

Coming Soon to a Plate Near You

TRENDCASTING

EatingWell sat down with nine trend whisperers—from nutrition and agriculture experts to lab-grown-meat gurus and microbiome researchers—to find out what transformative technologies, policies and products will define the next decade of eating in America. Buckle up: The road ahead will take us through some wild territory, with a lot to look forward to. We'll let our pros explain in their own words. **Reported by Sophie Egan**

ILLUSTRATIONS BY RICHARD MIA

LAB-GROWN MEAT GOES MAINSTREAM



THE EXPERT

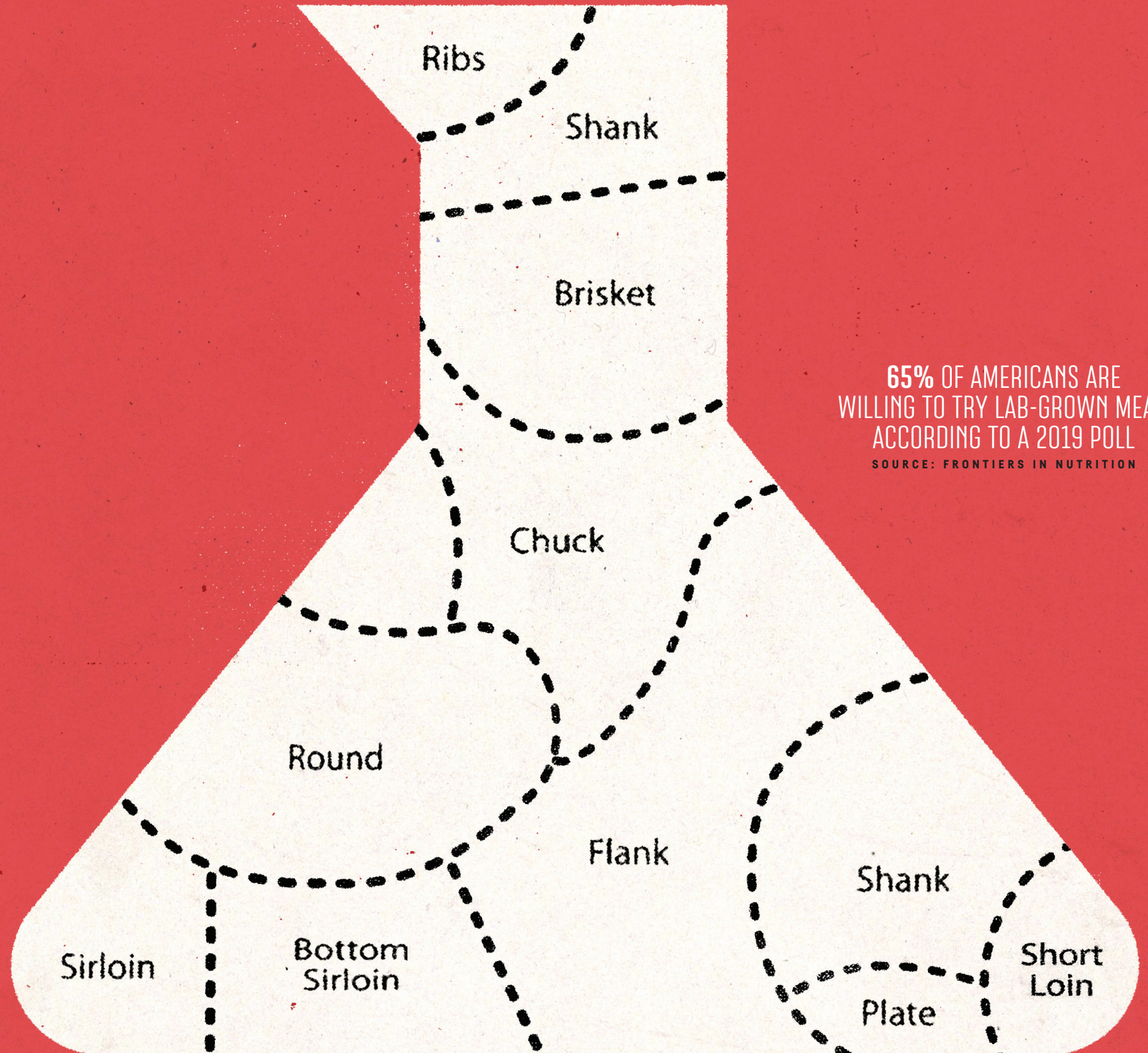
Brad Barbera, director of innovation at the Good Food Institute, a nonprofit think tank headquartered in Washington, D.C., that focuses on transforming our current food system from industrial animal agriculture to one centered on plant-based alternatives and cell-based meat.

