

# Bringing Agriculture to the Table

How Agriculture and Food Can Play  
a Role in Preventing Chronic Disease

Rachel Nugent, PhD, Chair



**THE CHICAGO COUNCIL**  
ON GLOBAL AFFAIRS



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# Foreword & Acknowledgments

## FOREWORD

Major themes in understanding the global agriculture and food system are long-standing abundance, uneven distribution, and the rising energy density of food in the form of greater production of animal-based foods and greater processing of all foods. The first two themes have been thrown into sharp relief with recent increases in food prices, raising anew the question: can total food production meet demand in the decades ahead, and how will the poor fare? A second, and related, question is also taking center stage: will natural resource limitations eventually put a halt to food supply growth? Both answers vitally depend on choices made now and are the subject of ongoing policy discussions and actions. The third theme has received less attention but prompts a no less important inquiry: how can the global food supply help people be healthy?

A High-Level Meeting convened by the United Nations General Assembly in late September 2011 focuses on actions to prevent and control noncommunicable diseases (NCDs) worldwide, especially in low- and middle-income countries. Leaders have urged a multisectoral response to NCDs, naming agriculture and food production among the important sectors in which policies should be developed to support health objectives. The UN resolution calling for the meeting emphasized the use of indicators to monitor development progress and specifically urged integrating indicators for NCDs within the system already in place to track the Millennium Development Goals. But measurements to track progress in building health outcomes into agriculture and nutrition policy are not simple to agree upon, or to implement.<sup>1</sup> The “whole-of-government approach”<sup>2</sup> to respond to NCDs is not yet well defined by the UN

nor has it been convincingly put into action in the preparations for the High-Level Meeting.

In the decades to come, the agriculture and food system will need to change to meet the related challenges of rising demand, accessibility and affordability, and improved nutrition and health. Burgeoning population and rising incomes will continue to raise demand for more food and increasingly diverse diets. At the same time, persistent economic deprivation and undernutrition in some areas of the world will require more efficient distribution and greater access.<sup>3</sup> The system will need to meet these demands in spite of increased frequency of natural disasters, shifting climate patterns, and growing resource scarcity, particularly of arable land and water.

This report offers an integrated look at agriculture, food, nutrition, and the growing threat of diet-related chronic diseases. It presents analysis and recommendations suggesting that the farm and food systems across the globe are dynamic and robust, capable of producing adequate food to meet people’s needs for the foreseeable future, but in need of significant course corrections as well.

The Healthy Agriculture, Food, and Noncommunicable Diseases project builds upon The Chicago Council on Global Affairs’ previous work on agriculture, development, and food policy, including the 2006 task force report, *Modernizing America’s Food and Farm Policy: Vision for a New Direction*; the 2009 report, *Renewing American Leadership in the Fight Against Global Hunger and Poverty*; and the recently released *Progress Report on U.S. Leadership in Global Agricultural Development*. Founded in 1922, The Chicago Council on Global Affairs is one of

the oldest and most prominent international affairs organizations in the United States. Independent and nonpartisan, The Chicago Council is committed to influencing the discourse on global issues through contributions to opinion and policy formation, leadership dialogue, and public learning. The Council believes that its midwestern base and knowledge of agricultural issues contribute to the value of this report and to international discourse on foreign policy issues.

## ACKNOWLEDGMENTS

The Chicago Council would first like to thank Project Chair, Rachel Nugent, for her vision throughout the project’s very demanding six-month process. Dr. Nugent brings a passion for the very complex issues surrounding the intersection of agriculture, diets, and health and is particularly dedicated to advancing the voice of vulnerable populations in the developing world and advocating for more attention and donor support to combating NCDs. Her longtime interest in these issues, technical expertise, and willingness to explore new fields and points of influence were essential to framing the project. It speaks to the energy of Dr. Nugent and the regard she has earned in the international community that the project was able to garner the support and assistance of key players in international organizations, academia, advocacy groups, and research communities.

The Council extends its deepest appreciation to the members of the Advisory Group: leaders and experts in the fields of agriculture, nutrition, health, economics, business, public policy and the environment. Each member’s distinct background, technical expertise, and views on the issues provided essential background for cross-sectoral examination of food

and NCDs. I would like to thank them for their time and willingness to share their expertise and exchange ideas and reactions candidly during and following their meeting in Chicago. They serve as ambassadors to their fields in the future dialogue between the agriculture, agrifood business, nutrition, and health fields.

The report was greatly strengthened by the suggestions provided by the Technical Review Panel. Drs. David Pelletier, David Nabarro, and K. Srinath Reddy offered invaluable feedback and guidance during the finalization of the report narrative.

The Council extends thanks to the senior industry representatives; numerous leaders in the NGO, advocacy, and think-tank communities; and to the academics and international development practitioners who made themselves available for useful conversations with the project chair and team. These individuals provided essential information and helpful insights that informed the final report.

The Council is grateful for the support of the Leverhulme Centre for Integrative Research on Agriculture and Health (LCIRAH), based at the London International Development Centre. Director Jeff Waage, Administrator Catherine Leigh, and Alan Dangour of the London School of Hygiene & Tropical Medicine graciously facilitated a side event for this project at the LCIRAH workshop on Measuring Effects of Agri-Health Interventions in London.

Credit is due to several members of The Chicago Council staff who played key parts in planning and implementing the project and creating the final report. Lisa Eakman, Executive Director, Global Agriculture & Food Policy, was instrumental in scoping the project and assembling the project team and provided guidance and expertise throughout the duration of the project. Elizabeth Ramborger, Senior Project Manager, adeptly managed the day-to-day operational support for all aspects of the project, organized the research and drafting process, and provided input on the project's materials and final report. Maggie Klousia, Senior Program Officer, and Sung Lee, Senior Editor and Research Analyst, played key roles in providing background research and materials to the project team. Consultant Marya Khan contributed to the report drafting and provided technical research, data analysis, and development of the report's figures and charts. Research assistants Asta Schuette, Ashwin Parulkar, and Joshua Scheinberg provided key inputs at various junctures of the project, including literature reviews, project framing documents, data collection, and report elements. Intern Robyn Jacobs cheerfully and efficiently contributed to research, obtaining permissions for data use, and development of the final report's figures, charts, and appendices, as well as providing invaluable support to the meeting of the Advisory Group in Chicago. Editor

Ellen Hunt expertly managed structural edits of the reports, while Carole Palmer of Creative Services, Inc., copyedited the final report. Consultant Reilly Lambert finalized and formatted references. Consultant Aimee de la Houssaye fact-checked the report. Other Chicago Council staff, including Jo Heindel, Sam Skinner, Elisa Miller, Elizabeth Lulla, Diane Gilbert, and Tyler Strom also made valuable contributions.

Finally, The Chicago Council would like to express its deep appreciation and thanks to PepsiCo for the generous support that made this project and report possible.

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# Executive Summary

The agriculture and food system plays a significant role in the illness and early death that arise out of the imbalanced diets, empty calories, and overconsumption that are rampant in high- and middle-income countries and increasingly apparent in the nutrition and epidemiological transitions under way in developing countries. This report describes the links between agriculture and health and demonstrates that agriculture's long-term success in surpassing the growth of demand with greater production—though not yet in Africa—is a necessary but not sufficient response for modern societies. Long-term human and environmental health should also be goals of agriculture. Food and agriculture must play a role in reversing recent trends that have the potential to stall or reverse the economic and health advances seen in developing countries in the last 40 years.<sup>4</sup>

While the benefits of the globalized food system are apparent—greater choice for consumers, greater nutritional diversity, and lower cost—the risks are increasingly apparent as well. The present system should be credited with making food more widely available and affordable to large portions of the world. Yet recent trends in food production, processing, trade, marketing, and retailing contribute to the rising occurrence of diet-related noncommunicable diseases (NCDs) around the world. This report is principally concerned with the health risks imposed by a modernized food and agricultural system and evidenced in the climbing global rates of chronic NCDs, and how to use innovation, policy levers, and public and private sector leadership to transform the highly sophisticated food and

agriculture capacity in the world today into a system for increasing longevity and well-being of humans as well as the health of the planet.

The shift from early death due to communicable disease to much longer lives and eventual death from chronic NCDs is primarily a story of success: technological, social, and economic. The success story may not have a happy ending, however. Changing dietary patterns and lifestyles—spurred by urbanization, the liberalization of markets, demographic shifts, and omnipresent marketing—have contributed to increased prevalence of overweight and the chronic diseases that accompany it. Low- and middle-income countries are confronting a “dual burden” of rising diet-related chronic

diseases and persistent infectious and childhood diseases. A related trend in these countries is the “dual burden of malnutrition,” in which hunger is commonplace, especially among children, while incidence of overweight, obesity, and nutrition-related NCDs are increasingly occurring among adults.

The food price “crisis” of the last few years amplifies preexisting inequities in food distribution and focuses international concerns on the poor. Beyond temporary shocks, the food system is undergoing long-term change that affects nearly everyone, including the poor. An ever greater share of farm output enters the commercial food system, with multiple transformations of food and many actors intervening between farmer and

consumer. While global commercialization provides a great variety of food and beverages to most people, it also offers more products in processed and packaged forms containing a wide array of ingredients, including salt, sweeteners, and oils. Consumption of excess amounts of those ingredients and products, combined with other lifestyle changes, manifests in adverse health outcomes.

Related to the trends in agriculture, food system products have also become more commercial, more global, and more complex. Great improvements in variety, quality, and availability have been accompanied by declining localization and tradition. These trade-offs may be desirable if food systems are delivering affordable and healthy food. But, except for the well-off few who can afford it, this is not the case. The affordability of modern diets measured by cost per unit of energy, or kilocalorie, is increasing. But energy is not the only measure of what a food system should produce. People around the world are consuming more calories but their health is worsening.

Agriculture and food systems across the globe are interacting directly with consumers to present a wider variety of dietary choices. Farmers and their farms remain as varied as they were a century ago, but the path from “farm to fork” is now through an increasingly complex food system that brings more food diversity and more common food buying and eating experiences to consumers across the globe.

In the developed world, market-driven modernization, basic and applied agricultural research, and subsidies have led agriculture to remarkable progress in two generations. Largely but not exclusively due to the Green Revolution in Asia, crop yields rose 70 percent in developing countries between the 1960s and 1990s. Per capita food consumption in developing countries rose 28 percent in that time.<sup>5</sup>

In the developing world, what the World Bank calls “an emerging new agriculture”<sup>6</sup> is occurring. It has several features: fast-paced institutional and technological change in markets, involvement of the public and civil society in connecting poor and small farmers to consumers, and a far-reaching private sector taking on new roles in the food value chain.<sup>7</sup>

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**If farm and food systems are to meet human needs and contribute to human health and longevity, they must produce affordable, diverse, and healthy food.**

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There is no good health without good nutrition, and good nutrition depends on agriculture. Yet public agriculture and health agencies interact little and are guided by distinct and sometimes contradictory objectives. Agriculture agencies and ministries aim for greater food and feed production with available resources and technology, while health ministries focus on disease control. Nutrition objectives and outcomes play a role in both agencies but are often secondary to the main political and technical concerns in those two sectors. This report explores the potential for defining new indicators that connect agriculture and health through progress in improving nutrition.

Policymakers are challenged to better leverage agriculture to produce desirable health and nutrition outcomes. Population needs will vary and programs targeted at the poor and other special groups are still needed. But for the vast majority of consumers globally, the commercial food system must be encouraged—and even directed where necessary—to meet society’s food and health needs.

