MENUS of CHANGE®

The Business of Healthy, Sustainable, Delicious Food Choices

2018 ANNUAL REPORT

The Culinary Institute of America®

HARVARD T.H. CHAN
SCHOOL OF PUBLIC HEALTH
Department of Nutrition

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I. MENUS OF CHANGE IN 2018

Welcome to the *6th Menus of Change® Annual Report*. This report provides you and your colleagues with briefings on areas where your decisions about menus, recipes, and ingredient selection can have the greatest impact on our health, our planet, and our businesses. It also documents a remarkable, positive change resulting from the work of so many chefs and foodservice industry professionals to improve what we eat, including focusing more of our creativity to developing new and delicious plant-forward choices for the dining public.

The first five years of the Menus of Change initiative have passed quickly as we have worked to engage, inform, and guide the culinary profession and foodservice industry in the business of serving healthy, sustainable, delicious food. The initiative, a partnership of The Culinary Institute of America and Harvard T.H. Chan School of Public Health, aims to help you successfully navigate a rapidly changing landscape. It does the essential, difficult, and unprecedented work of integrating the latest findings from both nutrition and environmental science into a single set of recommendations to help foodservice and culinary professionals make better choices. Chief among those choices is to re-think the longstanding emphasis of red meat and other animal proteins on our plates and find delicious new ways to elevate the role of plant-based foods.

During the first half-decade, this report and the initiative brought together key findings from both nutrition and environmental science along with new culinary strategies, and helped focus our profession and our industry on rethinking the role of protein on our menus. A few years, flips, and blends later—and with the involvement of many culinary and business leaders—our industry has increasingly embraced the vision and advice put forth by Menus of Change. The efforts of the many chefs and foodservice operators who have taken up the goals of Menus of Change are now beginning to reshape the American diet. In less than a decade, the culinary profession and the foodservice industry have rallied around a new vision of plant-forward dining. It's now a focus of menu development and culinary innovation in restaurants of all sizes, formats, and price points, from fine dining to student dining, and from full service to quick service.

As you'll read in this year's report, we're now seeing modest but meaningful improvements in what we eat. The report's issue brief on "Diet Quality and Health"(p. 23) and the Harvard Alternative Healthy Eating Index show an uptick in quality, as does our collective utilization of protein. Also, thanks in significant part to the foodservice industry's leadership, last year brought the first reduction in antibiotic use for livestock production, after many years of troubling increases.

Overall, as this year's Menus of Change Dashboard shows, changes made by restaurant and foodservice leaders are heading in the right direction, and they are introducing Americans to better food choices overall. As you'll read, our industry is accomplishing this shift while also wrestling with increasingly complex risks from climate change, water scarcity, lack of visibility into supply chains, and other environmental factors that now make our supply chain more brittle and less predictable.

This annual report is a core part of the Menus of Change mission. It seeks to advance a long-term, practical vision that integrates optimal nutrition, environmental stewardship and restoration, and social responsibility within the foodservice industry. It includes a guide to the key issues that face the foodservice community, as well as recommendations for improving business performance. It also provides the Dashboard to show the progress the industry has made—where it is moving fast and where it needs to make greater efforts. The indicators on the Dashboard can help businesses evaluate their own efforts in the areas that matter most. For culinary professionals, R&D teams, and senior-level strategic marketing managers, there is also a comprehensive set of principles to guide menu development and design.

The CIA and Harvard Chan School invite businesses to use this report to measure their progress and to navigate new and complex challenges. Not all culinary professionals and foodservice companies will take the same path forward. But more and more have a similar goal: to be successful in the businesses of serving healthy, sustainable, delicious food.

Onward!

II. EXECUTIVE SUMMARY: A TASTE OF WHAT'S AHEAD

The greatest opportunity in using the **Menus of Change Principles of Healthy, Sustainable Menus** is that they are comprehensive. Rather than foodservice operators needing to check a dozen sources scattered in different places or wade through conflicting guidance, the Principles offer an integrated roadmap. They work together to help create healthy, sustainable, delicious food choices. Their comprehensive nature also can pose a challenge, though, as so many professionals are striving to make one change at a time. So, when first looking at the principles, the question of where to start can be challenging. There are 24 of them, after all.

From this recognition of the need for prioritizing action, a way of focusing and framing many of the principles in an approachable way, Menus of Change published last year for the first time a formal definition of a term we see as filling the need for that focal point: *plant-forward*. We define "plant-forward" as: *A style of cooking and eating that emphasizes and celebrates, but is not limited to, plant-based foods—including fruits and vegetables (produce); whole grains; beans, other legumes (pulses), and soy foods; nuts and seeds; plant oils; and herbs and spices—and that reflects evidence-based principles of health and sustainability.* (Note the distinction from "plant-based," referring to foods and ingredients made entirely from plants, whereas "plant-forward" refers to recipes, menus, and concepts that may contain poultry, fish, dairy, or small amounts of meat.)

Importantly, "plant-forward" is and was always meant to be a B2B term; it's not meant to be the descriptor you list on your menu, or the catchphrase you use to market your new concept. It's an umbrella term—which can include vegetarian and vegan approaches but is far more inclusive and, we hope, better positioned to be adopted broadly by foodservice operators and culinary professionals. It is a way of getting on the same page within the Menus of Change community, for talking to one another as culinary professionals and menu decision-makers about where the GPS is pointed: the future direction we need and want to take our industry as a whole. The shorthand can help you tackle the vast majority of the principles covering healthy, sustainable menus.

Countless chefs, registered dietitians, researchers, educators, executives, and the Menus of Change leadership itself were all heartened to see "plant-based" and "plant-forward" dining grace nearly every major trend list of 2018, including both the top trends and hot concepts identified by the National Restaurant Association.

While it's worth celebrating that chefs and operators are increasing their plant-forward offerings, it's important that they not think of vegetable-centric, plant-forward menus as trends, but rather, a new normal. We must all do our part to ensure plant-forward has staying power, so it doesn't fall by the wayside as merely the "hot trend of 2018." Of course, there's sound reasoning behind each and every one of the 24 principles. Not to be overlooked are the ever-important needs to, for instance, continue to lower the use of salt and added sugar, to serve more kinds of seafood more often, and to reduce portions. And if we've learned anything about what it looks like to advance plant-forward menus on the ground, it's that the principle "Lead with Menu Messaging Around Flavor" is perhaps more relevant than ever before. So too is "Leverage Globally Inspired, Plant-Forward Culinary Strategies." So just remember: even the best highways certainly don't cover the entire map.

As the Dashboard reflects, the past year was pivotal in nearly all indicators of progress. Particular strides were seen for (1) food industry investor standards, (2) local and regional food systems, and (3) animal welfare and agriculture, drugs, and chemicals use. (Given how intertwined animal welfare is with agriculture, drugs, and chemicals use, we have now merged the issues in the 2018 scorecard, using the past scores for agriculture, drugs, and chemicals use as the comparison.)

1. **Food Industry Investor Standards**
The past year brought a wave of unprecedented changes and challenges to the U.S. food and agriculture sectors, and these effects translated to new approaches to investment in food and beverages. Much of the country's agriculture, energy, and distribution industries were buffeted by extreme weather, wildfires, and labor and farmworker disruptions. The Trump administration ushered in deregulation and a reversal of many policies long pursued by the U.S. Environmental Protection Agency (EPA), U.S. Department of Agriculture (USDA), and other key agencies for the food industry, and began dismantling some Obama-era investment rules. Newly energized social movements, strong state and local governments committed to climate change goals, and corporations aligning with the United Nations' Sustainable Development Goals (SDGs) redoubled efforts to advance sustainability. Finally, tech innovations like robo-investing, alternative proteins, and blockchain—which allows for massive amounts of information to be stored, dated, and easily searched—brought new possibilities for investors and food companies alike.

2. **Local and Regional Food Systems**
Restaurants and foodservice leaders play an important role in enabling local and regional farms to scale up and be profitable. And many of the newest restaurant concepts are focused on doing just that. According to the National Restaurant Association, the top concepts for this year included a host of variations on local sourcing: hyperlocal, locally sourced meats, locally sourced seafood, farm-branded items, and the continued emphasis on local fruits and vegetables. Now part of the mainstream thinking, local is beginning to show up in more concepts that reach beyond full-service dining to more types of eating occasions.

3. **Animal Welfare and Agriculture, Drugs, and Chemicals Use**
As noted in the *2017 Menus of Change Annual Report*, most of the largest U.S. restaurant, hospitality, and foodservice companies have taken on the challenge of antibiotic resistance in response to consumer demand. Well over half of these companies now have in place commitments to reduce or eliminate antibiotic use in their supply chains in the next few years. Most of these commitments are in the poultry sector, which continues to respond to consumer demand more robustly than the swine and dairy industries, where the ongoing use of low-dose antibiotics for prophylaxis is a problem.

In any industry, in any point in time, change is to be expected. But never before has the *pace* of change in the foodservice industry been so rapid. Consumer demands for transparency and traceability are becoming more and more granular, and the time for food companies to respond is becoming shorter and shorter. So, the outcropping of innovation, from business models to protein sources, and the many rigorous sourcing, menuing, operational, and investor initiatives, are all commendable.

And yet, we would not want to mistake these many positive improvements—or the pace of these improvements—for a false sense of the adequacy of our efforts. There remain critical areas where the foodservice industry must act much, *much* faster.

Given the complexities of change in order to benefit the triple bottom line of people, planet, and profit, the Menus of Change report is designed to give foodservice and culinary professionals the insights and the tools to make informed decisions about difficult issues. The report sifts through culinary trends and innovations to shed light on some of the most intriguing companies and projects happening around the country, all in the name of healthier, more sustainable food. The Menus of Change initiative also importantly provides comprehensive advice and strategies for menu design that support the triple bottom line with the 24 principles. These guidelines outline culinary strategies, such as new focuses on portion size, calorie quality, and plant-based foods, which are needed to increase the success of new business models.

The centerpiece of the Menus of Change report is a concise analysis of 12 issues at the intersection of public health, the environment, and the business of food. These issue briefs synthesize the latest health and environmental data to provide a clear picture of the industry's challenges and opportunities, as well as practical next steps for foodservice operations. The report assigns each issue an annual score that rates the industry's efforts in these critical areas. Among these 12 issues are two that merit particular attention, as in years past.

Water Sustainability
This past year, the United Nations Food and Agriculture Organization called global attention to the link between sustainable management of water resources, food production, and the food industry. With the price and availability of food so dependent on water resources, jobs in the foodservice industry are as well. There is no one-size-fits-all solution for crafting menus that strongly support water sustainability. Plant-forward menus and recipes, attention to water and environmental conditions in regions that grow food, and engagement with growers and food suppliers on sustainable water practices are all important steps toward finding more specific long-term solutions.

Climate Change
Climate change remains worthy of more urgent and substantive attention throughout the restaurant and foodservice industry. This past fall, a book was published called *Drawdown: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming.* A *New York Times* bestseller, and edited by Paul Hawken, the book has generated buzz for many reasons, but in the restaurant and foodservice world, what's especially attention-grabbing is the fact that eight of the top 20 solutions proposed relate to food—from regenerative agriculture to converting annual to perennial staple trees in the tropics. Out of 100 possible solutions, from wind turbines and rooftop solar panels to bioplastics and electric bikes, "plant-rich diet" comes in at #4. The international momentum being generated by *Drawdown* only adds fuel to the fire behind efforts like the Menus of Change Protein Flip and emphasis on plant-forward menu innovation to help make a measurable dent in finally bending the global emissions curve.

Overall, the industry is making substantial gains in the right direction: 11 of 12 issues received a score of four (making good progress) or three (holding steady). This year, scores for all of the following issues increased for the first time in several years: climate change, fruit and vegetable consumption and production, protein consumption and production, and portion size and caloric intake. Unfortunately, the lack of substantive action in the industry to address water scarcity has kept that issue stalled at a score of two. All in all, though, the average score across all 12 issues was 3.4. Looking at this big picture, this improvement compared to the 2017 average of 2.8 represents an inspiring step forward for the industry as a whole.

STATE OF THE PLATE

How are we doing? Sometimes it's hard to tell. The Menus of Change Dashboard on the next page provides a snapshot of the foodservice industry's progress to improve nutrition, sustainability, and profitability. Its scores on critical issues that affect the foodservice industry are updated annually to show where progress is being made. It also creates a set of standards that are designed to be used by businesses to judge their own efforts on health and sustainability.

Dashboard Score Key
The score assigned to each issue indicates progress or lack thereof in the foodservice industry and/or culinary profession over the last 12 months, as follows:

1: SIGNIFICANT PROGRESS

2: GOOD PROGRESS, WITH ROOM FOR MORE

3. NO SIGNIFICANT PROGRESS

4. GETTING BETTER, BUT FAR FROM WHERE IT NEEDS TO BE

5. SIGNIFICANT DECLINE OR REGRESS

METHODOLOGY

The scores were developed based on the expert opinions of the members of the Menus of Change Scientific and Technical Advisory Council, who considered new research findings and trend data as well as innovations and changes in business practices and policies. The information was then reviewed by members of the Menus of Change Sustainable Business Leadership Council to ensure it reflected new industry initiatives and practices.

2014–2018 MENUS OF CHANGE® DASHBOARD

ISSUE	SCORES 2018	2017	2016	2015	2014	JUSTIFICATION
SUPPLY CHAIN RESILIENCY AND TRANSPARENCY						Food supply chains remain especially vulnerable to fraud and contamination. Advances in technology should help track food from source to consumer and more quickly manage foodborne illnesses as they arise. Making more information available to consumers about food and its sourcing, processing, and treatment is more important than ever.
CHANGES IN FOOD INDUSTRY INVESTMENT STANDARDS						As uncertainty increases in the U.S. and abroad, investors seek businesses that incorporate sound sustainability and risk management stragegies. Food and restaurant businesses are expected to be responsive to and aware of key concerns such as transparency, climate risk, and workplace diversity.
LOCAL AND REGIONAL FOOD SYSTEMS						Chefs ignited the local food movement, and restaurant companies are now creating new concepts to bring local to the mainstream. However, established players still look to commodity markets to fill out most of the plate, missing an opportunity to support local communities, a more resilient farm sector, and biodiversity.
LAND USE AND FARMING PRACTICES			N/A	N/A	N/A	There has been little change in how we use, or manage, farmland and ranch lands as well as soil resources in the U.S.
AGRICULTURE, DRUGS, CHEMICALS USE & ANIMAL WELFARE						Antibiotic use may finally be declining after many years of continued increase as commitments made by major restaurant and foodservice companies have influenced the livestock industry. Species-specific data for 2018 and 2019 should confirm whether the decline is a true trend.
DIET QUALITY AND HEALTH						While public policy and nutrition promotion efforts have stalled, leading restaurant companies are making significant moves to reduce beef consumption, offer innovative and healthier sides, spark new customer and media interest in plant-forward flavors, and introduce new beverage choices.
PORTION SIZE AND CALORIC INTAKE						Progress is being made on improving calorie quality. Efforts to also reduce serving size while serving higher-quality food have now entered the pilot phase.
PROTEIN CONSUMPTION AND PRODUCTION						Motivation aside, eating out more and eating meat less are correlated, as many in the restaurant industry continue to find ways to help diners eat less meat, a move that also addresses climate imperatives.
FRUIT AND VEGETABLE CONSUMPTION AND PRODUCTION					N/A	Americans are shifting to healthier diets, with many chefs and operators elevating the role of produce on menus. While upticks in actual produce usage are still modest, aspiration is clearly growing on the part of much of the dining public.
FISH, SEAFOOD, AND OCEANS						Americans eat most of our fish and seafood away from home but only half as much as we should. The restaurant industry can help Americans eat more fish and do so responsibly. There's much work ahead and new approaches are needed, although recent federal action may reduce illegal fishing.
WATER SUSTAINABILITY						The U.S. foodservice industry is beginning to pay attention to water issues as drought and groundwater depletion have weighed heavily on profits in recent years.
CLIMATE CHANGE						The restaurant industry and culinary profession are driving an important trend in reducing red meat consumption, which has the largest GHG footprint or contribution to climate change, and highlighting plant-forward menu innovation, but efforts to promote other, more sustainable animal proteins or source from producers who use far superior growing practices remain sporadic.

OUR VISION

OUR VISION

HEALTHY, SUSTAINABLE, AND DELICIOUS

BUSINESS MODELS AND STRATEGIES

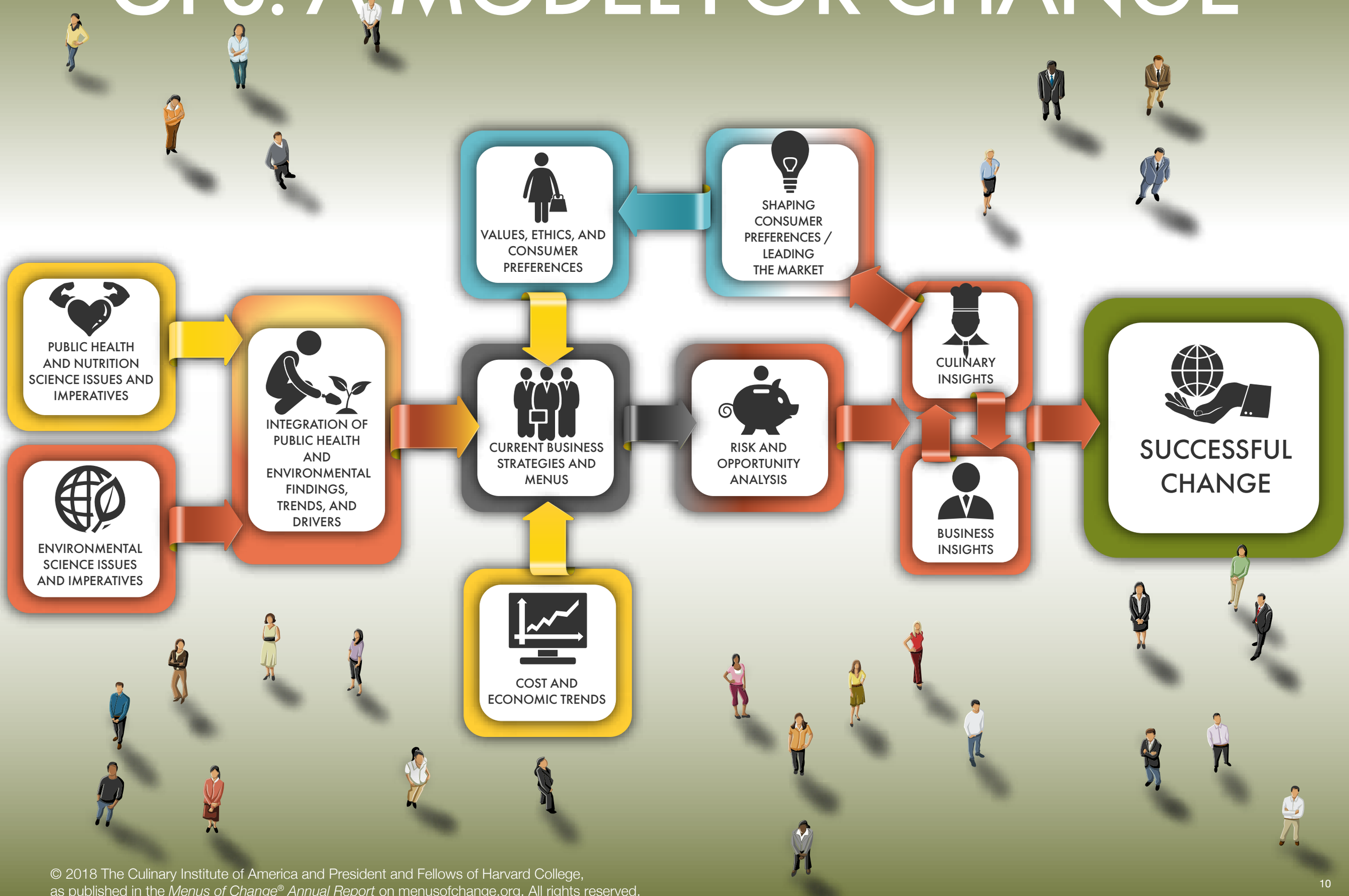
MENUS of CHANGE®

The Business of Healthy, Sustainable, Delicious Food Choices

THE FUTURE OF FOOD

INTEGRATED GUIDANCE FOR BUSINESS AND CULINARY LEADERS

GPS: A MODEL FOR CHANGE



WHAT'S IN A NAME?

To help communicate with your industry colleagues, the media, and, as needed, your customers about the distinctions between different menu strategies that leverage vegetables, fruits, nuts, legumes, whole grains, and plant proteins in leading roles, we've settled on some naming protocols. Let us know what you think.

- ***Plant-Forward***: Please see definition on the right. "Plant-forward" is a big-tent concept for dietary and food system transformation that includes a whole range of healthier, more sustainable culinary approaches—from those that contain poultry, fish, dairy, and/or small amounts of meat to vegetarian and vegan offerings.

- ***Plant-Based***: Used to refer to ingredients and foods themselves, i.e., fruits and vegetables (produce); whole grains; beans, other legumes (pulses), and soy foods; nuts and seeds; plant oils; and herbs and spices. Different from "plant-forward," which refers to the style of cooking and eating that emphasizes and celebrates these foods, but is not limited to them.

- ***Vegetarian***: Dishes or dietary patterns that do not contain meat, poultry, or fish but may, or may not, contain dairy, eggs, and/or honey, and individuals who do not eat meat, poultry, or fish but may, or may not, eat dairy, eggs, and/or honey.

- ***Vegan***: Dishes or dietary patterns that do not contain any ingredients that came from animals, and individuals who do not eat any ingredients that came from animals.

- ***Flexitarian***: Dietary patterns that are more focused on plant-sourced foods and much less reliant on meat—often following, for some or many meals, a vegetarian model—but that may occasionally include meat, as well as some poultry, fish, or dairy foods.

