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SHIFTING DIETS

Toward a Sustainable Food Future

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SUMMARY A global convergence toward Western-style diets that are high in calories, protein, and animal-based foods poses challenges for food security and sustainability. To quantify the benefits of shifting these consumers to more sustainable diets, several possible diet shifts are modeled. A framework is proposed to tackle the crucial question of how to shift people's diets through the retail and food services sector.

Demand for food is growing as a result of population growth and changing diets. As nations urbanize and citizens become wealthier, people generally increase their calorie intake and the share of resource-intensive foods—such as meats and dairy—in their diets.[2] Rapidly transforming food value chains are also contributing to diet changes, as multinational agribusinesses, food manufacturers, retailers, and food service companies increasingly influence what is grown and consumed worldwide.[3] Juxtaposed to these trends are roughly 800 million people who remain undernourished and 2 billion people suffering from micronutrient deficiencies.[4]

The world needs to close a 70 percent "food gap"—that is, the expected gap between the crop calories available in 2006 and expected calorie demand in 2050.[5] At the same time, the world needs to reduce agriculture's impact on land, water, and other resources as well as its contribution to climate change.[6] Relying solely on increased production to close this gap would exert pressure to clear additional natural ecosystems, making it hard to achieve the United Nations Sustainable Development Goals (SDGs), including long-term food security. For example, to increase food production by 70 percent while avoiding further expansion of agricultural land, crop yields would need to increase 33 percent faster between

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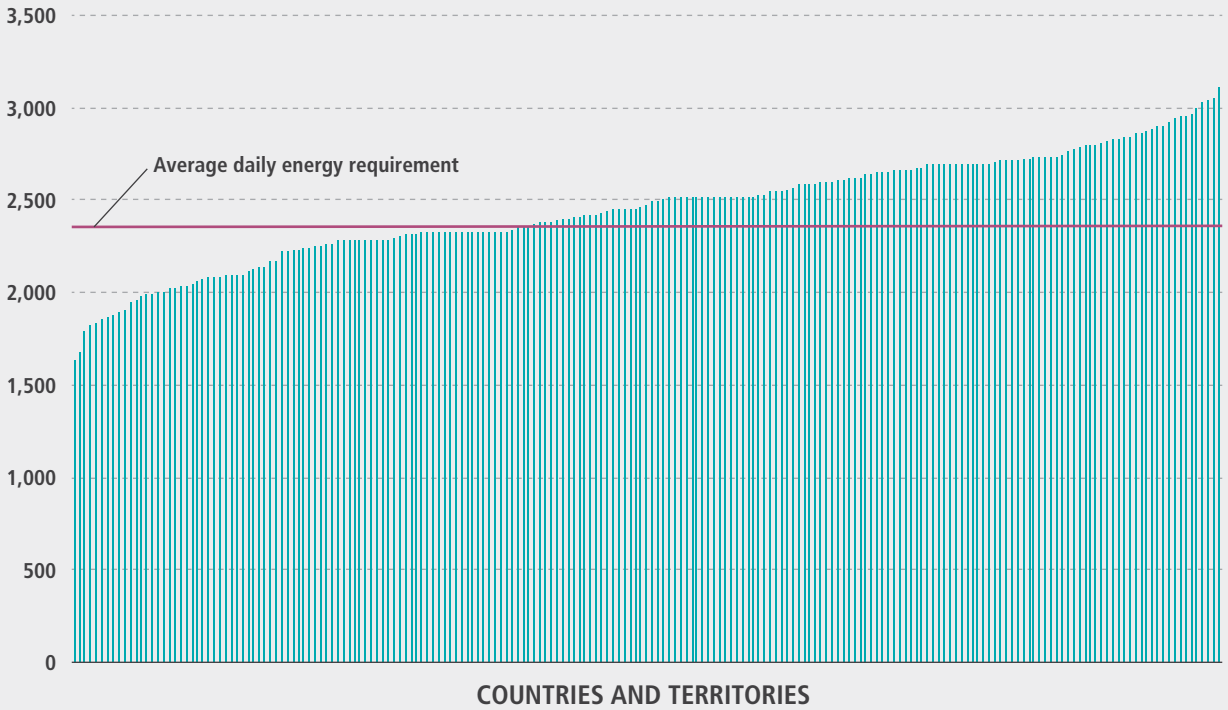
2006 and 2050 than they did in the previous four decades—a period that encompassed accelerated yield growth prompted by the Green Revolution.[7] In short, relying on yield increases alone will likely be insufficient. We must also explore shifts in food demand, including shifting diets, reducing food waste, and avoiding competition from bioenergy.

This chapter examines how shifting diets—the type, combination, and quantity of foods consumed—can help close the food gap sustainably. While the focus here is on calories and protein, diet shifts must also be implemented with an eye toward providing the full range of nutrients essential to a healthy diet.

THREE GLOBAL DIET TRENDS

Three current global diet trends increase the challenge of sustainably closing the food gap: (1) overconsumption of calories, (2) overconsumption of protein and a shift toward animal-based sources, and (3) growing demand for beef, in particular. The analysis below uses national-level food supply data from the Food and Agriculture Organization of the United Nations (FAO). It is important to note that the data mask differences in diets consumed by different population groups within countries—particularly between rural and urban areas and between high- and low-incomes—that must be taken into account in any effort to shift diets.[8]

FIGURE 1 Average daily per capita calorie consumption relative to average daily energy requirement (countries and territories, kcal/capita/day, 2009)



Source: GlobAgri model with source data from FAO, FAOSTAT (Rome: 2015), and FAO, *Global Food Losses and Food Waste—Extent, Causes, and Prevention,* (Rome: 2011).