## Recommendations

If farm and food systems are to meet those needs, they must produce affordable, diverse, and healthy food. Decision makers at all levels, both public and private, must participate in steering the food environment in such a direction. The most important decision makers are national and international policymakers, agrifood businesses, donors in agriculture, nutrition, and health, and, of course, the consumer. They must all contribute in the areas of governance, policymaking, increasing knowledge through research and technology development, financing, and personal behavior choices. Creative ideas and leadership are the first ingredients in the mix. This report recommends the following actions:

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### **To improve governance and strengthen links between agriculture and health:**

- Government policies should be aligned across sectors
- A supra-ministerial body should lead a cross-sectoral dialogue in countries
- Metrics should be developed to guide operational programs in agriculture and health toward common goals
- Donors should facilitate cross-sectoral programming and planning
- Value chain analysis should be used to identify commercial opportunities to improve the healthiness of the food supply
- Norms and standards should be developed for the food sector that improve nutrition and health
- Governments should work with business to encourage affordable healthy options for food retailing

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**Policy opportunities to improve health through agriculture and food include:**

- Using fiscal, trade, and regulatory instruments to support production and consumption of healthy food where feasible and effective
- Governments should measure and evaluate the contributions of agriculture and food to diet and health
- Agrifood businesses should define a value chain for each major product and work with suppliers and customers to maximize private and social values
- Agrifood businesses should build capacity in low-income countries to comply with food safety standards
- International organizations should develop technical teams that work cross-sectorally to support development assistance efforts
- International organizations should prepare model policies to regulate the food industry that can be adapted to country conditions
- Nutrition assistance programs should be designed to detect and respond to the existence of dual malnutrition in countries and households
- Food aid should be sourced locally where possible to meet nutrition needs
- Consumers should seek and support food and beverage companies that commit to health goals and work with them to build political will

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**Research, education, and technology development can contribute by:**

- Including food and health linkages in nutrition, health, and agricultural science education at all levels and prioritizing this research to better calibrate policies
- Conducting operations research on “nutrition-sensitive” agriculture
- Conducting research on how diet-related NCDs affect economic development prospects
- Adapting and developing low-cost technologies for primary processing that retain nutrient values
- Developing local solutions to post-harvest food losses
- Requiring and funding evaluations of agriculture program impacts on health
- Providing farmers and farmer organizations with tools to reduce financial risk
- Investing in product reformulation that demonstrates increased nutritional benefits
- Improving knowledge of the food supply in developing countries

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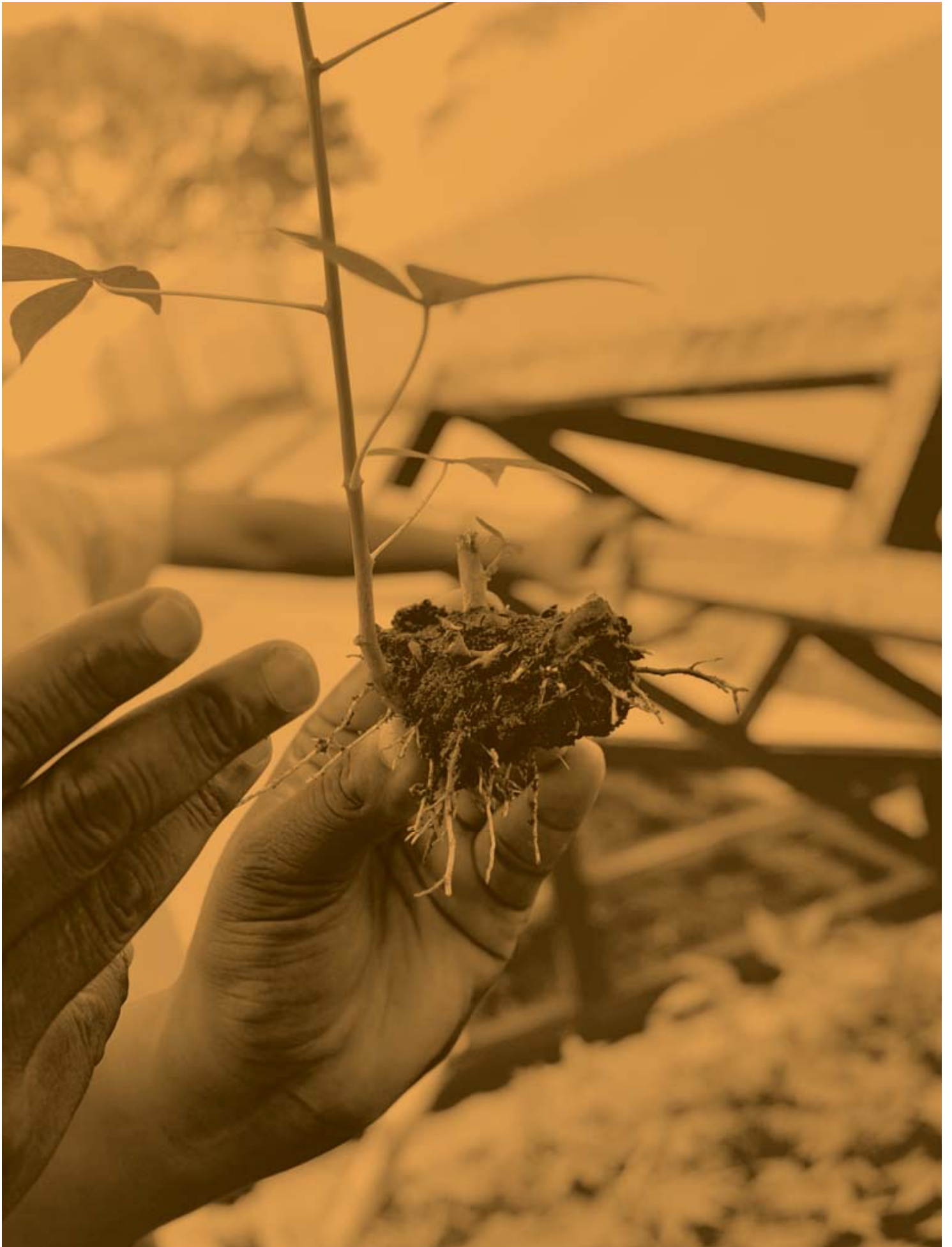
**Financing is needed to:**

- Build incentives into social insurance programs that encourage healthy nutrition behaviors
- Provide support through international organizations to countries seeking to align their agricultural and health policies
- Provide support to countries for multisectoral planning and strategy development
- Support agrifood business managers that meet health and nutrition goals

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**Incentives to support positive personal nutrition behavior should be introduced by:**

- Donors with programmatic opportunities to link agriculture and health
- Agrifood business through efforts to share healthy eating values
- Consumers and businesses to reduce food waste
- Consumers’ representatives to apply knowledge about cognitive and behavior change to encourage healthy eating



# Introduction: The Food System and Health

Today, the global agriculture and food system is challenged to meet monumental needs. As populations grow and incomes rise, the world's farmers, ranchers, and fishers are being asked to produce more food to meet growing demand. They will need to increase production at the same time that resources become more scarce and natural disasters more frequent. As complex as these challenges are, the agriculture and food sectors will miss a tremendous opportunity to advance society's well-being if they limit their objectives to producing more food sustainably: they must also feed the world nutritiously.

Food variety and abundance are not universal experiences. About 900 million people in the world live on less than \$1.25 a day and are undernourished. At the same time, more than 1.4 billion people<sup>8</sup> are overweight or obese, with the number of people suffering from diet-related diseases skyrocketing. In many parts of the world, these problems coexist, creating a “dual burden” of malnutrition and disease for the countries in which they occur. The health conditions create economic and social costs that threaten development in low- and middle-income countries. Almost one-third of chronic disease deaths occur to people under 60 years old in low- and middle-income countries, more than twice the age-standardized rate in high-income countries. Under a “business-as-usual” scenario, chronic diseases are projected to rise by 15 percent by 2020.<sup>9</sup>

It is challenging to create food and agriculture policies that support good health, and even more difficult to do so

in an environment of dual malnutrition. However, the threats posed by rapidly worsening health and the rise of dual malnutrition demand that the world recognize these problems and respond. Cooperation and dialogue must now extend to the full spectrum of malnutrition—both over- and undernutrition—and focus on finding solutions that can benefit the health of all. One essential solution to both these problems is good nutrition. And good nutrition depends, ultimately, on the food and agriculture system.

Although many in the health sector are discussing how to mitigate the growing burdens of chronic disease and nutritional deficiencies, little is said about how agriculture and the food system can help resolve the problems. The agriculture and health sectors often work separately and define success differently. While the health community discusses diet quality, the agriculture and food community generally measures nutrition based on caloric intake. Instead of focusing on how

to achieve good nutrition for the largest number of people in diverse settings, discussions focus on the subsets of the population that are over- and undernourished, leaving out the growing risks faced by the 5 billion other people in the world. Although there has been some cooperation between agriculture and health experts to find solutions to chronic food insecurity, it has been difficult for the two sectors to find a language to identify common goals.

This report argues that the agriculture and food system is well positioned to play a critical role in curbing the global rise in diet-related noncommunicable diseases (NCDs). It describes the linkages between what people consume and agricultural production, the food system, and the policies affecting them. It outlines opportunities to marshal the agriculture and food system's global reach, innovation, policy, and public and private leadership to transform the world's highly sophisticated food and agricultural capacity into a system

for increasing health and longevity. While acknowledging that individuals have a clear role and responsibility to make food choices that contribute to their health, this report focuses on how the agriculture and food system can make healthy foods more available and affordable to consumers at all income levels. Although under-nourishment is part of this equation, and the scope of the problem global, the report addresses how the agriculture and food system can contribute to reducing overnutrition in low- and middle-income countries, where the prevalence of diet-related NCDs is expected to rise most quickly in the decades to come.

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**Good nutrition depends, ultimately, on the food and agriculture system.... Much more is needed than adjustments to agriculture and food policy.**

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Now is the time for the agriculture and food sectors to take on this challenge and be more fully integrated into conversations on diet-related chronic disease. As a result of the 2007–08 food price crisis and continual commodity price volatility, the international community has rallied to support emerging agriculture and food systems, primarily those in Africa and Asia. As new programs are rolled out, the international community has the opportunity to design them to meet mutual goals of enhancing agricultural production, increasing food access, and supporting healthy populations.

Given the far-reaching health and economic impacts of NCDs, it is crucial to address the growing epidemic of diet-related chronic conditions. The agriculture and food system sectors must be part of a cross-sectoral solution. If governments, civil society, and industry can work together to make more nutritious foods widely available, they can help to transform the health and economic prospects of millions.

## What the UN High-Level Meeting Might Accomplish

The UN High-Level Meeting on NCDs in September 2011 is prompting a reappraisal of the causes of conditions affecting people's health around the world and a search for solutions to the rising problem of chronic diseases. The call for multisectoral involvement is strong, but the details of how it would happen and where it would lead are largely missing. Nonetheless, a coalition could be fashioned that would include the agricultural and food sectors as important determinants of people's health. A measure of the meeting's success will be whether it creates a momentum to develop broader government and private sector measures to build stronger nutrition and health objectives into the agricultural and food systems.

A number of organizations, including advocacy groups (NCD Alliance),<sup>10</sup> scholars writing in major health journals (the *British Medical Journal*, *The Lancet*),<sup>11</sup> and think-tank reports,<sup>12</sup> have laid out "asks" in advance of the UN High-Level Meeting on NCDs. They focus on leadership and international cooperation in regard to the prevention and treatment, and monitoring and reporting, of diet-related NCDs. The asks have generally been proposed by and for the health community, although they do acknowledge the importance of cross-sectoral collaboration. The food and agriculture-related requests from among the many recommendations that might be considered by countries attending the September 2011 meeting are:

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By 2025, reduce salt intake to less than 5g per person per day. Specific priority interventions include mass media campaigns and voluntary actions by the food industry to reduce salt consumption.

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Cross-sectoral coordination to align national policies on agriculture, finance, trade, industry, transport, urban planning, and education to collectively address the NCDs epidemic.

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Mass media campaigns, food taxes, subsidies, labeling, and marketing restrictions to address unhealthy diets and obesity.

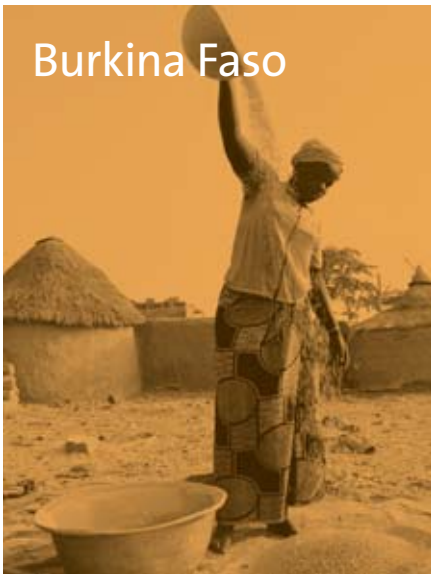
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Other interventions that have been mentioned, although not prioritized, include providing incentives for the production, distribution, and marketing of vegetables, fruit, and unprocessed food through trade and finance measures.

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It is highly likely that heads of state and ministries attending the meeting will endorse at least some of these actions, and then the task will be up to governments and others to carry out. The NCD-oriented UN-watchers believe strongly that the meeting must produce two things to have much impact on the growing chronic disease health burden in the world: deadlines for action among global actors such as donors, and UN and development assistance funding for resource-poor countries to apply to their needs to tackle NCDs. The "asks" raised at the high-level meeting, and many others proposed in this report, will be more swiftly and credibly implemented with broad-based efforts that are based on a unity of purpose among different sectors in society.