III. DEFINING PLANT-FORWARD: GUIDANCE FOR OUR INDUSTRY

PLANT-FORWARD

A style of cooking and eating that *emphasizes and celebrates*, but is not limited to, plant-based foods—including fruits and vegetables (produce); whole grains; beans, other legumes (pulses), and soy foods; nuts and seeds; plant oils; and herbs and spices—and that reflects evidence-based principles of health and sustainability.

HEALTHY, SUSTAINABLE, PLANT-FORWARD FOOD CHOICES

This distilled guidance about the future of our food choices, for individuals and professionals, is an outgrowth of multiple, joint leadership initiatives of The Culinary Institute of America and the Department of Nutrition at Harvard T.H. Chan School of Public Health, including Menus of Change; Healthy Kitchens, Healthy Lives®; Teaching Kitchen Collaborative; and Worlds of Healthy Flavors. It reflects the best current scientific evidence supporting optimal, healthy, and sustainable dietary patterns while addressing vital imperatives to achieve short- and long-term global food security.

Healthy, sustainable, plant-forward food choices—when informed by culinary insight—can transform palates and spur next-generation innovation, as is evident in the success of new menu, restaurant, and retail product concepts thriving in the marketplace. In short, this is a practical, achievable vision for a delicious future. For more information, please read the Principles of Healthy, Sustainable Menus at menusofchange.org.

Plant-forward is primarily envisioned as a B2B term, not a way to describe dishes on menus. For that, operators are encouraged to lead with descriptors that convey flavor, quality, deliciousness, sense of place, ties with local producers, seasonality, culinary adventure, cultural contexts or heritage, fun, and/or innovation or invention—according to their distinct restaurant or foodservice concept.

HEALTHY, SUSTAINABLE, PLANT-FORWARD FOOD CHOICES ARE THOSE THAT:

- Feature minimally processed, slow-metabolizing plant-based foods: fruits and vegetables (produce); whole grains; beans, other legumes (pulses,) and soy foods; nuts and seeds; healthy plant oils; and herbs and spices.
- Place animal-based foods in a reduced or optional role, with a special emphasis on decreasing purchases of red meat and minimizing foods sourced from animals raised with the routine, non-therapeutic use of antibiotics. These choices prioritize fish and poultry among animal-based proteins, with dairy options and eggs playing a supporting role (if desired).
- Might include vegetarian and vegan choices.
- Highlight the value of fresh, seasonal, locally produced foods; minimize sugary beverages and added sugars and sweeteners; and reduce sodium and unhealthy additives.
- Emphasize healthy dietary patterns and a rich diversity of whole foods versus an undue focus on specific nutrients and percentages; avoid excess quantities of calories but first ensure calorie quality.
- Celebrate cultural diversity, personal needs and preferences, and the unapologetic elevation of deliciousness, including room in our diets for foods of special occasions.
- Begin with transparent ingredient sourcing that supports sustainable farming methods and fisheries.
- Through food purchasing patterns, encourage innovation and sustainable practices in retail food and restaurant concepts and business models to advance public health, social well-being, and our food system.

IV: GREEN SHOOTS: DELICIOUS SIGNS OF CHANGE

"AI." "Soil health." "Plant-based foods." These are just a few of the buzzwords of the past year that stand to make a positive difference in the future supply chains and menus of the now $800 billion restaurant and foodservice industry.

Connected by themes of technology, transparency, cost reduction, climate change mitigation, and improved human well-being, what follows is a roundup of inspiring actions being taken in the name of healthy, sustainable, delicious food choices. Most of these initiatives are not yet happening at scale, but they're worthy of our attention for the innovative approach each one takes and the seeds of change they may very well sow in the long run.

DOUBLING DOWN ON FOOD WASTE

- *QSR* magazine reported this year that, according to the National Restaurant Association, half of all operators are now tracking their food waste. This represents a stunning consensus emerging about both the environmental and business case for waste reduction.

- DoorDash began a pilot program called Project DASH ("DoorDash Acts for Sustainability and Hunger") in partnership with Feeding America in which participating restaurants can connect a photo of extra food to a food bank or shelter in need. DoorDash does its part by applying its delivery algorithm to chart the fastest way to get it there.

- In support of the U.N. Sustainable Development Goals, a coalition of over 100 chefs from 36 countries has come together to put forward the Chefs' Manifesto, a list of values they agree are central to advancing the SDGs. On the list is not only protection of biodiversity and animal welfare, an emphasis on plant-based ingredients, and investment in farmer livelihoods and sustainable agriculture, but the bold vision of "No food loss or waste." *chefmanifesto.com*

SUPPORTING SOIL HEALTH

- In December, timed with the United Nations' World Soil Day, Karen Leibowitz and Anthony Myint, co-owners of the sustainability-focused restaurant The Perennial in San Francisco—who are also co-founders of the Zero Foodprint initiative, which works to advance carbon-neutral dining across the restaurant industry—released a Healthy Soil Guide for chefs. Their hope is that more and more chefs and foodservice executives will use their purchasing decisions and their menus to support farms with the healthiest soil. While the guide is not a step-by-step manual, it's a framework of best practices to look for that can get menu decision-makers on the right path: from crop rotation and perennial (as opposed to annual) crops to cover cropping and composting. *healthysoilguide.com/#/guide*

- To help promote the guide, the Center for Food Safety released *Chefs for Soil*, a short film featuring chefs such as Dominique Crenn, Tanya Holland, Dan Barber, and Jeremy Fox that articulates how biological diversity above ground is tied to diversity below ground. When soil is damaged—as happens by plowing, deforestation, and erosion, among other practices—carbon gets released into the atmosphere, acidifying oceans, heating the planet, and leaving soil without the nutrients it needs to grow food. Soil plays a critical role in not only climate change mitigation but nutrition, taste, and yield. The video's call to action reminds chefs that with 95 percent of what we eat reliant on healthy soil, culinary professionals have a huge role to play in helping reverse this problem. *soilsolution.org/watch-the-film/chefs-for-soil/*

SUPPORTING SUSTAINABLE SEAFOOD

- Marine biology meets culinary inspiration in support of open ocean aquaculture: Jeremy Sewall '92, the chef and partner of Row 34 and Island Creek Oyster Bar restaurants in the Boston area, has teamed up with a research scientist at University of New Hampshire's School of Marine Science and Ocean Engineering, Michael Chambers, to source fish that, as the *Boston Globe* reported, "was grown in an offshore pen that bears little resemblance to the stagnant, antibiotic-filled fish ponds people might associate with aquaculture." Chambers uses a method called an Integrated Multi-Trophic Aquaculture system (IMTA), that involves a "biological curtain" of mussels and seaweed on a rope to absorb nutrients and remove nitrogen. One downside, though, is that depending on the species, it can take months or even years to bring the fish to market. For Sewall, who was raised in a family of fishermen, the purpose is personal, but also a good business opportunity. He compares his support of Chambers' fish farming method to chefs who support small organic farms because of the superior flavor and quality they discern in the meat and produce. As Sewall sees it, the market is huge and the story on the menu will resonate with diners—so these fish are worth the wait.

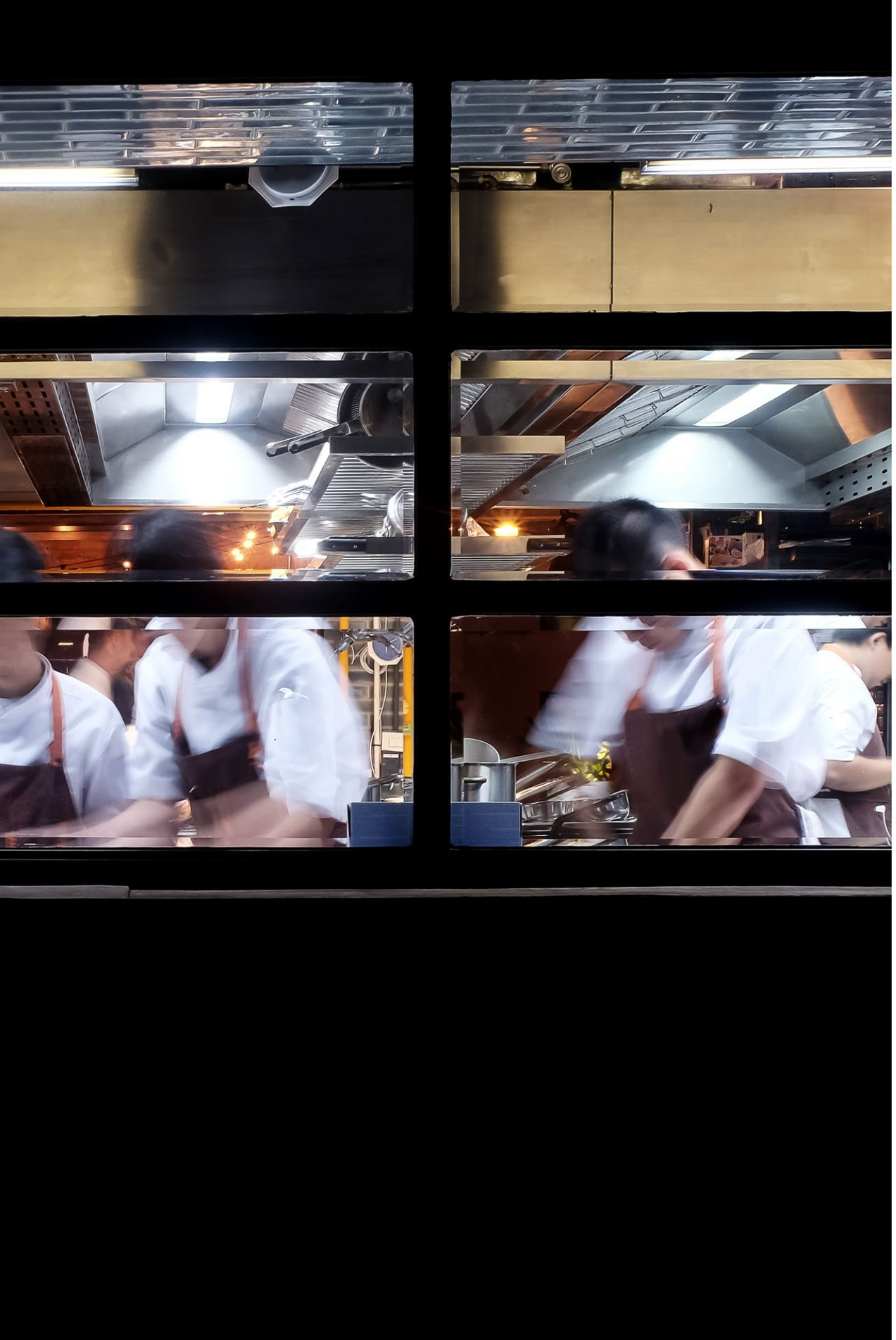
- Fast casual chains are starting to use underutilized species on a wider basis. As *QSR* reported in March 2018: "Created 20 years ago by the Monterey Bay Aquarium, Seafood Watch partners with more than 300 chefs and foodservice companies to provide recommendations for sustainable seafood species. Nevertheless, the majority of Americans continue to seek only a handful of fish species on restaurant menus. 'There's going to be a white fish, there's going to be a salmon, there might be a tuna dish, maybe some shrimp,' says Ryan Bigelow, program engagement manager for Seafood Watch. 'There's a few species that come up over and over again because we frankly don't have the palate or the culinary interest to try new things when it comes to seafood.'" Enter Brown Bag Seafood, a Seafood Watch partner based in Chicago featuring rockfish in its "Daily Catches" rotation, along with hake in place of cod, among other strategic sourcing moves. For its part, The Poke Lab in Monterey, CA has introduced options like sablefish, a local black cod, and sepia, a cuttlefish resembling squid. Other fast casual brands are using steelhead trout for salmon (when in season) from the Pacific Northwest, invasive species like lionfish from Florida in ceviche, and line-caught mackerel from the U.S. Gulf of Mexico in sushi.

SIMULATING THE FUTURE

- Last fall, author Alexandra Kleeman and artist/chef Jen Monroe hosted a themed dinner set 30 years in the future, illustrating a hypothetical meal sourced from an ocean that has been dramatically altered due to climate change: the water temperature is too high, all the fish are gone, coral reefs have been bleached, and acidification has wreaked havoc on the remaining sea life. So what would "The Next Menu" look like? At the event, diners' drinks contained green spirulina ice cubes, given the microalgae's steroidal growth rate in a future world where food is scarce; dishes featured seaweed and octopus, given their stamina to survive in the changing oceans; or, in one particularly grim dish, an empty oyster shell was served, as there are simply no oysters left.

- Institute for the Future's Food Futures Lab revealed six "artifacts from the future," using signals from the present to help consumers imagine possible futures. Artifacts included a "vitAImix" blender for a hypothetical blueberry smoothie that uses machine learning to automatically detect the price changes of the berries in real time and, with the power of the internet of things, have your refrigerator place the order for you at the moment the price drops. There was also a Pokemon Go-style augmented reality game in which players aim to maximizee the diversity of their gut microbiome, underscoring the emerging importance of biodiversity at the microbial level, which can impact biodiversity on the farm level, and is inspired by the connection between lack of diversity in the diet and chronic disease such as type 2 diabetes. A third artifact was an incentivized receipt system where a food delivery box gets curated with the help of food safety specialists and blockchain technology, tacking on a transparency fee to producers to avoid food fraud, minimize waste, reward plant-based foods, and even support health insurance for farmers.

- Future Market released six new concept products at this year's Winter Fancy Food Show, blending trends and technologies of today to bring to life what everyday products might look like in the future. Products included: Kernza® Krunch cereal using the drought-resistant perennial grain that helps build healthy soil; Block Bird, "the first, fully transparent supply chain line of chicken products verified by Blockchain technology"; and Plant Plate, a new frozen meal featuring a cauliflower steak entrée that changes seasonally, is plant-centric, and if animal protein is included is used merely as a garnish. The product's faux marketing description says, "Meat in the center of the plate? That's so 2010." Very much in line with the Menus of Change Protein Flip strategy, the concept product was inspired by Dan Barber's book *The Third Plate*. Of all the products debuted by Future Market, it's the one that most makes us feel as if, at least among many in the Menus of Change community, the future has already arrived.



V: BUSINESS IMPERATIVES: THE CHANGING CALCULUS ON COSTS, RISKS, AND OPPORTUNITIES

This section provides insights and advice on innovation, investment, and supply chain resiliency to help culinary professionals and the industry move more quickly in the right direction. Over the past year, there have been many signs of improvement in food traceability and safety, while disease outbreaks and food fraud continued to weigh on the food supply. New research revealed that more than half of all food poisoning cases come from food made in restaurant environments. These findings emphasize the need for foodservice operators to take a holistic and proactive approach to doubling down on food safety. Also revealed recently were new cases of food fraud, from adulterated olive oil to mislabeled seafood.

On the upside, several demonstrations of public interest and governmental response to supply chain transparency issues suggest these concerns are being taken more seriously, and an array of emerging technologies may begin to offer operators better tools for tracking, verifying, and communicating issues of food safety and food fraud.

While vulnerabilities persist in the supply chains upon which the restaurant and foodservice industries rely to run their businesses, investment in the space continued over the past year at a healthy clip. Strong, steady growth in sustainable and responsible investment, known as SRI, has remained consistent among investors, as has consensus that stronger financial performance is tied to companies that commit more substantially to environmental, social, and governance (ESG) concerns. Transparency, the effects of climate change on the availability and reliability of ingredients, and workplace diversity all appear to be of particular importance to investors looking to increase their engagement with companies in the food and foodservice industries.

SUPPLY CHAIN RESILIENCY AND TRANSPARENCY

In 2017, we saw many advances in food traceability and safety, but also reminders that continued improvement and attention is very much warranted, as our food supply remains vulnerable to disease outbreaks and food fraud. With the continued reliance on a limited number of major suppliers and ingredients, the resiliency of the food supply remains a challenge for the food industry.

An important food safety study by researchers at Penn State University found that over half of all food poisoning cases come from restaurant-prepared food. They also looked at states and cities with employee-favorable sick-leave laws and found that food safety increases when foodservice workers are paid not to work when sick. The work calls into focus the challenges in the quick-service food arena, and namely the food poisoning cases at Chipotle, which appeared again in 2017, and remind us that food safety requires a holistic consideration of the food preparation environment. This holistic approach improves the resiliency of the food supply chain, enabling restaurants to more quickly and easily recover from supply chain shocks.

Some challenges have arisen from changes in inspection and regulation. For instance, the USDA announced in December that it has terminated the advisory committee on food safety and nutrition and is reconsidering the zero tolerance of listeria in food safety testing. And we are reminded that it is important to remain focused on food safety, as a new stubborn strain of salmonella was detected and suspected as tied to the rise in salmonella illness cases reported in Europe.

Additionally, the complexity and vulnerability of our food supply was shown in a case in which 3.7 million pounds of breaded meat at multiple food processors had to be recalled, as the breadcrumb supplier used milk and did not disclose it, triggering an allergy violation in the labeling. The sellers of the meat reported difficulty in finding the exact source of the milk, showing that food traceability of critical ingredients and allergens is still challenging. General Mills pulled over 10 million pounds of flour last June because of a multi-state E. coli outbreak. Research on the recalled flour by the Centers for Disease Control and Prevention indicates that raw flour has an increased risk of Shiga toxin-producing E. coli bacteria (STEC), requiring a revisiting of popular foods like raw cookie dough, for instance. This level of analysis was made possible by whole-genome sequencing, underscoring that advances in food safety and traceability often require very detailed laboratory work.

Food fraud continues to be a major issue, and the past year brought more cases to light. The Hellenic Food Authority caught a Greek family business attempting to sell olive oil cut with sunflower oil as extra-virgin olive oil. Over 17 tons of adulterated olive oil were seized. Upon further analysis, it appeared that a dye was also used to tint the oil blend, introducing a carcinogen present in the dye into the food supply, all in the name of ill-gotten profits. This year, a study on sustainable seafood by Arlin Wasserman of Changing Tastes and Dr. Russell Walker of the Kellogg School of Management at Northwestern University found that seafood fraud costs U.S. consumers and consumer-facing businesses more than $10 billion a year in overpayment by consumers.

On the bright side, food safety has garnered important advances through lawsuits, setting new precedents. A U.S. judge sentenced the executives of Quality Egg LLC to prison for knowingly selling expired eggs and attempting to bribe a U.S. Department of Agriculture (USDA) inspector to approve bad eggs. The sale of the bad eggs caused over 56,000 cases of illness, including some serious and permanent. This is a good sign that courts are taking food fraud and food safety seriously.

We also see that food origin and food treatment matter to people and have driven new laws. A new ordinance passed in San Francisco in October requires retailers of raw meat and poultry to report the use of any antibiotics used in their production. The good news is that public interest and governmental response to this concern about antibiotics has never been higher, and demand for information about our food is increasing. However, major meat producers and retailers signaled that the necessary information is not systematically in place for the clear reporting of antibiotic presence in meat and poultry, triggering a new debate on the value and cost of such reporting.

In more positive news, increasingly, technology is providing the much-needed capability of better monitoring our food supply. Being able to better identify issues early on can improve the resiliency of our food supply, providing more lead time to adjust and better contain any problems. Researchers used Twitter to map foodborne illnesses in St. Louis with success. A novel website, *iwaspoisoned.com*, allows people to report foodborne illness so that outbreaks can be resolved more quickly and with less impact to health. Verizon has developed a network of sensors, using the Internet of Things (IoT) to track and confirm unbroken cold storage of perishable food for clients. A consortium including Dole, Driscoll's, Golden State Foods, Kroger, McCormick and Company, McLane Company, Nestlé, Tyson Foods, Unilever, and Walmart are working with IBM to identify new areas where the global supply chain can benefit from block chain technology, which leverages community confirmation for tracking and verification. The focus is to increase food traceability and reduce health risks to the public.

In the near future, we should expect more well-trained professionals to be available to study the problems of food safety and food fraud. In particular, Arizona University has launched a new degree program in food safety to go after the $15.6 billion in economic loss caused from foodborne illnesses in the U.S. each year. Codex Alimentarius (the world food code) committed to undertaking a new international effort to define the scope and reach of Food Fraud, Food Integrity, Food Authenticity, and related terms for the purposes of making food more protected from fraud through increased definition, measurement, and traceability.

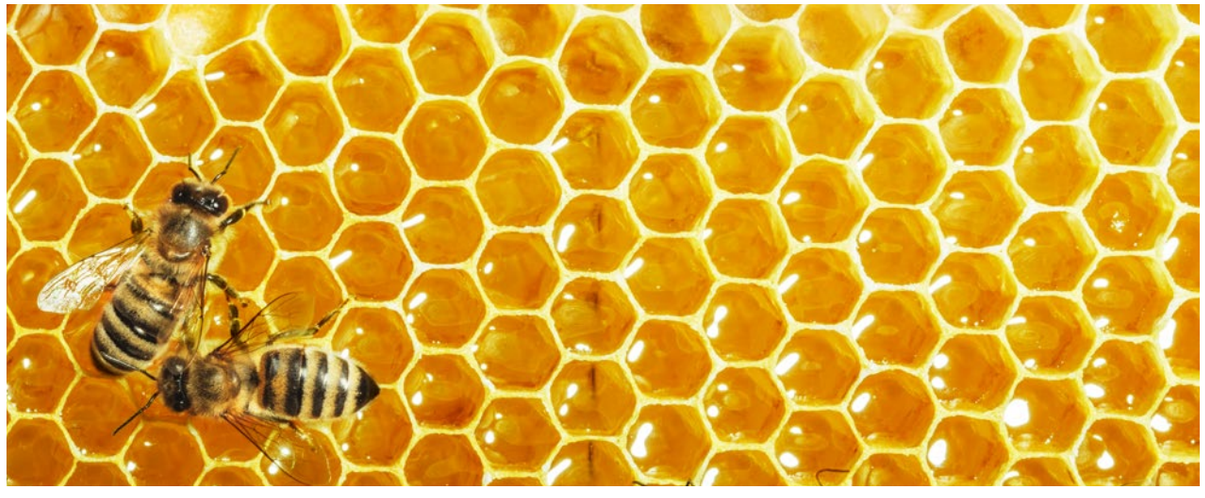
Food products over the past year show widespread economic fraud and misrepresentation, as well as advances in removing human antibiotics. Products are now measured in new and powerful ways with social media and technology such as IoT and block chain, though still difficult to trace in detail and subject to increasing governmental and customer demands about sourcing and treatment information. These features suggest that food traceability is a growing priority for consumers, regulators, preparers, and food producers.

