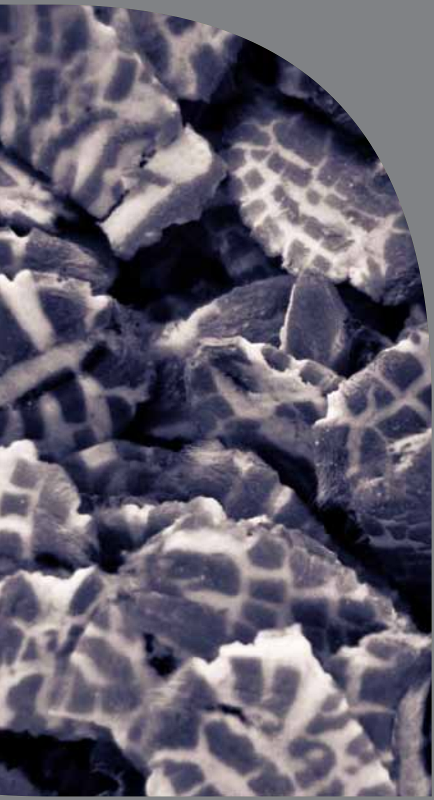

Food Choices in Flux: scenarios
four alternative futures of food

Part 2 Global Food Outlook Program › September 2011 › **www.iftf.org**

INSTITUTE FOR THE FUTURE 124 University Avenue, 2nd Floor, Palo Alto, CA 94301

about the …

The Global Food Outlook Program

Food sustains and nourishes us, and it also increasingly connects us to a global food web that is intertwined with politics, economics, environmental concerns, culture, and science. This global food web is undergoing rapid change, presenting considerable challenges and significant opportunities. IFTF's Global Food Outlook Program provides a distinctive perspective on the global food web, food markets, and the connections and discontinuities between everyday choices and large-scale challenges. We help organizations work with foresights, disruptions, and dilemmas to develop insights and strategic tools to increase their effectiveness and resilience in a volatile world.

The Institute for the Future

The Institute for the Future (IFTF) is an independent, nonprofit strategic research group with more than 40 years of forecasting experience. The core of our work is identifying emerging trends and discontinuities that will transform global society and the global marketplace. We provide our members with insights into business strategy, design process, innovation, and social dilemmas. Our research spans a broad territory of deeply transformative trends, from health and health care to technology, the workplace, and human identity. The Institute for the Future is located in Palo Alto, California.

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Contents

When imagining the future, we tend to assume that the next few years will mirror the recent past. In the global food web, this means we would see continued efforts to streamline the way food is bought, prepared, and consumed, and the spread of novel food products. Food-related health problems such as diabetes and heart disease would continue to increase globally, even as others throughout the developing world struggle with hunger and food insecurity. But is this really the future of food?

Change in the past has never been this linear. In just the past decade, examples from outside of the food web point toward far more radical shapes of change. Mobile technologies have transformed how we get information; financial markets have collapsed. Even as China has experienced unprecedented economic growth, many of its urban residents still live under the constraint of the one child policy.

These examples represent four shapes of change—constraint, collapse, growth, and transformation—that form the basis for the alternative future scenarios of the global food web that are presented in this report. In the past century, the global food system has undergone all of these diverse forms of change. Looking briefly at a few historical examples offers insight into possible futures of the food web:

CONSTRAINT

The chaos and violence of World War II brought with it widespread interruptions to food supplies as part of coordinated efforts to use hunger for military advantage. To manage this challenge, countries including the United Kingdom and the United States imposed rationing systems to keep food prices in check, ensure equitable distribution of food supplies, and mitigate the threat of widespread starvation.

COLLAPSE

The Dust Bowl of the 1930s resulted in a collapse in food supplies. After years of wet—and productive—weather, plains states and provinces in the United States and Canada were hit with a severe drought. This, along with problematic farming practices, saw fertile soil give way to dust, displacing millions of people and leading to widespread poverty and hunger. More recently, a drought in India that lowered global rice supplies contributed to a sudden, sharp rise in rice prices in 2008, resulting in panic, riots, and a collapse in food supplies.

GROWTH

It wasn't too long ago that U.S. agriculture policy revolved around keeping growth in check, but this policy changed in the early 1970s, when the Department of Agriculture began encouraging farmers to produce as much food as their land could bear. The ensuing growth in the availability of commodity crops like corn helped bring down the prices of animal feed and ushered in a boom in meat consumption. Continual growth in production worldwide has led to an increase in obesity (even as the number of people who go hungry has passed the milestone of 1 billion globally).