A Snapshot of Agriculture and Health in Burkina Faso

“I live in a rural community in Burkina Faso.<sup>13</sup> I am 17 years old<sup>14</sup> and have not completed primary school.<sup>15</sup> I am a farmer,<sup>16</sup> and my annual income is equivalent to \$1,260.<sup>17</sup> My family grows most of our own food,<sup>18</sup> but our village suffers from frequent droughts,<sup>19</sup> and we do not always have enough food to eat.<sup>20</sup> My diet consists mainly of sorghum, millet, and maize.<sup>21</sup> Sometimes I also eat peanuts, potatoes, beans, yams, and okra—and occasionally eggs or fish.<sup>22</sup> I most likely will have about five children,<sup>23</sup> and I expect to live until my mid-50s.<sup>24</sup> I am likely to suffer from a communicable disease, such as malaria, during my lifetime or a complication in childbirth.<sup>25</sup> However, I am just as likely to die from a noncommunicable condition such as heart disease.”<sup>26</sup>

This report is intended to be aspirational, while acknowledging that it takes time to change some of the detrimental conditions that have arisen in those sectors, just as it took time to create the conditions. The recommendations offered here go well beyond the agriculture and food-related “asks” at the UN meeting on NCDs. They are developed with the perspective of what food and agriculture can feasibly contribute to improve health.

This is the story of a typical person living in Burkina Faso, in West Africa. A low-income, land-locked country with little infrastructure development, Burkina Faso is predominantly rural and relies mainly on subsistence and small commercial agriculture. Eighty percent of the population in Burkina Faso lives in rural areas, and 92 percent is employed in agriculture, with women comprising 47 percent of the labor force.<sup>27</sup> Sorghum, millet, and maize are the main staple crops cultivated, although the demand for rice and wheat is increasing in urban areas.<sup>28</sup> Research among women in the capital, Ouagadougou, has shown that diets consist mainly of starchy staples and vegetables.<sup>29</sup> Ready-to-eat foods purchased outside the home constitute a considerable portion of the diet, accounting for 46 percent calorie intake, 52 percent of fat intake, and as much as 72 percent of sugar intake.<sup>30</sup>

In Burkina Faso, 9 percent of the population remains undernourished,<sup>31</sup> and 35 percent of five-year-old children are short for their age as a result—a condition termed “stunting.”<sup>32</sup> The burden of disease encompasses mostly infectious diseases, maternal and perinatal problems, such as eclampsia, and nutritional deficiencies. However, 45 percent of the population suffers from high blood pressure, a precursor to stroke and heart disease.<sup>33</sup>

Investments in infrastructure are key for countries at this stage of development. People in rural communities—comprised

Much more is needed than isolated or single-commodity adjustments to agriculture and food policy. A larger-scale and more coherent effort is required to reverse the rise in chronic diseases globally. A major UN summit on health is an opportunity to commit to a “whole of society” approach to human health, a central part of which is “whole of government” healthy policies that unite many ministries for the common goal of population health. These changes will

mainly of smallholder farmers—need improved farming technologies and training, and access to roads, transportation, markets, electricity, schools, and health facilities to improve their livelihoods. Rural roads, for example, reduce transport costs and enable farmers to bring crops to market. They also increase access to hospitals, leading to improvements in health.

Burkina Faso is one of few countries attempting to address links between agriculture, nutrition, and health with coordinated policies. One of the objectives of the country’s National Nutrition Policy is to reduce the incidence of chronic diseases related to nutrition.<sup>34</sup> Burkina Faso is also a member of the Economic Community of West African States (ECOWAS). Agriculture and health ministries in ECOWAS states are developing ways to address agriculture, food, and health in an interrelated way.<sup>35</sup> However, ensuring the national capacity and resources to implement these policies will be a significant challenge.

take time, effort, and political will—and the results are uncertain. However, it is urgent to begin now: every day that current health trends continue, it is harder to reverse course.



# 1

## Trends in Agriculture & Health

Since the nineteenth century, modernization has improved the health and well-being of societies. Thanks to advances in public health—including improved sanitation, immunization against childhood diseases, and the introduction of antibiotics in the mid-twentieth century—deaths due to infectious diseases have declined dramatically. As a result, people are living longer lives and dying from chronic noncommunicable diseases, many of which accompany old age.

Noncommunicable diseases (NCDs)—the main ones associated with diet are heart disease, respiratory illnesses, diabetes, and some cancers\*—caused 63 percent of all global deaths in 2008 and are the leading cause of mortality in low- and middle-income regions, with the exception of Africa. Middle-income countries experience the greatest number of NCD deaths and show the fastest rise in prevalence. In low-income countries, communicable diseases are still the most common cause of death, but NCDs are projected to outnumber deaths from communicable diseases and other causes by 2030.<sup>36</sup> In some low-income countries, NCD deaths already outnumber deaths from communicable diseases and other causes.<sup>37</sup> The case study on page 35 describes agriculture, diet, and health conditions in Bangladesh.

Almost 80 percent of global deaths from chronic diseases occur in low- and middle-income countries.<sup>38</sup> At the current rate, the World Health Organization (WHO)

anticipates that NCDs will continue to rise quickly in these regions, with Africa, South-east Asia, and the Eastern Mediterranean expected to experience over a 20 percent increase between 2010 and 2020.<sup>39</sup>

One of the most significant and alarming aspects of NCDs in low- and middle-income countries is that they affect people at a younger age than they do in high-income countries. Figure 1 shows death rates for same-age people from heart disease, and Figure 2 shows death rates among same-age people for both cardiovascular disease and diabetes for four representative countries featured in this report.

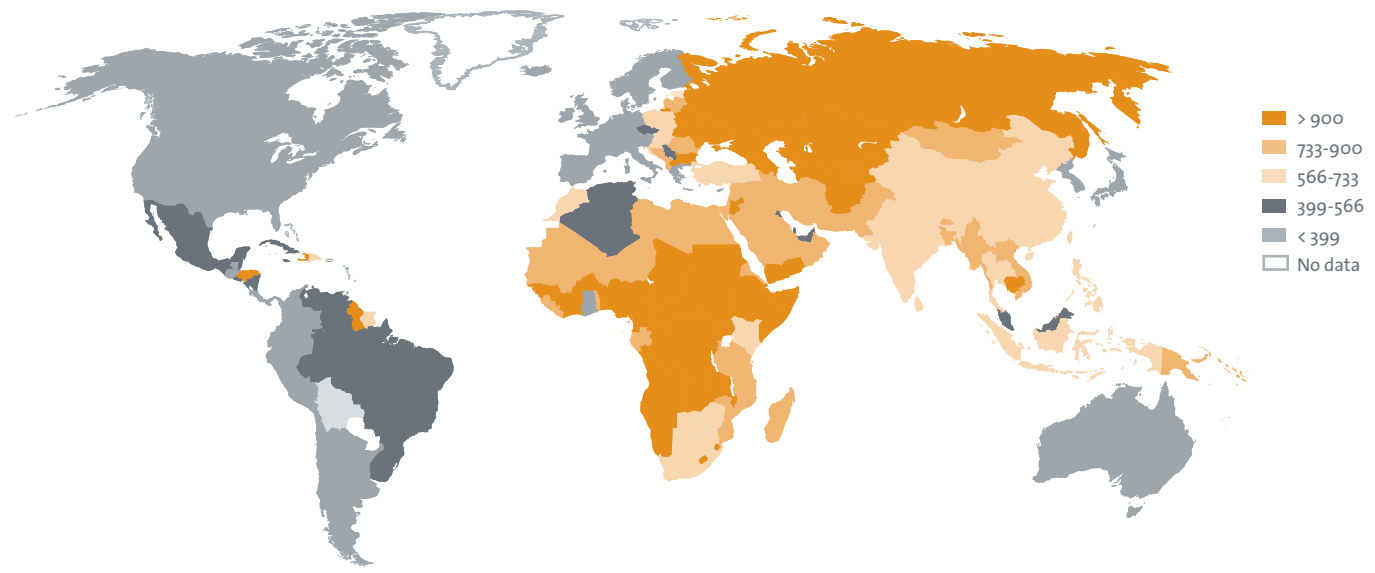
Figures 1 and 2 on page 18 show the number of deaths among same-age individuals due to selected NCDs. Almost half of people who die from NCDs in low- and middle-income countries are under 70, compared to about one-fourth in high-income countries, and the disparity widens at younger ages. About 29 percent of deaths from NCDs in low- and

middle-income countries occur below age 60, whereas only 13 percent occur in high-income countries at such a young age. A Burkinabe man is more than three times as likely to die from heart disease or diabetes than an Englishman of the same age. This confirms that aging is not the only driving factor in the rise of NCDs globally.

Unhealthy diet is a major cause of NCDs. According to the World Health Organization (WHO), the specific dietary contributors to NCDs are insufficient intake of fruits and vegetables, pulses, nuts, and whole grains and excess intake of salt, saturated fat, and trans-fatty acids. These dietary choices lead to high blood pressure, high cholesterol, overweight, and obesity. The WHO estimates that 1.7 million deaths worldwide are associated with a diet low in fruit and vegetable intake. Globally, 51 percent of deaths from stroke and 45 percent of deaths from cardiovascular disease are attributed to high blood pressure, which is linked to diets high in sodium. Cardiovascular disease and strokes are also linked to high cholesterol,

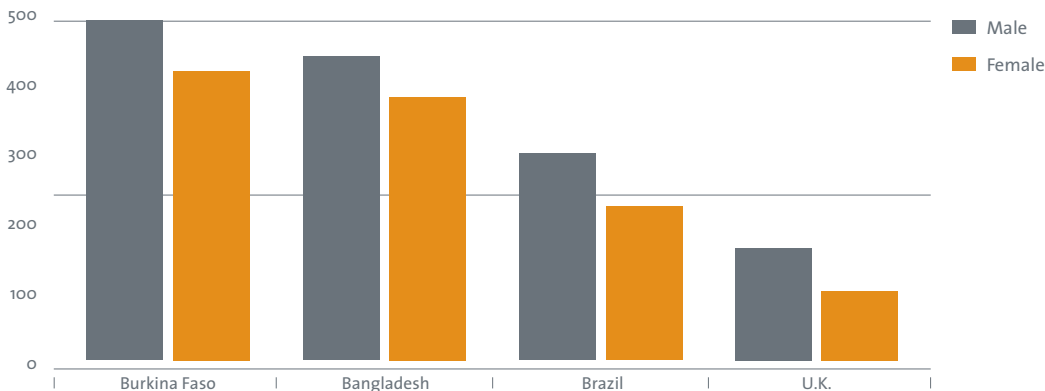
\* According to the World Cancer Research Fund/American Institute for Cancer Research, 30%-40% of cancers are diet-related.

Figure 1: Age-standardized deaths per 100,000 due to cardiovascular disease, various dates



NCD deaths occur at an earlier age in lower-income countries than higher-income countries  
 Source: World Health Organization.

Figure 2: Age-standardized deaths per 100,000 from noncommunicable diseases in selected countries



Source: World Health Organization.

which is associated with diets high in saturated fats. About 44 percent of all diabetes cases, 23 percent of cardiovascular diseases, and 7 to 14 percent of cancers are related to overweight or obesity.<sup>40</sup>

The shift from early death due to communicable diseases to much longer lives and eventual death from chronic, NCDs is primarily a story of success: technological, social, and economic. The success story is incomplete, however. Many poor

countries and disadvantaged people in other countries have not yet felt the benefits of modern health technologies or improved water and sanitation systems, so they continue to suffer from infectious diseases at the same time that they are experiencing the swift advance of noncommunicable diseases. Changing dietary patterns and lifestyles—spurred by urbanization, the liberalization of markets, demographic shifts, and declining levels of physical activity—have

contributed to overweight and the chronic diseases that accompany it. Low- and middle-income countries are confronting a “dual burden” of rising diet-related chronic diseases and persistent infectious and childhood diseases. A related trend in these countries is the “dual burden of malnutrition,” in which hunger is commonplace, especially among children, while incidence of overweight, obesity, and diet-related NCDs are increasingly occurring among adults.