SCORE: 3.5

Food supply chains remain especially vulnerable to fraud and contamination. Advances in technology should help track food from source to consumer and more quickly manage foodborne illnesses as they arise. Making more information available to consumers about food and its sourcing, processing, and treatment is more important than ever.

IN SUMMARY:

- Foodborne illnesses are highly tied to restaurant food preparation and foodservice worker illness. Programs to prevent foodservice workers from working when ill should be in place.
- Food fraud is rampant. At its core is the desire of a food processor or seller for economic gain by lying and cheating customers. Social media, technology, and customer reporting will continue to bring more food fraud to light.
- Consumers, governments, and honest food producers continue to demand more transparency in food reporting, signaling growing attention to the nature of our food supply.



CHANGES IN FOOD INDUSTRY INVESTOR STANDARDS

The past year brought a wave of unprecedented changes and challenges to the U.S. food and agriculture sectors, and these effects translated to new approaches to investment in food and beverages. Much of the country's agriculture, energy, and distribution industries were buffeted by extreme weather, wildfires, and labor and farmworker disruptions. The Trump administration ushered in deregulation and a reversal of many policies long pursued by the U.S. Environmental Protection Agency (EPA), U.S. Department of Agriculture (USDA), and other key agencies for the food industry, and began dismantling some Obama-era investment rules. Newly energized social movements, strong state and local governments committed to climate change goals, and corporations aligning with the United Nations' Sustainable Development Goals (SDGs) redoubled efforts to advance sustainability. Finally, tech innovations like robo-investing, alternative proteins, and blockchain—which allows for massive amounts of information to be stored, dated, and easily searched—brought new possibilities for investors and food companies alike. Despite such a volatile market environment, U.S. investors enjoyed a strong bull market and record index highs.

One investor trend that has remained consistent over the past decade is the strong, steady growth in sustainable and responsible investment (SRI). The investment thesis that companies with better environmental, social, and governance (ESG) commitments will have better financial performance than their less responsible peers over time is now widely recognized as valid and valuable. For example, 78 percent of the largest U.S. asset owners have incorporated ESG analysis into their investing strategy, up from 33 percent in 2013.

In addition to greater ESG investment overall, more mainstream investment firms like Blackrock and Vanguard Group are engaging in shareholder advocacy, voting their proxies in favor of select proposals that support transparency and sustainability. Investors dedicated to ESG are also stepping up advocacy through the number of shareholder resolutions filed. The Principles for Responsible Investment (PRI) group of investors reported a 180 percent increase in resolutions filed in 2017 over 2016, for an all-time high of 241 resolutions. Key themes include governance, environment (including climate change and water scarcity), and workplace diversity.
Many firms are asking major corporations to demonstrate that their boards of directors are "climate competent"—or knowledgeable about how climate change imposes business risks and opportunities to their company. Others are pushing for more women on boards of directors and greater commitment to hiring and promotion of minority or female employees. The food industry is plagued by issues of sexism and harassment; a recent study found that on a monthly basis, two-thirds of women experienced sexual harassment from management. Men also experienced sexual harassment, though at lower rates, and harassment was worse in general in states that allowed tipping. The #MeToo movement has focused attention on these issues, and recently several celebrity chefs have been called out as having been harassers for years. While the focus thus far has been on widely known individuals, food companies and restaurants should expect investors to be concerned about workplace harassment in the coming year, and the industry as a whole would do well to address sexual harassment head-on as a pre-competitive initiative. In any event, investors increasingly see this set of issues as a whole.

The growing threat of antibiotic or antimicrobial resistance (AMR) continues to be a concern for investors. The scientific evidence that the overuse of antibiotics on livestock translates to a heightened risk of AMR in humans is settled, and global institutions such as the World Health Organization have called for strong, rapid action before the arsenal of antibiotics that continue to work is depleted. Sixty-six investor companies representing an astounding $3 trillion of assets have signed a letter encouraging food companies to phase out the routine use of non-therapeutic antibiotics in their livestock, poultry, and seafood supply chains. As investor attention turns to AMR, related issues often ignored by mainstream firms are also gaining attention, such as animal welfare and the environmental impacts of intensive animal farming.

For food and beverage companies, this trend of greater investor engagement is challenging but will certainly continue. In addition to institutional investors discussed above, *individual* investors are interested in ESG investing, and new, automated ESG investment products with low barriers to entry (such as minimum investments of only $50), lower fees, and easy management through phone applications are poised to bring younger, passionate investors into the ESG space. For example, Swell Investing offers portfolio baskets focused on six sustainability themes, including healthy living (with a focus on healthy food and exercise products) and zero waste.

Finally, investors are taking note of innovation trends in the food sector, which continues to be something of a pet project of tech investors. Many focus on alternatives to animal protein, such as a new milk alternative that relies on genetically engineered yeast, or meat alternatives made with a variety of plant-based ingredients. The use of blockchain technology will enable greater food safety and traceability.

SCORE: 4

As social, political, and environmental uncertainty increase in the U.S. and abroad, investors seek businesses that incorporate sound sustainability strategies and risk management. As more institutional and individual investors increase their engagement with publicly traded companies on sustainability, food and restaurant businesses will need to be especially responsive to and aware of a key set of concerns to investors, including transparency, climate change risk to ingredient supply chains, and workplace diversity.

IN SUMMARY:

- Although the new administration has relaxed or removed many regulations affecting the food and restaurant industries, investors and many companies appear to be redoubling their commitment to sustainability. They have concluded that tangible risks like climate change and antibiotic resistance pose significant financial risk to operations.

- Interest in sustainable investing by institutions and individuals remains extremely strong, and even mainstream investors are engaging companies through dialogue, filing shareholder resolutions, and voting proxies in support of shareholder proposals that advance environmental, social, and governance (ESG) benefits. Companies should expect this trend to continue.

- As more institutional and individual investors increase their engagement with publicly traded companies on sustainability, food and restaurant businesses will need to be especially responsive to and aware of a key set of concerns to investors, including transparency, climate change risk to ingredient supply chains, and workplace diversity.

VI. NUTRITION, HEALTH, SUSTAINABILITY, AND FOOD ETHICS

The issue briefs in this section highlight the essential role of chefs and foodservice providers in leading with flavor to help build preference for eating patterns known to support human and environmental health.

Across the board, a tremendous amount of positive change has occurred throughout the industry over the past year. To name a few, these positive trends include: expanded sourcing from nearby growers, in turn connecting consumers to their regional food systems; new and ongoing commitments to serve chicken raised without medically important antibiotics; more proactive effort to ensure more humane practices for raising poultry; leveraging strategies for healthier menu R&D such as greater reliance on healthy fats and herbs and spices and less emphasis on red meat and salt; and considerable innovation by way of offering more delicious, plant-forward menu options (including using more fruits and vegetables in total, and making the ones that are offered even more appealing than the alternatives).

Much room for improvement remains in several other important arenas of nutrition, sustainability, and food ethics, such as: greater attention to consumers' desire for smaller portion sizes; further pressure to address the use of low-dose antibiotics in the swine and dairy industries; more concerted efforts to shift menus to support seasonal sourcing, organic products when possible, more regionally appropriate crops, and greater flexibility based on the availability of certain ingredients; more varieties of fish and seafood being served more often, to help Americans enjoy the higher intake that would benefit their health while sourcing responsibly to ensure sustainable supplies of fish and seafood for years to come; and, as in years past, much more robust and urgent attention to global water security.

LOCAL AND REGIONAL FOOD SYSTEMS

Chefs sourcing ingredients for their restaurants from within local and regional food systems began in earnest with the New American cuisine movement of the late 1970s and early ’80s, led by pioneers such as Alice Waters, Jeremiah Tower, and Cindy Pawlcyn. What started as a mostly fine-dining movement has become customary for restaurants and foodservice operations of all sorts, styles, and volumes across the country, from large cities to small towns. Some source exclusively locally and find inspiration in their own gardens and farms, while a great majority of operations combine local and broadline sourcing.

Looking at it with some historical context, the 1980s and early ’90s were marked by the growth of farmers markets and community-supported agriculture programs, both direct-to-consumer (DTC) strategies. Restaurant and foodservice sourcing was limited to finding farmers willing to let a chef pick up or make a delivery. In the late ’90s and early ’00s, local grocers began to consciously stock local products. Concurrently, sourcing by chefs and foodservice providers increased.

In addition, college and university foodservice operations began sourcing more local and organic products in response to student demands. Recently the top trends in restaurants have been dominated by aspects of local, organic, and/or sustainable sourcing. Local and regional sourcing has become part of the restaurant industry’s way of doing business that covers the plate, or at least a portion of it. Today, 51 percent of all local sales are still fruit, vegetables, and nuts, while far-flung commodity and large-scale producers provide most of the rest. One next big challenge with regional sourcing will be moving towards more seasonal menus—rather than simply substituting distant for regional as the weather changes.

There are two simple questions to ask to gauge the extent and potential of local/regional food systems beyond 2018:

- Is there sufficient food quantity and diversity in various regions of the U.S. to feed its population?
- Is there enough land available?

Simply put—maybe, depending. Researchers found that New York State could feed 34 percent of its population from in-state production (with significant shifts in production to meet needs). Others did a national analysis of local potential. They reported that, using a 100-mile foodshed model, the available agricultural land could, on average nationally, produce 88–92 percent of the local population’s food needs depending on dietary pattern (more meat = lower potential). No studies project forward in time and account for population growth, land development, or potential climate change or water scarcity impacts in various regions. Also, none of the studies account for urban agriculture potential or indoor production potential. In almost all local regions, it is clear that the diversity of agriculture and various forms of indoor production would need to change substantially for this to become a reality.

Is “local” always more environmentally friendly and good for business? Given the data, it’s difficult to determine precisely positive environmental differences between those farms supplying local markets and those supplying broader markets. How food is grown can be a more significant factor than where it is grown. A recent study that compared DTC producers vs non-DTC producers found there is a greater proportion of DTC producers who are certified organic, though only 5 percent of the DTC farms are classified as organic. DTC producers are also more likely to use manure as a fertilizer source.

A recent report provides a first take on this question of economic sustainability. In 2012, there were in excess of $6.1 billion in local sales—55 percent of which is from intermediated channels (i.e., indirect to consumers). Most of these sales, in dollar value, occur with farms having gross sales of over $350,000 (the transition size between small and mid-size farms). Between 2006-07 and 2012-14 there was a 180 percent increase in farmers markets, but a 288 percent increase in food hubs and a 430 percent increase in local sourcing by school districts. Farms selling locally with intermediated market sales—i.e., through a food hub or some other distributor type—tended to get larger, and as farms grew larger, they tended to be more viable (i.e., net positive cash flow in both 2007 and 2012). This insight implies that the types of channels restaurants and foodservice operations typically source from are important in helping farms grow in size and maintain profitability.

Regional distributors and nonprofit food hubs also are becoming a more important component of regional food systems.

In short, restaurants and foodservice leaders play an important role in enabling local and regional farms to scale up and be profitable. And many of the newest restaurant concepts are focused on doing just that. According to the National Restaurant Association, the top concepts for this year largely focus on various flavors of local: hyper-locally sourced meats, locally sourced seafood, farm-branded items, and the continued emphasis on local fruits and vegetables. Now part of the mainstream thinking, local is beginning to show up in more concepts that reach beyond full-service dining to more types of eating occasions.

From grocery stores to full-service restaurants, chefs and operators are helping their consumers connect to their regional food systems in greater numbers every year, by featuring products from local farmers and growers. While the age of naming the farmer behind each item in every dish on a menu is mostly behind us, restaurants and foodservice operations often choose to list all of their local purveyors in one section of their menu, on a board on a wall, or on their website, all of which are effective ways to communicate with their diners and help them further support those purveyors at markets or directly on farms; more operations can follow that path. The next stage of communication and consumer education should be around the environmental and economic impacts of tapping into a local food system. The two are more complex elements for chefs to explain and diners to understand than creating a personal connection between producers and consumers, but they will go further in helping diners understand the business structure behind a restaurant or foodservice operation and its impact on food costs.

Next Door, Modern Market, Sweetgreen, Tender Greens, Cava, and many others highlighted in past Menus of Change annual reports and summits now are leading the industry to a local, regional, and delicious future. Established companies will need to reduce their reliance on far-flung commodity markets and suppliers in order to stay competitive.

SCORE: 4

Chefs ignited the local food movement, and restaurant companies are now creating new concepts to bring local to the mainstream. However, established players still look to commodity markets to fill out most of the plate, missing an opportunity to support local communities, a more resilient farm sector, and biodiversity.

IN SUMMARY:

- Currently, across the U.S. there is great potential to re-regionalize a high proportion of our food system. The land base relative to population exists for this to become a reality. However, there is still a need for an analysis that projects forward relative to population growth, climate change, and water availability.
- Significant growth has occurred in intermediated local and regional sales. These types of sales show a solid correlation with respect to profitability and growth of farms marketing within a local region.
- Chefs ignited the local food movement, and restaurant companies are now creating new concepts to bring local to the mainstream. However, established players still look to commodity markets to fill out most of the plate, missing an opportunity to support local communities, a more resilient farm sector, and biodiversity.

LAND USE AND FARMING PRACTICES

We have enough fertile farmland and range lands to produce the food needed to provide a healthy diet for all Americans. A recent report showed current U.S. rangeland and farmland can support the dietary needs of 130 percent to 261 percent of the current U.S. population, depending on specific dietary patterns. The major determinant is how much meat and dairy products the typical American eats. These require relatively more land to produce but also can take advantage of the western rangelands and perennial pastures, which can support cattle and other ruminants. That said, this land capacity analysis doesn't address the environmental attributes or negative impacts of food production.

There are three main issues regarding land and farming practices: where, what, and how. First, national carrying capacity says nothing about where in the U.S. it could be most beneficial to produce different foods relative to a variety of environmental attributes (for example, managing phosphorus and nitrogen cycles through judicious recycling) or national food system resilience. Second, on average our consumption patterns are far from those needed to promote full health—production responds to consumption to some degree. Third, how our food is produced is a vital component of environmental sustainability.

In thinking about land use and global ecosystem integrity, there is a range of considerations to be accounted for. The most useful global approach is the 'planetary boundary' concept, which considers nine domains including land system change. At least five strategies emerge that could improve the U.S. picture with respect to land use, farming practices, and environmental boundaries:

- Decrease livestock production (including feed production) as currently practiced. Phosphorus runoff into the Gulf of Mexico could be reduced dramatically if the most erodible land in the Mississippi Basin were taken out of row crop (feed) production and planted into perennial crops (e.g., pasture grasses and legumes). Improving grassland management can have positive impacts on soil carbon (C) sequestration.
- Increase regional production of plant proteins and produce, including off-season via high tunnels (vegetable production in unheated greenhouses). For example, research has demonstrated a lower relative carbon footprint of high-tunnel greens produced in the upper Midwest compared to shipping from the West Coast. In part, this can be done in and around city regions on smaller parcels of land.
- Encourage a more seasonal diet and start driving demand away from production that is wildly out-of-step with the local and regional ecosystems—for example, buying water-intensive crops from drier parts of the country.
- Reduce production of high-water crops in low-water environments (e.g., Romaine lettuce in the American Southwest), and distribute this production across the country.
- Source organic products to the highest extent possible—especially plant-based products. Recent research demonstrates that a combination of 100 percent organic production, reduced food waste, and change in dietary consumption can feed the global population, with the caveat that nitrogen would be a limiting plant nutrient for sufficient production.

In the past year, there has been little substantial effort by the restaurant industry or major companies to engage in changing how farm and rangeland is used in the United States. Early efforts to even improve supply chain practices to know where food comes from might make this possible in future years.

But the continued dramatic decline in beef consumption driven largely by other concerns—and highly correlated with the public's increased spending on meals prepared by the restaurant industry—helps make better land management possible.

Chefs need to work on three fronts to ensure that their menus feature products grown according to the most sustainable farming practices: First, they need to communicate regularly with both their local farmers and their national and global purveyors to understand their practices and in turn request and select items least damaging to the environment. In the off-season, we will never produce the same mix locally as can be done in-season. Second, chefs should work in partnership with local farmers to help plan menus for periods when produce is sparse, such as late winter, by knowing ahead of time what might come in and how they might prepare it.

Third, chefs need to share this dialogue with their consumers. Not all diners will want to know how their food is produced, but the more they understand about sustainable farming practices, the more they can then apply the same decision-making process applied by chefs in their restaurants to their purchasing practices for at-home consumption. By sharing their sourcing process strategies with regional and national media and, more broadly, with consumers, chefs can impact a demand for better practices for every sector of the food industry. This information does not need to appear on a menu, but can be provided on a restaurant's website, for example, or framed in a waiting area.

SCORE: 3

There has been little change in how we use, or manage, farmland and ranch lands as well as soil resources in the U.S.

IN SUMMARY:

- U.S. agricultural lands are capable of producing sufficient food for a large population; how many is primarily dependent on meat consumption.
- Changes in production patterns to more fully match dietary guidelines could have positive environmental benefits if done thoughtfully.
- There has been little change in how we use, or manage, farmland and ranch lands as well as soil resources in the U.S. Leading scientific institutions have found that crop diversity is critical, but the U.S. continues to grow and raise a small set of plants and animals on much of its land.

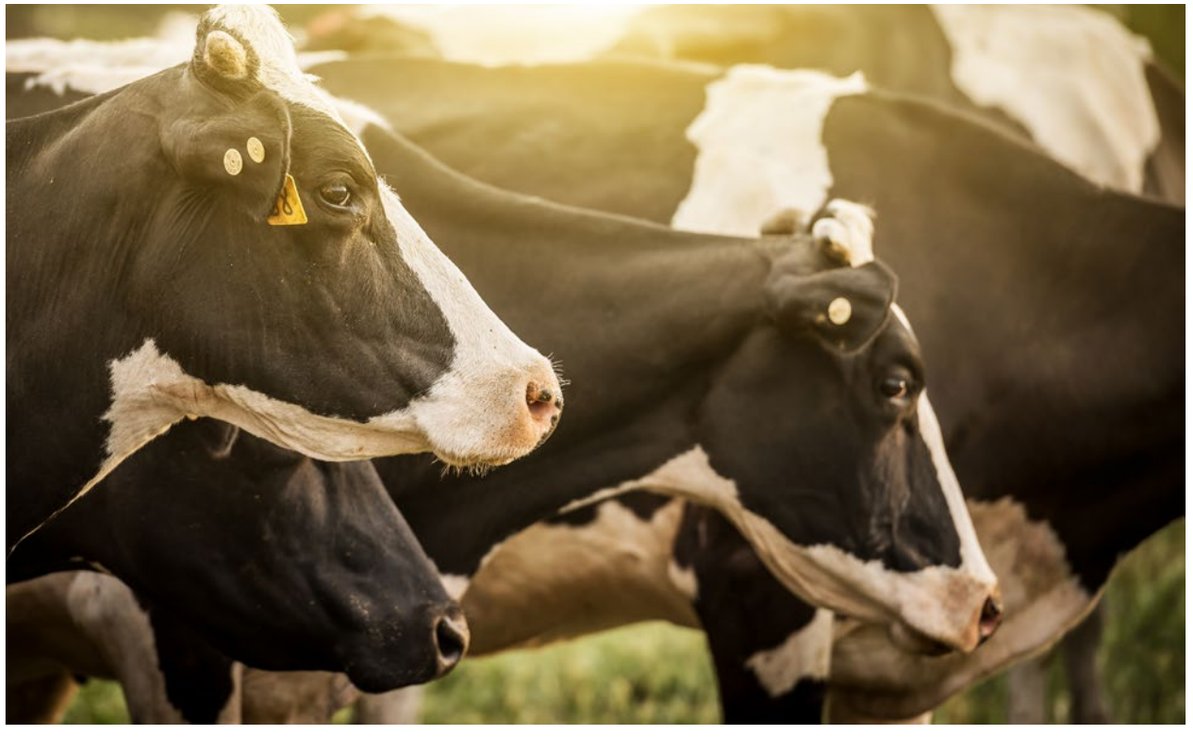
AGRICULTURE, DRUGS, CHEMICALS USE, AND ANIMAL WELFARE

The rapid rise of diseases and infections that are resistant to antibiotics is one of the three slow-motion disasters threatening global public health. Heeding a warning by World Health Organization (WHO) Director General Margaret Chan, in 2016 the United Nations General Assembly formally recognized that inappropriate use of antibiotics in animals was a leading cause of rising resistance to antibiotics (AMR). The UN Secretary General established an interagency working group to coordinate efforts to combat AMR. The group is expected to report in September 2018 on progress of three global policies to reduce antibiotic use in food animal production: 1) enforcing regulations to cap antibiotic use; 2) following nutritional guidelines to reduce meat consumption; and 3) imposing a user fee on veterinary use of antibiotics.

All indications are that antibiotic use in animal production is still increasing but varies greatly between countries—from a low of 8 milligrams per population correction unit (or mg/PCU, a kilogram of animal product) in Norway to a high of 318 mg/PCU in China, both major suppliers of aquaculture productions.