Note: Each bar on the *x*-axis represents one of 205 countries and territories. Average daily energy requirement of 2,353 kcal/capita/day is given in FAO (2015). Individuals' energy requirements vary depending on age, sex, height, weight, pregnancy/lactation, and level of physical activity.

Overconsumption of calories

People overconsume calories when their calorie intake exceeds what they need for an active and healthy life. Overconsumption increases the size of the food gap and drives unnecessary agricultural impacts. It also contributes to overweight and obesity,[9] negatively affecting health and productivity.

Over the past five decades there has been a global trend toward greater per capita availability of calories. In 2009, average per capita calorie consumption in more than 60 percent of the world's countries and territories exceeded average daily energy requirements (Figure 1). Countries exceeding this calorie threshold, however, can still have large numbers of people below the threshold, especially populous countries in the process of urbanizing, such as China.[10] Globally, there are now two and a half times more overweight people than undernourished people. More than one in three adults is overweight and one in ten is obese.[11] The related economic and healthcare costs are formidable. Obesity's global economic cost alone was estimated to be around US$2 trillion in 2012, on par with armed conflict or smoking.[12]

While there are signs that per capita calorie availability may be peaking in developed countries, it is rising in developing countries, particularly in emerging economies, such as Brazil and China.[13] Once considered a problem of high-income countries, obesity and overweight are now rising in low- and middle-income countries too, especially in urban areas—although obesity is also on the rise in rural areas and among poor populations.[14]

Overconsumption of protein and a shift toward animal-based sources

People overconsume protein when their dietary protein intake exceeds the body's protein requirements for maintenance and growth. This increases the size of the food gap, agricultural resource use, and environmental impacts.

Global average per capita protein availability has been growing for decades.[15] In 2009, in all but 19 countries and territories, average per capita protein consumption was greater than estimated average daily requirements (Figure 2) (although, as noted above, countries will likely also have a significant percentage of their population below the protein consumption threshold).[16] In addition, the share of animal-based protein relative to plant-based protein is growing. Between 1961 and 2009, global average per capita availability of animal-based protein grew by 59 percent while that of plant-based protein grew by only 14 percent.[17]

> Overconsumption increases the size of the food gap, drives unnecessary agricultural impacts, and contributes to overweight and obesity. Once just a problem of high-income countires, overweight and obesity are on the rise in low- and middle-income countries.

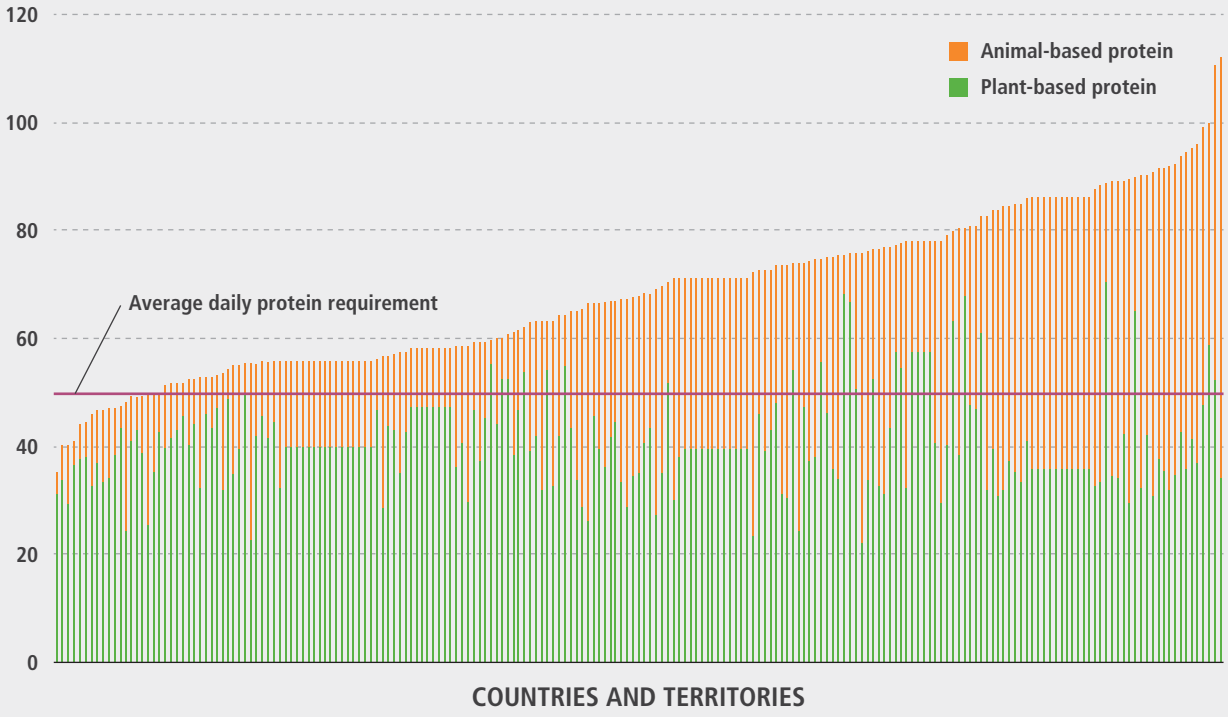
Animal-based protein production is typically more resource intensive and has greater environmental impacts than plant-based protein production (Figure 3). While the impacts shown in Figure 3 are global means—masking variations across locations, production systems, and farm management practices—they enable general comparisons across food types.