TRANSFORMATION

Over the past century, refrigeration has paved the way for stable food storage, ready-to-eat meals, and massive global trade in perishable fruits, vegetables, and meats, essentially reshaping our relationships with food and with each other. Meals can be eaten alone in cars, and family members can individually heat up their own dinners. Refrigeration has also enabled a globalization of taste; for example, sushi can be bought all over the world, even in places thousands of miles from a source of fresh fish.

These historical examples highlight the complexity of the food web and the importance of considering and preparing for multiple possible futures when developing long-term responses. This report describes scenarios for four such futures, each depicting a self-contained world based on one of the shapes of change just described. They will be experienced differently in different places, and differently by people with greater or fewer resources. Set in 2021, these scenarios are not predictions; the real future will likely be shaped by elements from all of them. Figures cited in the scenarios are provocative fiction. The scenarios are intended to provoke you to think about threats and opportunities in the food web and inspire you to devise resilient responses to the shocks and uncertainties of the future.

Each scenario begins with a description of a major shift in the global food web and highlights several key drivers that underlie the scenario. It then paints a picture of how consumers, companies, governments, and other key stakeholders in **Brazil**, **Europe**, **China**, and **North America** might correspondingly navigate the future in their efforts to access and make choices surrounding food.

At the end of the regional section of each scenario, you'll find a working section designed to be used in tandem with the insights and action steps you identified in *Food Choices in Flux: Forecasts of Emerging Values, Strategies and Contexts in Four Regions*.

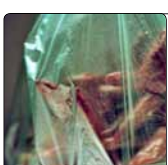
The report's conclusion offers a set of processes you can use to think systematically about the future and synthesize your insights across these futures.

alternative future: Constraint

Just as chicken consumption was starting to rebound following a deadly global food poisoning incident in 2012, meat producers were hit by an even worse event: cattle started dying off in droves. By the time the cause of the disease had been traced, one in five industrial meat producers had slaughtered their animals. This one-two punch destroyed consumer confidence in the safety of most meat, as well as internationally traded food in general. Fisheries, already fragile from acidified oceans and overfishing, collapsed en masse when people turned to them for safer protein. Periodic grain shortages also undermined faith in the resilience of global supplies of food staples. The rallying cry all over the world became “Know your farmer. Eat local. Eat plants.”

Buying local was easier said than done. Farms that had optimized their land for animal feed found there was little demand for commodity corn. The majority of cities throughout the world repurposed rooftops and open spaces for urban farming, but not nearly enough food could be produced to meet demand—at least not at first. Unprecedented chaos followed: trade of everything from commodity crops to packaged foods plummeted, and dramatic spikes in hunger caused food riots in many cities.

Now, in 2021, after years of chaos and human misery, things have started to settle down. Legal efforts, ranging from municipal laws to international treaties, set limits on food choices and trade. In many places, people pay huge taxes for eating too much food or for eating food that requires too many resources to produce or ship. Advances in urban farming, including micro-gardening, aquaponics, rainwater capture, and crowd-sourced efforts to grow and harvest food, contribute significantly to food supplies. Global hunger rates and obesity are both down from 2011 levels. Citizen efforts, combined with effective government policies, keep the food system from collapsing.



SCENARIO DYNAMICS:

- **Zoonotic diseases** cause repeated shocks to, and undermine nearly all faith in, the global meat supply, while global fish supplies collapse under increased demand.
- **Government efforts to contain energy prices** and consumer distrust of imported food make local options preferable in most places.
- **Advances in urban and peri-urban food production and distribution models** bring city dwellers around the world closer to their food.
- **International, national, and local government policies align** to make local choices more attractive, to protect domestic food assets, and to reduce inequality while resources continue to dwindle.

Constraint in Brazil: Reviving Resilience, Chasing Trust

- Brazil's great biodiversity and social structures for dealing with constraint allow resilient responses for both food supplies and food economics, including maintaining some exports (especially to China). But there is still a keenly felt gap between the nation's capacity to produce food and the everyday experience of getting enough to eat in Brazilian cities.
- During hyperinflation in the 1990s, many affluent families stored extra groceries in a second freezer, a practice which reemerges. Many newly wealthy Brazilians buy their own spare freezers (with locks) to start hoarding. People do not trust their neighbors, their domestic workers, or the food system generally.
- Without resorting to direct rationing, Brazil's Fome Zero (Zero Hunger) network of programs—specifically Bolsa Familia (Family Allowance, making direct payments to the poor)—kicks into overdrive, expanding the distribution of basic foods to those in need and subsidizing food purchases through a sophisticated mobile electronic system.
- Hydroponic farms in Brazilian cities gain footing as an urban expression of land reclamation, although a steady trickle of people return to rural areas to be closer to a functional subsistence base.
- Trust is still the scarcest commodity in the food trade, as politicians and companies use food safety as leverage for their own reputations. Soccer teams become the principle branding agents for local food, conferring their stellar reputations on meats, vegetables, oils, and packaged products.