Not only is a nutritious diet crucial to good health at each stage of the life cycle, but the theory known as “early origins of health and development” links undernutrition early in life to greater susceptibility to diet-related NCDs later in life.<sup>41</sup> Chronic undernutrition manifests in 180 million children in the world who are short for their age, a condition called “stunting.” Stunted children who live in emerging economies appear to be especially vulnerable to obesity and later chronic disease<sup>42</sup>—a situation that is suggested by the Brazilian example<sup>43</sup> described in

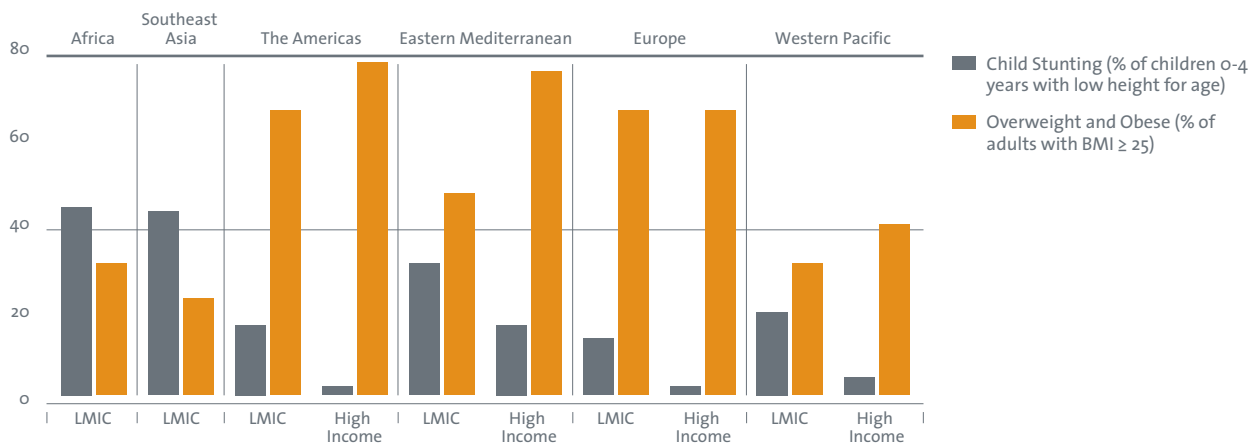
the case study on page 51. Figures 3 and 4 show a range of countries at different income levels that have significant prevalence of both under- and overnutrition in their populations.

### Rising Cost of Noncommunicable Diseases Globally

Chronic diseases present particular challenges to low-income country health systems that are overburdened with patients needing immediate care for infectious diseases and acute conditions.

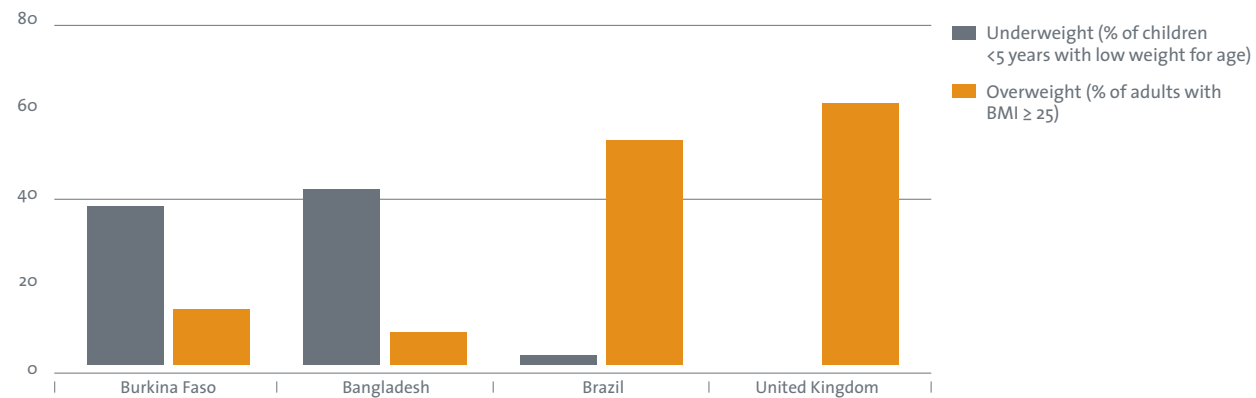
Health facilities in low- and many middle-income countries lack trained health workers with knowledge of chronic disease treatment and the behavioral and other risk factors that lead to disease. The economic costs of diagnosing, treating, and providing long-term management for NCDs are potentially overwhelming to low-resource health systems. Although data on health expenditures for NCDs are limited, research on specific conditions and risk factors provides some indication of how much governments are spending. In China, direct and indirect costs related

Figure 3 : Over- and Undernutrition in regions of the world, various dates



Low- and middle-income countries experience a dual burden of malnutrition; overnutrition predominates in high-income countries. Source: World Health Organization.

Figure 4 : Over- and undernutrition in selected countries, various dates



Source: World Health Organization.

## What Is a Healthy Diet?

There is a wealth of conflicting information regarding what constitutes a healthy diet. Consumers in higher-income countries encounter “functional food” that promises health benefits from reduced cholesterol, better digestive health, enhanced brain activity, and increased energy. In lower-income countries, governments, donors, and industry provide delivery of minerals and vitamins through fortified food products. While affordability and accessibility of adequate food remain a challenge for many people, what we know about the paths to good nutrition, and thus good health, is relatively simple. The World Health Organization report on Diet, Nutrition and the Prevention of Chronic Disease<sup>48</sup> reviewed the evidence on the strength of the links between diet and chronic diseases and provides an overview of the most convincing evidence of the types of foods that increase disease risk. High-calorie foods are linked to weight gain and obesity, high sodium and trans fat are linked to cardiovascular disease, and saturated fats are linked to diabetes.

A key feature of a healthy diet is dietary diversity—consuming a variety of foods across and within food groups to improve the intake of essential nutrients. Common food groups include dairy products, meat and meat alternatives, fruits, vegetables, and grains. Because dietary patterns differ from place to place, the specific food items included in food groups must be established according to the cultural context, the local foods available, and their nutritional content. Sufficient dietary diversity is a

difficult thing for the poor to attain in all countries, especially in rural areas of some countries where diets are heavy in starchy staples and there is little consumption of animal products, fruits, or vegetables.<sup>49</sup> In urban areas, increased consumption of packaged foods even among the poor aggravates micronutrient deficiencies. Food availability is not the only constraint—these populations also share a lack of awareness about the benefits of diversifying diets.

A simple prescription for a healthy and diverse diet follows as close as possible to following 11 simple rules and one piece of advice.<sup>50</sup>

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### Emphasize:

- Fruits
- Vegetables
- Quality Carbohydrates (whole grains, fiber)
- Nuts
- Fish
- Healthy Vegetable Oils
- Modest Amount of Dairy Products

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### Limit:

- Processed Foods
- Processed Meats
- Sugar-Sweetened Beverages
- Industrial Trans Fat and Salt

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### Eating Behavior:

Eat at home rather than away from home—food prepared at home is generally healthier than take-away food or other restaurant meals.

to being overweight and obesity are equivalent to 4 percent of the country’s GDP, and by the year 2025 these costs are projected to reach 9 percent.<sup>44</sup> A recent study shows that health spending on diabetes care alone ranges from 6 percent of all health expenditures in China to 15 percent in Mexico.<sup>45</sup>

Diet-related NCDs impose significant economic burdens on health systems and impede worker productivity, especially in low- and middle-income countries where they disproportionately affect working-age people. The WHO estimates that a country’s economic growth rate falls 0.5 percent for every 10 percent increase in prevalence of NCDs.<sup>46</sup> Aggregating economic losses from countries to a global scale, a recent Harvard School of Public Health study estimates that the “global decline in productivity due to illness and deaths from noncommunicable diseases will reach \$35 trillion by 2030 ... an amount seven times larger than the current level of global health spending.”<sup>47</sup>

The current and anticipated economic costs alone are reason enough to make preventing diet-related NCDs a priority for the international community. Although health systems can be improved, health approaches alone cannot solve this problem. An effective strategy to improve health must include a variety of measures to encourage increased physical activity among populations and support good dietary choices by providing consumers with nutritious food options at an affordable price.

## Stages of Dietary Transition Around the Globe

Agriculture and the food system play a significant role in the illness and early death that arise out of the imbalanced diets, empty calories, and overconsumption that is rampant in high- and middle-income countries, and increasingly apparent in the nutrition and epidemiological transitions under way in developing countries. In order to illustrate in concrete terms how countries at different developmental stages experience these

transitions, Figure 7 presents key agriculture and food system, dietary, and health characteristics for four countries in different stages of transition. Specific indicators are in the table and longer descriptions of dietary and health conditions in each of these countries are in boxes elsewhere in the report. These country examples—from Burkina Faso at stage 1, to the mixed transition under way in Bangladesh at stage 2, to advanced transition in Brazil at stage 3, and finally to the United Kingdom at stage 4—show how health conditions are affected by transitions in agriculture and food systems. While a 4-stage model can't adequately represent all agriculture and health conditions across the globe, it does convey a sense of how agriculture and health conditions change as countries develop and allows some generalizations about policy options to be made.

In general, the indicators show a predictable relationship between the agriculture system and health conditions. As countries develop, they urbanize, and fewer people work in agriculture. Simultaneously, their agriculture systems modernize and add greater value. Agricultural transition occurs alongside improvements in diet that become more diverse and protein-filled, which, in turn, drives the epidemiological transition from conditions of undernutrition to overnutrition and NCDs. For instance, as the table shows, Burkina Faso remains an agrarian society with low investment in agriculture and therefore there is low value added in that sector. Ninety-two percent of the population is employed in agriculture, but the agricultural system produces value of only \$181 per worker; therefore, income and productivity remain low. The population suffers from high poverty and undernutrition but is beginning to also experience other health problems, with 20 percent of the burden of disease due to NCDs in the population. Spending on health is high for a country at this low level of income, but most spending on health comes from people's personal expenditures, and the performance of the health system is poor. These indicators

suggest that Burkina Faso should focus on public investment and facilities that enhance the ability of its agriculture sector to deliver a diverse diet, and the health sector should increase preventive health measures to slow the rise in NCDs. Cross-sectoral efforts should be employed wisely to buttress the efficiency of private sector and individual actions.<sup>51</sup>

While also a very poor country with a poverty level near 50 percent, Bangladesh is further along in the agricultural and health transitions and faces a real dual burden of malnutrition. The burden of disease due to NCDs is 41 percent, while 27 percent of children under 5 are stunted. Twenty-nine percent of people in Bangladesh face very high NCD risk.<sup>52</sup> Bangladeshi farmers benefit from greater government investment in agriculture, and the value added per person is much higher than in Burkina Faso, at \$435 per year. As a stage 2 country, Bangladesh can usefully target public interventions to address gaps—such as greater fruit and vegetable production—and work across sectors for greater impact. For the first time, Bangladesh's new health sector program for 2011–2016 includes an operational plan for addressing NCDs.<sup>53</sup>

Countries with higher income, such as Brazil and the UK, face very different agriculture, food, and health conditions. Traditional diseases of poverty have almost disappeared, but NCDs and their risk factors increasingly affect the poorer segments of the populations. A wide array of food choices exists, but overconsumption is common. Agriculture is a small and/or declining portion of the labor force, but may be important economically for exports, as in Brazil's case, or for cultural and environmental values, as in the UK. In these settings, the government's role is no longer to spur and guide development as such, but to prevent the unintended health consequences of harmful development. Regulation of both food producers and consumers might be warranted, as well as positive incentives for the private sector to provide healthy food

and for consumers to demand healthy food can also be considered.

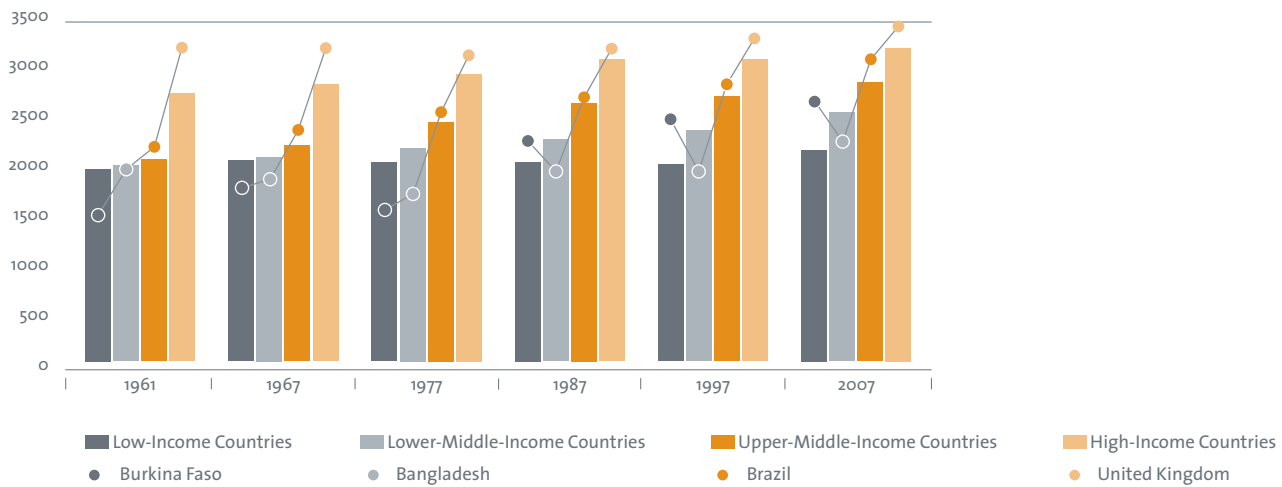
The four countries described in this report are just examples, each with their own specific circumstances. But they point toward a global shift in human conditions—at different stages but underway around the world—that will only be exacerbated with rising incomes and changing demographics unless concerted action is taken to move the trends in a more healthy direction.