Looking ahead, total consumption of animal-based foods is projected to rise by nearly 80 percent between 2006 and 2050.[18] Although animal-based food consumption may be peaking in some developed countries, it is projected to rise in developing countries, especially in emerging economies and also urban areas.[19]

Rising beef consumption

Per capita beef consumption has been rising in emerging economies and showing signs of peaking in some developed countries. In Brazil, per capita beef availability has increased steadily over recent decades and is now more than three times the world average, having surpassed that of the United States

FIGURE 2 Average daily per capita protein consumption relative to average daily protein requirment (countries and territories, grams protein/capita/day, 2009)



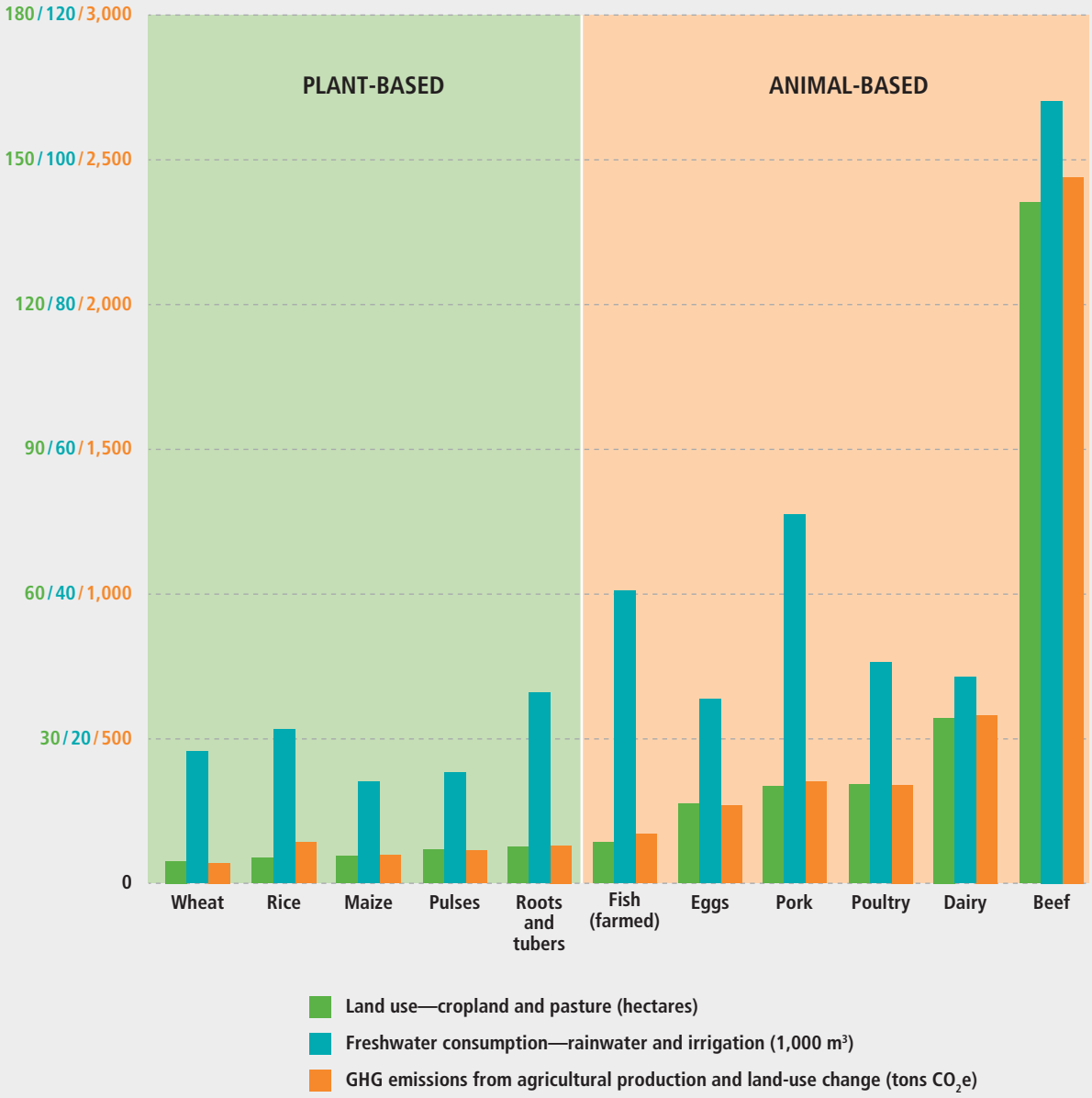
Source: GlobAgri model with source data from FAO, FAOSTAT (2015) and FAO, *Global Food Losses and Food Waste—Extent, Causes, and Prevention,* (Rome: 2011).

Note: Each bar on the *x*-axis represents one of 205 countries and territories. Average daily protein requirement of 50 grams/day is based on an average adult body weight of 62 kilograms (S. C. Walpole, D. Prieto-Merino, P. Edwards, J. Cleland, G. Stevens, and I. Roberts, "The Weight of Nations: an Estimation of Adult Human Biomass," *BMC Public Health* 12 [2012]) and recommended protein intake of 0.8 g/kg body weight/day (G. L. Paul, "Dietary Protein Requirements of Physically Active Individuals," *Sports Medicine* 8, 3 [1989]). Individuals' energy requirements vary depending on age, sex, height, weight, pregnancy/lactation, and level of physical activity.

in 2008. In China, per capita beef availability is still only half of the world average, but is growing. In India, growing demand for dairy products is spurring an expansion in the cattle population.[20] In the European Union, per capita beef availability declined by 29 percent between 1991 and 2011, and is expected to remain relatively stagnant to 2050. Global demand for beef is projected to increase by 95 percent between 2006 and 2050, with much of this growth occurring in countries where current per capita consumption is low, such as China and India.[21]