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Constraint in Europe: Wasting Not, Wanting Not

- Europe transitions with relative ease into a shared sense of necessity and self-monitoring. The European Union enacts strong regulations for safety, efficiency, and stewardship in its member states. Consumers begin to expect regularity compliance information to be displayed prominently.

- Precision agriculture, perennial crops, and crops like legumes and carrots that replenish nutrients or cleanse soils become focal points for innovation. Systems to precisely calibrate production to demand are highly sought after. Waste-to-energy systems become ubiquitous at both the regional and community levels, ensuring that even waste is not wasted.

- The Slow Food movement takes the prolonged fear and panic as a vindication of its core tenets and expands dramatically in Europe, in values and practice even more than in membership. Having personal relationships with suppliers becomes the ultimate measure of accountability. Eating alone becomes taboo for social and economical reasons.

- Small-scale, local retailers with short and sincerely transparent supply chains become the food sources of choice, along with direct-to-consumer sales by producers. Europeans struggle to retrofit cities to produce food densely, vertically, and with greater consistency as weather and water supply patterns fluctuate dramatically. Maintaining the stability of fisheries is a constant battle, as fish becomes the protein of choice.

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Constraint in China: Rehearsed Vigilance, Grudging Localism

- Chinese consumers are not strangers to the fear and uncertainty that grip the world, and Chinese authorities, well rehearsed from surges of swine and bird flu, react quickly. A web of protectionist tariffs, taxes, and import inspections seek to insulate domestic markets from contamination. Over time, more and more resources are devoted to bolstering the capacity of domestic food producers.

- Trust in the local supply chain is not the answer for most Chinese. Imported meat is seen as far preferable to domestic stocks, though it becomes harder to obtain. The Chinese government has expanded the scope and intensity of their vigilance of both domestic and international food supplies. Mob vigilantism rises sharply, starting with online exposés and resulting in real-life protests and demands for better practices.

- The rhetoric of a local, plant-based diet resonates with traditional values of health and seasonal diets, but living safely by these messages is still difficult. More than ever, communities seek strategies for producing their own food. Residential units, employers, and retailers increasingly offer cafeteria and ready-made foods that are cheaper than buying raw ingredients and expending the effort and fuel to cook at home.

- Foreign retailers struggle to be transparent enough to suit the demands of online crowds angry over food contamination. Securing safe domestic supplies becomes a necessity, making commonplace the once experimental notion of directly procuring all products from primary production. Establishing a new layer of trust in domestic supply is now in the best interest of all the corporate players.

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Constraint in North America:

Networked Stability, Networked Choices

- North Americans haven't had an easy time of adapting to constraint. Having less availability and less choice has incited a wave of attempts to mitigate monotony: group buying becomes a major way for people to get their hands on otherwise unattainable variety, and cottage industries of small-scale local producers thrive in many areas.

- Regulations and their consequences have been highly uneven, leading to significant variation in what food people can access, where their food comes from, and which producers they trust. Farmers markets grow exponentially across the continent as putting a face to any food makes it feel safer. Whereas once only a few oddball communities declared themselves "food sovereign," accountable to no regulations but their own, scores of communities have followed suit.

- It has become common for any place that sells food to have a direct relationship with the people who produce the food, giving rise to elaborate webs of local production and reputation systems to distinguish the most trustworthy suppliers and sellers. Walmart's network of farmers serves as a model, but as the phenomenon grows, schools, religious institutions, and municipal governments push to increase the rooftop, marginal, and green-belt food growing capacities of their communities.

- Migration to areas with greater quality and variety of local food production is overwhelming. Self-organized groups take over warehouses and deserted shopping malls to lease growing space, or simply squat on guerrilla farms. As the price of oil skyrockets, railroad shipping and railroad towns are reinvigorated for products that absolutely must be shipped between states and countries. Monitoring of such products, along with careful consideration of demand for precision supply of uncommon goods, is a flourishing area of technological support.