We've seen an explosion of interest in the cell-based meat industry (also called cellular agriculture). This is meat that's grown in a controlled, clean production facility by "feeding" a small sample of animal cells the right nutrients so that they multiply and grow until you have enough to make an actual piece of meat. And I think we're at an inflection point now where we'll see the technology accelerate much faster than we have in the past five years. Some of the brands pursuing cellular ag now are Memphis Meats and Finless Foods. Products are not on the grocery store shelves yet, but within 10 years, we're looking at cellular beef, chicken and fish competing

side-by-side with conventionally produced meat. In fact, I see cellular ag vastly outperforming traditional animal products because, as the technology improves, it can be designed to fit the consumer's needs. Imagine being able to select a blend of your favorite proteins—say, beef, pork and ostrich—combined in a single piece of meat with the exact texture and amount and type of fat you want (higher in omega-3s and lower in saturated fat, for example). You wouldn't be limited by an animal's biology or how it was raised.

Eventually, the technology will get to the point where consumers simply enjoy it for the superior taste and affordable price (which has already dropped from the initial project's cost of more than \$1 million per pound in 2013 to maybe \$25 to \$50 currently). They won't think about the fact that it's cell-based meat—they'll eat it because they like it. Because it's the new normal. I love comparing it to the example of Louise Brown, the world's first test-tube baby. When she was born more than 40 years ago, many considered IVF (in vitro fertilization) "unnatural" and her parents got hate mail. But now there are more than 8 million people in the world—that's the entire population of New York City—who were born through IVF. It's perfectly normal and acceptable. That's how I imagine these meats being seen.

INSERT: MATTHEW DAGOSTINO FOR GFI



65% OF AMERICANS ARE WILLING TO TRY LAB-GROWN MEAT, ACCORDING TO A 2019 POLL

SOURCE: FRONTIERS IN NUTRITION

MICROBIOME MONITORING FOR ALL



THE EXPERTS

Erica D. Sonnenburg, Ph.D., and Justin L. Sonnenburg, Ph.D., senior research scientist and principal investigator (respectively) at the Sonnenburg Lab at Stanford University in California, a leading research center on the microbiome. They are co-authors of *The Good Gut*.



Justin: Scientists now have a really good understanding of the microbiome—the bacteria that populate your gut—in the context of laboratory animals. We know that it is at the center of health and is integrated into immune function, metabolism and the nervous system. The future is about answering how the microbiome influences these things in humans. We have some research, but it's still very new.

Erica: Once we understand the way diet impacts the human microbiome in general, then we can see how it applies to the individual. Everyone's microbiota is somewhat different, so in the next five to 10 years we'll see the more personalized aspects of this science—how each person can make food choices to specifically influence his or her own microbiome and help prevent disease.

Justin: I imagine, in the not-too-distant future, having tests at your annual physical where you get a readout of your microbiome and immune system that would result in clinically meaningful recommendations. To take it a step further: if you think of the continuous glucose monitoring that exists for people with diabetes, you could have something similar for your gut bacteria, like an in-toilet device in your home that would show how different foods—say, lamb chops versus broccoli—affect your microbiome. (Some companies offer at-home stool tests, but it's not clear what science they're using to make their dietary recommendations. It's very suspect.) Gut bacteria imbalance is associated with all kinds of Western diseases like type 2 diabetes, heart disease and obesity-related diseases. Prevention is usually an easier task than fixing a problem, so using diet to create the healthiest gut ecosystem possible, before a chronic illness has set in, has a much better chance for success than repairing a “broken” microbiota.