Beef has one of the lowest "feed-to-food" conversion efficiencies of commonly consumed foods. Only 1 percent of gross cattle feed energy and 4 percent of ingested protein are converted to human-edible calories and protein.[22] As a result, beef uses more land and freshwater, and generates more greenhouse gas (GHG) emissions per unit of protein than other commonly consumed food (Figure 3). One-quarter of the earth's land mass, excluding Antarctica, is used as pasture, and beef accounts for one-third of the global water footprint of farm animal production.[23] Ruminants (of which beef is the most commonly produced) are responsible for nearly half of GHG emissions from agricultural production.[24] Recognizing the potential environmental implications of demand growth, several international organizations and researchers have stated that reducing

FIGURE 3 Impact of production of animal- and plant-based foods, global (per ton of protein consumed, 2009)



Source: Authors' calculations. Land use and GHG emissions: GlobAgri model with source data from FAO, FAOSTAT (Rome: 2015), and FAO, *Global Food Losses and Food Waste—Extent, Causes, and Prevention* (Rome: 2011); freshwater consumption: M. M. Mekonnen and A. Y. Hoekstra, "A Global Assessment of the Water Footprint of Farm Animal Products," *Ecosystems* 15 (2012); and farmed freshwater fish consumption: R. Waite, M. Beveridge, R. Brummett, S. Castine, N. Chaiyawannakarn, S. Kaushik, R. Mungkung, S. Nawapakpilai, and M. Phillips, *Improving Productivity and Environmental Performance of Aquaculture* (Washington, DC: World Resources Institute, 2014).

Note: Data presented are global means. Indicators for animal-based foods include resources used to produce feed, including pastureland. Tons of harvested products were converted to quantities of calories and protein using the global average edible calorie and protein contents of food types as reported in FAO (2015). "Fish" refers to all aquatic animal products. Protein amounts refer to human consumption. Based on the approach taken by the European Union for estimating emissions from land-use change for biofuels, land-use change impacts are amortized over a period of 20 years and then shown as annual impacts. Land and GHG emissions estimates for beef production are based on dedicated beef production, not beef that is a coproduct of dairy. Dairy figures are lower in GlobAgri than some other models because GlobAgri assumes that beef produced by dairy systems displaces beef produced by dedicated beef production systems. Tons refers to metric tons.

the consumption of GHG-intensive food, particularly beef, is an important element in limiting global warming to 1.5 to 2 degrees Celsius above preindustrial levels.[25]

THREE PROPOSED DIET SHIFTS

Three potential diet shifts that could contribute to a sustainable food future were analyzed using the GlobAgri biophysical model, using a 2009 baseline, to estimate the impacts on agricultural land use and GHG emissions. These shifts target countries and populations that currently consume high amounts of calories, protein, or beef—or are projected to by 2050. They do not target undernourished people, nor do they seek to eliminate animal-based food consumption, recognizing that livestock production is an important source of livelihood and income. The economic effects of the various diet scenarios were not estimated; these would need to be carefully monitored and managed.

1. **Reduce overconsumption of calories.**

- **Eliminate obesity and halve overweight.** This scenario assumes that an obese person on average consumes 500 more calories per day than a person eating the average energy requirements, and that each overweight person on average consumes 250 more calories per day than the average energy requirements of people with sedentary lifestyles.[26] Calorie consumption is reduced proportionately across all foods eaten in each region to eliminate obesity and cut the number of overweight people in half.
- **Halve obesity and halve overweight.** With the same assumptions as the previous scenario, the numbers of obese and overweight people are both reduced by half.

2. **Reduce overconsumption of protein by reducing consumption of animal-based foods.**

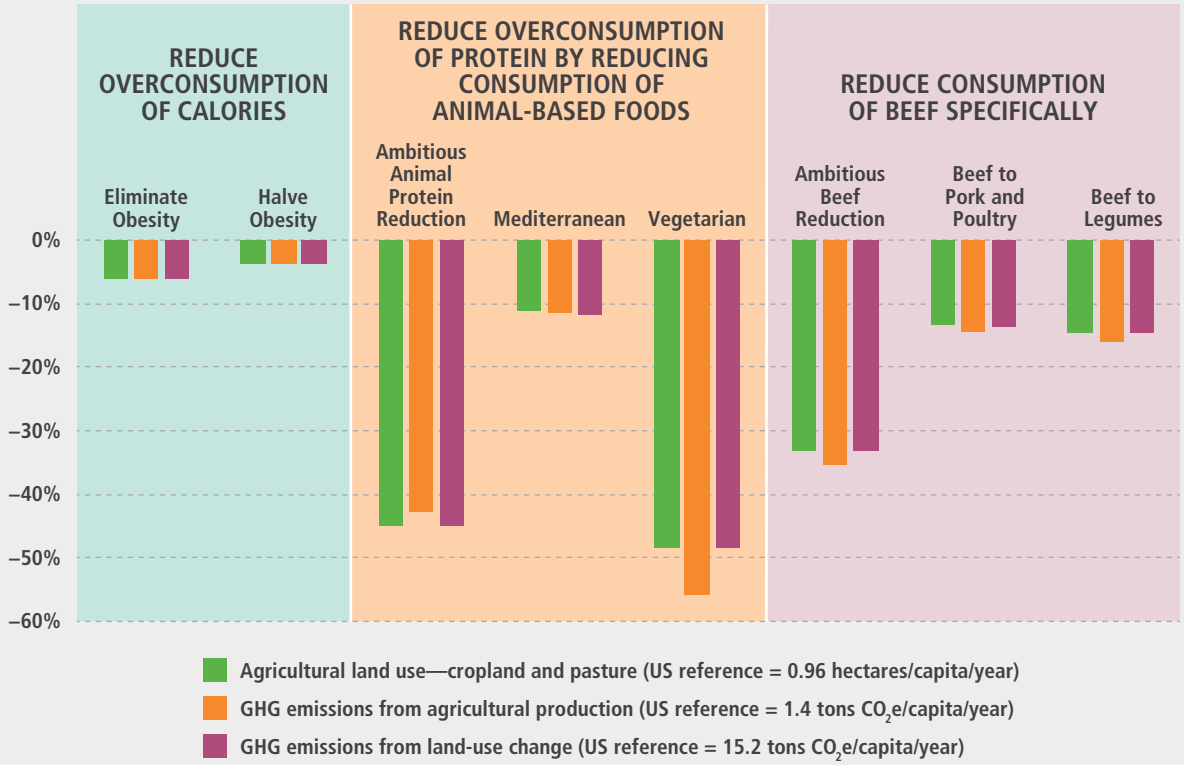
- **Ambitious animal protein reduction.** In regions that consumed more than 60 grams of protein per capita per day, diets were modified to reduce protein consumption to 60 grams per capita per day by reducing animal-based protein consumption proportionately across all sources of meat and milk. Globally, animal-based protein consumption was reduced by 17 percent.
- **Traditional Mediterranean diet.** In regions that consumed more than 40 grams of animal-based protein per capita per day, diets were shifted to the actual average diet of Spain and Greece in 1980, without lowering calorie intake.[27]
- **Vegetarian diet.** In regions that consumed more than 40 grams of animal-based protein per capita per day, diets were shifted to the actual vegetarian diet as observed in the United Kingdom between 1993 and 1999, without lowering calorie intake.[28]