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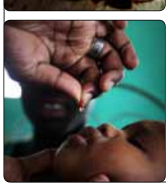
alternative future: Collapse

The United Nations has announced that 2.5 billion people (out of a total of 7 billion) are living in hunger worldwide in 2021. Worsening climate conditions, they caution, could increase that number in 2030 to nearly half of the world's 8 billion people. The pockets of land that escaped the worst problems of the decade are like fortresses, their residents few and insulated. But even in these places, as in the rest of the world, nutritional deficiencies and diseases like scurvy and rickets have resurged.

Experts had warned about dire consequences of collapsing pollinator bee populations for years, and their dire prediction came to pass when already decimated bee populations dropped in 2013. Worse yet, the pollinator maladies that had plagued North America and Northern Europe spread to China and Eastern Europe. Production of some of the most nourishing foods—numerous varieties of vegetables, fruit, nuts, and legumes—ground to a nearly complete halt, and those that remained skyrocketed in price. Economies around the world that were still recovering from the Great Recession of the 2000s were devastated.

In 2011, 2014, and 2018, disease and extreme weather events resulted in scarcity of the most basic cereals. Corn blights, wheat rusts, and rice-killing floods were compounded by rising energy costs, making it even harder for food to get from the few places where it was thriving to everywhere else. Political crises and violence ensued. Negotiations between foreign investors and sovereign nations over agricultural lands failed as the speculative bubble on farmland burst, exacerbating scarcity and political and financial crises. Extended fuel crises have caused major parts of the global food distribution and retail infrastructure to break down, adding to the chaos.

High-protein miracle foods developed in the 2000s to combat hunger in dire circumstances have become staples nearly everywhere. Many countries around the world have added direct rationing to their coping strategies, and food choices are reduced across the board. Supermarkets, skating on thin ice with their complex supply chains, are failing. Some major food manufacturers have already gone under due to the unreliability of key ingredients, but those that remain scrape by with brands that try to make the remaining foods approximate what we had before. Vegetables emerge in new varieties but are scarce. And while the developed world still produces meat, it's a pricey delicacy.



SCENARIO DYNAMICS:

- Converging environmental disasters cause market and political chaos.
- Blights, rusts, and volatile weather batter all major cereal crops in relatively close succession, and pestilence and pollinator collapses decimate whole categories of food.
- Hoarding and protectionism by countries, communities, and individuals protracts instability.
- Financial and fuel crises drag on over the decade, undermining responses.
- Countries and companies pay their workers in food rations rather than monetary currency.

Collapse in Brazil: Fighting for Rights, Hacking Hunger

- Brazil sits in a peculiar position of both prosperity and chaos in the global crisis, exporting more than its hungry population would like and producing super supplements to assuage the nutritional needs of the suffering north.
- Food is entwined with both politics and crime, and hoarding and distrust rise as companies and countries try to secure large swaths of Brazil that are less devastated than elsewhere. Politicians make bribes of staples and supplements, while drug lords move into the lucrative territory of food.
- Zero Hunger cards can't be issued fast enough to meet demand, and their value escalates so rapidly that people start hacking them and trading them on shady electronic markets. All classes of Brazilians are prepared to use violence to secure meat, coffee, and other comforting foods.
- High security and surveillance blanket the supply chain, from farms to transport to checkout stands. Direct home delivery by armored car is the new status symbol among the urban elite, while peer-to-peer sales channels thrive by trading in trust.
- High unemployment and poor food distribution drive many poor Brazilians back to the countryside, where the Landless Workers Movement, a grassroots subsistence organization, swells and engages in violent clashes with landowners.

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Collapse in Europe: Falling Apart, Buckling Down

- Converging financial, political, and environmental challenges have all but broken the European Union. Imports are more financially challenging, and sweeping regulations for damage control are nearly impossible to implement. Greenland, however, is the new green belt of Europe, as climactic shifts make it a more attractive source of high-quality foods.

- In many countries in the European Union, cultural hostility and lack of opportunity incite migrants to leave, hollowing out Europe's labor force just as the worst ecological challenges began to manifest. Refugees from drought- and flood-torn countries are held in decommissioned cruise ships along the coast to labor on flotillas of emergency food production ships.

- The largest superstores hang on and ride out storms while smaller stores simply can't keep stocked. Efficiency, scale, and elimination of waste become key strategies at the national, corporate, and personal levels.

- Participation in civil society and mutual aid groups grows, tackling pieces of the environmental puzzle from cereal production to monitoring of shaky marine resources. Creative culinary minds attempt to make the best of radically decreased variety and quality. Vegetarianism is extremely common everywhere, except in France.