INSETS: MARINA EYMANN (2); ARIZONA STATE UNIVERSITY

REIMAGINING LAND & SEA USE



THE EXPERT

Kathleen Merrigan, Ph.D., executive director of the Swette Center for Sustainable Food Systems at Arizona State University, which focuses on food systems that drive economic productivity and social progress.

Land is a fixed asset, and with a growing world population to feed, we need out-of-the-box solutions. Rather than deforesting the Amazon so we can plant more fields, there's going to be an acceleration and expansion of indoor agriculture of all kinds—greenhouses, aquaponics, aeroponics, hydroponics and vertical farming operations that require much less space, water and even soil to grow food. Some crops, like lettuce, don't need to be produced in the ground; we could save that land for crops that really have to be grown traditionally, like wheat and apples.

There's also a lot of innovation happening around insect protein. While much of the conversation is devoted to humans eating it—and there are plenty of cultures now in which people eat insects regularly—I think there's an important implication for fish consumption of these proteins. Currently, 6% of wild-caught fish are manufactured into fishmeal for farmed fish. Most of these wild-caught fish are among the tiniest of species and we are disrupting the ocean ecosystem by depleting them. This is as wacky a thing as I can think of, from an environmental viewpoint, when there are viable alternatives, like insects. These insects provide farmed fish the necessary protein at a very reasonable cost. It's time to think out of the box. (For more on fish farming, see our story on *Passmore Ranch*, page 94.)

“YOU COULD HAVE AN IN-TOILET DEVICE IN YOUR HOME THAT WOULD SHOW HOW FOOD AFFECTS YOUR MICROBIOME.”



FIGHTING CLIMATE CHANGE WITH CROPS

THE EXPERT



Fred Iutzi, *president of The Land Institute, a nonprofit research organization in Salina, Kansas, dedicated to making agriculture sustainable through the use of perennial crops.*

Land Institute scientists are leading a movement to develop perennial grain crops and ultimately transform global grain production with them. (Perennials are plants that go dormant in the winter and resprout in the spring.) While our current crops produce abundant food, the plants are all annuals—meaning that farmers need to plant new seeds every year, disrupting the soil in the process. This and other modern agricultural practices are causing us to lose soil faster than it's being formed. Grain fields, for example, are losing soil about 16 times faster than new earth can be created. And that's a huge problem because all of our food supply goes back to the soil. It's the way plants get nutrition. It's this whole other ecosystem right under our feet.

Before our ancestors plowed up the native grasslands to create farm fields, we didn't have a soil-loss problem, in part because wild grains were perennials.

IT'S ESTIMATED THAT KERNZA CAN REMOVE TWO TIMES MORE ATMOSPHERIC CARBON THAN ANNUAL CROPS—ABOUT 1.5 METRIC TONS PER ACRE ANNUALLY.

SOURCE: AGRICULTURAL AND FOREST METEOROLOGY

If modern agriculture could mimic this ancient ecosystem, we could have the no-till sustainability of the prairie *and* help solve climate change.

Plants that grow back year after year have time to grow very long roots and this has a massive influence on the environment. On a basic level, these roots are simply better at holding down the soil, meaning less erosion and runoff. But plants also “breathe in” the greenhouse gas carbon dioxide from the atmosphere. This carbon ultimately becomes the plant's building blocks to grow seeds, leaves and roots—and to generate a bigger root system, the plant needs to suck up more CO₂ out of the air.

Bigger root systems also mean that the carbon *stays* buried deep in the earth. Annuals' shallower roots, on the other hand, can allow the carbon to escape right back into the atmosphere more easily, especially after the soil is turned over to plant a new crop.

