out of the 192](#) national climate plans submitted as part of the Paris Agreement even mention food loss and waste.

“It's crazy that there's that lack of focus at a government level,” Goodwin says. Yet [strong government policies](#) around food waste could help put businesses and consumers on the right track, encouraging best practices while discouraging bad behaviors.

Better Communication

Accurate data and measurement clearly play key roles in making sure the right foods end up at the right place at the right time. Communicating that data and creating transparency up and down the supply chain is just as important. It ensures that just the right amount of supply moves its way down every level to support those needs. “Technology must be able to help with that,” Goodwin adds.

Introducing Afresh

Optimized grocery store ordering, accurate measurement, precise forecasting, and improved communication are all key ingredients to creating better decision making at the grocery store level, and a more efficient supply chain overall. But to make that happen—especially in the fresh department, where complex dynamics are at play—grocery stores require more than traditional inventory management technology can offer.

That’s where Afresh comes in.

Afresh is a [mission-driven company](#) focused on eliminating food waste and making fresh food accessible to all. The [Fresh Operating System](#)—the first of its kind—helps grocery retailers optimize their fresh forecasting, inventory, ordering, and store operations. As of January 2022, we’ve improved the ordering process across 6.7 billion pounds of food through the use of AI, helping our customers prevent 6.9 million pounds of food waste and recognize \$4.9 million in bottom-line savings.

Those changes are already creating a more sustainable future, with 3,818 metric tons of greenhouse gas emissions avoided thanks to Afresh, and 140 million gallons of water saved.



Conclusion

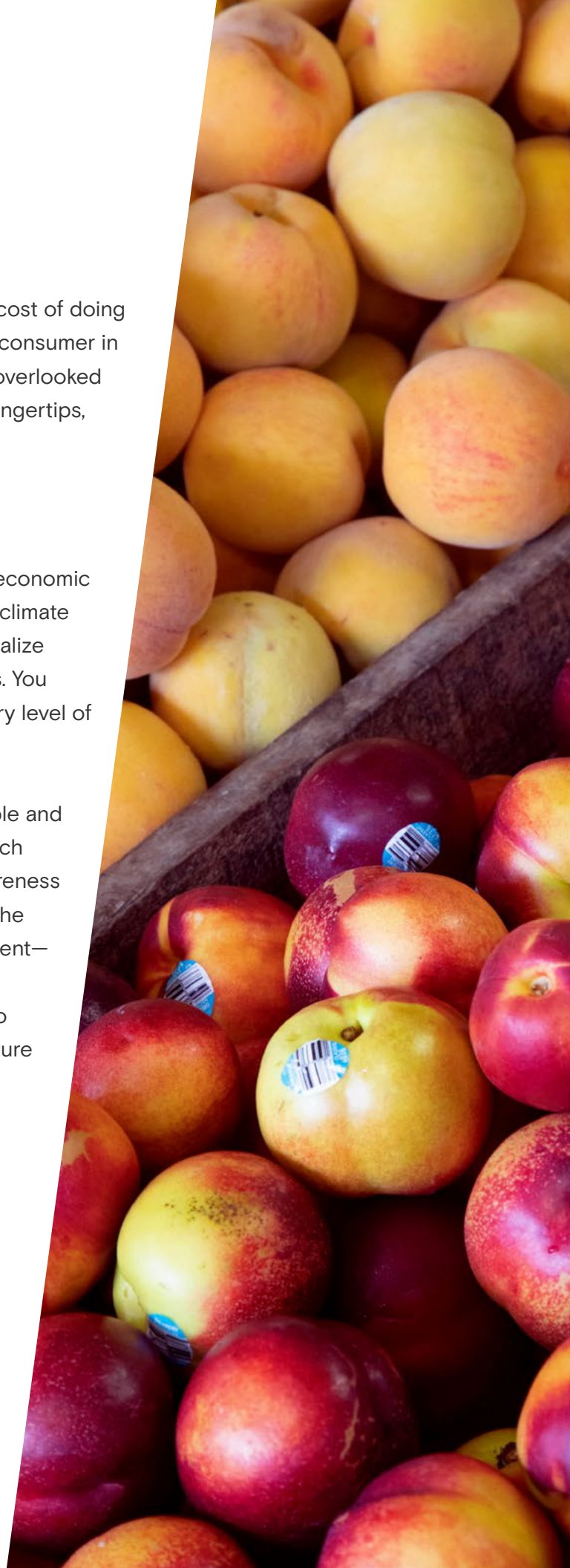
In many ways, food loss and waste has become a cost of doing business—of being part of the food system and a consumer in the modern day. That is, an “acceptable” or often overlooked tradeoff for having all of the food we want at our fingertips, anytime we want it.

Until we add up all the costs.

When you look at the environmental, human, and economic impacts food waste has—including how it adds to climate change and issues around food insecurity—you realize exactly how prevalent and unacceptable it really is. You understand that changes need to be made at every level of the food supply chain to stop it.

But the good news is that food waste is preventable and work is already being done to prevent it. While much more momentum is needed—including better awareness at the consumer level, more transparency across the supply chain, and increased government involvement—concerned businesses, grassroots nonprofits, and innovators around the world are already working to turn food waste into a problem of the past that future generations can learn from.

Afresh is proud to help solve this dilemma, today. Food waste is one of the defining issues of our time, but it's one that can be fixed in our time. By helping to improve every link in the supply chain that ties us together, we can plant the seeds for a brighter future. A world where everyone has access to the fresh, nutritious food they need.



About Afresh

Afresh is the world's leading fresh technology company. Afresh's AI-powered solutions optimize critical functions in fresh food, including ordering, inventory, merchandising, and operations. Afresh significantly reduces food waste, improves its partners' profitability, and makes fresher, healthier food more accessible to all. Founded in 2017 with the mission to eliminate food waste and make fresh food accessible to all, Afresh has grown rapidly with grocery customers across the US. Today Afresh has announced partnerships with grocers in over 2,500 stores and 42 states, including Albertsons, WinCo Foods, Heinen's, Save Mart, Bashas, Cub Foods, and more. Learn more at www.afresh.com.

**Fresh
Operating
System**