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Collapse in China: Building Capacity, Rationing Needs

- Global instability and scarcity of foods rapidly become national security issues in China, and the production capacities that have in recent decades been applied to exports are turned inward. The government acts quickly to do what it can to build internal distribution infrastructure while still trying to import foods from increasingly unwilling trade partners.

- Chinese companies and even the government become more aggressive in procuring food needed during the transition to greater internal production capacities, making raids on fellow citizens and on the suffering fish stocks of oceans around the world.

- As work and food resources move into the areas between major cities, China experiences a massive return to ruralization. But migrants return to their hometowns wired for digital participation and remain vigilant of domestic food producers, gradually growing to trust them a little more.

- Rationing, though not strictly popular, is seen as a legitimate response to scarcity, and both state retailers and the foreign retailers that remain participate. Eating as one might personally prefer takes a backseat to helping ensure the long-term stability and success of the country.

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Collapse in North America:
Hoarding Basics, Supplementing Nutrition

- Faced with failing crops, vast swaths of land are repurposed to maximize calories and protein, and biotech companies and agricultural schools race to find resilient alternatives. The more agile food manufacturers are best able to reformulate to whatever is available and to offer familiarity to North Americans faced with sharply reduced choices.
- Food retailers struggle to patch together radically simpler supply chains based on direct relationships, as big-box retailers and drugstores cushion shocks and thrive by keeping food and nutrition supplements marginally accessible even if to a limited extent.
- As more communities become food deserts, mobile retail models become more common, with trucks outfitted to deliver groceries and defend them from robbery. Insular enclaves at both the regional and neighborhood levels work hard to produce and hoard as much as they can. Bulk buying and hoarding are seen as the best strategies a household can pursue, but few can actually afford to keep it up for long.
- Basic nutrition aspects, especially protein, vitamins, hunger satiation, and emotional comfort become the most attractive selling points of all foods. While diseases of dietary deficiencies are creeping up, obesity, at least is way down.

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GROWTH

alternative future: Growth

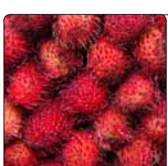
In 2021, people around the world can get practically anything they want, whenever they want, and without much concern for cost. In Minnesota, avocados are always "in season," and whether imported from California in July or from Argentina in January, arrays of foreign-grown goods are hitting Algerian market shelves—and at a cost affordable enough for most of the citizenry.

This embarrassment of riches was made possible by major breakthroughs in energy technology in the early 2010s. Agressively pursuing hydrogen-based fuels and expanding all possible energy sources ensure clean power to support expanding infrastructure. New, more convenient foods easily keep busy young people fed, and safety is not an issue for the elderly, thanks to meals that self-heat when removed from the package. International migrants use smartphone credit options to buy food for their relatives in other countries.

Not everyone has access to this abundance. Even as more countries plug into a booming commercial food infrastructure, rural poverty and urban inequality keep the number of hungry people inching upward. And though the wealthier residents of countries all over the world have more choices, they also have more problems. Consumers find themselves awash in branding messages. Gimmicky packages compete for attention in the supermarket, and advertisers have taken full advantage of smartphone adoption.

Access to all this food also means that more people suffer from heart disease and diabetes. Back in 2005, diet-related health risks were as big a problem as HIV/AIDS and tuberculosis combined; in 2021, they dwarf these communicable diseases twofold. Now that people can get the tastes they want quickly and cheaply, they expect getting healthy to be just as easy and instant. Diet fads pop up and fade at a dizzying rate, promising easy health with a magic bullet.

The food and biotechnology industries thrive in this growing marketplace. Hybrid crops that do well in arid climates take hold where global warming has hit the hardest, and help ensure a constant supply of staple foods. But while vertical farms and energy-intensive fixes to water supplies take some pressure off the land, intractable problems like waste management, lost carbon uptake, and peak phosphorous still loom.



SCENARIO DYNAMICS:

- Interconnection in the global food system intensifies; even locavores are served behind the scenes by conglomerates contorting to meet their requirements.
- Abundant energy enables easy transport and more energy-intensive interventions into water and food security.
- Supply chain management has gained massive economies of scale, and commercial food infrastructures are greatly expanded.
- Agricultural science achieves great leaps in intensifying production of staple foods, but ecosystems are under great strain.
- The cost of diet-related illness is a growing driver of countertrends towards reducing comsumption.
- Global flows of health wisdom, diet fads, and fusion flavors sweep across continents with almost no lag time.