To better understand what is driving the rise in malnourishment and diet-related NCDs in low- and middle-income countries, it is important to examine drivers of consumer demand and food production and the interplay between them. In the last few decades, global diets have shifted dramatically to include increased consumption of foods that place people at a higher-risk for diet-related NCDs. This shift is driven by changes in incomes, food prices, and lifestyles. At the same time, the agriculture and food systems have dramatically changed the types and amounts of food products available to consumers. Greater amounts of high-value foods, such as meat, fruits and vegetables, and processed foods, are available to consumers everywhere.

## Consumption Trends

Scattered information is available about what people eat in developing countries and how it affects their health. Food expenditure surveys are sporadic and food composition studies are rare. Further, food preferences are not immutable but are influenced by many factors. People's eating behavior is strongly shaped by information from popular culture and global information networks. For instance, traditional foods in Brazil have been replaced by mass-produced convenience foods.<sup>54</sup> Dietary surveys from India and China show that consumption of animal products, sugar, and fat have risen year after year for more than 20 years.<sup>55</sup> A closer look at consumption patterns in regions and countries is required

Figure 5: Per capita caloric intake in selected countries and average for low, low-middle, upper-middle, and high-income-level countries, 1961–2007



Average food intake is rising across all income levels.  
Source: FAOSTAT.

to understand the implications of agricultural production trends for health.

Much of what we understand about people’s diet in different countries is derived from food balance sheets produced by the Food and Agriculture Organization of the United Nations (FAO). The balance sheets calculate available calories per capita using agricultural production data, plus imports, minus exports. Nonetheless, data from agricultural production do not accurately represent food consumption, particularly in developing countries, where even basic data are incomplete, out of date, and do not properly account for home production.

Further, experts estimate that large amounts of food are wasted. In low-income countries, postharvest losses are a particular problem due to lack of adequate storage or transportation means, resulting in spoilage. The FAO estimates losses at the postharvest and processing levels of over 40 percent.<sup>56</sup> In higher-income countries, more than 40 percent of food is wasted at the retail and consumer levels, when consumers overpurchase groceries, restaurant portions

are excessive, and improper storage spoils food. In the United Kingdom, for example, 15 percent of all food—an estimated 20 million pounds’ worth—are wasted each year. The biggest losses are white bread and salad vegetables.<sup>57</sup>

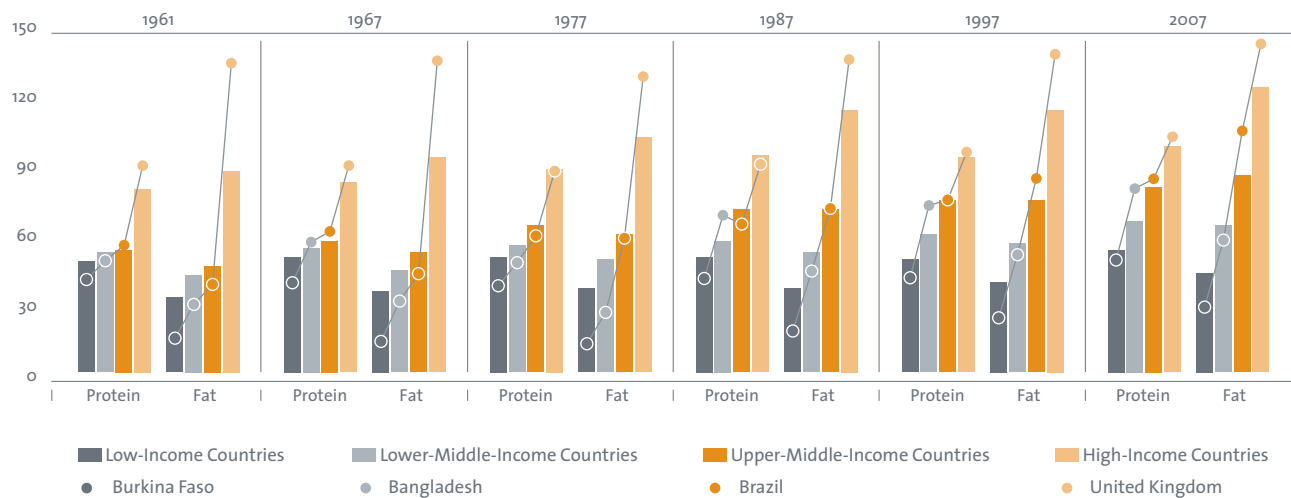
Despite these limitations, food availability data shed light on overall trends in global consumption. In many areas of the world, traditional diets based on local staples are gradually being replaced with increasing intake of fats, animal products, sweeteners, and processed foods. As shown in Figure 5, per capita calorie availability in low income countries has increased from 1,981 in 1961 to 2,180 in 2007. In high-income countries over the same period, it has increased from 2,760 to 3,229. In addition, diets have shifted from cereals and other staples to energy-dense (see Figures 6 and 9), nutrient-poor foods.<sup>58</sup> In China, Egypt, India, and Sub-Saharan Africa, increased caloric consumption has been driven by higher consumption of fats and oils, especially palm oil.<sup>59</sup> The types of protein people consume have shifted, with more poultry and red meat becoming available. At the same time,

levels of fruit and vegetable consumption are considerably lower than the recommended amounts for most countries where data are available.<sup>60</sup> Overall, consumption in a wide range of low- and middle-income countries has increased for foods high in fat, salt, and sugar, with the largest per capita increases in consumption of meat (150 percent), oils (112 percent), dairy (58 percent), and sugar (41 percent).<sup>61</sup>

Caloric beverages are an increasingly common way that people consume calories. In the United States, consumption of sugar-sweetened beverages—including soft drinks, fruit drinks, energy drinks, and vitamin water drinks—is common and, according to the American Heart Association, is the primary source of added sugars in the American diet.<sup>62</sup> Although less data exist on beverage consumption in the developing world, national surveys reveal growing demand. In Mexico, a twofold increase in sugar-sweetened beverage consumption occurred between 1999 and 2006,<sup>63</sup> with about 10 percent of Mexicans’ total energy intake from the beverages.<sup>64</sup>



Figure 6: Daily per capita protein and fat intake (in grams) in selected countries and average for low-, middle-, and high-income-level countries, 1961–2007



Overall protein and fat intake is rising across all income levels.  
Source: FAOSTAT.

### Meat Consumption Increasing in the Developing World

Livestock offers a range of services to the rural poor—serving as assets and risk management devices and providing nutrition.<sup>65</sup> Livestock products provide one-third of the world’s protein intake and are an important source of essential micronutrients, including iron, zinc, and vitamin A.<sup>66</sup> For many people at the bottom of the pyramid, increased meat consumption will signal a major achievement and pose no health risks. But the levels of meat production and consumption for many others in developing countries—and for the heavy meat consumers in wealthy countries—raise concerns about risks to both health and the environment. The current average meat consumption around the world is about 101 g per person per day, ranging from 47 g in developing countries to 224 g in developed countries.<sup>67</sup> Demand for meat has been on the rise, especially in the developing world, where annual per capita meat consumption doubled between 1980 and 2002.<sup>68</sup> Even among developing countries, there is wide variation. Animal-derived foods constitute 22 percent of daily caloric intake in Brazil and average only 7 to 8 percent in Sub-Saharan and North Africa.<sup>69</sup>

### Income as a Key Driver of Food Consumption

One of the most important food consumption drivers is household income. Analysis of the role income plays in food choice helps explain the current and expected rise in nutrition-related disease.

Households earning \$2 a day have limited dietary choices and concentrate on consuming a sufficient amount of food.<sup>70</sup> As household incomes continue to rise, people begin to consume a wider variety of agricultural products, such as meat, dairy products, fruits, vegetables, and edible oils. Once households reach income of \$10 a day, they often substitute packaged, processed, and luxury food items, resulting in diets that are high in saturated fats, sugar, and salt and low in fruits and vegetables.<sup>71</sup> This change in diet that accompanies changes in income levels is called the “nutrition transition.” Figure 9 shows the shift toward higher value and energy-dense foods that takes place as countries become wealthier. Increasingly, low-income nations can afford more energy-dense diets and are experiencing related dietary and disease patterns at much lower levels of GDP than those who





went through the nutrition transition two or three decades ago.

In middle-income countries, the nutrition transition is still in progress, with the income level a good indicator of its progression. The nutrition transition often serves as a harbinger of health transition. The health transition from infectious diseases to predominantly NCDs is well along in upper-middle-income countries such as Brazil, and visibly under way in low-middle-income countries. As these populations catch up with the developed world, societies at all economic levels are converging toward diets high in saturated fat, sugar, and refined foods and low in fiber.<sup>72</sup> Figure 8 shows steady increases in body mass index (BMI) for men and women in four countries.

### The Ambiguous Relationship Between Price and Food Choice

The degree to which the price of different foods influences the healthiness of diets is debated. It is widely believed that healthy food costs more to buy, and therefore a healthy diet is out of reach of many consumers. In high-income countries, this view is supported by economic studies that measure the nutrient content and

Figure 7 : Development transitions in health and agriculture: a country model

		stage 1 : Pretransition, Low Income	
		Data from: Burkina Faso	
 <p>Indicators of Health Conditions, Risks, and</p>  <p>Health Policy Context</p>		<ul style="list-style-type: none"> <li>• Pervasive undernutrition</li> <li>• High infectious disease burden</li> </ul>	
	NCD burden of disease	20%	
	Undernourished	9%	
	Overweight and obese	13%	
	5-year-olds stunted	44.5%	
	In poverty	56.5%	
	Per capita health expenditures	\$82 (PPP int. \$)	
	GDP spent on health	5.9%	
	Overall health system performance	132 ranking	
 <p>Indicators of Agricultural Conditions,</p>  <p>Food Systems, and Diet</p>		<ul style="list-style-type: none"> <li>• Smallholder and subsistence agriculture</li> <li>• Diet low in calories and micronutrients</li> </ul>	
	Population in urban centers	25.4%	
	Population employed in agriculture	92.03%	
	Agricultural value added per worker	\$181.00	
	Postharvest losses	7.62%	
	Government expenditure on agricultural research and development	\$6.8 million	
	Total available calories, per capita	2,677 calories per day	
	Meat consumption, per capita	88 calories per day	
	Cereal consumption, per capita	1,953 calories per day	

Countries across the development spectrum face risks of noncommunicable diseases.  
 Source: Country classifications adapted from Paarlberg.




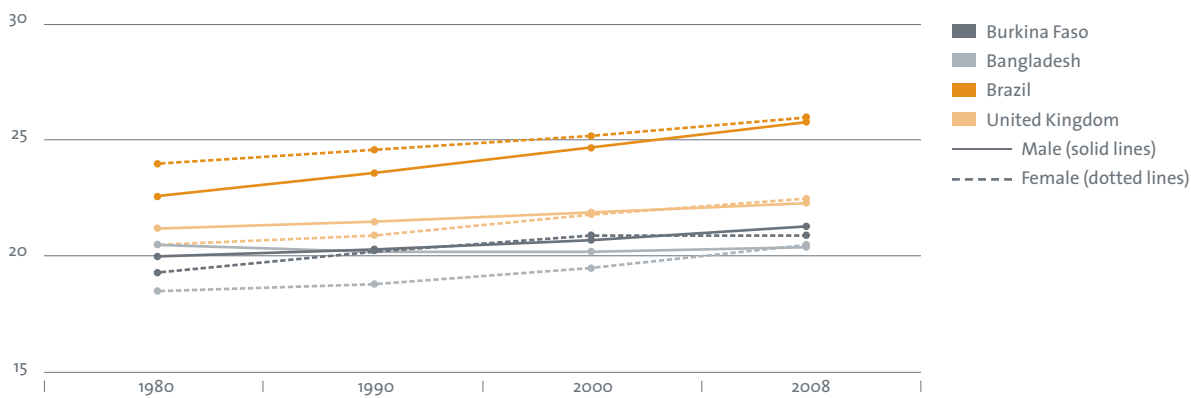
	stage 2 : Transitional, Low Income	stage 3 : Transitional, Middle Income	stage 4 : Completed Transition, High Income
			
	Data from: Bangladesh	Data from: Brazil	Data from: United Kingdom
	<ul style="list-style-type: none"> <li>• Malnutrition/dual burden</li> <li>• Rising noncommunicable diseases</li> </ul>	<ul style="list-style-type: none"> <li>• Pervasive overnutrition</li> <li>• Dominance of noncommunicable diseases</li> </ul>	<ul style="list-style-type: none"> <li>• High overweight and obesity</li> <li>• Diet and lifestyle-related disease</li> </ul>
	41%	64%	89%
	27%	6%	5%
	7.7%	52.8%	61.5%
	43.2%	7.1%	0.0%
	49.6%	5.2%	0.0%
	\$44 (PPP int. \$)	\$875 (PPP int. \$)	\$3,222 (PPP int. \$)
	3.3%	8.4%	8.7%
	88 ranking	125 ranking	18 ranking
	<ul style="list-style-type: none"> <li>• Smallholder farming</li> <li>• Transitional diets with little diversity</li> </ul>	<ul style="list-style-type: none"> <li>• Industrial and artisanal agriculture and fisheries</li> <li>• Diets high in meat and processed food</li> </ul>	<ul style="list-style-type: none"> <li>• Mixed farming with niche production</li> <li>• Abundant and diverse food supply</li> </ul>
	31.03%	86.75%	79.46%
	44.42%	10.41%	1.45%
	\$435.00	\$3,760.00	\$26,370.00
	6.74%	7.47%	2.10%
	\$34.2 million	\$584.6 million	\$432 million
	2,281 calories per day	3,113 calories per day	3,458 calories per day
	16 calories per day	372 calories per day	468 calories per day
	1,780 calories per day	955 calories per day	889 calories per day

Figure 8 : Male and female Body Mass Index trends in selected countries, 1980–2008



Higher average body size increases risks of noncommunicable diseases.