After decades of careful research, we now have the very first early-stage perennial grain crop: a relative of wheat and barley called Kernza. Today there are about 1,000 acres of Kernza in commercial production in the U.S. Within 10 years we hope to increase that to hundreds of thousands of acres by teaming up with farmers and food companies. Patagonia Provisions sells a Kernza beer, and General Mills has developed a Kernza breakfast cereal under its Cascadian Farm label. We're also taking Kernza for a test drive in the artisanal market, working with a number of independent restaurants and bakeries.

In the future, we'll see things like vegetable oil made from perennial sunflowers, and hummus and bean soups made from perennial legumes. Eventually, you could fill your whole grocery basket. And you'd be doing it with an agricultural system that is a genuine source of solutions—not problems—for biodiversity, soil health and climate change.



VIEWING FOOD AS MORE THAN NUTRIENTS



THE EXPERT

Dariush Mozaffarian, M.D., Dr.Ph., dean of the Friedman School of Nutrition Science &

Policy at Tufts University in Medford, Massachusetts. A cardiologist, his work centers on understanding how nutrition can prevent and treat obesity, diabetes and heart diseases, and on evidence-based policy to reduce these burdens in the U.S. and globally.

The average consumer is looking for a simple, one-concept golden rule to make the right food choices—things like low-fat, low-carb or gluten-free. But this is at odds with where the research is going: toward complexity. We know the impact that individual nutrients can have, but researchers are just starting to scratch the surface of the health effects of whole foods. (Most people don't realize how new modern nutrition science is compared to other sciences. Vitamin C was discovered less than 100 years ago.) For instance, dietary guidelines have recommended low-fat dairy foods for decades—based mostly on theories about the benefits of isolated nutrients: get the calcium and vitamin D, avoid fat. Now we're starting to understand the complexity of the effects of probiotics in yogurt or the fermentation of cheese, and that dairy fat itself may have metabolic benefits. Milk, yogurt and cheese are really three different foods with very different effects on the body.

Or look at whole grains. Research shows that eating them has benefits like reduced inflammation, improved weight loss, lower LDL cholesterol and lower rates of heart disease, diabetes and possibly stroke. And yes, higher dietary fiber contributes to these benefits. But emerging evidence supports additional, independent contributions to health from other characteristics of whole grains—things like slower digestion as well as higher levels of minerals, phytochemicals and fatty acids. So the health effects of whole grains may result from the synergistic effects of multiple factors that are unlikely to be matched by fiber alone. In the future, people won't be making decisions about their diets based on isolated nutrients, but on the complex effects of foods on multiple pathways in our bodies, such as in our liver, brain, heart, fat cells, immune system and gut microbiome.