3. **Reduce beef consumption specifically.**

- **Ambitious beef reduction.** In regions where daily per capita beef consumption was above the world average and calories consumed were above 2,500, beef consumption was reduced to the world average. Globally, beef consumption was reduced by 30 percent.
- **Shift from beef to pork and poultry.** In regions where daily per capita beef consumption was above the world average, beef consumption was reduced by one-third and replaced by pork and poultry, proportionate to the amounts consumed in each region, without lowering calorie intake.
- **Shift from beef to legumes.** In the same regions as the above scenario, beef consumption was reduced by one-third and replaced with increases in equal sizes of pulses and soy, without lowering calorie intake.

Figure 4 shows the effects of the three diet shifts on per capita agricultural land use and GHG emissions in one high-consuming country: the United States.[29] Adding one average American to the world population in 2009 would have resulted in nearly 1 additional hectare needed to produce food, an additional 1.4 tons of carbon dioxide equivalent (CO_2e) emitted from agricultural production, and 15.2 additional tons of CO_2e from converting that extra hectare of land to food production. Reductions in animal-based food consumption led to deep reductions in land use and GHG emissions associated with the average American diet, with reductions ranging from

FIGURE 4 Predicted per person land and GHG savings from applying the shifts to the average US diet (% change relative to 2009 reference year)



Source: GlobAgri model.

Note: Data are for the United States and Canada relative to 2009 reference year. Land use includes both cropland and pasture used to grow food and animal feed. Land-use change emissions are amortized over a period of 20 years and then shown as annual impacts. Calculations assume global average efficiencies (calories produced per hectare or per ton CO_2e) for all food types. GHG = greenhouse gas. Tons refers to metric tons.

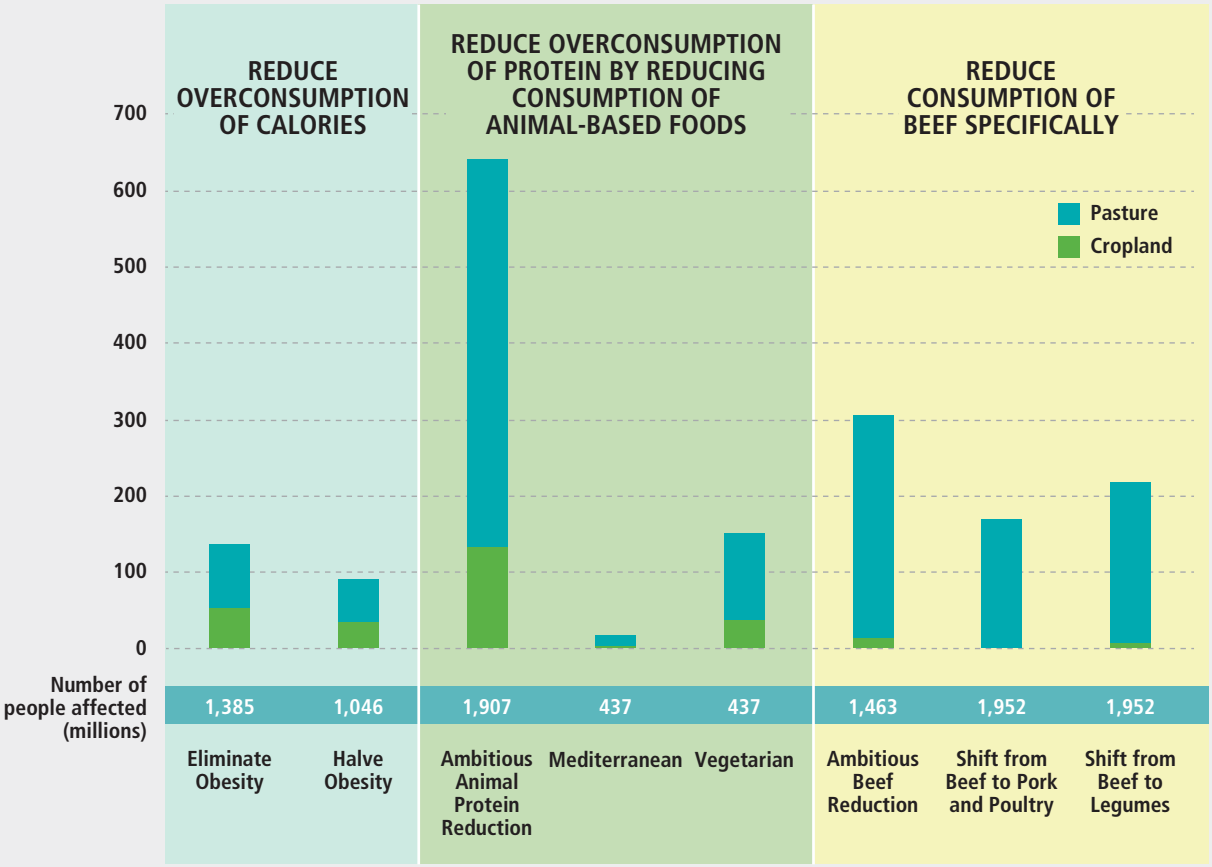
- 11–12 percent (*Traditional Mediterranean Diet* scenario);
- 13–16 percent (*Shift from Beef to Pork and Poultry* and *Shift from Beef to Legumes* scenarios);
- 33–35 percent (*Ambitious Beef Reduction* scenario); and
- 43–56 percent (*Ambitious Animal Protein Reduction* and *Vegetarian Diet* scenarios).