Variations in use reflect the effectiveness of policies and the influence of business commitments and consumer demand. The European Union has successfully used policy changes to reduce antibiotic use, while modest reductions in the U.S. have come mostly from consumer demand. Capping antibiotic use at 50 mg/PCU per year—the current global average—could reduce total consumption by 64 percent by 2030. Limiting meat intake to 40 grams per day (about one quick-service burger) could reduce global consumption of antibiotics in food animal production by 66 percent. Average meat consumption in the U.S. is currently 260 grams per day, so achieving this goal would require an *85 percent reduction.*

As noted in the *2017 Menus of Change Annual Report*, most of the largest U.S. restaurant, hospitality, and foodservice companies have taken on the challenge of AMR in response to consumer demand. Well over half of these companies now have in place commitments to reduce or eliminate antibiotic use in their supply chains in the next few years. Most of these commitments are in the poultry sector, as illustrated by the following example of one of the latest companies to make this commitment. Pollo Tropical, a quick-service restaurant chain with more than 140 outlets in Florida and Georgia as well as franchises throughout the Caribbean and Central and South America, announced in early January 2018 that all chicken products it serves will come from poultry producers certified by the U.S. Department of Agriculture (USDA) as "NAE compliant," meaning "no antibiotics ever."



The poultry industry continues to respond to consumer demand more robustly than the swine and dairy industries, where the continued use of low-dose antibiotics for prophylaxis is a problem. In December 2017, the U.S. Food and Drug Administration (FDA) released the annual summary report of antibiotics sold or distributed in 2016 for use in food animals. The good news is that antimicrobial sales decreased from 2015 to 2016 by 10 percent, and sales of medically important antimicrobials decreased by 14 percent. In all previous years from 2009 to 2015, sales volumes increased annually, leaving the agricultural sector 9 percent higher in sales of medically important antibiotics since we started tracking sales in 2009. In May 2016, the FDA issued a final rule requiring antimicrobial drug sponsors to provide estimates of sales for major food-producing species (chickens, turkeys, cattle, and swine).

The 2016 summary report also is the first to include species estimates with the caveat that sales data only approximates use data. Having more of the species-specific sales data will clarify the problem and provide the restaurant, hospitality, and foodservice companies information to focus their pressure on the supply chain to reduce antibiotic use.

The December 2017 FDA summary "estimated that 43% of domestic sales of medically important antimicrobials was intended for use in cattle, 37% intended for use in swine, 9% intended for use in turkeys, 6% intended for use in chickens, and 4% intended for use in other species/unknown." These more detailed data on use by species may help explain where the slow increase in antibiotic use is occurring even as major poultry producers continue to pledge to eliminate low-dose use for prophylaxis.

The past year has been pivotal in other ways as well: 2017 was the first year that an important provision of FDA's Guidance for Industry #213 went into effect, prohibiting animal producers from buying antibiotics off the shelf at the local feed store for use in feed or water, and calling for voluntary compliance by drug producers to move their antibiotics from over-the-counter to veterinary feed directives or prescription status. Stay tuned for the FDA's release of the 2017 summary report in late 2018 to see what effects this rule is having on overall as well as species-specific sales volumes. Consumer demand continues to grow for animal products raised without antibiotics, as evidence mounts of the direct links between AMR arising from industrial food animal production and human disease. Industrial producers of poultry are responding, and those who deny the links between use of low-dose antibiotics and human AMR infections have been largely silenced. Purdue states that it now raises 95 percent of its broilers without antibiotics, and Tyson eliminated the use of antibiotics in all of its broiler flocks in 2017, although it continues to use ionophores—antibiotics not used in human medicine but possibly capable of stimulating the emergence of resistance genes to antibiotics used in humans. The swine and beef industries are lagging far behind.

ANIMAL WELFARE

There is a natural link between the problem of AMR caused by using low-dose antibiotics for prophylaxis against the spread of disease in crowded, unhygienic industrial livestock operations and animal welfare practices. Without relying on the crutch of antibiotics, producers must reduce crowding and provide more effective waste management techniques. In doing so, the environment for the animals becomes more humane and healthier, as demonstrated more than a decade ago by changes in the Danish swine industry.

The decision by the Trump administration to withdraw the USDA's organic livestock and poultry practices final rule was a setback. Most animal welfare and environmental groups had regarded the final rule as a useful first step. Purdue Farms stated in 2017 that it had already met the proposed Organic Animal Welfare standards included in the final rule that the Trump administration pulled back. Purdue's "Commitments to Animal Care 2017" is being implemented with more space, more light, longer lights-off rest periods, windows, studies of the role of enrichments (shelter boxes and straw bales for perching), raising and studying slower growing chickens, and moving to controlled-atmosphere stunning. Purdue is responding in part to the pressure from corporate customers like Aramark

and Compass Group, which have declared that by 2024 they will only purchase chickens that are raised more humanely (reduced stocking densities and environmental enrichment).

Other positive developments for animal welfare in the past year include: a ruling by the U.S. district court of Utah that Utah's ag-gag statute was unconstitutional; a January 2018 ruling by the 9th Circuit Court of Appeals striking down Idaho's ag-gag law; advocacy by the American Society for the Prevention of Cruelty to Animals, Friends of the Earth, the Johns Hopkins Center for a Livable Future, and others for more research on animal welfare to be included in the next Farm Bill; and Cargill and Smithfield recommitting to the complete end of gestation crate use in swine production by 2027.

Chefs and foodservice operators can play a vital role by sourcing their animal products from producers who raise their animals without the use of low-dose antibiotics for growth promotion or disease prevention. Fish and seafood should be included in any antibiotic reduction policies. Operators also need to carefully monitor progress in their supply chains and ask for regular updates on changes that suppliers are making to achieve long-term commitments to reduce antibiotic use.

The leading seller of chicken in the U.S., Chick-fil-A, remains committed to serving only chicken raised without antibiotics by 2019. Burger King, Tim Horton, and Wendy's joined McDonald's in 2017 in serving only chicken from growers who don't use antibiotics that are important in human medicine. KFC, the last major holdout in the retail sale of chicken raised with antibiotics, announced in April 2017 that it would only serve chicken raised without medically important antibiotics by the end of 2018.

The foodservice industry, through its sourcing decisions, is pressuring producers to restrict the use of low-dose antibiotics in animal husbandry. The poultry industry is responding more than the pork, dairy, and beef sectors—areas where the foodservice industry could push harder for animal products raised without the use of medically important antibiotics.

Consumers are asking for more and more transparency from the people who produce and cook their food. Because of the goodwill those disclosures tend to generate, food companies and operations of all sizes have been particularly effective at communicating their purchasing policies when it comes to antibiotics and animal welfare. To educate their customers fully on such issues, however, and in turn impact their overall purchasing decisions, operators should be knowledgeable on the issues of antibiotic resistant bacteria contaminating meat and train their staff to provide explanations as well, particularly if the price of a meal or product is affected and consumers need to understand why they might need to pay more.

SCORE: 4

Antibiotic use may finally be declining after many years of continued increase as commitments made by major restaurant foodservice companies have influenced the livestock industry. Species-specific data for 2018 and 2019 should confirm whether the decline is a true trend.

IN SUMMARY:

- The negative impact of antibiotic use in industrial food animal production on the global problem of antimicrobial resistance is now well established, and reducing unnecessary antibiotic use is a priority for the UN and WHO.

- Consumer demand in the U.S. continues to move the foodservice industry and some producers, notably the poultry industry, to raise animals without medically important antibiotics and, consequently, with increased attention to animal welfare.

- Antibiotic use may finally be declining after many years of continued increase as commitments made by major restaurant foodservice companies have influenced the livestock industry. Species-specific data for 2018 and 2019 should confirm whether the decline is a true trend.

DIET QUALITY AND HEALTH

Dietary quality is an important determinant of weight gain and obesity, and a vast body of evidence shows that diet quality directly affects the risk of almost all important diseases independent of its effect on body weight. A previous report from the Centers for Disease Control and Prevention (CDC) indicated some reduction in obesity among young children, but the most recent data suggest that this was a statistical aberration, and the trends in obesity among adolescents and adults have continued upwards. A recent projection based on historical weight trajectories predicted that 57 percent of today's children will be obese by age 35. The health implications of weight gain among adults, which accounts for about half of the excess obesity in the U.S., were detailed in a recent report. The amount of weight gained by adults up to age 55 strongly predicted poorer health after age 55, including rates of cardiovascular disease, type 2 diabetes, various cancers, reduced quality of life, and overall mortality after age 55.

These findings highlight the need to redouble our efforts to control weight gain among both children and adults, and that failure to do so will have serious personal and societal consequences. That noted, large differences in obesity rates within the U.S. and across countries indicate that this epidemic is not inevitable.

The quality of foods and beverages in our diets plays a major role in the cause, and potentially the prevention, of excess obesity. Dietary quality has been slowly and steadily improving in the U.S., especially in reduction in consumption of trans fat and sugar-sweetened beverages, but our score for overall dietary quality is only close to 50 on a scale of 100. This and the failure to control the obesity epidemic highlight the urgency of improving dietary quality for everyone in every venue possible.

DEFINING DIET QUALITY

The indicators of diet quality the Menus of Change initiative has used for tracking trends have been selected because they reproducibly predict risks of major diseases in multiple, large prospective studies. These indicators are discussed in more detail and with additional references on the Harvard T.H. Chan School of Public Health website, Nutrition Source. They are intakes of:

- **Vegetables** (not including potatoes)
- **Whole Fruits**
- **Whole Grains** (especially more intact, or cut, versus ground whole grains, to replace refined grains)
- **Nuts and Legumes**, including soy-based foods
- **Fish**
- **Plant Oils** (liquid, rich in polyunsaturated and monounsaturated fats, from non-tropical, non-hydrogenated sources)

In practice, increasing polyunsaturated fat means using liquid plant oils (i.e., liquid at room temperature) instead of butter, lard, partially hydrogenated fats, or tropical oils (e.g., palm, palm kernel, and coconut oils) wherever possible. These plant oils also contain healthful monounsaturated fats. Because of widespread promotion of coconut oil as a health-promoting fat, the American Heart Association recently released a review of available evidence. This review emphasized the lack of evidence on long-term health consequences, but clear evidence that coconut oil has adverse effects on blood cholesterol fractions when compared with liquid plant oils. Moderate use of coconut oil when the special flavor is important is reasonable, but is best not used as a basic cooking fat.

- **Trans Fats** (to be eliminated)
- **Red and Processed Meat** (to be substantially reduced)
- **Sugar-sweetened Beverages** (to be substantially reduced)
- **Sodium** (salt added in processing and cooking, to be substantially reduced)

Sodium reduction deserves special attention because it is the only indicator of diet quality that has been moving in the wrong direction. Unprocessed foods contain very little sodium, and foodservice operators (along with food manufacturers) play a major role in determining the amount of sodium consumed by the public.

Our indicators of diet quality do not include dairy foods as they are not essential and are not clearly related to risk of major health outcomes, including fractures. Consumption of cheese has been increasing dramatically over the last several decades in the U.S., becoming almost routine in salads and sandwiches. Cheese provides large amounts of sodium along with less healthy fats and many calories. Consuming smaller amounts of cheese and the use of alternative ways to add flavor and variety to these foods, such as using nuts, are desirable.

Overall, evidence accumulated over the last several decades strongly supports plant-forward food choices, meaning a style of cooking and eating that *emphasizes and celebrates*, but is not limited to, plant-based foods—including fruits and vegetables (produce); whole grains; beans, legumes (pulses), and soy foods; nuts and seeds; plant oils; and herbs and spices—and that reflects evidence-based principles of health and sustainability. This pattern was examined directly in a recent analysis using a plant-based dietary index that gives one point for each serving of healthy plant-based foods, and a negative point for each serving of animal-sourced foods. Among over 200,000 men and women followed for up to

26 years, a higher plant-based score was linearly related to lower risk of coronary heart disease. This finding is consistent with an earlier report that found that a higher plant-based score was also related to lower risk of type 2 diabetes.

In the past year, the plant-forward dining trend has become part of the restaurant industry mainstream, both a focus of culinary innovation and also now a feature of more and more menus. Large chains like Sonic Drive-In have even added a blended meat-mushroom burger to their core offerings while some of the fastest-growing restaurant chains are built around plant-forward menus, in both global and traditional U.S. concepts. A recent analysis by Changing Tastes also found that the increase in spending on meals prepared by the restaurant industry is strongly correlated with our decline in beef consumption.

This recent leadership from the culinary profession and restaurants of all sizes comes at a crucial time, as efforts to promote healthier diets have weakened at the federal level, putting the responsibility for offering healthy choices squarely in the hands of the foodservice industry. It's important not to overlook the role of foodservice in also offering options for children that are higher in diet quality and supportive of their health; providing these better choices can be a win-win for both restaurants and for kids. While progress has been made, the supply of healthier kids' meals needs to grow alongside consumer demand. Work at ChildObesity180 has shown that this is possible. Kids and their parents have positive attitudes toward healthier kids' meals, and when put to the test these attitudes can translate into action. "You're the Mom", a campaign to boost demand for healthier kids' meals among frequent quick-service restaurant customers, has shown potential to shift ordering patterns toward healthier offerings.

In foodservice operations, chefs can most effectively improve the diet quality of their customers by adopting healthier practices themselves. Beyond adding craveable plant-forward dishes to their menu, this means reducing the amount of red meat they serve, relying on herbs and spices rather than solely on salt for flavor, or cooking with healthier fats. Those strategies can be as explicit or implicit as they'd like, depending on their clientele, but must be part of their menu design.

SCORE: 3.5

While public policy and nutrition promotion efforts have stalled, leading restaurant companies are making significant moves to reduce beef consumption, offer innovative and healthier sides, spark new customer and media interest in plant-forward flavors, and introduce new beverage choices.

IN SUMMARY:

- Diet quality in the U.S. remains low and is helping to fuel an unrelenting epidemic of obesity.
- In general, healthy plant-forward diets will provide improved health and well-being.
- While public policy and nutrition promotion efforts have stalled, leading restaurant companies are making significant moves to reduce beef consumption, offer innovative and healthier sides, drive interest in plant-forward flavors, and introduce new beverage choices.

PORTION SIZE AND CALORIC INTAKE

Culinary professionals have an unprecedented opportunity to help end the epidemics of obesity and related diseases. The restaurant industry now is starting to shift away from an older paradigm of big portions and low quality and has learned a vital lesson—measures that only reduce calories, without enhancing the quality of those calories, are destined to fail. The efforts to improve calorie quality are abundant, and now even major restaurant brands are experimenting with serving smaller portions of higher quality ingredients focusing on flavor.

The conventional approach to weight control is focused on calorie balance, with advice to "eat less, and move more." Yet an astoundingly small proportion of people with excessive weight (more than two-thirds of the U.S. adult population) can maintain significant weight loss over the long term, despite the simplicity of this advice.

One explanation for this failure is a combination of low willpower and our "toxic environment." Surrounded by inexpensive, high-calorie foods ubiquitously available in large portion sizes, many people are unable to exert self-control, so they mindlessly overeat and gain weight. Without doubt, the portions Americans eat have increased dramatically in the last half-century. For this reason, a major focus of public health in obesity prevention has been reducing and redefining portion size, as exemplified by the "100-calorie pack."

However, a focus on calories alone disregards a fundamental scientific fact demonstrated repeatedly in the research laboratory: body weight is determined more by biology than willpower over the long term. When people cut back on calories, they will initially lose weight. But the body fights back, with rising hunger and slowing metabolism. This effect was illustrated in a recent and much-publicized follow-up of contestants on the show "The Biggest Loser." Despite participants' exceptional motivation (and the intensive support they received), virtually all described a constant struggle with their bodies and weight regain over time.

Certainly, genetic makeup helps to explain individual differences in predisposition to obesity. But our genes haven't changed in recent decades, as obesity prevalence has skyrocketed. Beyond calorie abundance and more sedentary lifestyles, the quality of the food supply has changed, brought on largely by the excessive focus on reducing dietary fat.

During the low-fat craze of the last 40 years, the American public was told to eat all fats sparingly and instead fill up on carbohydrates. Responding to this call, the packaged foods industry marketed tens of thousands of reformulated food products that substituted fat with refined starches and added sugars. Unfortunately, these highly processed carbohydrates have exceptionally low satiety value (please see the box below) and adversely affect metabolism.

The 2015 Dietary Guidelines Advisory Committee found that fat in the diet, despite its high calorie content, does not uniquely lead to weight gain, but does increase satiety, and that some high-fat foods are highly protective of our health.

Increasing the portion size of refined starchy foods (e.g., most extruded breakfast cereals, white bread, white rice, fries) and added sugars (e.g., sugar-sweetened beverages, highly sweetened desserts) erodes diet quality and leads to obesity and chronic disease. Conversely, increasing the portion size and serving frequency of minimally processed carbohydrates (vegetables, fruits, legumes) and healthful fats (nuts, avocados, oil-based salad dressings) will displace less healthful foods, improve diet quality, and protect against chronic disease. In addition, high-quality plant-based proteins (nuts, legumes, soy products) and seafood have a special role in promoting satiety and balancing the metabolic effects of carbohydrates.

Over the past year, the restaurant industry has made progress mostly on calorie quality, through shifts to serve more plant-based foods and healthier animal-based protein choices like chicken. Efforts to actually reduce portion size along with improving quality remain in the "pilot" stage, with McDonalds, for instance, now in trials for a smaller hamburger made with fresh meat.

Operator attitudes may remain one of the biggest obstacles, as new research shows that while diners are interested in smaller servings of higher-quality protein, menu and purchasing decision-makers believe consumers still want larger servings. Of course, smaller portions won't necessarily lead to higher prices even if food and ingredient quality also improves. But they may help address food costs. Successful pilots may be a harbinger of a change in operator attitudes and the mainstream adoption of smaller portions.

Flavor and aesthetic are two key tools that chefs can use to move diners toward healthier habits when it comes to righting portion size and balancing the right kind of calories. Chefs can hesitate to reduce portion sizes because customers often then complain that the value of the meal is not good (a perception of too little food for too much money). Ensuring that the healthier components on the plate are packed with flavor will help diners feel satiated, while clever plating practices can minimize perception issues around size.

SCORE: 3.5

Progress is being made on improving calorie quality. Efforts to also reduce serving size while serving higher-quality food have now entered the pilot phase.

IN SUMMARY:

- All calories are not alike. The belief that they are has produced misguided attempts to modify the food supply and led to confusion about what to do within the culinary profession and the foodservice industry. Simply lowering the total calories in a meal by reducing fat content will not produce benefit, if that meal is less satisfying and leads to subsequent overeating.
- To increase consumption of minimally processed carbohydrates, healthful fats, and high-quality proteins, changes in national policy that focus on decreasing prices of these foods relative to commodities are needed. Culinary strategies are also needed from the foodservice industry to make these options more available on menus and served in a variety of delicious ways.
- Progress is being made on improving calorie quality. Efforts to also reduce serving size while serving higher-quality food have now entered the pilot phase.

IN A WORD: SATIETY

According to the "energy balance" view of weight control, an eight-ounce sugary soda at 100 calories would be better for your weight than a one-ounce serving of nuts at almost 200 calories. Of course, common sense and definitive research say that's not so. The sugary beverage might give you a quick rush of energy, but it will leave you hungry again and prone to overeating soon. In contrast, the nuts will elicit strong satiety—that long-lasting sense of fullness after eating. Even though fat has about twice the calories per gram of carbohydrate, high-fat foods typically produce *greater satiety per calorie* than processed carbohydrates. Some of the most calorie-dense foods in existence (e.g., nuts, olive oil, dark chocolate) are consistently associated with lower body weight than refined grains, potato products, and concentrated sugars. They are also demonstrably healthier for the heart. All calories are *not alike* to the body.

Often repeated phrases in the public health community and media such as "balance energy intake with energy expenditure" and "there are no bad foods" do not reflect current science. These arguments distract us from focusing on the paramount importance of diet quality as a key determinant of long-term caloric intake and metabolic health for each of us individually—and ultimately as a key determinant of many of the largest food, health, and environmental challenges for all of us collectively.

PROTEIN CONSUMPTION AND PRODUCTION

The average American adult man consumes 75 percent more protein than is recommended; for American women, it's 50 percent more. Animal-based foods like meat, fish, poultry, eggs, and dairy account for approximately two-thirds of this dietary protein. Yet, plant-based foods such as nuts, seeds, beans, peas, legumes, grains, and cereals are also important sources of protein. The amount and types of protein consumed can have significant effects on the environment and the risk of chronic diseases and premature death. Culinary and foodservice professionals have an important role to play in leading and inspiring a balance of protein sources on Americans' plates that is healthier for both people and planet.

Red meat consumption in the U.S. continues to decline steadily, with beef consumption in the U.S. now at the lowest level in over two decades. In the U.S., total meat consumption (red meat plus poultry) still remains high, at 59.2 kg per capita in 2015, which is the fifth highest consumption rate globally. The continued decline in the U.S. also is a departure from global trends. In recent decades, meat consumption has increased sharply worldwide, especially in developing countries. That said, there are important distinctions between red meat and poultry in terms of both environmental and human health effects, as well as between red meat and other protein sources.

ENVIRONMENTAL IMPACTS

Animal-based foods contribute disproportionately to the total environmental costs of food production. The main reasons for these impacts are enteric emissions from the digestive activities of ruminant animals such as beef and milk cows, emissions to air and water from manure management, and the growing of crops to produce animal feed. Thirty-eight percent of the U.S. corn crop, which uses more land than any other crop, goes to feeding livestock (please see Sankey Diagram on page 28 for a snapshot of overall corn usage). Feed conversion efficiencies, or how effective an animal is at converting feed into edible meat, vary greatly by species. By one estimate, it takes 36 calories of feed to produce one consumed calorie of beef. This ratio is 11:1 for pork, 9:1 for poultry meat, about 6:1 for eggs and dairy, and sometimes lower than 2:1 for fish and insects. These differences, combined with methane emissions from ruminants, explain the variability in GHGE from animal protein sources seen in the figure on page 29.