Source: *The Global Burden of Metabolic Risk Factors of Chronic Diseases Collaborating Group.*

cost of people’s diets. These studies find that the poor eat less nutritionally than others and that food cost is a barrier to eating better.<sup>73,74</sup> In the United States, fresh fruits and vegetables have been found to be more expensive than oils, fats, and sugars,<sup>75</sup> and more resistant to inflation.<sup>76</sup> Studies in the United Kingdom, France, the Netherlands, and Denmark show similar trends.<sup>77</sup>

However, the effect of food prices on diet varies enormously due to seasonable price volatility, changes in food availability over time, and quality differences.<sup>78</sup> In contrast to the above studies, a U.S. Department of Agriculture (USDA) study found that the real price of unsubsidized fruits and vegetables—controlling for season and quality—had fallen at almost exactly the same rate as the price of chocolate chip cookies, cola, ice cream, and potato chips over 25 years.<sup>79</sup> In addition, measures of cost must take into account that food preparation time for consumers is an increasingly important factor in choices between prepared and unprepared foods.

The importance of food price as a determinant of diet healthiness is even harder to pinpoint in developing countries. Both in times of food crisis and in normal times, the poor are clearly inhibited from

consuming an adequate diet; but in some rural contexts, the poor may have greater access to homegrown pulses and vegetables and consume less energy-dense food than better-off urban dwellers. In the developing world, starchy staples have been shown to be the cheapest sources of energy. Animal products, vegetables, and fruits can be from 5 to 100 times more expensive than less nutritious staple products.<sup>80</sup> In Bangladesh, the lowest-cost healthy diet for a family of five (based on recommended intake levels of micronutrients and macronutrients, protein, and fat, taking into account locally available foods) is unaffordable for 79 percent of Bangladeshi households.<sup>81</sup>

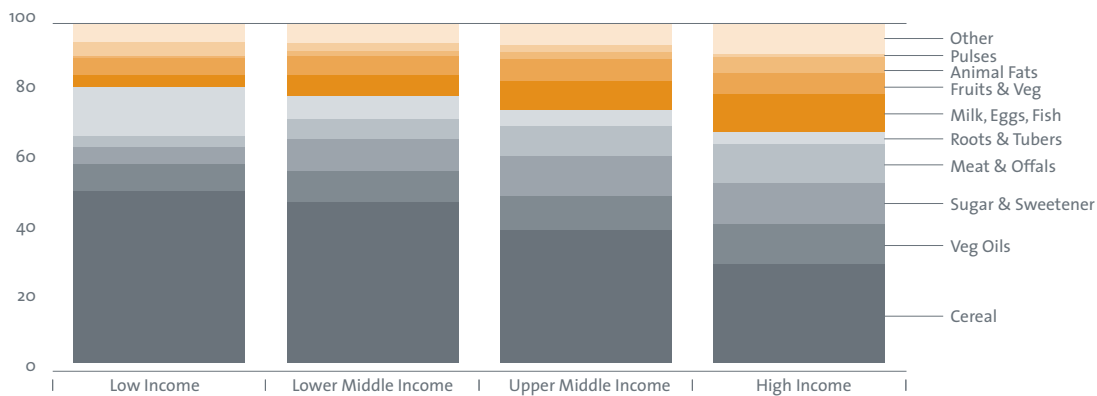
The results of a Save the Children pilot program in Tanzania pointed to marked seasonal variation in availability and price of goods, making certain items unaffordable for poor families without a steady income. Before harvest, household diets were less diverse because of limited food availability and higher prices. After harvest, dietary diversity increased because foods were more abundant and, therefore, affordable.<sup>82</sup>

### Food Consumption Driven by Behavior and Lifestyle Changes

Along with changes in income and price, diets are affected by where food is purchased and eaten, by attitudes concerning certain foods, taboos and religious teachings, biological components of taste that determine personal preference, changes in lifestyles, marketing, and the food environment. Demographic factors and household composition also play a role. Although the nutrition transition is not exclusively an urban phenomenon, living in cities strongly influences people’s food consumption behavior. The pace of urbanization has accelerated over the past century, and by 2050, 69 percent of the world’s population will live in cities.<sup>83</sup>

More sophisticated food production, distribution, and storage, as well as a greater penetration of imports and investments in food processing and retailing in urban areas, results in increased food availability and dietary diversity, with benefits to food safety, nutrition, and health. However, urban employment, including increased employment options for women, impacts lifestyle and incomes, with changes in eating behavior. Food preparation carries higher opportunity costs, and urban populations often lose connections to traditional fresh foods

Figure 9 : Share of dietary consumption in total energy consumption—by income level 2005–2007 (percent)



Dietary diversity increases with country income.

Source: FAO Statistical Yearbook.

and come to rely on what is readily available, often in the form of high-fat and salt “street foods.” The box on page 28 describes how street foods are an important source of cheap food for many urban dwellers but provide nutritional risks when left unregulated.

Increasingly, the ability to eat well away from home is a key determinant of health and nutrition in the world.<sup>84</sup> Food consumed away from home tends to be less healthy than food made at home.<sup>85</sup> But it can also offer consumers greater diversity and food safety. Within countries, the change in where consumers purchase food happens first in large cities and towns and then small towns. Retailers offer processed food in supermarkets and then add the full range of food items including semiprocessed (dairy products, meat, fruit) and fresh foods. In low-income countries, fresh fruits and vegetables are still bought mostly at open food markets and small produce shops, but competition encourages some small retail stores to upgrade and expand to offer fresh produce, as is happening in India.<sup>86</sup> Regulatory and consumer demands for standardization and quality are an important feature of modern food processing, especially for higher-value products.<sup>87</sup>

In sum, people everywhere are moving away from traditional diets. But two different outcomes are visible. For individuals who can afford it, consumption patterns have diversified to include both the healthy and unhealthy choices more widely available in today’s globalized marketplace. For those with fewer resources, diets have more often diversified to include only the unhealthy choices. One could say that diets are becoming “similarly diverse.” For instance, the number of fast-food chains is rapidly increasing in Russia, where demand is high because the fast food market is still relatively new and small, and the people are willing to spend more of their disposable income. In 1990, McDonald’s opened the first fast-food restaurant in the country. Now McDonald’s has 279 restaurants and Papa John’s Pizza has doubled its number of restaurants in the past year.<sup>88</sup>

### Agriculture and Food System Production Trends

Agriculture is undergoing a long-term structural change that began in the early twentieth century with mechanization and has slowly and only partially spread to developing regions of the world. Farmers began to utilize animals and then machines as substitutes for human labor. They found other ways to

intensify production, such as increased use of chemical fertilizers and pesticides. Both large- and small-scale farms that obtained modern technology and practices benefited from massive increases in productivity. The productivity gap widened between these farming operations and the poor and smallholder farmers of some regions, such as sub-Saharan Africa, who were left out of the transformation. By the end of the twentieth century, this bifurcated global agricultural production system began giving way to a wide spectrum of farming methods—still dominated by high-productivity, commercialized agriculture in rich and middle-income countries and low-productivity, labor-intensive, and subsistence agriculture in poor countries—but with growing diversification in farming models. The overall result is greater efficiency and expanding food production in many countries, such as Mexico and China,<sup>102</sup> but exclusion of small-scale farmers in some instances.

This wide range of farming methods that is replacing the bifurcated farm industry is especially apparent in Africa, where agriculture still predominates, providing two-thirds of jobs, one-fourth of GDP, and more than half of export earnings.<sup>103</sup> There, greater diversification in farming

## Street Food

Many people in the developing world are reliant on cheap and unregulated foods sold from street vendors and urban markets. Known as street food, these products have consistently been found to contain a high percentage of fats and sugars with little to no micronutrient content.<sup>89</sup> In the developing world, street foods are consumed by people of all classes and socio-economic status and represent the cheapest available source of food.<sup>90</sup> Street vending is also a central source of employment of urban poor populations, in some instances employing up to 25 percent of the labor force.<sup>91</sup> Local farmers and food producers are also supported through the street food market by providing vendors with wholesale raw food products. The interactions between actors involved in the production and consumption of street foods have created a fluid, but unique and sustainable, alternate food economy in many countries.

The variety and selection of street foods can vary dramatically depending on the country, region, and access to local agriculture inputs. Ready-to-eat foods consisting of cereals, starches, and corn-based products make up the majority of street foods purchased and consumed daily.<sup>92</sup> In a recent Beninese study, researchers found that cereals and cereal products contributed up to 42 percent of all street foods consumed by school children surveyed.<sup>93</sup> In Botswana, vendors reported that maize, meal, rice,

and sorghum were the most popular street food items sold.<sup>94</sup>

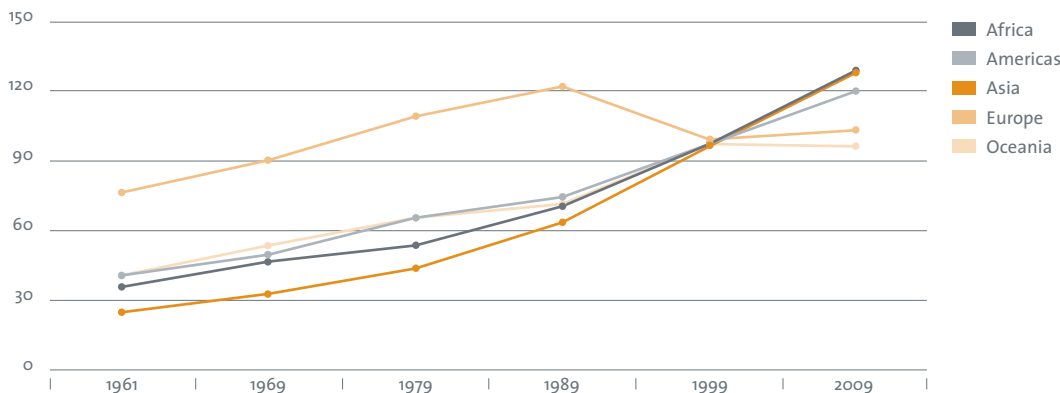
Street food vendors are very responsive to consumer preference. The majority of vendors located in the slum areas of Korogocho, Nairobi, offer only a single food group mainly consisting of cereals,<sup>95</sup> whereas vendors offer more expensive foods containing higher nutritional value to consumers working in the developed industrial regions of the city. Micronutrient-rich foods such as fruits are generally too expensive and are not considered stomach-filling by the urban poor.<sup>96</sup> Vendors located in the wealthier areas also offer multiple food groups, and “with proper combinations, street food consumers in the industrial areas could be able to obtain a healthy diet from street food vendors.”<sup>97</sup> Consumer tastes are very important. Participating mothers in a study evaluating the efficacy of nutrition rehabilitation centers in Ghana preferred street food for their children to the healthier food provided by the United Nations.<sup>98</sup>

Focus groups and interviews have revealed that vendors are generally aware that they do not provide nutritious foods, but only because it is what the consumer requests.<sup>99</sup> Likewise, children and adult street food consumers have stated that they would prefer more nutritious foods but are prevented due to the high price or the lack of availability.<sup>100</sup> It has also been proposed that street foods

offer an excellent opportunity for food fortification.<sup>101</sup> Vendors or suppliers could utilize fortified flour and raw ingredients that are commonly found in the most popular street food products. The addition of iron, vitamin A, or calcium to raw ingredients could benefit many populations who are reliant on street foods and deficient in specific micronutrients. Consumers require the nutritional knowledge to be able to choose which foods will satisfy their nutritional needs and vendors need to seek out these food items from their wholesale suppliers.

Food consumption is inherently linked with the lifestyle, culture, and economic status of the consumer. As urbanization and economic growth spread throughout the developing world, local populations will continue to seek out alternative sources of food. Street foods will continue to provide urban and poor populations with nutrition to fit their lifestyles, but whether they make a positive or negative contribution to health will ultimately be decided through active attention to what street foods can offer.