INSETS: KEVIN MA/TUFTS UNIVERSITY; THE FUTURE MARKET

GROCERY STORES GROW THEIR OWN FOOD



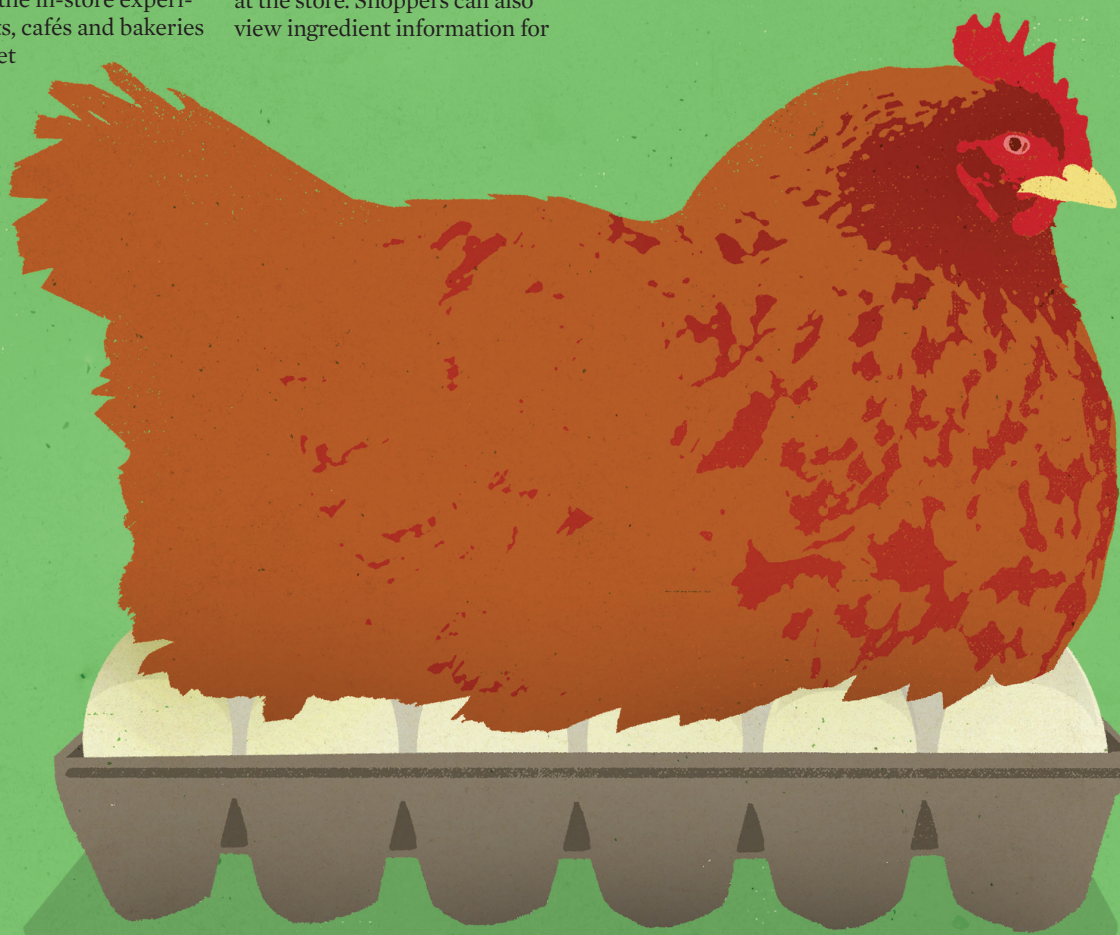
THE EXPERT Mike Lee, co-founder and co-CEO of Alpha Food Labs in New York City, a platform for building and launching new food products, and founder of Future Market, a food lab that evaluates the broader effects of today's food-related innovations, trends and behaviors over the next 25 years.

The idea of a grocery store is becoming more flexible and accommodating to the varied needs of busy people. Soon, there will no longer just be a big building where all the food is and you have to go there to get it. You'll be able to order groceries from a touchscreen kiosk in the subway and have them waiting for you when you get home, delivered by a self-driving car. Stores are already working on these kinds of innovations, but like other technologies, the novelty will eventually wear off and it'll be the new baseline expectation. (Look at Uber: it initially felt like magic, but we're so used to it now that even a 6-minute wait feels too long.) Once that happens, retailers will need to compete on other elements. Because all this convenience chips away at why you'd want to put pants on and go to the store, I predict that the next big area of competition will be the in-store experience. As the restaurants, cafés and bakeries inside grocery stores get more interesting and delicious, people will start to think of the supermarket as that "third place" between home and work to hang out in, like Starbucks.

The prototype for this is a fleet of grocery store mega-centers in China, called Hema. Hema has all of the food items and home goods you would find in a Walmart. It's also an epic destination for people to eat—think live seafood tanks where you can hand-pick a fish or lobster that's cooked on the spot for you to eat in the dining room, served by a robot. And every item in the store is labeled with a QR code. Scanning a package of fresh meat, for example, brings up information on the animal's origin, producer, how it was raised, when it was slaughtered, where it was transported from and when it arrived at the store. Shoppers can also view ingredient information for

premade foods, flavor profile descriptions and even reviews from other shoppers.