Production methods certainly influence the environmental impact of animal-based foods, but the type of protein chosen matters more. Popular alternatives must be fully assessed before being lauded as solutions. For example, pasture-based beef production can have many local environmental advantages over grain-fed beef such as reduced water use and nutrient losses, and greater ecosystem biodiversity. Yet, often the GHGE associated with grass-fed beef are higher than grain-fed. Under some conditions and production methods, significant carbon sequestration under intensively managed pastures can be achieved, which may offset other GHGE, but this cannot be assumed. In summary, the GHGE of beef can be high, whether grain-fed or even when grass-fed, whereas dual-purpose systems, producing both milk and beef, may offer the lowest burden per unit of food produced. In the end, switching production methods alone will not be enough: we need to first serve much less beef, and then seek a premium product such as sustainably produced grass-fed, which may carry a higher price point, reflecting higher costs (a strategy sometimes termed "less meat, better meat"—in principle, allowing food costs to remain constant). Future technical advances are expected to improve the environmental efficiency of food production, but analysts project that these improvements will be insufficient to reach GHGE reduction goals, meaning shifts in eating habits are needed to reach such targets.

HEALTH IMPACTS

Red meat consumption also has significant impacts on human health. The science is clear that regular consumption of red meat contributes to higher risk of chronic diseases and premature death. Diets that include substantial amounts of red meat and products made from these meats increase risk of diabetes, heart disease, and some cancers. Nearly one in 10 premature deaths could be prevented in the U.S. if American adults were to cut their current red meat consumption to less than half a serving per day.

In 2015, the International Agency for Research on Cancer (IARC) of the World Health Organization (WHO) announced that processed meats such as hot dogs, bacon, and sausages should be classified as carcinogenic (Group 1) to humans for colorectal cancer, and unprocessed red meats should be classified as "probably carcinogenic" (Group 2A). It was estimated that a 50-gram portion (1.8 ounces) of processed meat eaten daily increases the risk of colorectal cancer by 18 percent. Red and processed meats have already been associated with type 2 diabetes, cardiovascular disease, and other chronic disease; an increased cancer risk further underscores the need for consumers to reduce their consumption of meats, especially processed meats.

On the flip side, there is increasing evidence to support the notion that replacing animal protein with plant protein can help prevent chronic diseases. In a large study from eight European countries, higher intake of animal protein was associated with an increased risk of developing type 2 diabetes, whereas plant protein was not associated with risk. In a recent analysis of 131,342 participants from the Nurses' Health Study and Health Professionals' Follow-Up Study who were followed for two to three decades, higher intake of animal protein, particularly red and processed meats, was associated with increased risk of death from cardiovascular disease. They also found that substituting plant protein for animal protein, especially that from red and processed meat, was associated with lower risk of death from cardiovascular disease.

The health effects of protein sources depend on comparison or reference foods. Compared to red meat, eggs and dairy products have less adverse health impacts. There is little evidence that moderate consumption of eggs (up to one egg per day) has adverse effects on the risk of chronic diseases. However, consumption of dairy products may affect human health in complicated ways, depending on the types of dairy products. Total dairy consumption has little benefit on body weight, diabetes, and cardiovascular disease, although there is some evidence that higher consumption of fermented dairy products (especially yogurt) is associated with lower risk of weight gain and type 2 diabetes.

DIETARY CHANGE

Eating out more and eating meat less have gone hand in hand for more than a decade, as consumers continue to spend more food dollars on meals prepared by culinary professionals while red meat consumption declines. The restaurant industry continues to lead a positive change in the American diet both by shifting away from red meat, creating more scratch-cooked, plant-based options, with plant-forward concepts like bowls now rapidly growing on American menus. Restaurants are also introducing diners to a new generation of meat alternatives, such as the recent debuts of Impossible Burger and Beyond Burger in restaurants before entering the grocery market. Moves by the restaurant industry to serve more poultry—and, more recently, more plant-based foods—have led to a significant change in our nation's diet.

Both restaurants and food manufacturers also have been responding with a flood of meatless protein alternatives, some scratch-cooked and others manufactured from quite novel sources. Options abound for replacing meat with plant-based proteins—from traditional foods like seitan, tofu, and tempeh, to quinoa, lupine, and wheat-, pea-, and rice-based food products designed to combine with meats. Insect-based proteins, which appear to have a very low environmental footprint, have also emerged on the menus of some restaurants, and as featured ingredients in new snack foods. The prevalence of alternative "meat" products in the marketplace far outpaces the research on their environmental and health impacts, while scratch-cooked substitutes offer a clearer benefit. Preliminary results show that most "meat" replacements have reduced environmental impact, but some evidence suggests that plant-based protein sources requiring significant processing, such as soy protein isolate, may approach some of the environmental footprints of animal-based foods because of energy requirements in processing.

Recent years have also seen numerous studies exploring the environmental and human health effects of dietary change and the potential for diet shifts as a climate mitigation strategy. There is clear consensus that reducing animal-based foods in the diet can result in lowered environmental impact. These patterns can be seen among self-selected diets in the U.S. Using the National Health and Nutrition Examination Survey (NHANES) dietary recall data, researchers examined the linkages between diet, health, and environmental impact. Individuals' diets from NHANES were ranked based on the GHGE associated with their production. Compared to those with high dietary GHGE, those in the lowest emission group consumed more than twice as much plant protein foods and less than half as much animal protein foods, and also ate more poultry and less red meat. The lowest GHGE diets (bottom quintile) included more vitamin E, folate, and dietary fiber, and less sodium and saturated fat than the highest GHGE diets. However, there was a higher content of calcium, vitamin D, and potassium in the highest GHGE diets. Shifting the diets in the highest quintile to diets with an average carbon footprint would offer 10 percent of U.S. emissions reduction targets, as submitted to the United Nations. This means that diet shift can play an important role in climate action at city and state levels, and culinary professionals can greatly influence this cultural shift. But according to a new study funded by the federal beef checkoff program, consumers who value nutrition and the environment tend to purchase less beef, so as these concerns grow, we might anticipate lower demand for red meat.

As part of that cultural shift, chefs and foodservice operators should focus on two key impacts they can have on consumers' attitudes when it comes to proteins, through their menus—both in the design they conceptualize and the language they use. They should reduce their reliance on red meat and instead feature more plant-based dishes, including offering smaller meat portions accompanied by craveable and flavorful whole grains, legumes, and vegetables. On the menu itself, chefs should then describe dishes more holistically rather than always featuring the animal protein first, which contributes to an unbalanced perception of its importance. By using descriptions that make meat and plants equally enticing, they can create dishes that are healthier whether their diners notice it or not. Chefs also need to help consumers understand that proteins are present in most whole foods. Instead of using protein as a synonym for meat—whether it is during culinary demonstrations or on fast-casual menus where customers pick from a variety of options—chefs should instead use the term "animal protein" when they refer to such a thing. Additionally, when appropriate, chefs can speak of "plant-based protein"—a simple vocabulary shift that may go a long way.

SCORE: 3.5

Motivation aside, eating out more and eating meat less are highly correlated, as the restaurant industry continues to find ways to help its diners eat less meat, a move that also addresses climate change.

IN SUMMARY:

- High meat consumption, particularly red meat, has harmful effects on both human health and the environment.
- New studies add to existing evidence that shifts in eating habits toward more plant-based proteins, fruits, and vegetables can reduce the risk of certain chronic diseases, greenhouse gas emissions, and the burden on water and energy resources.
- Motivation aside, eating out more and eating meat less are highly correlated, as the restaurant industry continues to find ways to help its diners eat less meat, a move that also addresses climate change.

WHERE DOES OUR CORN COME FROM? AND WHERE DOES IT GO?

CORN PRODUCTION AND USES IN THE U.S.

1 B bu = 1 Billion Bushels

INVENTORY

1.7 B bu

PRODUCTION

13.1 B bu

DOMESTIC SUPPLY

11.1 B bu

DOMESTIC USE

2 B bu

EXPORTS

1.7 B bu

SEED

ENDING STOCK

ANIMAL FEED

5.2 B bu

2 B bu

CATTLE (INC. DAIRY)

1.7 B bu

POULTRY

1.5 B bu

HOGS & PIGS

4.6 B bu

FUEL ETHANOL

1.3 B bu

FOOD & INDUSTRIAL USES

HFCS

HIGH-FRUCTOSE CORN SYRUP

SUGAR

GLUCOSE & DEXTROSE

STARCH

BEVERAGE ALCOHOL

CEREALS & OTHER PRODUCTS

Figure 1. Data (from 2009-2010 harvest) are courtesy of Changing Tastes and the Analytical Consulting Lab at the Northwestern University Kellogg School of Management. Kevin Heckman, Ben Reizenstein, Tim Carone, Arlin Wasserman, and Russell Walker, *Risk Information in the Corn Supply Chain*, Analytical Consulting Lab at the Northwestern University Kellogg School of Management, 2012.

RELATIVE GREENHOUSE-GAS EMISSIONS ASSOCIATED WITH SOME COMMON PROTEIN SOURCES

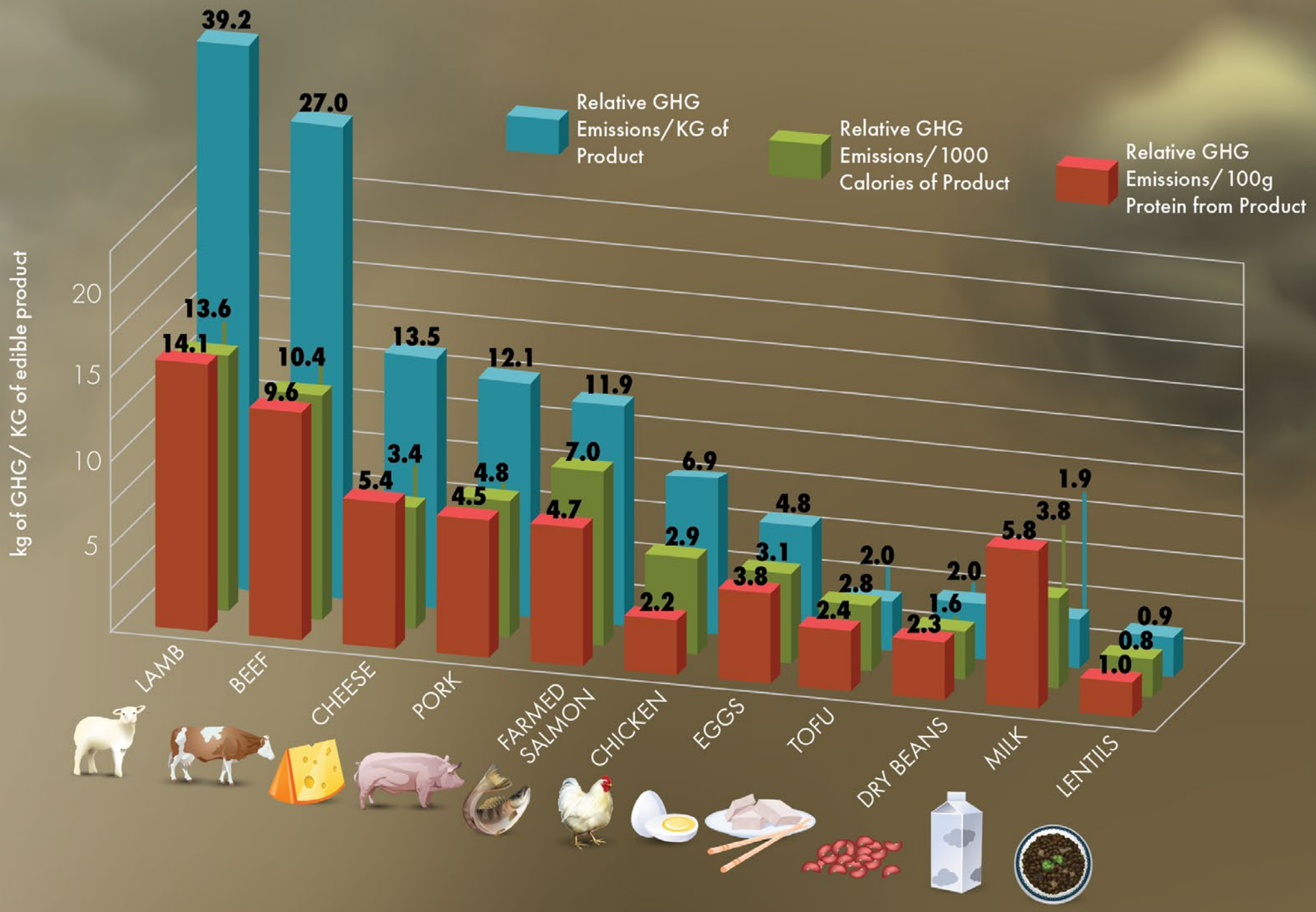


Figure 2 illustrates the greenhouse-gas emissions associated with several common protein sources and is a good indicator of environmental impact including energy and chemical use, soil management, and mechanical irrigation. Both public health and the environment will improve if restaurants decrease the amount of red meat on menus and replace it with alternative protein sources.

***Calorie Reference:** USDA National Nutrient Database for Standard Reference, Release 25: Energy (kcal) Content of Selected Foods per Common Measures, https://www.ars.usda.gov/SP2UserFiles/Place/12354500/Data/SR25/nutrlist/sr25a208.pdf
****Protein Reference:** USDA National Nutrient Database for Standard Reference, Release 25: Energy (kcal) Content of Selected Foods per Common Measures, https://www.ars.usda.gov/SP2UserFiles/Place/12354500/Data/SR25/nutrlist/sr25a203.pdf

FRUIT AND VEGETABLE CONSUMPTION AND PRODUCTION

Most people recognize compelling reasons why fruits and vegetables would, could, and simply *should* become a larger part of the American plate. Increasing fruit and vegetable consumption is great for our health. The fruit and vegetable sector has been a leader in engaging environmentally aware consumers with offerings that are certified organic, locally produced, low in greenhouse gases, or some combination of these qualities. In their 2018 forecast of food and beverage trends for restaurants, the consultants Baum and Whiteman listed "the rapid consumer shift to 'plant-based' foods" as the #1 trend of the year for 2018.

However, our interest in eating more fruits and vegetables is not yet showing up in the hard numbers reflecting the current total national consumption and production. This sobering fact has appeared consistently across multiple sources.

Per capita food supply data from the Economic Research Service of the U.S. Department of Agriculture (USDA) describes how much food is available from production and net imports. In 2015, the most recent data available, the American food supply offered a per capita annual total of 632 pounds (fresh weight equivalent) of total fruits and vegetables, barely higher than the previous year. A decade earlier, in 2005, the corresponding per capita annual total was much higher, at 684 pounds, so long-term trends have not been favorable. The downward trend from 2005 to 2015 is observed separately for fruits and vegetables, and it is observed whether or not one uses USDA's loss-adjusted estimates to account for food waste. Using data from multiple rounds of the National Health and Nutrition Examination Survey (NHANES) from 1999 to the most recent round, a 2016 article in the *Journal of the American Medical Association* reported that Americans had made many improvements in the healthfulness of their food intake—more whole grains, less sugar-sweetened beverages, and a higher total diet score, for example—but no significant improvement in daily consumption of fruits and vegetables.

Though one frequently hears that prices or U.S. agricultural production constraints are to blame, neither of these potential barriers provides a fully persuasive explanation. For potatoes, the largest vegetable by volume, U.S. production rose from 2005 to 2015, but exports also increased, so per capita availability for consumers fell. The total land area assigned to other fruit and vegetable crops is smaller and not increasing much. In the Census of Agriculture, conducted once every five years, U.S. farmland use fell by more than seven million acres from 2007 to 2012 (a decline of just under one percent). During this time, vegetable production fell by 0.2 million acres (a decline of about four percent). Simultaneously, farmland for soybeans, which are heavily used in meat production, grew by 12 million acres (an increase of 19 percent).

All things considered, demand constraints rather than supply constraints are most limiting for U.S. fruit and vegetable consumption. While most people recognize the terrific benefits of increased fruit and vegetable consumption, these opportunities have not yet come to "fruition." As the December 2016 report in *Nation's Restaurant News* on food trends for 2017 observed, "There's a lot of talk of cauliflower becoming the new kale, and of spiralized zucchini replacing pasta, but the bottom line is that Americans say they're interested in eating more vegetables, but they've shown that they're not going to give up on taste to do it."

Over the past year, culinary professionals continued to find new ways to make fruits and vegetables more popular and easier to choose. From redesigning menus to the rapid spread of plant-forward concepts like grains, greens, and protein bowls topped with an array of vegetable and fruit toppings and condiments, the restaurant industry is moving produce towards the center of the action. In 2017, *The Wall Street Journal* even reported that "bowls are the new plates" as bowled items increased by 31 percent on U.S menus since 2010.

Consumer trends are clearly indicating a growing interest in plant-forward and vegetable-centric eating patterns. In 2018, many chefs are offering more vegetables on menus, and those options are often being met with a positive response from diners. In a study sponsored by the Dutch Ministry of Economic Affairs and the Fresh Produce Centre, researchers showed that simply increasing vegetable portions while decreasing protein portions on plates served in restaurants resulted in increased consumption of vegetables, with no change in customer satisfaction. But beyond this swap example, more effective strategies and new ideas are needed to lead a substantial change in our diets, because so far these early trends have yet to show up in national databases.

At a high level, chefs and foodservice operators have two simply ways to influence consumers' attitudes around fruits and vegetables: use more of them, and make them more appealing.

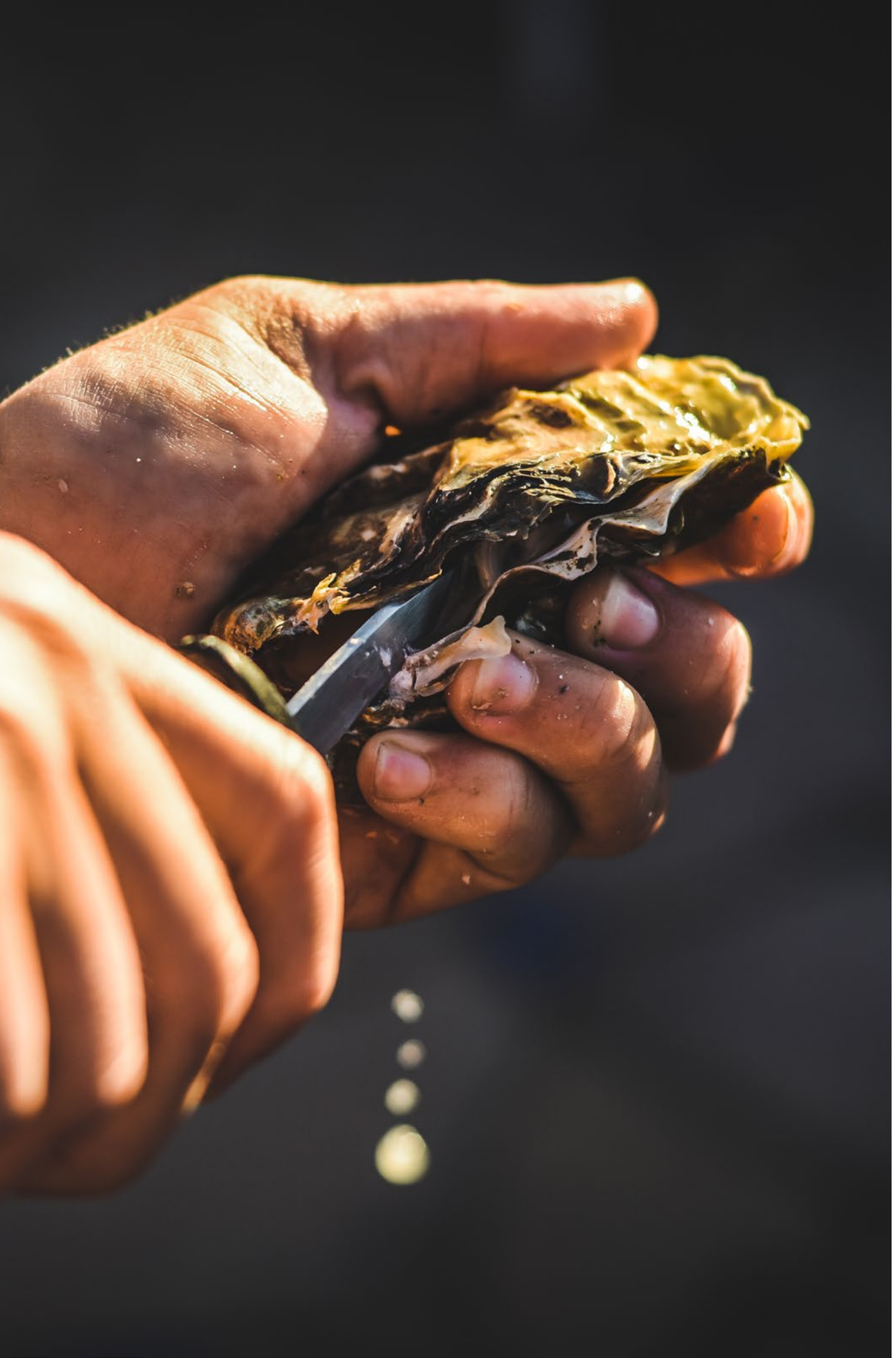
It's no longer enough to offer only one vegetarian entree consisting of pasta or roasted vegetables, or an afterthought fruit salad for dessert. Vegetables have begun driving single menus and entire operations, from fine dining to fast casual, showing their wide creative and entrepreneurial potential. Consumers seeking to eat more fruits and vegetables generally know about these restaurant concepts; it is likely that they will continue to proliferate, since the trend is far from peaking, and in the process these establishments may grow diners' interest in a wide variety of preparations and ingredients. In operations that are not labeled veg-centric (which is still the vast majority), chefs should look for inspiration among those menus and seek to create dishes tailored to their customer base that nonetheless use a wider range of produce in more exciting preparations. Attention to menu labeling that offers the same amount of details when it comes to vegetables as to other types of dishes or components will also contribute to diners selecting them because they feel equally special; spices, condiments, and cooking techniques are all elements that can be added to vegetables' descriptions to make them more enticing. Beyond adding more vegetable dishes on menus and more vegetables as a garnish around an animal protein, chefs can also use blended dishes, from burgers (beef with mushroom) to mashes (potatoes with cauliflower) to cake (chocolate with beet), to enable diners to eat more fruits and vegetables in every dish.

SCORE: 3.5

Americans are shifting to healthier diets, with many chefs and operators elevating the role of produce on menus. While upticks in actual produce usage are still modest, aspiration is clearly growing on the part of much of the dining public.