Figure 10 : Index of agricultural production by region, 1961–2009



Food availability increased rapidly in all regions of the world for 50 years.  
Source: FAOSTAT.

methods and of rural economic activities demonstrates many ways that agriculture can be competitive and sustainable. Recent research identifies more than 20 distinct farming systems in Africa, ranging from labor-intensive, and small-scale farms well suited for efficient production of fresh and biodiverse products for a local market, to industrial plantations producing for export markets, such as horticulture in Kenya.<sup>104</sup> Some argue that African agriculture has been “dynamic and adaptive,” with consistent growth in production, especially in North and West Africa.<sup>105</sup> Yet, most agriculture in Africa has not sufficiently modernized to keep up with increased food demand due to population growth. Cereal yields per hectare in Sub-Saharan Africa are only one-tenth as high as in Europe or North America, and the income of most smallholder farmers averages less than two dollars a day. The continent is importing more of its food than ever from other countries. Rapidly expanding and prospering urban populations in some cases have better access to imported food than to locally produced food, in areas where transport infrastructure and postharvest losses prevent food from getting to the market.<sup>106</sup>

Underlying trends in the agricultural sector hold the potential to affect health. The most important among those are

production, prices, technology, and trade. This section summarizes those aspects most relevant to health.

#### Increases in Production

Across regions, from 1961–2009, Figure 11 (page 31) shows growth in selected food groups during the same period by country income level. The present agricultural production system should be credited with making food more widely available and affordable to large portions of the world. Yet recent trends in food production, processing, trade, marketing, and retailing appear to be contributing to rising occurrence of diet-related NCDs around the world. Figure 10 shows the increase in aggregate agricultural production.

The commodities growing fastest for decades are oilseeds, followed by meat, and fruits and vegetables. World oilseed production increased by more than 610 percent between 1961 and 2009,<sup>111</sup> with growth driven by the top three oils: soybean, palm, and canola/rape seed.<sup>112</sup> Between 1961 and 2009, total global meat production grew from 71.4 million to 284 million tonnes—an increase of over 372 percent.<sup>113</sup> Global production of fruit and vegetables rose 332 percent, from 398 million tonnes to 1,606 million tonnes in the same period.

#### Increased Processing of Foods

Throughout the world, an increasing share of farm output enters the commercial food system, with multiple transformations of food and many actors intervening between farmer and consumer. In 2002, 610 percent of the \$4 trillion global food sales were in processed foods.<sup>114</sup> Processed food has become ubiquitous and presents both risk and opportunity for improving human health. Food processing includes activities such as canning, drying, fermenting, crushing, milling, packing, fortifying with nutrients and vitamins, and preserving via different additives. Food processing is as simple as cutting and canning foods, or as complex as industrial “ultraprocessing” that results in a more energy-dense product, often with added salt, sugar, and fat.<sup>115</sup>

Processed foods run the gamut from near-raw food stuffs such as prewashed and cut fruit and vegetables to packaged, frozen, ready-to-eat meals or the hot entrées consumers can get from street vendors or fast-food restaurants. Food processing is not necessarily harmful to health—it offers more food and greater dietary diversity to most people, with improved food safety, palatability, and nutrition.

## Agriculture and the Environment

As lower-income countries experience economic development and aspire to catch up with higher-income countries' levels of consumption, the agriculture and food system will need to provide increased quantities and quality of food. Yet the current modes of production compromise the earth's ability to produce higher quantities and quality of food into the future.<sup>107</sup> The food system's main impacts on the natural environment are greenhouse gas emissions and threats to biodiversity and habitat. For both of these, livestock production is a particularly strong driver of change.

The World Bank's World Development Report 2008: Agriculture for Development categorizes agriculture's effects on the environment accordingly to on-site (such as soil degradation), off-site (such as pollution and loss of biodiversity), and global (for example, greenhouse gas emissions). The extent of the challenges means that a range of actors operating in or influencing the food system shares a responsibility to manage and curb the effects of agriculture on the environment, including individual farmers and producers, agrifood business, government and international institutions, and civil society.

Other publications detail the relationship between environmental drivers and agriculture in more depth,<sup>108</sup> an analysis this report does not endeavor. These include the United Kingdom's Government Office for Science's Foresight Report on The Future of

Food and Farming, the International Panel on Climate Change's (IPCC) Fourth Assessment Report on Climate Change, the WDR2008, and the International Food Policy Research Institute's studies on Food Security, Farming, and Climate Change to 2050. However, climate change, land use and the availability of natural resources, and the boundaries of yield-increasing innovations pose a number of questions that must be considered in projecting the ability to produce nutritious food.

Some agricultural products consume more natural resources than others. Production benefits of different types of food need to be weighed from an economic, nutritional, and environmental standpoint. Clearing of tropical forests in Indonesia and Malaysia for palm oil production—a source of saturated fats—accounts for forest conversions, and loss of habitat for tigers, elephants, and orangutans.<sup>109</sup> Livestock production has increased substantially since the 1960s, with accompanying shifts in the amounts of available arable land, pastures, and forests.

A change in diet can positively impact the environment and the future ability to produce. A realignment of health and agriculture is an opportunity to move toward a more virtuous cycle in the interplay between environmental linkages, agriculture, human health, and nutrition that considers not only our ability to meet but to contain consumer demand for the most resource-intensive types of food.<sup>110</sup>

Consumption of highly processed food also poses health risks, if not part of a balanced high-quality diet.

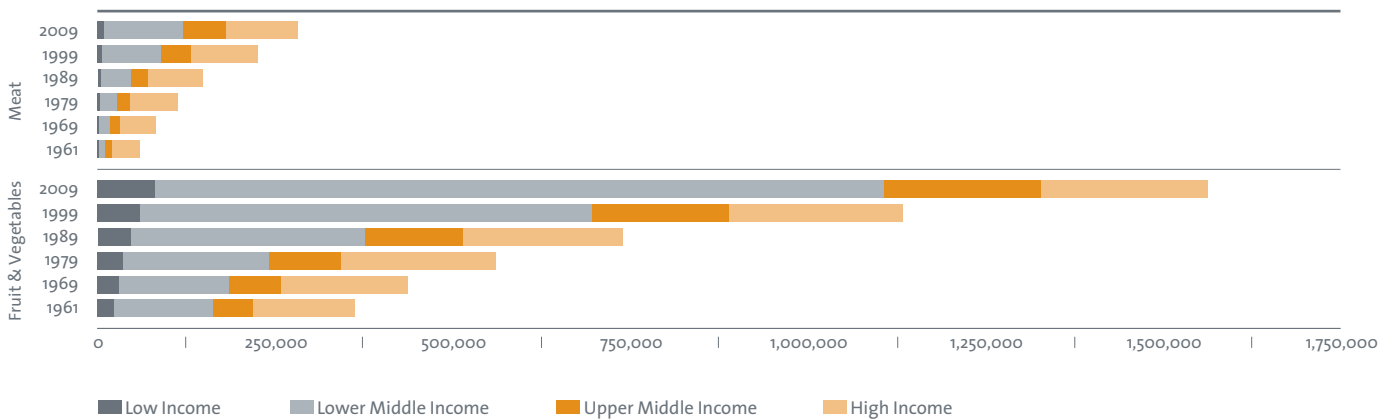
The structure of food processing activity in developing countries depends on a variety of factors, including the size and sophistication of primary agriculture, urban–rural linkages, and integration with global markets. Middle-income countries have been most actively processing food for export, but food processing for domestic consumption has developed rapidly in both low- and middle-income countries, with retail sales of packaged food increasing by 28 percent annually in low-middle income countries and by 13 percent per year in low-income countries between 1996 and 2008, much faster than in high-income countries.<sup>116</sup>

The integrated global food processing system has evolved to create tight links between farmers and consumers, however distant they are geographically. The transition is well under way as the global agrifood industry responds to rapidly increasing demand in countries at all stages of development<sup>117</sup> for high-value dairy products, meat, fruit and vegetables, and processed agricultural products.

Farmers stand to increase their incomes by 10 to 100 percent by participating in the modern food supply system, whether they are producing for export or domestic consumption.<sup>118</sup> In fact, the distinction is increasingly blurred in the food processing industry.<sup>119</sup> Small and medium-sized companies can prosper in these flexible and dynamic markets, allowing them to respond to logistical and market fluctuations, while still adapting to consumer demand for quality and safety. Compliance with the World Trade Organization's sanitary and phytosanitary standards can cost 0.5 to 5.0 percent of the value of their food exports, although it creates many jobs around smallholder farms.<sup>120</sup> Lettuce growers connected to modern processing in Guatemala have twice the farm size (average of two hectares per grower), 40 percent more education, and are twice as likely to



Figure 11: Global agriculture production of meat and fruits and vegetables by country income values, 1961–2009 (tonnes in thousands)



Agriculture production of high-value products has increased in countries at all income levels.  
Source: FAOSTAT.

have a truck and be near paved roads and belong to a farmer association.<sup>121</sup>

In spite of the income opportunities, smallholder farmers in low-income countries often struggle to participate in the modern agricultural supply chain. For example, high transport costs of up to 50 or 60 percent of the cost of getting their product to market in some African countries,<sup>122</sup> weak market information systems, and little ability to protect themselves from price fluctuations are challenging to poor farmers. Postharvest losses can range from 15 to 40 percent of their product from spoilage and deterioration because of these inefficiencies in marketing. To protect perishable foods, product handling, cold-storage facilities, and delivery speed need to be improved.

### Agricultural Policies Impact on Food Consumption

Agriculture is dynamic, and decades of support from governments in high-income-producing countries have drawn resources into favored subsectors, such as the “covered” commodities: wheat, corn, rice, pulses, grain sorghum, soybeans and other oilseeds, barley, oats, cotton, and dairy in the United States and most grains, dairy and meat, sugar, and

fruits and vegetables in the European Union. Depending on the types of policy support, farms producing these favored commodities also became very efficient. The net effect is that prices of their products are lower than they would have been without the long-term government support, although trade barriers in the United States and Europe have kept some farm prices artificially high.

Conversely, policies in developing countries have been used to place a wedge between farmers and consumers, usually to keep consumer prices low. In the short term, such policies can improve food security, although analyses show that the benefits tend to go to the elite in cities rather than to those who need them most.<sup>123</sup> In the longer term, agriculture-taxing policy has discouraged efficient development of the farm sector and has added to long-term food insecurity. Reforms have greatly reduced the unfavorable treatment of agriculture, especially in Africa. Countries with major agricultural exports have built infrastructure, and provided other support to develop semiprocessed and processed food industries.

As mentioned previously, a complaint popularized by the media about developed country agricultural policy is that it subsidizes unhealthy eating by supporting production of food and feed commodities.<sup>124</sup> Food prices are a result of complex market and policy dynamics over time that have increased production of specific commodities while generally leaving other commodities to market forces. The net effect of policies over a long period has undoubtedly been to increase production of favored commodities and to lower prices of those food items relative to what they would otherwise have been. Periodically, some commodities—such as corn in the United States and dairy in Europe—have been in surplus because of the influence of agricultural policies. Those products have found their way into the food supply directly to consumers and as ingredients into manufactured food.

The aggregate effect of policies on price varies across countries according to the types of policies employed, and looks different in the short term than from a long-term perspective incorporating dynamic market adjustments. Attention has largely been targeted at the agricultural policies of rich countries, such as the United States and countries in Europe,

where decades of support to agriculture have broadly increased research and development and other investments, and thereby raised productivity in agriculture and selectively supported program commodities. The resulting changes in farm gate prices vary across commodities. For instance, in the United States, farm gate prices for most vegetables have declined over the long run, while long-run price change for fruit at the farm gate is mixed.<sup>125</sup>

Fiscal crises combined with shifts in political and consumer interests are reducing the proportion of total government agricultural support in high-income countries and the number of commodities receiving support. Under pressure to liberalize trade, the traditional price supports in the United States and European Union are giving way to policies to help achieve conservation goals and to direct payments. This is partly because recent global food prices have been high enough to surpass the price targets that trigger government payments. Although price supports are an incentive to produce more, increasing amounts of support are being decoupled from volume produced, especially for grains. Average support to producers fell from 37 percent of gross farm receipts in 1968–88 to 30 percent in 2003–05.<sup>126</sup> By 2003–05, 28 percent of support for farmers in developed countries was decoupled from production volumes, thereby reducing incentives for farmers to overproduce.<sup>127</sup> In spite of these policy changes, the total amount spent by high-income countries—predominantly the European Union, United States, Japan, and South Korea—to support farmers rose from \$242 billion to \$273 billion between 2009 and 2010.<sup>128</sup>

Tracing the role of agricultural policies in food consumption is a work in progress. Debate continues between those who suggest a large role of agricultural policy in producing unhealthy food<sup>129</sup> and those who have concluded that agricultural policy has contributed to increased production of certain foods, not necessarily to overconsumption of those foods.<sup>130</sup> Some

health and consumer advocates further conclude that production of healthier commodities that have not received public support has been slower.<sup>131</sup> However, even in light of the large continuing subsidization of certain commodities, the farmer share of food expenditure in the United States is less than 20 percent<sup>132</sup> and, at least in the short term, policy distortions affecting farm gate prices are unlikely to have much effect on consumer prices. One study suggests that the European Union's Common Agricultural Policy did not harm nutrition in the European Union because it is designed to maintain high consumer prices on supported commodities. Therefore it concluded that policy is not likely responsible for increased energy intake in Europe.<sup>133</sup> More broadly, government policies that affect agricultural production opportunities, such as support for infrastructure and research, are more likely to have long-run effects on food availability, cost, and eventually consumption.<sup>134</sup>

#### **Food and Agriculture Trade Increasingly Global**

Price and access largely determine which agricultural products are purchased from international markets and which from domestic markets. International trade in agricultural products has risen steadily in the past five decades, and represents nearly 10 percent of total international trade. Global trade in higher-value products is rising, and many of these products, such as fruits and vegetables, are a part of healthy diets. However, conclusions about the overall effects of trade on healthy diets cannot be drawn from global analysis. Further research at the country level is required.