As a point of comparison, the land use and GHG emissions associated with the average American diet in 2009 were roughly twice those associated with the world average diet—suggesting that the *Ambitious Animal Protein Reduction* or *Vegetarian Diet* scenarios would bring the environmental impacts of the average American diet in line with the world average.

Figure 5 shows the global effects of the three diet shifts on agricultural land use. The shifts were applied to between 440 million and 2 billion people (between 6 percent and 29 percent of the world population), depending on the specific scenario and level of ambition. Because a wholesale shift by an entire region to a vegetarian diet or Mediterranean diet is very ambitious, we applied these scenarios to only half of the populations in the regions affected by those two scenarios (North America and Europe).

Assessing the amount of land "freed up" at the global level by reducing overconsumption by the

FIGURE 5 Predicted savings in agricultural land use from applying the shifts globally (millions of hectares saved relative to 2009 reference year)



Source: GlobAgri model.

Note: The *Shift from Beef to Pork and Poultry* scenario includes a 196 million hectare (Mha) decrease in pasture, but a 26 Mha increase in cropland, for an overall 170 Mha "savings."

world's wealthier countries makes it clear that these diet shifts could make a significant contribution to a sustainable food future. The *Traditional Mediterranean Diet* scenario spared around 20 million hectares of land, the two obesity reduction scenarios spared between 90 million and 140 million hectares of land, and the *Vegetarian Diet* scenario and three beef reduction scenarios spared between 150 million and 300 million hectares.

Moreover, under the *Ambitious Animal Protein Reduction* scenario—which affected the diets of nearly 2 billion people—500 million hectares of wetter (nonarid) grazing land were spared, along with 130 million hectares of cropland. This is a total quantity of land greater than the roughly 500 million hectares of agricultural expansion between 1961 and 2006.[30] It could potentially free up enough land to meet future food needs—including the growing demand for beef and dairy by those who currently consume little—without net agricultural expansion. Because the effects of food production on water use and GHG emissions roughly track the land effects across different food types (Figure 3), these scenarios can also be expected to generate significant

freshwater savings and emissions reductions at the global level.

In summary, our analysis yields the following insights about the three diet shifts:

- **Reduce overconsumption of calories.** While reducing overweight and obesity is important for human health, it contributes less to reducing agricultural resource use and environmental impacts than the two shifts that reduce consumption of animal-based foods.
- **Reduce overconsumption of protein by reducing consumption of animal-based foods.** This diet shift resulted in the largest benefits, including deep cuts in per capita land use and GHG emissions among high-consuming populations and dramatic reductions in agricultural land use—and associated GHG emissions—when applied at the global level.
- **Reduce beef consumption specifically.** The effects of this shift were larger than the obesity reduction scenarios, but smaller than the most ambitious scenario that reduced animal-based food consumption more broadly. Nevertheless, this shift is worth pursuing because of its relative ease of implementation and because it has historical precedent. In the United States and Europe, per capita beef availability has already fallen substantially from historical highs while availability of pork and chicken has increased.[31] As shown in Figure 5, when applied globally this shift could result in savings of up to 300 million hectares of wetter (nonarid) pasture land—close to the entire area of pasture expansion since 1961.[32]

The diet shifts would help close the gap between crop calories available in 2006 and expected demand in 2050. Based on the FAO's assumption that 25 percent of all crops (measured by calories) will be dedicated to animal feed by 2050,[33] we calculate that applying the *Ambitious Animal Protein Reduction* scenario to projected consumption patterns in 2050 could reduce the food gap from about 70 percent to 50 percent—thereby significantly reducing the challenge of sustainably feeding nearly 10 billion people by midcentury.[34] But with global trends overwhelmingly pointing to further increases in consumption and overconsumption, how can the tide be turned?

WHAT CAN BE DONE TO SHIFT DIETS?