IN SUMMARY:

- Food supply data and food intake data both show little change in consumption of fruits and vegetables.
- Interest is rising, motivated by goals for public health nutrition, food production and the environment, and profitable innovation for the food retail and restaurant sectors.
- Americans are shifting to healthier diets, with many chefs and operators elevating the role of produce on menus. While upticks in actual produce usage are still modest, aspiration is clearly growing on the part of much of the dining public.



FISH, SEAFOOD, AND OCEANS

Seafood is a nutritious and environmentally efficient protein that can complement almost any operation's sustainability platform. Americans eat most of their seafood away from home, which offers opportunities for culinary professionals to provide diners with delicious menu choices highlighting fish and seafood, with a focus on sustainably sourced and underutilized species.

The sustainable seafood movement has been working for two decades to lessen the environmental impacts of the way these products are harvested from fisheries, or produced in aquaculture. This movement has worked to lessen the impacts from fisheries including ensuring that we don't catch more than is biologically appropriate (overfishing), catch other species than what is targeted (bycatch), have excessive habitat damage, or support fisheries where illegal, unreported, or unregulated catches occur. In aquaculture, the emphasis has been on minimizing the nutrients that are added to the environment, being efficient in the use of resources for feed, minimizing and eliminating the use of antibiotics, and ensuring that more animals are not farmed in an area than is biologically appropriate. Chefs have been involved in this movement by advocating for the use of lesser utilized species, and by creating linkages from the boats and the farms to the plates. For all of the work over the last two decades, it is important to understand that there is still a great deal of advancement that remains to be accomplished. Issues such as the use of slave and indentured labor still remain problematic in this industry, and new initiatives continue to be developed.

From a health standpoint, current dietary recommendations are that we should eat two 4-ounce servings of seafood per week. In other words, this means we should eat 26 pounds of seafood per person per year, and yet Americans average only 14.9 pounds per person per year. However, the U.S. only produces 9.4 pounds of seafood per person per year (adjusted for waste), and since we cannot produce enough seafood for our own citizens, we are reliant on imports. Consumers and culinary professionals alike also rely on imports not only because of supply but because of long-standing dining preferences. Shrimp continues to be the most consumed seafood item, averaging 4.1 pounds per person, with salmon, canned tuna, and tilapia in second through fourth place, averaging 2.2, 2.0, and 1.2 pounds per person respectively.

Relying on imports has its benefits and risks. The benefits are that the economic and environmental burden of many species is lower outside of the U.S., and this is prudent from a cost and sustainability perspective. The risk is that sourcing product from so many countries makes it challenging to ensure management and environmental ethics are maintained. This is why independent third-party certifications have been instrumental in creating strategic sourcing plans. However, certifications are not a one-approach-fits-all solution. For example, nutritional guidance and the total amount of energy used for production are lacking from certifications. Therefore, creative culinary establishments can use extant certifications to create a base platform, but then differentiate themselves by adding layers to push the bounds for nutrition and sustainability.

As is true for the push towards a more plant-forward diet in the terrestrial areas, the same should be true of the seafood sector. There are many nutritious plants (seaweeds and algae), and filter feeders (oysters, mussels, and clams) that rank high from a sustainability standpoint. Any institution with any type of sustainable seafood program should increase the offerings of plants from the sea along with shellfish.

One of the greatest nutritional benefits of eating seafood is the high levels of long-chain omega-3 fatty acids, nutrients that are healthy for both the heart and the brain. As aquaculture diets substitute plants for fish meal and oil (a positive step in terms of sustainability), there are some concerns that the nutritional benefit will drop. Although this is happening to some extent, salmon still remains the best source of omega-3s. In addition, herring, mackerel, and sardines are excellent sources and should have a greater presence on restaurant menus.

Acknowledgement is growing that sustainability in seafood incorporates more than just good management. Ultimately, the drive toward more sustainable seafood is a journey that cannot be achieved in a single step. It is imperative that communication of a sustainable seafood program not be defined by adherence to a sourcing strategy. Adhering to a specific sourcing strategy does not equate to 100 percent sustainability, even if the sourcing strategy is defined around solid sustainability guideposts. The best case for restaurateurs is to be open and transparent about your sustainability goals, and to communicate how you will meet the goals.

SIGNS OF PROGRESS IN THE INDUSTRY

Many of the problems in the seafood industry come from a lack of traceability. Thus, the quest for fully traceable seafood from boat or farm to plate remains a high priority. The U.S. is mandating the Seafood Import Monitoring Program (SIMP) beginning in 2018. This is a risk-based approach where key data for traceability will be reported for 12 species. SIMP is attempting to force the collection of vessel information in an effort to curb Illegal, Unreported, and Unregulated (IUU) fishing. IUU fishing runs counter to good management, and it also harbors the use of unregistered and forced labor. SIMP is not a labeling program, but it will make it easier for culinary establishments to create boat to plate messaging, while eliminating IUU fishing from U.S. restaurant supply chains for some of the most common types of fish and seafood.

One reason the U.S. has been able to rebuild the fish stocks that have been overfished is because of the Magnuson-Stevens Fishery Conservation and Management Act, a 1976 law that sets quotas as a way to rebuild overfished stocks. However, there has been recent political pressure to extend fishing seasons, and to give regions more control over their fisheries. The U.S. Commerce Department extended the red snapper (a species that has been overfished) season this year in the Gulf of Mexico. The senate voted to overhaul the Magnuson-Stevens Fishery Conservation and Management Act, and conservation organizations are concerned change could negate the past three decades of work to rebuild U.S. fish stocks.

For all of the progress that the seafood industry makes, it is plagued by individual cases of bad decision-making that shine poorly on the rest of the industry. Cooke Aquaculture let old salmon cages break apart and release 300,000 fish off Washington State; a Starkist Tuna cannery in Samoa violated the Clean Water Act for spilling wastewater into Pago Pago Harbor; Carlos Rafael of New Bedford, MA was indicted on 28 counts, including falsifying fishing quotas, false labeling, conspiracy, and tax evasion; and finally, 17 right whales died this year out of a population of less than 500. While not all deaths were related to fishing, a significant number were, and this exemplifies the ongoing challenge for fisheries to achieve greater sustainability.

Seafood represents a dichotomy in that there is the scientific advice that Americans need to eat more fish and seafood because they are among the healthiest animal proteins, but usually purchase only the handful of varieties they know, which might come from unsustainable practices and/or be greatly overfished. Chefs have a large role to play in helping the general public expand their knowledge. This starts by chefs offering affordable options as well as diversifying their fish and seafood offerings by focusing on the most sustainable varieties they can find. This requires research and recipe development that they should consider an investment in the future of their menus, to be able to continue offering fish and seafood 10 or 20 years down the road. Then, they need to explain to their customers how a particular variety relates to something they know, whether it is in texture or in optimum mode of preparation, to take away the fear of ordering or purchasing something new. In foodservice operations, the service staff can provide that information, and in grocery stores, a small placard can provide cooking tips.

SCORE: 3

Americans eat most of their fish and seafood away from home but only eat half as much as they should. Making responsible choices is difficult, although recent federal action will help reduce illegal fishing. The restaurant industry can play a lead role in helping Americans eat more fish and do so responsibly, but there's much work ahead and new approaches are needed.

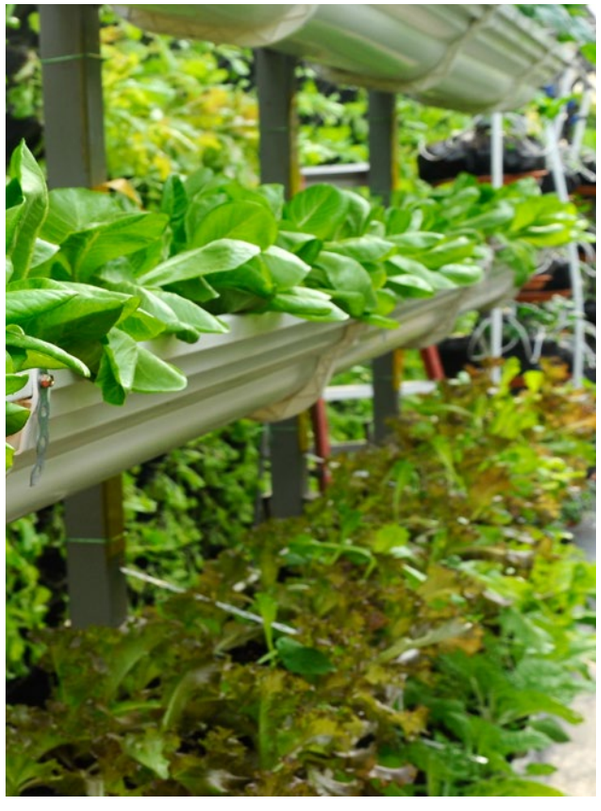
IN SUMMARY:

- Know and trust your supplier. You can be confident the product you purchase meets your sustainability and traceability requirements.
- Be engaged. Ask questions of your suppliers, and comment while certification organizations are revising their standards.
- Americans eat most of their fish and seafood away from home but only eat half as much as they should. Making responsible choices is difficult, although recent federal action will help reduce illegal fishing. The restaurant industry can play a lead role in helping Americans eat more fish and do so responsibly, but there's much work ahead and new approaches are needed.

WATER SUSTAINABILITY

This past year, the United Nations Food and Agriculture Organization called global attention to the link between sustainable management of water resources, food production, and the food industry. The way we eat—both dietary patterns and how we grow our food—dramatically impacts how much water each person requires, varying around the world from 2,000 to 5,000 liters per day. By 2050, feeding a world of 10 billion people may require us to increase food production by 50 percent or perhaps much less depending on how we choose to eat. And, while far below the doubling of food production often bandied about, achieving a 50 percent increase is a substantial challenge, especially given that as much as two-thirds of the world's population will live in water-stressed countries by 2025.

Agricultural production is responsible for over 70 percent of global water demand, and more than two-thirds of global water consumption is for irrigated agriculture, which provides 40 percent of global agricultural production. With the price and availability of food so dependent on water resources, jobs in the foodservice industry are as well.



Food production, particularly raising livestock, also can pollute and further stress water resources. Fertilizer and manure can run off into surface waters and into groundwater, although better management practices including planted buffers, nutrient and manure, and drainage management efforts can reduce or eliminate water pollution. Relying on pastured livestock production also can reduce water use and better protect water quality compared to feedlot production methods, offering this and other environmental benefits beyond addressing climate change. For over two years, the U.S. Environmental Protection Agency has delayed actions to manage agricultural pollution of surface water. Few states (such as California) actively manage fertilizer and manure discharge to groundwater. This makes it even more important to see efforts by foodservice companies to purchase from farmers and ranchers who take voluntary steps to conserve and protect water resources.

The International Food Policy Research Institute estimates that nearly half of global gross domestic product (GDP), more than half of the global population, and 40 percent of grain production could be at risk due to water stress by 2050. These are no small matters for the foodservice industry. Water stress will be driven by increased urban demands as population increases, especially in developing countries, but even more so by increasing demand for agricultural production of foods. In past years, we have pointed out in this report how animal foods are sometimes particularly water intensive (please see Figure 3 on page 35). The food and foodservice industry, through its close relationship with agriculture, has a critical role to play in addressing increased water security. Specifically, there is a need for more menu innovation around options that reduce the emphasis on red meat and emphasize plant-based foods.

A 2016 MIT study showed that climate change will also alter growing conditions and water demands for many major food staples due to both increased temperature and changes in precipitation patterns and amounts. Climate change and growing food demands will be challenging for water resource management, while potentially also reducing protein and nutrient quality of cereals. As in prior years, the United Nations urges additional efforts in 2018 and beyond to adapt to increasing water stress to avoid potentially dramatic effects on trade and migration as a result of drastic economic losses from dwindling reliable water supplies.

Warmer—and in some parts of the world, drier—climate conditions will contribute significantly to increased water demand in some agricultural regions. In the U.S., 2017 brought relief to drought-stricken California, which officially called an end to a five-year drought cycle, although Plains states remained abnormally dry. But with winter precipitation scarce in much of California, a new drought cycle has already begun this year. The prior drought cycle caused more than $2.5 billion in economic impact. And the continued year-by-year, season-by-season focus on weather forecasts highlights the extensive current risk and lack of preparedness facing our food supply chains.

Engagement on water footprint and water sustainability is not a matter of one-size-fits-all. Unlike carbon emissions, which have similar effects around the globe, pound for pound, each watershed and each groundwater basin has its own unique structure and set of complex issues. Like other food sectors, foodservice companies can discover and adopt innovative solutions to reduce water consumption, increase water reuse, and decrease waste discharge, including food waste discharge. Food waste in particular represents significant potential for reduced water use, namely through the "virtual water" waste embedded in food's water footprint. More importantly, the foodservice industry may realize even larger water sustainability impacts by increasing its role in diverse local, regional, and global partnerships with agricultural and food suppliers to help reduce water—including groundwater—risks in agricultural production and move toward sustainable farming practices. Chefs and foodservice providers can adjust menus by understanding the impacts of food production. Menu decision-makers may favor sustainable suppliers, while also minimizing the water footprint and water quality impacts across the food portfolio that a menu represents. Increasing the appeal of plant-forward menu options would be one such step in the right direction.

Many restaurants and operations in cities or areas that are or have been drought-stricken indicate on their menu that water will only be served upon request. This simple note, which a verbal announcement from the server can further emphasize, brings awareness of the local scarcity of water. Doing so should not be construed as equivalent to developing a menu that pays careful attention to the water resources associated with different foods or to the relative water efficiency of an operator's dishwashing facilities, which have a far greater impact than serving tap water or not. However, the note can be a worthwhile educational gesture, as a way to engage diners in a conversation about the importance of water conservation, but far beyond that, chefs and operators need to design menus that are less water intensive and make that process transparent to their consumers so they too can think about how to reduce their water consumption at home. This can take the form of notes on the menu or on a website, or as part of a newsletter that operations send their subscribers, for example. Sharing tips that have proved useful in a commercial setting with consumers will not only help make everyone more environmentally responsible, but can also strengthen the relationship between business and customer.

SCORE: 2

The U.S. foodservice industry is beginning to pay attention to water issues as drought and groundwater depletion have weighed heavily on profits in recent years.

IN SUMMARY:

- Agricultural production is responsible for over 70 percent of global water demand. Long-term water security is closely tied to food security and the economic success of the foodservice industry. Climate change, population growth, and dietary changes are putting increasing pressures on global water resources.
- There is no one-size-fits-all solution for crafting menus that strongly support water sustainability. Plant-forward menus and recipes, attention to water and environmental conditions in regions that grow food, as well as engagement with growers and food suppliers on sustainable water practices are all important steps toward finding more specific long-term solutions.
- The U.S. foodservice industry is beginning to pay attention to water issues as drought and groundwater depletion have weighed heavily on profits in recent years.

CLIMATE CHANGE

Climate change and water scarcity are among the greatest threats to the U.S. foodservice industry and the nation's food system overall. Over the next few decades, forecasts indicate temperatures will continue to rise, precipitation patterns will change, extreme weather events will become more frequent and intense, and many regions will experience a decline in freshwater availability. All this will make growing conditions more challenging and farming and ranching far less predictable. As a result, foodservice professionals should be prepared for supply chain disruptions, heightened risks of foodborne contamination, and more uncertainty in the availability, price, and nutrient content of food. Elevated carbon dioxide concentrations may lead to a decline in the iron and zinc content of legumes and certain grains, for example. These threats are discussed in the ***Climate Change*** and ***Water Sustainability*** issue briefs in the *2016 Menus of Change Annual Report*.

The food and foodservice industries have a critical role to play in addressing the climate and water crises. If global meat and dairy consumption continues to rise as projected, the greenhouse gas (GHG) emissions from food production alone will nearly surpass the threshold for keeping temperature rise at or below two degrees Celsius—the limit for avoiding the most catastrophic climate change scenarios. Shifting toward plant-forward cuisines is thus a necessary and urgent intervention for meeting sustainability goals, a message that has been echoed repeatedly in the scientific literature. The U.S. restaurant industry and foodservice sector—including our nation's chefs—play a substantial role in shaping the tastes of the world's dining public as well the priorities for our professional peers around the world.

How much room does this leave on the menu for animal foods? It depends—some are vastly more sustainable than others. Farmed shellfish generally have a minimal GHG and water footprint, while providing the co-benefit of cleaner waterways. The handful of studies on the GHG and water footprint of edible insects, such as mealworms and crickets, show promise. By contrast, the GHG intensities of pork, poultry, and dairy are high.

Ruminant meat—beef, mutton, and goat—has been repeatedly shown to be the most GHG-intensive food group, on the order of 100 times more so than plant foods, and the most demanding of land and energy.

Not all beef is created equal, however, raising questions about the relative sustainability of feedlot-finished beef compared to grass-finished beef. In contrast to intensive or "landless" systems, where beef or dairy cattle are confined to densely-stocked feeding operations, grazing systems capitalize on human-animal-ecosystem relationships in ways that can promote biodiversity, healthy soil, and farmer autonomy, while minimizing or avoiding many of the public health, ecological, and animal welfare harms associated with industrial production. Grazing animals also offer the benefit of converting crops that are inedible to humans (grass) into a food source, and can do so on land that is too rocky or hilly for crop production.

Certain grazing management techniques have also been shown to offset the GHG emissions from cattle by sequestering—or capturing—carbon in soil. More long-term studies are needed, however, to measure how much these practices could reduce, eliminate, or even reverse the GHG footprint of beef on a broader scale—because sequestration by grazing systems occurs only under highly specific conditions, and is time-limited, reversible, and potentially outweighed by the heavy climate burden from other GHGs (i.e., methane and nitrous oxide). And in the absence of ideal conditions, the GHG footprint of grass-finished beef may be *higher* than feedlot-finished beef, even after accounting for carbon sequestration.

In summary, there are many benefits from choosing pastured and grazed livestock, but it's not yet clear whether climate change mitigation is *one of those reasons*—at least not based on the available evidence at this time. Even if certain grazing practices prove to be climate-friendly, we couldn't simply swap all of our feedlot beef for pastured beef without at least halving the amount we consume—because all the pastureland in the U.S. could only support an estimated 45 percent of current production levels.

Amidst seemingly conflicting information, it can be challenging for foodservice professionals to identify the most sustainable culinary choices. As a general rule, plant-based foods should be prioritized above all else; shellfish and insects can probably be used liberally; and other animal products should be used sparingly as a flavor enhancer, a less frequent side dish, or the very infrequent, larger portion for special occasions (again, with a special emphasis on red meat reduction). Animal foods from pasture-based or agro-ecological operations are a little more complicated—there are many sound public health and ecological reasons to favor them over their industrially produced counterparts, but serving "better" meat and dairy needs to come along with substantial reductions in the amounts served. While definitive answers to "how much is acceptable?" have yet to be quantified, reductions on the order of 60 to 80 percent would substantially mitigate the ecological burdens of production, greatly increasing our chances of meeting climate mitigation goals.

The culinary profession and restaurant industry are making substantial strides in addressing climate change by serving less red meat. The long-term trend of spending an ever-larger share of food dollars in the U.S. on meals prepared by culinary professionals is highly correlated with the long-term decline in beef consumption. Chefs are taking the leading in popularizing plant-forward dining on their menus, increasing the share of plant-based foods they serve—for instance, through the now widely prevalent use of mushrooms to offset portions of beef patties in blended burgers—and also introducing new types of plant-based foods to the public. Both measures influence what we choose to cook when we cook for ourselves.

While the restaurant industry's efforts are helping to address climate change overall, the industry has made little progress in managing its own near-term risks, including increased volatility in food availability and price triggered by more extreme and less predictable weather and long-term droughts. Companies like McDonald's are finally acknowledging the risk of climate change. Needed improvements in supply chain transparency (pp. 16) will help restaurant operators better understand where their ingredients come from. They will also help them make menu and sourcing decisions to both avoid risk and support sustainable agricultural practices, including sourcing from farms that effectively sequester carbon.

As leaders of the plant-forward direction for American food choices, chefs and foodservice professionals need to create a culture of craveability around produce and healthy, plant-based foods, shifting from a perception of deprivation to one of pleasure. In foodservice operations, that includes reducing the amount of animal protein in a dish to the profit of plant-based ingredients and developing plant-forward entrées that go beyond a plate of roasted vegetables. In grocery stores and other prepared food settings, that means offering flavorful fresh and frozen plant-forward dishes, selling both raw and partially prepared (peeled and cut, for example) produce that a home cook can use conveniently and rapidly, and providing cooking advice to help consumers make good purchasing decisions.

Creativity in the restaurant and non-commercial foodservice sectors is increasingly showing the way, by offering more choices not less choice, and presenting a multitude of pathways towards "plant-forward" embedded in culturally based flavors from the Mediterranean and Asia to Latin America; by dazzling diners with small plates of fresh, farm-to-table creations; by constructing whole-grain-and-produce-based bowls with meat or other animal protein as a 1- or 2-ounce topping; or by marrying reduced portions of animal protein with savory preparations of legumes (pulses), nuts, and/or seeds. Just as a good investment advisor suggests building the components of a sound retirement portfolio across a whole range of sectors and strategies, innovative restaurants are now demonstrating the promise of diversifying menu categories and concepts beyond the old, simply bifurcated "regular" meat and vegetarian/vegan options.

SCORE: 3.5

The restaurant industry and culinary profession are driving an important trend in reducing red meat consumption, which has the largest GHG footprint or contribution to climate change, and highlighting plant-forward menu innovation, but efforts to promote other, more sustainable animal proteins or source from producers that use far superior growing practices remain sporadic.

IN SUMMARY:

- Menus should prioritize plant-based foods; shellfish and insects are among the more sustainable options from the animal kingdom.
- There are sound reasons to transition from industrially raised to pasture-based animal products, but so far this has not been shown to be a solution for climate change despite popular claims to the contrary. A substantial reduction in meat production is the surest way to mitigate the negative environmental impacts of feedlot-finished beef, even as the science around pasture-finished beef continues to be explored and evaluated.
- The restaurant industry and culinary profession are driving an important trend in reducing red meat consumption, which has the largest GHG footprint or contribution to climate change, and highlighting plant-forward menu innovation, but efforts to promote other, more sustainable animal proteins or source from producers that use far superior growing practices remain sporadic.