Growth in Brazil: Eating Well, Getting Sicker

- Brazilians of all classes are obsessed with the ebb and flow of international food trends. They can find the latest sweets, culinary novelties, and beauty diets anywhere, from street-corner stalls to major retail stores, and they're also proud when Brazilian foods become fads abroad.

- Both international and domestic retailers expand rapidly, and not just in traditional store formats. In addition to brick-and-mortar growth, mobile markets can be found in more of the remote reaches of the country.

- The quantity of meat consumption skyrockets, as Brazilian firms expand their focus beyond exporting their own feed crops to also importing meat from Canada, Australia, and the United States.

- Appreciation of the wide variety of edible Brazilian products has grown, and the mantra to eat biodiverse foods has given rise to novel products and cultivation efforts, with varying levels of environmental impact. To influence broadening demands, massive investment goes into advertising campaigns for food products, food categories, and diet advice.

- The huge network of peer-to-peer sales channels has grown more complex, setting up not only new entrepreneurs but also new food experts, as people turn to their trusted suppliers for advice and information as well as for products.

- Diet-related diseases create a large burden on the public health and medical infrastructure, especially for older generations still adjusting to such abundance. Younger people are more conscious of their weight and appearance, but beauty standards are steadily expanding to include fuller figures.

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- In light of the external forces described in this scenario, reconsider your analysis. Consider questions such as: Will consumers shift how they buy food? Will they eat completely different diets? What consumer behaviors would remain similar? What behaviors would be radically different?

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Growth in Europe: Minding the Home, Experimenting Abroad

- Stable, plentiful supplies of food, both imported and homegrown, ensure that Europeans continue eating at the quality level to which they're accustomed. The gradual decline in meat consumption has continued, however, creating some leeway for the burgeoning demands for meat from the growing appetites in the south and east.
- European businesses combine the abundance of energy with improved standards of efficiency, enabling food production to be more streamlined and automated and less environmentally destructive. But even as systemic sustainability is improving, concern about environmental impacts of food choices and behaviors remains highly uneven.
- Major food retail channels do a brisk business locally and also expand overseas. They experiment with specialty formats to cater to every conceivable lifestyle, responding to changing needs and applying lessons learned from developing markets. Food retailers and manufacturers invest in long-term food innovation, experimenting with super-nutritious staple foods and oceanic self-sustaining food farms.
- Convenience models of online and mobile ordering with home and workplace delivery cater to an aging population and more productivity-focused workers. Largely impervious to the food fads racing around the globe, European food innovation is centered more on increasing access to high-quality foods and reflecting carefully crafted identities.

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Growth in China:
Appreciating Stability, Pursuing Elite Experience

- Land leases and trade agreements with African countries and Australia supply China with feed for livestock, and increasingly with livestock itself. Over the past decade, China's focus has been not only on volume but also on price stability. Food is still not as cheap as in the United States, but at least everyone knows how much it will cost.

- Chinese people are succumbing to economic and political pressure worldwide to increase their consumption. The country's transportation infrastructure has improved, productive regions have become powerhouses of specialized food offerings, and the safety of domestic produce is gradually improving.

- The variety of available foods has exploded. More Chinese people are eating imported foods, including produce that's not in season locally. Interest in luxury foods is expanding in every channel. Food retail chains already have "VIP" programs, with benefits like personalized service coordinated through smart phones and bold, and often unfounded, assurances of safety and quality.

- Food and entertainment are more closely tied than ever. Grocery stores are almost as intense as amusement parks, serving as anchor stores in malls and blending with other retail formats in an effort to delight and surprise. The popularity of cruises and tours that focus almost exclusively on eating and food science continues to grow.

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Growth in North America:
Eating Everywhere, Searching for Quick Fixes

- Improvements in breeding and shipping have led to a nearly total disappearance of concern for seasonality and, with such a broad palette of choices, North Americans are eating more fruits and vegetables—along with more of everything else. Just as Americans became accustomed to the 24-hour news cycle, eating occasions have blossomed throughout a 24-hour food cycle. The United States and Canada are awash with flavors from all over the world, as well as with local fusions.

- A variety of food retail formats can be found in every neighborhood, and eating and shopping for food have become part of nearly all retail experiences, from abundant snacks in toy stores to spill-conscious treats in electronics shops. Store-branded foods are not just for major grocery stores anymore. Personalization becomes rampant, with offerings for individual genetics and metabolic types with widely varying degrees of accuracy. Genetic-based nutrition counseling gains popularity among wealthy longevity enthusiasts.