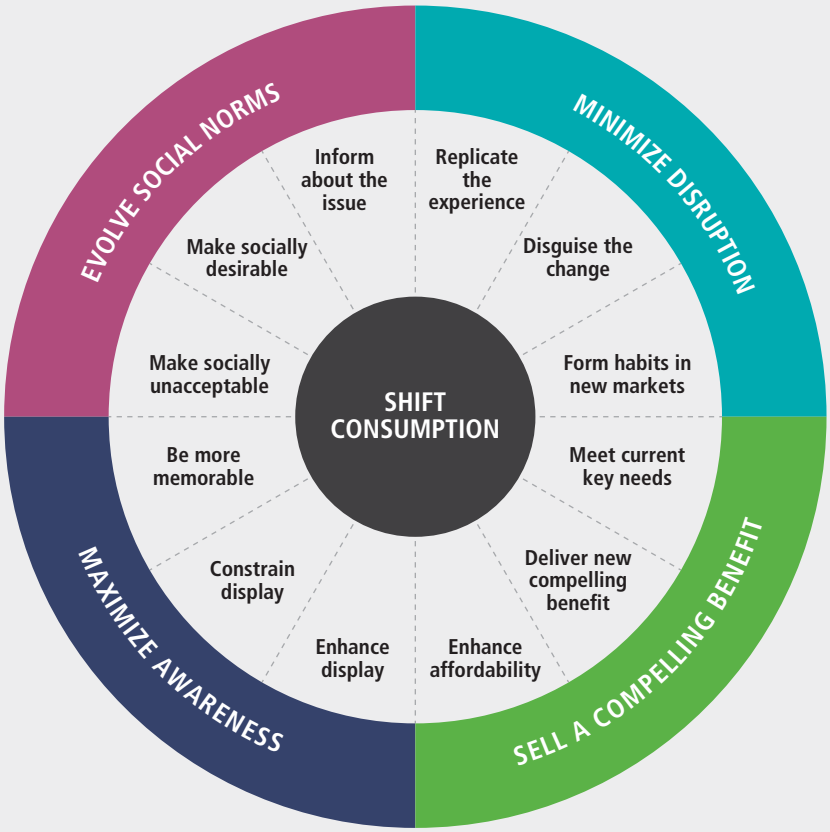
Efforts to encourage more sustainable eating have largely focused on consumer education and package labeling. These have had limited success influencing consumers, whose purchases are typically based on habit and subconscious mental processing rather than on rational, informed decisions.[35] In addition, attributes like price, taste, and quality tend to be more important than sustainability in purchasing decisions.[36]

Shifting diets requires strategies that work in step with how consumers make decisions and influence the factors that drive their food purchases. Given the growing influence of global food companies on consumer choices, it is important to engage companies in efforts to shift diets.[37] In 2000, supermarkets accounted for 70 to 80 percent of food retail sales in France and the United States.[38] Supermarkets are playing a growing role in developing countries today, increasing their share of food retail sales in East Asia, Latin America, urban China, South Africa, and Central Europe from an estimated 5–20 percent in 1980 to 50–60 percent in 2000.[39] At the same time, consumers are increasingly dining out. In the United States, expenditures on "food away from home" as a share of total food expenditures grew from 25 percent in 1954 to 50 percent in 2013.[40] In China, out-of-home food consumption grew more than 100-fold between 1978 and 2008.[41]

> Given the growing influence of global food companies on consumer choices, it is important to engage these companies in shifting consumers toward sustainable diets.

To help shift consumption, we developed the Shift Wheel framework (Figure 6), which is informed by consumption shifts successfully orchestrated in the fast-moving consumer goods sector. It comprises four complementary strategies:

FIGURE 6 The Shift Wheel framework for shifting consumption



Source: J. Ranganathan, D. Vennard, R. Waite, T. Searchinger, P. Dumas, and B. Lipinski, *Shifting Diets,* Installment 11 of *Creating a Sustainable Food Future* (Washington, DC: World Resources Institute, 2016).

- **Minimize disruption.** Changing food consumption behavior typically involves changing habits—a difficult task. This strategy seeks to minimize the disruption of the shift to consumers' existing habits by minimizing changes to a product's taste, look, texture, smell, packaging, and location within a store. For example, companies have created animal product substitutes from plant- or fungus-based proteins, replicating the familiar taste and texture of chicken, eggs, ground beef, and fish as closely as possible. Others have blended in new ingredients within current formats to help disguise the shift toward plant-based ingredients. Another approach is to replicate packaging formats and product placement; in the case of soy milk, a number of brands have launched packaging that looks similar to fresh milk, and have placed the product in retailers' chillers alongside fresh milk.
- **Sell a compelling benefit.** This strategy involves marketing a product attribute known to shape consumers' food purchases. It requires identifying and delivering product attributes that can stimulate a behavior change, such as health, affordability, taste, or product quality. For example, Birds Eye repositioned its pollock fish fingers as healthier "Omega 3 Fish Fingers" and, in doing so, helped shift a large proportion of sales away from codfish fingers to more sustainable pollock.[42] Similarly, a few countries have introduced

BOX 1 Could food taxes drive diet shifts?