GALLONS OF WATER USED IN FOOD PRODUCTION PER SERVING

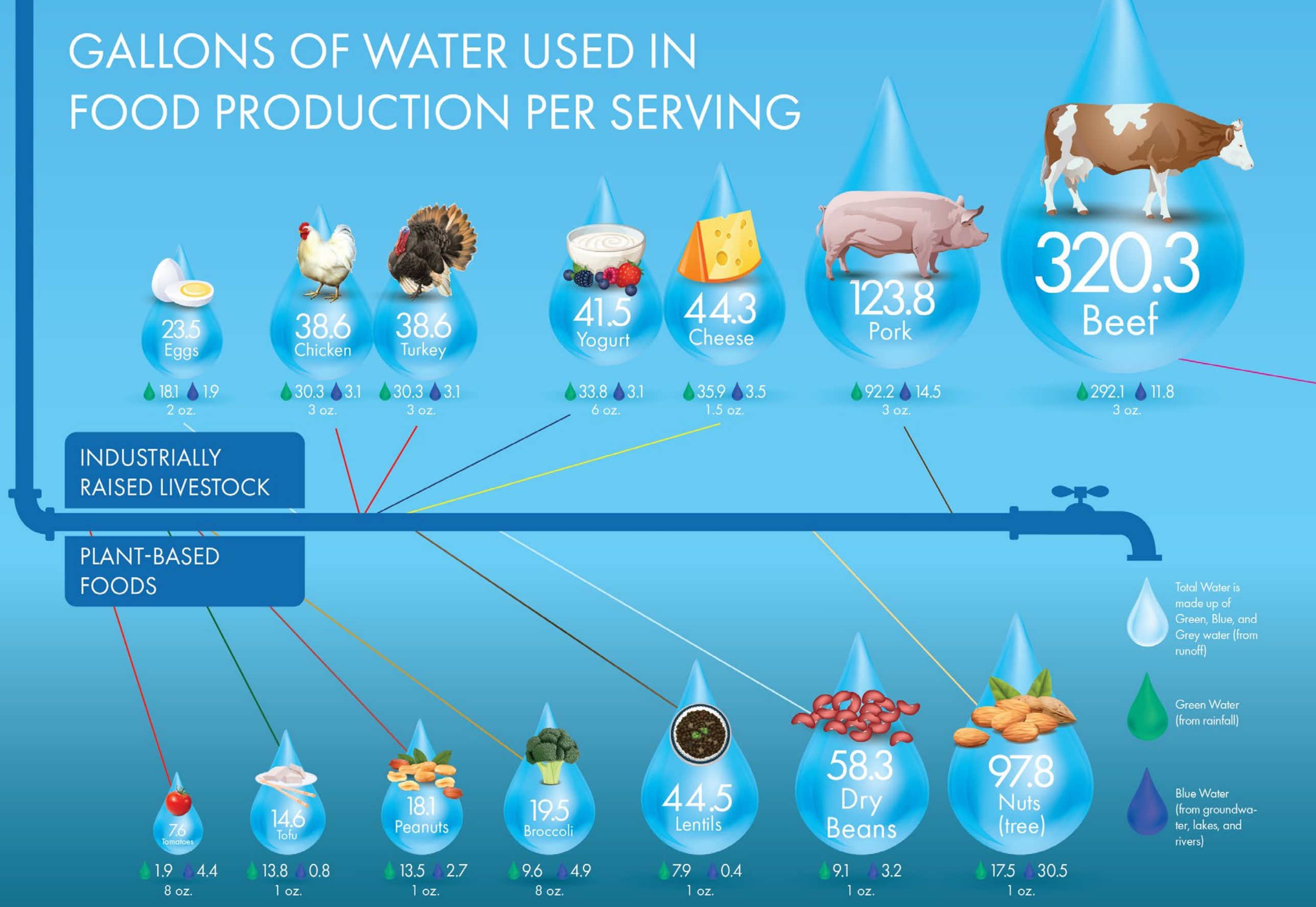


Figure 3. Source Data: m3/ton in Water Footprint Network Water Statistics Table (Animals, Crops) for the U.S.
Sources: T. Harter, 2015, Changing Tastes, 2015 and M.M. Mekonnen and A.Y. Hoekstra, "The Green, Blue and Grey Water Footprint of Crops and Derived Crop Products," and "The Green, Blue and Grey Water Footprint of Farm Animals and Animal Products," Value of Water Research Report Series No. 47 and 48, UNESCO-IHE, Delft, the Netherlands, 2010.

TOOLKIT RESOURCE:
WHAT BUILDS STRONG EVIDENCE ON DIET AND HEALTH?

HOW TO IDENTIFY SCIENCE SUPPORTING OPTIMAL FOOD CHOICES.

THE CULINARY INSTITUTE OF AMERICA®
HARVARD T.H. CHAN SCHOOL OF PUBLIC HEALTH
Department of Nutrition

VII. WHAT BUILDS STRONG EVIDENCE ON DIET AND HEALTH?

AS A CULINARY OR FOODSERVICE BUSINESS PROFESSIONAL EVALUATING DIETARY AND MENU GUIDANCE, LOOK FOR THESE MARKERS OF QUALITY IN THE RELEVANT STUDIES CITED AS EVIDENCE.

- **Studies in humans with large numbers of participants.** Animals and test tubes differ from humans in many ways and often respond to diets differently. Large numbers of people are needed for reliable statistical conclusions.

- **Outcome is health.** For making decisions about diet, it is important to study either disease outcomes like heart disease, diabetes, or cancer, or important health outcomes like quality of life.

- **Participants followed over time.** Studies should measure diets of participants before they develop disease and then follow them over time; these are called cohort or prospective studies. Randomized trials in which participants are assigned to different diets and then followed over time would be desirable, but these are relatively few because of the challenges of keeping people on their assigned diet for long periods of time.

- **Confirmation by other studies.** A single study should rarely be the basis for making changes; results that are confirmed by other studies are most reliable.

- **Supportive evidence from controlled feeding studies with biochemical or physiological outcomes.** In controlled feeding studies, participants are actually fed different diets, usually for a few weeks, and the effects on blood pressure, blood cholesterol fractions, or other biochemical variables are measured. Consistent evidence from large cohort studies with disease outcomes and controlled feeding studies with biomarkers provide confidence that an observed relationship is causal, not just a correlation.

- **Systematic reviews, sometimes including meta-analyses, by investigators knowledgeable about the topic.** When many studies have been conducted, a summary of the evidence can be valuable when the studies are selected in an unbiased, systematic manner. A statistical summary of the results, or meta-analysis, can provide an overall picture of the evidence. Because of the complexity of nutrition and human diseases, input of those with deep knowledge in the topic being summarized is needed to avoid misleading conclusions.

- **Publication in top-tier journal.** Findings from high-quality, peer-reviewed journals like *New England Medical Journal, Lancet*, and *JAMA* are more likely to be reliable than findings in lower-level journals. However, this is not a totally reliable criterion, and confirmatory findings from other journals can be extremely important.

OFF THE RAILS: A CHECKLIST

A USER'S GUIDE TO SOURCES OF CONFUSION ABOUT DIETARY GUIDANCE

Changing food habits, making healthier food choices, and re-imagining menus is hard enough when chefs, operators, and their customers are well informed and have confidence in clearly defined dietary goals and strategies. Unfortunately, too often, a range of factors undermines the strength of that confidence, or throws our thinking off the track of sound science entirely. As you sort through the regular onslaught of news headlines touting the latest research, the release of government reports, and the opinions of diet books, TV commentators, bloggers, other media sources, friends, and colleagues, here is a short checklist of 12 "things to watch out for" in navigating this noisy landscape.

- ✓ **Poorly constructed studies.** These may be small, short-term, retrospective studies (diet is assessed after disease has been diagnosed). They are often found in obscure journals. Prospective studies, in which diet is assessed before disease has been diagnosed, are superior because they avoid effects of disease on what people eat or their recall of diet.

- ✓ **Outlier studies.** Results that are inconsistent with "established" evidence are often small, sometimes in animals or test tubes, and may be in extreme or unrepresentative groups of people (e.g., astronauts).

- ✓ **The train wreck of bad meta-analyses.** Summaries of available evidence are important, but these are often conducted by people not engaged in nutrition research who don't understand its complexities or the definitions of disease.

- ✓ **Research swayed by economic interests.** Individual companies and business associations can influence what research gets funded, and what gets reported. Though not always the case, this can often add spin to what is published.

- ✓ **Government policies, politics, and special-interest lobbying.** Powerful trade groups in agriculture and manufacturing strongly influence federal dietary guidelines.

- ✓ **Defending the status quo when the science has evolved.** Individuals and organizations can be reluctant to change positions, even when they are contradicted by available evidence.

- ✓ **The media opinions of untrained "experts" and diet book writers.** The media is overwhelmed with opinions of self-appointed authorities who have little or no nutrition education or research experience. Science writers often attempt to achieve "balance" using opinions on both sides of a story even when the evidence on one side is much stronger. One should be very skeptical of diet book writers, food bloggers, and celebrities who tout miracle diets or supplements.

- ✓ **"Compared to what?"** Because we unconsciously regulate our caloric intake, a single food or nutrient (e.g., saturated fat) cannot be evaluated in isolation. The effect of increasing or decreasing intake of a food or nutrient will depend in part on what it replaces or is replaced by.

- ✓ **Intentional or unintentional “half-truths.”** Because the replacement food is important, foods can contain both healthful and harmful components, and more is not always better, advice can be partially true but misleading. For example, high intake of refined carbohydrates can be harmful, but replacing this with red meat and saturated fats is not desirable.

- ✓ **Sensationalism distorts news coverage of research.** Scientists and institutional press offices sometimes overstate the importance of their findings, and the media is pressured to attract readers. Thus, “man bites dog” stories capture front-page attention but important, solid findings are often uncovered or buried on other pages. Further, both media writers and editors are generally averse to reporting on new studies that simply reinforce an earlier finding, or reproduce a previously published study, even though that is essential to do. For example, “New Study Finds Nuts Are Still Healthy, Just as the Research Has Already Shown” is an unlikely headline, while “New Study Finds Nuts Reverse Hair Loss” would be a likely headline.

- ✓ **Our brains: making our dietary beliefs fit our worldview.** All of us have absorbed cultural beliefs about foods, and this can make us resistant to new ideas or dietary change. However, over a period of years, changes in diet, both beneficial and harmful, are occurring worldwide, documenting that diets are modifiable, and that specific food choices have important consequences for our health, and the health of the planet.

- ✓ **The food environment, education, and health messages: lost in translation.** Many Americans have limited resources, and their daily reality is constant exposure to unhealthy processed foods, overly indulgent portions of restaurant food and sugary beverages, as well as to the aggressive marketing of these foods. Messages about healthier options may often seem irrelevant or simply not heard in that environment. Thus, special attention needs to be given to developing compelling, alternative messages and approaches that can break through and secure affordable, healthy, and delicious dietary patterns for all Americans.

Photo: Boston College

Photo: Stanford University

Photo: Harvard University

VIII: MENUS OF CHANGE AND THE NEXT GENERATION

It's a unique opportunity to influence the palates, preferences, and values of the young adults whose food identities are being shaped during their college years. In light of much troubling news—about the obesity rate still climbing; type 2 diabetes and cancer robbing so many of optimal quality and years of life; wildfires, mudslides, and hurricanes revealing unsettling realizations that global warming is not a future scenario to be avoided but a current reality—rest assured that the next generation of eaters in this country (your future customers) are in remarkably good hands. At least those diners fortunate enough to eat three times a day at any number of boundary-pushing campus dining programs across the nation. The planet could be in good hands too, as we learn what strategies are most effective for building preference for healthier, more sustainable dietary choices.

To accelerate innovation around the most effective ways to implement the Menus of Change Principles of Healthy, Sustainable Menus and shift diners toward more plant-forward eating patterns, the Menus of Change University Research Collaborative works on research and education in support of culinary-centric, evidence-based food systems innovation within and beyond universities. This network of senior university administrators, dining directors, executive chefs, nutritionists, sustainable food program managers, and academic faculty now represents more than 50 colleges and universities from a cross-section of the nation's top dining programs at both public and private institutions, as well as other large dining programs such as Google and U.S. Olympic Training Center. The Collaborative was co-founded in 2014 and is jointly led by the CIA and Stanford University. Together its 200 members serve over 700,000 meals per day. This figure represents billions of meals consumed over the course of the collective lifetimes of the students and customers they serve.

What follows is a small sample of some of the most inspiring work based on the Menus of Change principles that is taking place across their campuses. These operators and educators are leading with flavor, being transparent about their sourcing and operations, leveraging globally inspired, plant-forward culinary strategies—and much, much more. These are the principles in action. These are small steps with big impact.

- University of Connecticut Dining Services' Executive Director C. Dennis Pierce was honored in March with the coveted Silver Plate Award given by the International Foodservice Manufacturers Association. Having already reduced salt in their recipes, sourced chicken free of antibiotics, increased their locally sourced fresh fish, and reduced the use of red meat on their menus, Pierce led the roll-out of a robust UCuisine program for the spring 2018 semester that featured theme meals and events that each focus on a specific principle. It's part of an educational awareness program to inform students, but more importantly, to have students taste and enjoy great menu options.

- Northeastern Dining's annual signature event, Educate Your Palate, aims to expand the palates and food knowledge of students through a unique culinary adventure. This year's event, "Rethink Zero," was a comprehensive exploration of the zero-waste philosophy, from a menu that challenged students to step outside their culinary comfort zones to a sustainable approach to event décor. Beyond the annual event, Northeastern's campus chefs host Menus of Change Action Stations in their dining locations to educate students about how they implement and utilize the principles in their daily operations. Their chefs focus on a different principle each month; for instance, "Reduce Added Sugar" with banana oat cookies and aquafaba cappuccino kisses, or "Drink Healthy" with an iced tea bar featuring combinations like peach + thyme and pomegranate + lime.

- Stanford Dining and the FEED Collaborative at Stanford co-teach a course in Earth Systems and the Stanford d.school that uses design thinking to understand and explore the social, cultural, and economic forces of our food system. With the principles as a major theme underlying the class, students conduct research to understand eating behaviors in the dining halls. Final projects give students a real-world taste of life as an operator creating “plant-forward” and “flipped” serving stations for the serveries that diners will find delicious. Combining their research insights with hands-on cooking skills gained in the Teaching Kitchen @ Stanford, they create a menu along with storytelling collateral to make each item engaging. (Perhaps these young adults are not only your future customers but your future employees!)

- University of Colorado, Boulder’s Campus Dining Services (CDS) was named the Tech Accelerator of the Year last fall by the editors of *Restaurant Business* magazine. Two of the innovative technology elements for which CDS Director Paul Houle and his team were recognized were their biodigester—which breaks down food waste (of which 70 percent is water) into gray water that can safely re-enter the waste-water supply—and electrochromic glass used in the windows at their Village Center. The glass automatically tints in proportion to the intensity of the sun, allowing diners to enjoy unobstructed views of the stunning Flatiron mountains year-round, while lowering the need for indoor lighting.

- Rutgers Dining started monthly chef demonstrations in their dining halls, which they offer four to five times per meal period. Student dietitians team up with the chefs to provide recipes and nutrition advice, together educating diners on both the science behind the principles and how to cook delicious plant-forward recipes.

- University of Colorado, Colorado Springs, as part of a robust set of educational and dining programs, runs the Flying Carrot Food Literacy Truck. Whether on-campus or in the surrounding community, the innovative mobile project offers hands-on cooking skills, education, and access to local, seasonal, sustainable foods. UCCS also offers a weekly student-run dinner experience in the dining halls called Food Next Door, which highlights healthy, sustainable recipes such as blue corn brownies and Protein Flip burgers.

Leveraging the unique opportunities of the higher education sector for advancing culinary literacy, member colleges and universities use campus dining facilities as living laboratories to test strategies for behavior change. MCURC’s scientific research seeks to answer questions that integrate the currency of academia (journal publications) with the currency of dining services leaders (student satisfaction); it is unique in that it is informed by the real-life business needs of campus dining departments. The MCURC research portfolio includes experiential research and applied analysis, procurement data analysis, behavior modification, and studies of the psychological, sensory, linguistic, and marketing elements of food choices. Research is coordinated across multiple member institutions, and over time, MCURC disseminates key findings and insights gained from completed research projects within and beyond the Collaborative.

So, with any luck, your job offering healthy, sustainable, plant-forward food choices in corporate dining, hospitals, hotels, casual dining, fast casual dining, and quick-serve settings will become easier and easier as these research insights come to the fore, and as this next generation of Americans learns and tastes what an undoubtedly delicious way that is to eat—and demands ever-more of those options on the menu.

Photo: Boston College

OUR APPROACH: DIVERSITY OF STRATEGIES

Any approach to providing guidance on nutrition, the environment, and culinary insight to business leaders must recognize that America's $800 billion foodservice industry is as diverse as it is large and omnipresent in our culture. Customers, quite apart from their interest in health, sustainability, or food ethics, look to different kinds of operations to fill a variety of needs and interests. Appetites and preferences vary, depending on whether the meal is a workplace lunch, a mid-week dinner with the family, a snack on the run, or a celebratory occasion. What a diner or a family chooses to eat and order in a single instance is less important for their health and the environment than the aggregate pattern over days and weeks. Chefs and the foodservice industry have an enormous opportunity to embrace change, while still preserving a wide range of options for an American public that often wants someone else to do the cooking. These principles and strategies, together with the *Menus of Change Annual Report*, are intended to support innovation on the part of operators and entrepreneurs wherever they are positioned in the industry, and help connect them with their aspirations and their unique views of imperatives and opportunities.

IX. PRINCIPLES OF HEALTHY, SUSTAINABLE MENUS

Consumers say they want food that is healthy, sustainable, and ethically sourced, but figuring out which foods to eat is often not easy. As a result, the dining public is looking to chefs and food industry leaders to help them make the "right" choices. Culinary professionals are responding. But giving people what they want isn't always easy either. Some diners believe that foods advertised as "farm to table" or certified with sustainability labels are also healthier. While customers don't always purchase what they say they want, these trends are profoundly changing the landscape of the foodservice business.

The **Principles of Healthy, Sustainable Menus** represent unique guidance for the foodservice industry. They incorporate findings from nutrition and environmental science perspectives on optimal food choices, trends in consumer preferences, and impacts of projected demographic shifts in order to provide culinary insight and menu strategies that build on promising innovation already occurring in the sector.

The principles anticipate that fast-moving, mid- and long-term global trends—from continued population growth and increasing resource shortages to commodity price spikes and food security issues—will increasingly reframe how we think about food and foodservice in the United States. They also consider that the rise in diet-related chronic diseases suggests that many of today's food and foodservice business models cannot remain unchanged for the long term. They outline pivotal culinary strategies designed to increase the odds that customers will reward pioneering and innovative restaurants and other industry operations with their business.

In short, the Menus of Change Principles offer a guide to optimal menu design and innovations for future culinary development to promote the foodservice industry's abundant creativity and entrepreneurial dynamism in support of a future of tremendous opportunity.

Collectively, these principles and strategies also speak to our most vulnerable members of society. Chefs who are inspired by the possibility of delicious, healthy, and sustainable foods are working to make these flavors more accessible across America, in K-12 schools, in hospitals, and in low-income neighborhoods. Without the benefit of culinary expertise and insight, a focus on inexpensive ingredients can often be a recipe for failure, whether the customer is a child or an adult, middle-class or economically disadvantaged, healthy or sick.

Finally, the Menus of Change Principles have not been chiseled in stone; rather, they are designed to be part of an interactive, cooperative, and evolving process. As science progresses, trends shift, and new opportunities and challenges come to light, we will revisit and revise this document annually. Please join the conversation at the annual Menus of Change Leadership Summit or online to help us further strengthen this essential guidance for the foodservice sector. You can reach us at **info@menusofchange.org**.

For additional guidance on sustainability and nutrition science-based dietary advice, consult the CIA-Harvard Chan School Menus of Change website, **menusofchange.org**, and Harvard Chan School's Nutrition Source website, **nutritionsource.org**, which includes additional CIA-Harvard Chan School integrated dietary information and culinary strategies.