- Mobile food offerings abound for ready eating and easy disposal—not just car foods but also bike foods, desk foods, and safe self-heating foods to drop off at Grandma's house. Instrumental attitudes about food are ubiquitous. Ideally, eating should boost productivity, be entertaining, and address as many common health concerns as possible.

- Although North Americans are better fed and have longer life spans, they're still faced with shrinking health spans. Lifestyle diseases are growing steadily among all ages, and quick-fix mentalities dominate the conversation of what to do about it. After a brief reprieve from fad diets, the number of influential dieting celebrities has multiplied every year for the past decade. Gastric bypasses, complete with specialized recovery meal-plan packages, are the "cure" of choice for everyone from diabetics to depressed overeaters.

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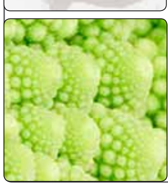
alternative future: Transformation

Lab-grown, in vitro meat has been approved for sale in the United States and parts of Asia and Latin America since the mid-2010s. In response, many of the commodity crops that were once used in meat production have been repurposed for more direct human consumption and have shifted to less water-intensive, more richly nutritious staples. Perennial hybrids of conventional grain staples are becoming more common, and superfoods like algae that require no land at all are ubiquitous. Integrated tracking and monitoring of demand, transportation, foods produced, and resources required to produce them enable unprecedented accuracy in supply and shipping.

These shifts have slowed down the environmental costs of food production and have dramatically lowered hunger—but these are only the agricultural factors affecting global food trade. 3D food printers, which layer food and flavors in precise ways, have been commercialized for home use; by 2021, they've made it into one in ten kitchens in the developed world and are extremely common in food retail and even many restaurants. Consumer protection and food safety agencies have been forced to collaborate in new ways, after early adopters of food printers encountered unfamiliar and challenging contamination problems.

In Africa and Latin America, community groups are investing in shared food printers. By 2021, hundreds of thousands of entrepreneurs all over the world have established businesses selling downloadable recipes that work with 3D printers for everything from snacks to entire meals. Known as Food Gurus, these tinkerers have remade food consumption in the same way that social media and bloggers transformed the media landscape in the 2000s. The frequency with which people eat out at restaurants has plummeted, and so have sales of most packaged foods and drinks (although food companies were quick to provide downloadable recipes of their own).

Not everyone likes all this new food technology. Home cooking, using traditional stovetops and ovens, has resurged among groups of people who see this technology as an assault on authentic food. A sizable minority of consumers in nearly every country refuses to eat lab-grown meat, despite its lower cost, better safety, and low carbon footprint. To encourage traditional food preparation, an international group calling themselves Authentic Eaters has launched a "Human Made" program. According to their website, "We grow and eat food the way people have for thousands of years. Our imperfections are our humanity."



SCENARIO DYNAMICS:

- Scientific breakthroughs result in safe, precisely crafted, and tasty synthetically produced and assembled foods.
- In vitro meat takes hold as an environmentally sound, humane, and mostly appealing alternative in much of the world.
- Demand for variety and technical capacities prompts a shift away from packaged blockbuster foods toward on-demand and custom options.
- Open intellectual property and makers' movements make the transition to business models around new fabrication technologies bumpy for many corporations.
- Cultural backlash against technology-heavy food production creates a strong countertrend.

Transformation in Brazil: Open-Source Food, Unequal Access

- Brazil views in vitro meat as a precious rainforest-preserving technology, and the government has subsidized research to create organic standards for new foods as well as old. Starting with major cities, the country is styling itself as a source of high-quality organic food and the technology to make it sustainably. Many wealthy people scorn lab-grown meat, however, and purchase pricey animal-grown meat as a status symbol.

- The distinction between lab-grown and handmade foods remains important, and a complex system of symbols arises accordingly. Traditionalist slow-food proponents are pitted against those impressed by the environmental stewardship of new technologies, but so far technology is winning. Divisions and multi-leveled pricing schemes that distinguish between the two can be found in all manner of restaurants, in supermarket aisles, and in everyday events.

- The open-source movement of Brazil latches onto the idea of open-source food and reverse engineering of proprietary new formulations. Food hacker collectives emanate from universities and supply much of the world with ideas for new foods.

- Sweets are the hottest spot of flavor innovation in Brazil, and this has caused a rise in diet-related diseases over the past decade.

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Transformation in Europe:
Precautionary Principles, Fragmented Adoption

- A patchwork of cautious regulations blankets the European Union as scientific and cultural communities evaluate in vitro meat technologies and food printing mechanisms. Some countries ban them outright, while others experiment with them sporadically.