Taxes intended to correct negative externalities (such as environmental pollution) associated with inefficient markets—known as Pigouvian taxes—impose a tax equal to the social cost of the externality. Although favored by some economists, these taxes can be politically difficult to implement because of opposition from the public and affected industries.[50]

Several jurisdictions—including Barbados, Chile, Denmark, Finland, France, Hungary, Mexico, and local governments in the United States—have established taxes on foods high in fat, salt, and sugar, citing health reasons.[51] However, the "fat tax" in Denmark was abolished after one year, in part because consumers were able to purchase the same products without a tax in nearby Germany.[52]

Food taxes could change purchasing choices. Reviews of the efforts either to tax unhealthy foods or to subsidize healthier foods, such as fruits and vegetables, indicate significant effects on consumption.[53] Although experience with food taxes is limited, evidence from modeling studies suggests potential for substantial reductions in specific targeted "undesirable" foods, such as sugary soft drinks. Models also suggest that taxes on undesirable foods work best when complemented by removal of taxes or provision of subsidies on "desirable" substitutes. Estimates of elasticities of consumption for various meats also suggest that a tax on beef, for example, could shift consumption to other meats.[54]

Studies on food taxes also highlight potential caveats. First, taxes imposed at the agricultural production level—such as a beef tax—may not work if production shifts to other countries.[55] Likewise, retail-level taxes may not be effective if consumers can shop abroad, as the Danish "fat tax" experience suggests. Finally, taxes may have to be high to substantially reduce consumption. One survey suggested that a 10 percent tax on meat would be needed to achieve just a 10 percent reduction in consumption.[56] Such high taxes could have unfair distributional consequences unless carefully managed.

taxes on unhealthy foods to make healthier foods comparatively more affordable (Box 1).

- **Maximize awareness.** The more consumers see or think of a product, the greater the likelihood they will consider purchasing it.[43] This strategy involves increasing the visibility of a product by enhancing its availability and display through memorable advertising. For example, a school cafeteria in Minnesota found that students waiting to pay for their lunch faced an array of grain-based snacks, chips, granola bars, and desserts near the cash register, leading to impulse purchases. Rather than simply removing these products, which would have reduced total sales, the cafeteria replaced them with fruits. As a result, fruit sales increased, snack food sales decreased, and total revenue did not significantly decrease.[44] In other cases, distribution and display of the less sustainable food is limited, curtailing consumption.

  Creating memorable advertising campaigns can increase the probability of a particular food's being purchased.[45] Coca-Cola, for example, is associated with the color red, its distinctive bottle shape, its logo script, and its ability to refresh on a hot day.[46] In the United States, agricultural commodity marketing programs have introduced memorable advertising campaigns, such as "Got Milk?" and "Beef: It's What's for Dinner." Memorable marketing programs for plant-based foods could help shift consumption. On the flip side, some countries are experimenting with limiting marketing of undesirable foods. Chile passed a law in 2012 that aims to limit children's exposure (through marketing and sales) to unhealthy foods.[47]

- **Evolve social norms.** What people eat is highly influenced by cultural and social norms. This strategy involves adapting or changing the underlying social and cultural norms by informing and educating consumers. For example, to reduce the consumption of shark fin in China—which nearly led to the extinction of several shark species—the conservation organization WildAid ran a series of public service announcements in

2006 on the devastating effects of shark fishing. The campaign featured high-profile celebrities, including basketball star Yao Ming, Olympic athletes, business executives, famous actors, and screenwriters, publicly declaring their opposition to shark fin soup and challenging its social acceptability. Building on the campaign, several prominent businessmen petitioned the National People's Congress to ban shark fin at government banquets. In response, China's State Council banned shark fin at official receptions in 2012. The Chinese Ministry of Commerce reported a 70 percent decline in shark fin sales during the 2012–2013 Spring Festival.[48]

Given the significant benefits of shifting diets, how might the Shift Wheel be applied to achieve this end? The first step would be to analyze the landscape of animal- and plant-based food consumption in a given geography or market: who the consumers are; what they are eating; and where, when, why, and how this consumption is occurring. This analysis would identify the most promising intervention points, which could be a specific occasion (for example, evening family meals); product format (for example, meatballs); social perception (for example, that plant-based protein is inferior to meat); demographic groups (for example, millennials); or specific outlets (for example, school or workplace cafeterias). The next step would involve designing approaches to achieve the chosen shift by drawing on relevant strategies from the Shift Wheel. The final steps would involve testing the selected approaches and scaling up successes.

> "Reducing overconsumption of food, especially resource-intensive food, could contribute significantly to a sustainable food future. A shift in diets could help close the food gap and reduce agriculture's pressure on land, water, and climate.

RECOMMENDATIONS

In a world on course to demand 70 percent more calories, nearly 80 percent more animal-based foods, and 95 percent more beef by 2050,[49] reducing overconsumption of food—especially resource-intensive foods—could contribute significantly to a sustainable food future. The three diet shifts proposed in this chapter can help close the food gap and reduce agriculture's pressure on land, water, and climate. The crucial question is how to make these shifts happen. To this end, we offer four recommendations for governments, research institutes, nongovernmental organizations, and food companies.

1. **Set targets, test the Shift Wheel, learn from the results, and scale up successes.** Governments and food companies should set quantifiable targets and test the use of the Shift Wheel to increase the share of plant-based protein in diets and reduce beef consumption specifically. Shifting to more sustainable food consumption choices can both reduce consumer costs and help businesses deliver on their sustainability commitments, including those around water, climate change, and deforestation.
2. **Ensure government policies are aligned with promoting sustainable diet choices.** Governments should ensure coherence among agriculture, health, nutrition, water, biodiversity, and climate change policies in relation to promoting sustainable diets. Agriculture production subsidies should be an important focus given their size and influence on what types of food farmers produce. Since subsidy reform is likely to be politically difficult, taxation and other regulations related to product labeling, marketing, or both should also be explored.
3. **Increase funding for efforts targeted at shifting diets.** Governments and the philanthropic community should create funding mechanisms to support the development, testing, and rollout of evidence-based strategies to shift diets.

4. **Create a new initiative focused on testing and scaling up strategies to shift diets.** A new initiative should be established to test the Shift Wheel in specific contexts and catalyze new approaches to shifting diets, conduct pilot tests, build an evidence base, measure behavior change and its impacts on people and the environment, and share and scale up successes. Its goal should be to increase the share of plant-based protein in diets and reduce beef consumption specifically. ■