PRINCIPLES
OF HEALTHY, SUSTAINABLE MENUS

MENUS of CHANGE®
The Business of Healthy, Sustainable, Delicious Food Choices

The Culinary Institute of America | Harvard T.H. Chan School of Public Health, Department of Nutrition

GENERAL OPERATIONS

BE TRANSPARENT ABOUT SOURCING AND PREPARATION

BUY Fresh AND SEASONAL, LOCAL AND GLOBAL

REWARD BETTER AGRICULTURAL PRACTICES

LEVERAGE GLOBALLY INSPIRED, PLANT-FORWARD CULINARY STRATEGIES

MENU CONCEPTS AND DESIGN

FOCUS ON **WHOLE, MINIMALLY PROCESSED** FOODS

GROW EVERYDAY OPTIONS,
WHILE HONORING SPECIAL OCCASION TRADITIONS

CELEBRATE CULTURAL DIVERSITY & DISCOVERY

LEAD WITH **MENU MESSAGING AROUND FLAVOR**

REDUCE PORTIONS, EMPHASIZING CALORIE QUALITY OVER QUANTITY

DESIGN HEALTH AND SUSTAINABILITY INTO **OPERATIONS AND DINING SPACES**

FOODS AND INGREDIENTS

THINK PRODUCE FIRST

MAKE **WHOLE, INTACT GRAINS** THE NEW NORM

LIMIT POTATOES

MOVE LEGUMES AND NUTS TO THE CENTER OF THE PLATE

CHOOSE HEALTHIER OILS

REIMAGINE DAIRY IN A SUPPORTING ROLE

GO "GOOD FAT," NOT "LOW FAT"

SERVE **MORE KINDS OF SEAFOOD, MORE OFTEN**

USE POULTRY AND EGGS IN MODERATION

REDUCE ADDED SUGAR

SERVE **LESS RED MEAT, LESS OFTEN**

CUT THE SALT;
RETHINK FLAVOR DEVELOPMENT FROM THE GROUND UP

SUBSTANTIALLY **REDUCE SUGARY BEVERAGES; INNOVATE REPLACEMENTS**

DRINK HEALTHY:
FROM WATER, COFFEE, AND TEA TO (WITH CAVEATS) BEVERAGE ALCOHOL

DESIGNED BY J WRIGHT DESIGN

PRINCIPLES
OF HEALTHY, SUSTAINABLE MENUS

1. Be transparent about sourcing and preparation. Providing customers with abundant information about food production methods, sourcing strategies, calorie and nutrient values, labor practices, animal welfare, and environmental impacts is a necessity in our technology-driven and networked era. Consumer engagement is driven by the rise in food safety and fraud alerts, a growing interest in sustainability and food ethics, and a hyper-connectivity that yields instant access to information such as impending crop failures or the latest farm-labor conditions across global supply chains. Consumers can learn about what they eat regardless of what chefs and businesses share. Given that, foodservice operators can build trust by learning about environmental and social issues in the food system and sharing information about their own practices. Identifying the farms that grow key ingredients, for example, is a strategy that creates value and brand identity and one that is quickly becoming a standard practice. Going further and explaining how food is produced and the rationale for sourcing decisions are the next steps, while limiting or restricting information on hot-button consumer issues such as calories, trans fats, genetically modified ingredients, or processing methods are approaches not likely to survive over the long term. Operators who do not adjust business models and strategies to anticipate the impacts of this accelerating trend risk disappointing the dining public and having to play costly catch-up as such issues assume greater urgency with the public.

2. Buy fresh and seasonal, local and global. For chefs, peak-of-season fruits and vegetables can help create unbeatable flavors—and marketing opportunities. When designing menus, draw ideas and inspiration from local farmers and their crops during your growing season as well as the varieties and growing seasons of more distant regions. The advantages of local sourcing include working with smaller producers who may be more willing to experiment with varieties that bring interest and greater flavor to the table. A focus on local foods also can play an important role in building community by encouraging school children, retailers, media, and others to learn how to grow food, steward the land, and adopt healthier eating habits. But designing menus to draw on in-season fruits and vegetables from more distant farms also is a key strategy for bringing fresh flavors to menus throughout the year.

3. Reward better agricultural practices. Sourcing sustainably grown foods is complex, but there is one important rule of thumb: the environmental cost of food is largely determined by how it is produced. The best farms and ranches protect and restore natural systems through effective management practices, such as choosing crops well-suited for their local growing conditions, minimizing use of synthetic pesticides and fertilizers, and avoiding the use of groundwater for irrigation. Better-managed farms sometimes qualify for organic or other sustainable-farming certifications. But many—including smaller farms—simply adopt better practices. One such practice is livestock raised without the routine use of antibiotics. The most powerful strategies for supporting better farms include aligning menus to emphasize fresh foods during the peak of their local growing season and shifting purchases toward farms that have responsible management programs.

4. Leverage globally inspired, plant-forward culinary strategies. Scientific research suggests that the most effective way to help diners make healthy, sustainable food choices is to shift our collective diets to mostly plant-based foods. Growing plants for food generally has less of a negative impact on the environment than raising livestock, as livestock have to eat lots of plants to produce a smaller amount of food. In fact, no other single decision in the professional kitchen—or in the boardrooms of foodservice companies—can compare in terms of the benefits of advancing global environmental sustainability. From the well-researched Mediterranean diet to the cuisines of Asia and Latin America, traditional food cultures offer a myriad of flavor strategies to support innovation around healthy, delicious, even craveable cooking that rebalances ratios between foods from animal and plant sources.

5. Focus on whole, minimally processed foods. In general, consumers and chefs should first focus on whole, minimally processed foods. Such foods are typically higher in micronutrient value and less likely to contain high levels of added sugars, saturated or trans fats, and sodium. (Indeed, nearly three-quarters of the sodium in the U.S. food supply is estimated to come from processed foods.) Whole, minimally processed foods are also typically slowly metabolized, preventing sharp increases in blood sugar that over time may lead to insulin resistance.

That said, some minimally processed foods—low-sodium tomato paste, wine, nut butters, frozen fruits and vegetables, mayonnaise, dark chocolate, canned low-sodium beans, 100 percent whole-grain crackers, fresh-cut vegetables, spice mixtures, yogurt, reduced sodium sauces, many kinds of canned fish and shellfish, among other things—can be incorporated into healthy meals. Processing can also be used to extend the season of local and sustainably grown produce and to make use of cosmetically imperfect foods, especially produce.

6. Grow everyday options, while honoring special occasion traditions. The foodservice industry historically developed around special occasion dining. Today's industry, however, is increasingly responsible for providing everyday food choices to a substantial segment of the U.S. population. From a health and environmental perspective, there will always be room in the industry for indulgence and special occasion foods. However, the real opportunity in menu and concept development is the expansion of everyday food and menu choices that embrace current nutrition and environmental science, as well as emerging consumer values about how food is produced.

7. Lead with menu messaging around flavor. To sell healthy and sustainable food choices, lead with messages about flavor, rather than actively marketing health attributes. Research shows that taste trumps nearly all, even if customers want chefs, on some level, to help them avoid foods that increase their risk of chronic disease. Additional research shows that labeling a healthy menu option as healthy can decrease the likelihood of a diner choosing it, whereas using indulgent or flavor-focused descriptions can actually increase the appeal of that same dish. The best approach to menu messaging is to emphasize deliciousness. Messages that chefs care and are paying attention to how and from whom they are sourcing their ingredients—such as by naming specific farms and growing practices (e.g., organic)—can also enhance perceptions of healthier food choices (if, in fact, these choices are healthier—i.e., that they are also consistent with guidance for optimal nutrition).

8. Reduce portions, emphasizing calorie quality over quantity. Moderating portion size is one of the biggest steps foodservice operators can take towards reversing obesity trends and reducing food waste. Defaults are important. This is different from offering multiple portion sizes, as many diners "trade up" to bigger portions, which they see as offering greater value.

Consider menu concepts that change the value proposition for customers from an overemphasis on quantity to a focus on flavor, nutrient quality, culinary adventure, new menu formats, and the total culinary and dining experience (thereby mitigating potential downward pressure on check averages). Calorie quality is also important. Dishes should feature slowly metabolized whole grains, plant proteins including nuts and legumes, and healthy oils that promote lasting satiety and create great flavors.

9. Celebrate cultural diversity and discovery. Our respect for cultural diversity and the savoring and preservation of family traditions and centuries-old food cultures are as vital as our public health and environmental sustainability. Fortunately, these imperatives can, in fact, be a key to success in implementing the Principles of Healthy, Sustainable Menus. Chefs collaborating with nutrition experts and public policy leaders need to reimagine the role of less healthy, culturally based food traditions by limiting portion size, rebalancing ingredient proportions, or offering them less often. At the same time, many chefs are reporting greater success from introducing new, healthier, and more sustainable menu items instead of reconfiguring existing items. Emerging demographic changes and greater global connectivity are making the American palate more adventurous, giving foodservice leaders a long-term opportunity for creative menu R&D.

10. Design health and sustainability into operations and dining spaces. Food and menu design are not the only ways to advance health and sustainability in foodservice. Choices that affect the way restaurants and other foodservice operations are designed, built, and operated are also important. These include imagining kitchens that support the optimal preparation of fresh, healthy foods and selecting energy- and water-efficient equipment and environmentally friendly building materials. As behavioral economics studies have shown, dining-room operations and foodservice eating spaces also deserve more attention: design, setup, service, and communication strategies can all lead consumers towards healthier, more sustainable choices.

PRINCIPLES OF HEALTHY, SUSTAINABLE MENUS

FOODS AND INGREDIENTS

1. Think produce first. Focus on fruits and vegetables first—with great diversity across all meals and snacks. Recognize that customers aren't eating nearly enough produce—they should be filling half their plates. Menus should feature green leafy vegetables and a mix of colorful fruits and vegetables daily. Fruit is best consumed whole or cut, fresh and in season, or frozen and preserved without added sugar or salt. Fruit juice often contains healthy micronutrients, but it also packs a large amount of fast-metabolizing sugar and should be limited to one small glass per day. Dried, unsweetened fruit is also a good choice; though it contains natural sugars, it also contains fiber, which can mitigate negative blood sugar response.

2. Make whole, intact grains the new norm. Menus should offer and highlight slow-metabolizing, whole, and intact grains, such as 100 percent whole-grain bread, brown rice, and whole-grain/higher protein pasta. Use white flour and other refined carbohydrates sparingly, as their impacts on health are similar to those of sugar and saturated fats. Ideally, new menu items should emphasize whole, intact, or cut—not milled—cooked grains, from wheat berries and oats to quinoa, which can be used creatively in salads, soups, side dishes, breakfast dishes, and more. In baking, blend milled whole grains with intact or cut whole grains to achieve good results. For sandwich menus, equally appealing whole-grain bread options should always be available, and, if possible, served as the default option.

3. Limit potatoes. Potatoes have rapid metabolizing impacts on blood sugar, which is of special concern as they are regularly used as a starch to fill plates. Chefs can limit their use of potatoes by combining small portions of them with other, non-starchy vegetables, or featuring them as an occasional vegetable, as they do green beans, broccoli, carrots, and peppers. Chefs should also consider healthier alternatives including sweet potatoes, which are rich in beta-carotene and other vitamins, and healthier side dishes that highlight fruits, vegetables, whole grains, legumes, and nuts.

4. Move nuts and legumes to the center of the plate. Nuts and legumes are full of flavor, contain plant protein, and are associated with increased satiety. Nuts contain beneficial fats, while legume crops contain fiber and slowly metabolized carbohydrates. Legumes also are renowned for helping to replace nitrogen in the soil and produce impressive quantities of protein per acre. Nuts (including nut butters, flours, and milks) and legumes (including soy foods and legume flours) are an excellent replacement for animal protein. They also are a marketable way to serve and leverage smaller amounts of meat and animal proteins.

5. Choose healthier oils. Using plant oils and other ingredients that contain unsaturated fats, such as canola, soy, peanut, and olive oils, as well as featuring fish, nuts, seeds, avocados, and whole grains, are simple ways to create healthier menus. Research shows that reducing saturated fat is good for health if replaced with "good" fats, especially polyunsaturated fats, instead of refined carbohydrates such as white bread, white rice, mashed potatoes, and sugary drinks. High-flavor fats and oils that contain more saturated fat—including butter, cream, lard, and coconut oil—can have a place in healthy cooking if used only occasionally in limited, strategic applications. Trans fats from partially hydrogenated vegetable oils, now labeled a "metabolic poison" by leading medical scientists, have no place in foodservice kitchens.

6. Go "good fat," not "low fat." Current nutrition science reverses the mistaken belief that we need to limit all fat. Moderate and even high levels of beneficial fats in the diet—from (most) non-hydrogenated plant oils, nuts, nut butters, avocados, and fish—are associated with optimal nutrition and healthy weight. Beneficial fats paired with an abundance of vegetables, whole grains, legumes, and nuts can give our diets a baseline of slow-metabolizing, healthy foods, which are associated with increased satiety. A more liberal usage of healthy fats, offering the potential to deliver high-impact flavors, might represent the difference between consumers liking—or not liking—healthier and more environmentally friendly foods. Even small, occasional servings of deep-fried foods and condiments are appropriate offerings if operators use healthy, non-hydrogenated oils, and avoid potatoes, breading, and other refined carbohydrates in favor of fish, vegetables, legumes, and legume flour. Research confirms that the vast majority of people report better adherence to a moderate- or higher-fat, healthy diet.

7. Serve more kinds of seafood, more often. Seafood is an important part of a healthy diet, and most Americans don't eat the recommended one to two servings per week of fatty fish, which contain higher levels of health-promoting omega-3s. However, the focus on just a few species is emptying parts of our oceans of popular types of seafood such as cod and tuna and now also fish like menhaden that are a key ingredient in feed for some types of farm-raised fish. Scientific studies have found that the benefits of eating seafood greatly outweigh the risks and that removing or reducing seafood from the diet can have negative effects on health. Serving more kinds of seafood more often from responsibly managed sources is the priority. Chefs can have a positive impact on the environment and public health by expanding their understanding of how to source and use a greater variety of responsibly managed and underutilized wild-caught and farm-raised fish and shellfish. Serving small fish like sardines and anchovies, as well as clams, oysters, mussels, mollusks, and other low-trophic species (meaning lower on the food chain) are also good choices for our health and the environment.

8. Reimagine dairy in a supporting role. While there is tremendous innovation underway to improve dairy production and its impact on the environment, the nutrition science on dairy is still unsettled and evolving. Current research suggests that it seems prudent for individuals to limit milk and dairy to one to two servings per day. Chefs should leverage the flavor of cheese (high in saturated fat and sodium) in smaller amounts and minimize the use of butter. Yogurt (without added sugar) is a good choice for professional kitchens, as its consumption is associated with healthy weight.

9. Use poultry and eggs in moderation. Antibiotic-free chicken and other poultry in moderation is a good choice for healthier protein with a far lower environmental footprint than red meat. Chefs should avoid or minimize the use of processed poultry products, which are high in sodium, often as a result of sodium pumps and brining. Eggs in moderation—an average of one per day—can be part of a healthy diet for most people. Creative menu items that mix whole eggs and egg whites for omelets, and eggs with vegetables, are ideal.

10. Serve less red meat, less often. Red meat—beef, pork, and lamb—can be enjoyed occasionally and in small amounts. Choose products from animals raised without the routine use of antibiotics, and that have been grass-fed or primarily pastured. Current guidance from nutrition research recommends consuming a maximum of two 3-ounce servings of red meat per week. Chefs and menu developers can rethink how meat is used by featuring it in smaller, supporting roles to healthier plant-based choices, and experimenting with meat as a condiment. From at least some environmental perspectives (e.g., GHGE, feed efficiency ratio), pork is the better choice among red meats (though not distinguishable from a nutritional perspective).

Saturated fat is one health concern associated with red-meat consumption, but it's not the only issue. Chefs should strive to limit bacon and other processed and cured meats, which are associated with even higher incidence of chronic disease and some cancers than unprocessed red meats. Many diners choose to splurge on red meat when they eat out, and for many there will always be an appropriate place for meat-centered dishes. But chefs can help to shift eating patterns by building a sense of theater and value in menu concepts that don't rely so heavily on a starring role for animal protein.

For example, they might offer delicious meat/vegetable and meat/legume blends, or smaller tasting portions of red meat as part of vegetable-rich, small-plate formats.

11. Reduce added sugar. Consumers crave sugar, and the foodservice industry responds by selling processed foods and sweets that are loaded with it. But sugar's role in spiking blood-sugar levels and increasing rates of type 2 diabetes and other chronic diseases means that professional kitchens should substantially restrict its use. Various strategies include: choosing processed foods with little or no added sugar; favoring healthy oils over sugar in products such as salad dressings; featuring smaller portions of dessert augmented with fruit; and substituting whole, cut, and dried fruit for sugar in recipes. There is nothing wrong with an occasional dessert; but pastry chefs and dessert specialists need to take up the challenge to create sweets centered on whole grains, nuts, dark chocolate, coffee, fruit, healthy oils, yogurt, small amounts of other low-fat dairy and eggs, and, as appropriate, small amounts of beverage alcohol—with the addition of only small to minimal amounts of sugar and refined carbohydrates. Fresh thinking about dessert menu language and positioning is also needed, as illustrated by such concepts as the Three Pleasures: a challenge to restaurants to create a delicious dessert using only dark chocolate, nuts, and fresh-cut or dried fruit.

12. Cut the salt; rethink flavor development from the ground up. The foodservice and food-manufacturing sectors have long been too reliant on salt to do the heavy lifting to create high flavor impact and customer satisfaction. Single items, such as a sandwich or entrée, might contain more than 2,500 milligrams of sodium, well above the current maximum recommended intake of 1,500 milligrams to 2,300 milligrams for the entire day. Chefs should focus on a range of other strategies to deliver flavor, including: sourcing the best-quality, highest-flavor produce; working with spices, herbs, citrus, and other aromatics; and employing healthy sauces, seasonings, and other flavor-building techniques from around the world. Many chefs are finding success in focusing their innovation where they have the highest aggregation of sodium (e.g., processed meats, cheese, and bread) in a single menu item. Others are making progress in implementing an across-the-board incremental 10 to 20 percent sodium reduction in their preparations. Still others are focusing on collaborating with manufacturing partners to reduce sodium by using alternative strategies to create desired flavors and textures.

13. Substantially reduce sugary beverages; innovate replacements. A drastic reduction in sugary beverages represents one of the biggest opportunities for foodservice operators to help reverse the global obesity and diabetes epidemics. Sugary beverages add no nutritional value and contribute negligible satiety. Yet they are a prime source of extra calories in the diet and a principal contributor to the development of type 2 diabetes, heart disease, and other chronic conditions.

Smaller portion sizes and less frequent consumption are steps in the right direction, but nowhere in foodservice is there a greater need for creative, "disruptive" innovation than in the challenge to replace current soda and sugary beverage formulations with more healthful options. Operators should diligently research, support, and promote the products of entrepreneurs and emerging and established brands that are rapidly developing beverage solutions in this important area. Diet sodas and other diet beverages, though lower in calories, may reinforce an aggregate preference for sweet flavors, potentially driving down the appeal of vegetables and other healthy foods. As such, they should be consumed in smaller portions less frequently.

14. Drink healthy: from water, coffee, and tea to (with caveats) beverage alcohol. Water is the best choice to serve your customers, either plain or with the addition of cut-up fruit, herbs and aromatics, or other natural flavors—but no sugar. Served plain, coffee and tea are calorie-free beverages containing antioxidants, flavonoids, and other biologically active substances that may be good for health. Wine, beer, and other beverage alcohol present a more complicated story of benefits for many individuals, with some offsetting risks. Current nutrition guidance suggests a maximum of two drinks per day for men, and one drink per day for women.

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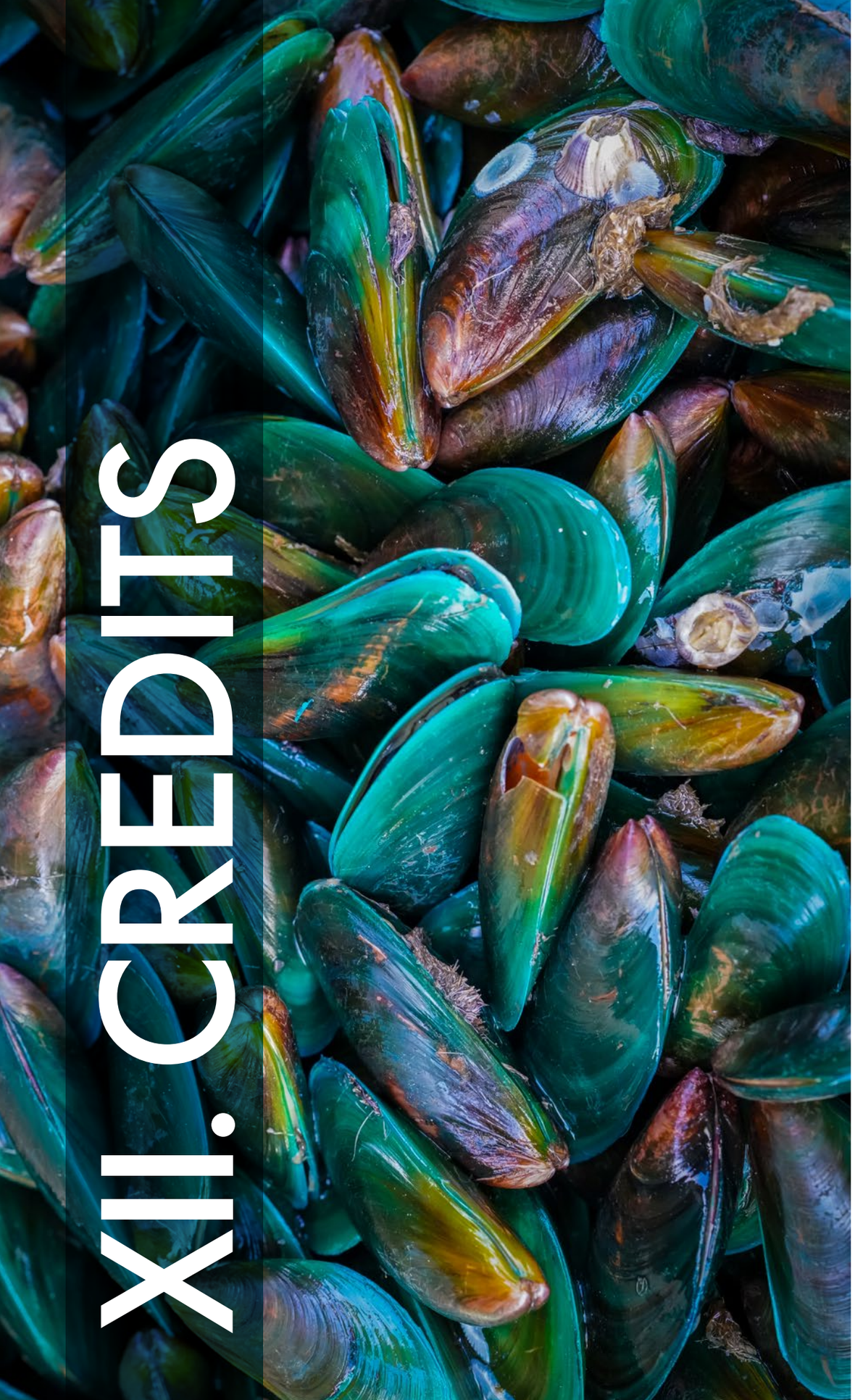

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