- Regional food access and preferences have become more fractured over the past decade. But even among those who scorn new-wave foods, there is still a burning demand for niche offerings that reflect people's need to practice and display their identities. Precision gastronomy for elder health and longevity is a booming market.

- The Authentic Eaters movement is based in Europe, but it and the international Slow Food movement have become more fractious than ever as the values of traditional foods and those of environmental sustainability drift dramatically apart. "Human Made" isn't always the best choice for the planet.

- Regardless of philosophical orientation, Europeans increasingly find pleasure, fun, and meaning in the experience of consuming food, but not in shopping for it. Kiosks and direct delivery of foods become not only common but also dominant models of food acquisition in many places.

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Embracing Sustainable Oddities, Playing with Patriotism

- New forms and origins of foods are touted in China as the safest, greenest options, with guaranteed supply chains and machinery in stores and communities to make food on demand. Information-intensive supply chains go a long way in validating many of these claims, heightening the appeal of new foods.

- Genetically modified, environmentally friendly pork, in vitro meats, and meat analogues fit well into Chinese cuisine and culinary habits. The scaling back of large-scale animal production slows down some of the worst environmental degradations and transforms both supply chains and political relationships. Food safety regulatory bureaus are consolidated and given more power. New crops that promise to revitalize China's shrinking supply of arable land receive strong support and wide implementation.

- The government ties the playful and healthful notions of new food to the national happiness strategy, making homegrown novelty creation a patriotic act. Still, rumors circulate on the Internet that some high-level officials are eating from secret organic farms, fueling an undercurrent of distrust in novel food forms.

- Young people enjoy experimenting with the palette of new food combinations and control. What starts as a supermarket gimmick becomes a major form of creative expression, design, eating, and sharing of designs and experiences. Personalized diets, based on both genetics and traditional medicine, are popular among people of all ages.

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Transformation in North America: Chasing Variety, Enhancing Performance

- The variety of flavors, textures, utilitarian attitudes, and contexts in which food is eaten in North America expands dramatically. Among those who embrace synthetic and custom-produced foods, the possibilities abound for performance-enhancing offerings, wild combinations of flavors, and immediate gratification.

- Easy, accurate, and safe on-site manufacturing further blurs the line between groceries and ready-made foods. Retailers lease brands and formulations from manufacturers, but in the burgeoning open design space, in-house specialties and house brands proliferate.

- Direct sales through kiosks become the mainstay of all sorts of branded foods, including snacks, drinks, and whole meals. The more advanced units and the high-end personal models sync with personal sensor data for fine-tuned gastronomy. "Epigenetic diet" foods and pills are in fashion, combining personal genetic insight, local variation, environmental consciousness, and extreme personalization.

- Although packaging culture has shifted toward personalized and reusable containers, the abundance of food results in a mentality that doesn't mind food waste. Obesity and diet-related health problems grow in this petri dish of abundant choice, but there are also formulations to counteract it.

- Actual cooking, a languishing skill, is full of social significance and elicits admiration when it's practiced. Agricultural tourism to old-style farms booms as these settings become an even quainter curiosity. Biochemistry is taught at advanced levels in grade schools, and understanding one's personal genetic needs is something that many children take for granted.

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Conclusion: Thinking Systematically about the Future

The four scenarios contained here are designed to help you prepare for the changes we'll see in the global food web. The working sections in this report offer space for you to consider each future world on its own and imagine how your organization could respond. In light of the uncertainty of the next decade, it's critical to not simply prepare for one possible future, but to understand common threats and opportunities that emerge from multiple scenarios. This concluding section offers a process for looking across each of the individual future scenarios to develop a broader synthesis that will enable you to develop more resilient, comprehensive actions that can withstand multiple potential threats and succeed in a world of uncertainty.

› Review your working sections from this scenario report. For each region, list the threats and opportunities that emerged in multiple futures, as well as any other key themes that persisted across the futures.

Brazil

Europe

China

North America

› **Synthesize these ideas globally.** Describe the big global threats and opportunities that cut across multiple scenarios.

› **Review this scenario report and note the organizational strengths and weaknesses that cut across multiple scenarios.** Describe the strengths you identified. In what ways is your organization best prepared to thrive in multiple possible futures? How can you further develop those capacities?

› **Describe some of the weaknesses you identified.** Where is your organization most vulnerable to uncertain possible futures in the next decade? Describe what you could do to address these weaknesses.