The real magic is how Hema gracefully wove together all of those individual technologies into one space. So what will be added next? Supermarkets are going to be tapping into advancements that will allow them to become places where food is actually grown and made. Indoor farming is already happening, and it's possible to improve and miniaturize that model and put it on top of a grocery store. So now your supermarket is also a farm. The same could happen with cellular agriculture, where beef is produced in the back of a Whole Foods without a cow. If the promises that these technologies have put forth come to fruition, it's conceivable that the grocery store might not need any goods from the outside world in order to produce food for its shoppers. That would change how supermarkets compete: each store would make its mark by creating products—not just reselling them.



ENDING HUNGER: WHERE TECHNOLOGY MEETS PARTNERSHIP



THE EXPERT

Claire Babineaux-Fontenot, CEO of Feeding America, based in Chicago. With a network of 200 food banks across all 50 states, it is the nation's largest hunger-relief organization.

In the United States, hunger is not about lack of food: 72 billion pounds of quality, nutritious food goes to waste each year. We have enough food; the problem is getting it to the 40 million Americans who struggle with hunger, before it gets wasted. Connecting surplus food to food-insecure people would help us make significant progress toward ending hunger—but such a feat requires partnership, innovation and perseverance.

It starts with harnessing the power of digital technology, especially smartphones. First of all, this strategy offers accessibility: more than 70% of households with income below \$30,000 have a smartphone today and that number is expected to grow. It also helps streamline the process, all while offering new levels of confidentiality. Imagine a smartphone app that would allow a person in need to visit a restaurant or grocery store and receive food that would otherwise be wasted, at little to no cost.

For example, say a store knows that they normally throw away 10% of their rotisserie chicken. They could post "50 free chickens" on an app. Then a person could claim one through the app, come to the store and pick it up with the rest of their groceries. When they go to pay through the app—just like any other payment app—they simply won't be charged. All this would happen out of sight right in the same line with other paying customers, making it discreet and reducing the stigma associated with receiving charitable food (which can keep some people from accepting help that they may need). Y Waste is an emerging platform in Australia that is laying the groundwork for this, allowing food retailers to sell discounted surplus food through an app and let people just show the receipt when they come in to get it.

What's amazing is that much of the technology already exists to do these things. Now it's just a matter of using it in bigger, more innovative ways.

SMART SENSORS TRACK EVERY NUTRITIONAL DETAIL



THE EXPERT

Sarah Smith, research director, Food Futures Lab at the Institute for the Future (IFF), an independent, nonprofit research group in Palo Alto, California. She works with organizations and companies to explore how technology and social change will influence how people and communities pursue health and well-being.

The holy grail of nutrition is the ability to accurately track every calorie and nutrient that enters our body through a portable or ingestible sensor. This would revolutionize nutrition research, since the self-reported diet journals many scientists currently use are notoriously unreliable. And I can imagine a future where nutrition tracking devices are commonplace and connected to health coaches on our phones, to preference filters for online food shopping or even to workplace wellness incentive programs. The transparency these devices create will also force food companies to clean up their recipes as people become more aware of just how much excess sugar, salt and other unhealthy ingredients are hidden in what they're eating. At this early stage, technology can't yet count calories, but the progress of what we can track is impressive. A research project out of Tufts University, for example, is using a 2-millimeter device that sticks on your tooth and tracks glucose, salt and alcohol intake. With this capability for detailed diet tracking, we will move away from one-size-fits-all understandings of nutrition toward a more personalized approach. Likely, we'll see early adoption of the next generation of sensors among people with diabetes or health conditions that really make it necessary to monitor diet. But as these trackers become better developed, cheaper and more accessible, they'll undoubtedly shift to a broader consumer context. 🍌

SOPHIE EGAN is a San Francisco-based writer whose work on food and health has appeared in *The New York Times*, *The Washington Post*, *The Wall Street Journal*, *Time*, *Wired* and other publications. Her book—*The Conscious Eater: A Radically Practical Guide to Food Choices That Are Good for You, Others and the Planet*—will be published in spring 2020.