Concern that globalization is driving unhealthy diets leads some observers to view increased international trade as a culprit, especially in regard to bringing energy-dense and processed foods to the developing world.<sup>135</sup> These arguments tell only part of the story. Two other fast-growing components of domestic supply in many countries are production from foreign direct investment and operations

of transnational companies within the countries. These three factors—global corporate operations, external investment, and trade—combine to produce highly integrated global agricultural markets.

Food and feed crops from developed countries previously dominated the agricultural trade landscape, and developing countries' involvement in food trade was limited to meat exports and fruit and other tropical crops as a result of historical trading agreements. Gradual easing of farm subsidies in developed countries and partial liberalization of agricultural trade have allowed developing countries to increase their exports of a broader variety of agricultural goods in the last decade,<sup>136</sup> as well as continuing to import food. Net imports of food to developing countries is projected to increase almost tenfold between 1997 and 2030. Developing countries with year-round production have increased high-value exports in the past two decades. Fresh and processed fruits and vegetables, fish and fish products, meats, nuts, spices, and floriculture valued at \$138 billion now account for 47 percent of agriculture exports from these countries.<sup>137</sup>

#### **Growth in Agricultural Technology**

Technology in agriculture runs the gamut from mechanized equipment and animal traction to the development of genetically modified organisms. Since the Green Revolution in the 1960s and other investments in agricultural research, new seed and crop varieties have increased yields in developing countries and contributed to increased food availability.<sup>138</sup> Adoption of higher-yielding seeds has been slower in Sub-Saharan Africa, but many areas in the region are now planted with improved varieties. For example, while only 28 percent of maize area in Tanzania is planted to hybrid varieties, 80 percent of the maize area in Kenya has been planted with improved varieties, and more than half of the cassava crop area in Nigeria is planted with disease-resistant strains.<sup>139</sup> However, many barriers stand in the way of poor farmers accepting new technologies, such as

poor supply chains or lack of information about how to use new technology.<sup>140</sup>

The potential for environmental and nutritional benefits from indigenous foods is gaining attention from agricultural researchers.<sup>141</sup> And new research in plant and food science may demonstrate how protecting biodiversity in plant varieties will help maintain resistance to disease as well as offer greater nutritional diversity for consumers. Examples are the development of Golden Rice and orange-flesh sweet potatoes supported by global donors.<sup>142</sup> Progress in developing drought-, flood- or heat-tolerant varieties, which are especially important in Africa, has been slower, but recent advances in drought-tolerant maize, drought- and heat-tolerant wheat, and flood-tolerant rice are promising. They will become increasingly important because of climate change.

All of these trends signify that people in developing countries have a growing ability to purchase high-value nutritious products from both domestic and foreign producers—an ability that is already realized in middle-income countries and emerging in urban areas of low-income countries. Further trade liberalization could accelerate those trends.

## Linking Agriculture and Food Systems to Health

There is no good health without good nutrition, and good nutrition depends on agriculture. Nutrition throughout life—the consumption and absorption of food to support physical and mental growth and functions—is the critical link between agriculture and health. The diagram on page 34 (Figure 12) presents those linkages in a stylized way to illustrate the myriad influences of food and agriculture on nutrition and health. Many of these influences have been mentioned in earlier sections of this report, along with ways in which they affect either food consumption or production. Because of these many factors in the chain between agriculture and health, it is impossible to point to a single

or dominant entry point to leverage agriculture for improved health—many levers are available. Similarly, because human nutrition is biologically quite complex and influenced by many factors, it is impos-

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### There is no good health without good nutrition, and good nutrition depends on agriculture.

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sible to point to any single or dominant nutrient or food that determines good or bad health. Good policy and the dictates of human biology suggest that multiple policy levers and a diverse diet have the greatest likelihood of creating a healthy agriculture and food environment.

The trends described in the previous section—dramatically increased efficiency of food production and processing, changing policies and technology, and lower international trade barriers—attest to the agriculture and food system’s ability to evolve. Compared to agricultural systems of a century ago, today’s food and agriculture systems provide more and cheaper food and help to reduce poverty. Although further research is needed to define a clear causal relationship, shifts in the global agriculture and food system described above are associated with changes in health—both good and bad. This suggests opportunities exist for actors along the agriculture and food processing and transformation pathways to influence people’s consumption and nutrition.\*

As the agriculture and food system responds to trends in the twenty-first century, it should consider not only how to produce sufficient quantities of food at widely affordable cost, but also how to do so nutritiously. Innovations in the food system can be directed toward transforming the highly sophisticated agricultural capacity in the world today into a system that can support diverse and healthful diets.

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\* Primary production and processing also influence worker health, but this is not the focus of the argument in this report

Although global food production is projected to exceed demand by 44 percent in 2030 and by 49 percent in 2050,<sup>143</sup> maintaining current trends in agriculture would mean maintaining inequitable food distribution, unhealthy diets, unsustainable environmental threats, and unknown risks from climate change. For agriculture to help create a more salubrious future, the agriculture and food system must make better use of existing knowledge and technology, as well as invest significantly in the discovery and implementation phases of research into new technologies in developing countries. In addition, policy changes are needed in rich countries to alter the mix and destination of agricultural commodities, and in poor countries to reduce crop losses. Of particular importance to health is the production and availability of fresh fruits and vegetables, a neglected subsector in poor countries because it is often the purview of women, relatively small-scale, hard to mechanize, and not a major income producer for countries. An exception is a country such as Chile, which is a large producer of citrus fruit and often exports the fruit in a processed state. In rich and some middle-income countries, fruit and vegetable production is efficient, although still neglected by policy.<sup>144</sup>

The global agriculture and food system is already interacting directly with consumers to present a wider variety of dietary choices. Diversified food processing and delivery systems are prolific, but smallholders in low- and middle-income countries are also linking to markets. The new agriculture and food system includes both small-scale producers and global firms providing local food that fits the cultural and nutritional needs of a diverse population, as well as local farmers and distributors connected to a global food supply chain that delivers specialty and other high-value products to distant customers. As incomes continue to rise in the developing areas of the world, these changes are likely to spread.

Figure 12: Agriculture, food, and nutrition drivers affect health



Source: Adapted from Hawkes and Pinstrip-Andersen.

## Bangladesh



### A Snapshot of Agriculture and Health in Bangladesh

“I am from a rural area<sup>145</sup> in Bangladesh, and I have completed primary school.<sup>146</sup> I am 24 years old<sup>147</sup> and have two children.<sup>148</sup> I am employed in the agriculture sector,<sup>149</sup> and my annual income is equivalent to \$1,620.<sup>150</sup> Almost two-thirds of my household budget is spent on food.<sup>151</sup> Although I grow some of my own food, most is purchased from the market. There are times when I do not have enough food to eat.<sup>152</sup> I mostly eat rice, some vegetables and pulses, a little fish, and some fats. Occasionally, I’ll have milk, dairy products, or meat.<sup>153</sup> I have a 39 percent chance of developing high blood pressure<sup>154</sup> and a 26 percent chance of developing high cholesterol.<sup>155</sup> I am likely to suffer from communicable diseases during my life<sup>156</sup>, but I am more likely to die from a noncommunicable condition, such as heart disease.”<sup>157</sup>

This is the story of a typical person living in Bangladesh—a transitional, low-income country that is largely agricultural and rural, with some infrastructure development in place. Countries at this stage of economic development are transitioning from a diet that is insufficient in both calories and nutrients to one that meets basic energy requirements but still lacks dietary diversity and essential micronutrients. The burden of disease in these countries encompasses undernutrition and infectious diseases as well as overnutrition and related chronic conditions. Approximately one-quarter of the population in Bangladesh are undernourished and does not meet the minimum dietary energy requirements.<sup>158</sup> At the same time, noncommunicable conditions account for 40 percent of the disease burden in Bangladesh. The prevalence of NCDs is expected to rise, since an estimated 7 percent of the population is overweight, 10 percent has high blood sugar, a quarter has high cholesterol, and over a third has high blood pressure, all of which increases the risks of developing diet-related chronic diseases.<sup>159</sup>

Average incomes in Bangladesh are rising, and demand for higher-value products will follow.<sup>160</sup> Bangladesh has increased its food production, especially rice production, through irrigation and cultivating modern rice varieties. Fish, meat, and poultry production are rising fast, but not fast enough for the poor to be able to afford them.

Countries at this stage of development require continued investment in infrastructure to ensure that the majority of the population has access to roads, electricity, schools, and clinics. In addition, targeted public services are needed to reach underserved populations. Governments and donors can fortify food as well as provide feeding programs for the poor and offer technical assistance to smallholder

farmers to diversify their production to higher-value crops.

In Bangladesh, local and international nongovernmental organizations have led efforts to address agriculture and nutrition issues, often in collaboration with the government. The rural development organization BRAC (formerly Bangladesh Rehabilitation Assistance Committee) provides agricultural extension services to poor, rural populations in order to increase vegetable production and foster greater dietary diversity. Helen Keller International has been providing nutrition education and seeds to households for fruit and vegetable gardens. As a result, vegetable consumption among children in these households has risen by 60 percent.<sup>161</sup> These programs illustrate the possibilities for improving agricultural production to benefit farmers, improve diet, and potentially improve health outcomes.

The government of Bangladesh has developed a Strategic Plan for Surveillance and Prevention of Noncommunicable Diseases in Bangladesh, 2007–2010. The government has identified cancer, cardiovascular diseases, and diabetes as major public health problems and has included the prevention and control of major NCDs as an objective under the Strategic Investment Plan. These policy changes represent significant strides toward addressing NCDs. However, there are challenges to implementation, especially since the main focus of the public health sector and donor programs is on maternal and child health and communicable diseases. While there are some governmental and nongovernmental NCD programs in the country, they are mostly dedicated to specific NCDs and are largely focused on surveillance or treatment.<sup>162</sup> There is a need for a more coordinated response that emphasizes prevention.



## 2 | Bringing Agriculture to the Table

How agriculture contributes to health depends on the relationship between farmers and consumers. In premodern societies, they were one and the same. Over time, that relationship has been altered and, in most countries, become more distant. Modernization has engendered multiple transitions—epidemiological, nutritional, demographic, technological, economic, and environmental—that make it difficult to causally link changes in agriculture and food to changes in health conditions.<sup>163</sup> But agriculture forms the basis of what people eat and therefore influences human health.

The 21<sup>st</sup> century changes under way in even poor countries require the agriculture and food systems to innovate to provide consumers with appealing, convenient, and healthy choices. Many examples show it is possible, but a more concerted, energetic, and collective effort is needed.

In the last few decades, food systems have become more commercial, more global, and more complex. These developments have contributed to more affordable diets for many, if affordability is measured by cost per unit of energy or kilocalorie. This report looks at trends that reveal that healthfulness is not best measured by energy consumed, however, and it argues a food system should offer consumers a basket of food that constitutes a healthy, balanced diet. How to reach that goal is a challenge that involves a wide range of actors, each with its own goals and function in the food system but interlinked in the collective endeavor of food production and distribution.

The previous chapter described the key changes affecting agriculture and health over several decades. The following pages sketch a future vision for agriculture and food that asserts its centrality to human health in the modern era. Using the tools suggested here—the food value chain to identify how to produce greater social benefit from the food system, mutual metrics to provide indicators of progress that can be achieved by collective action, cross-sectoral and other partnerships to invent new programs and policies, and greater responsibility and transparency in food choices throughout society—the current trajectories of agriculture and food systems can be aligned to achieve better health outcomes.

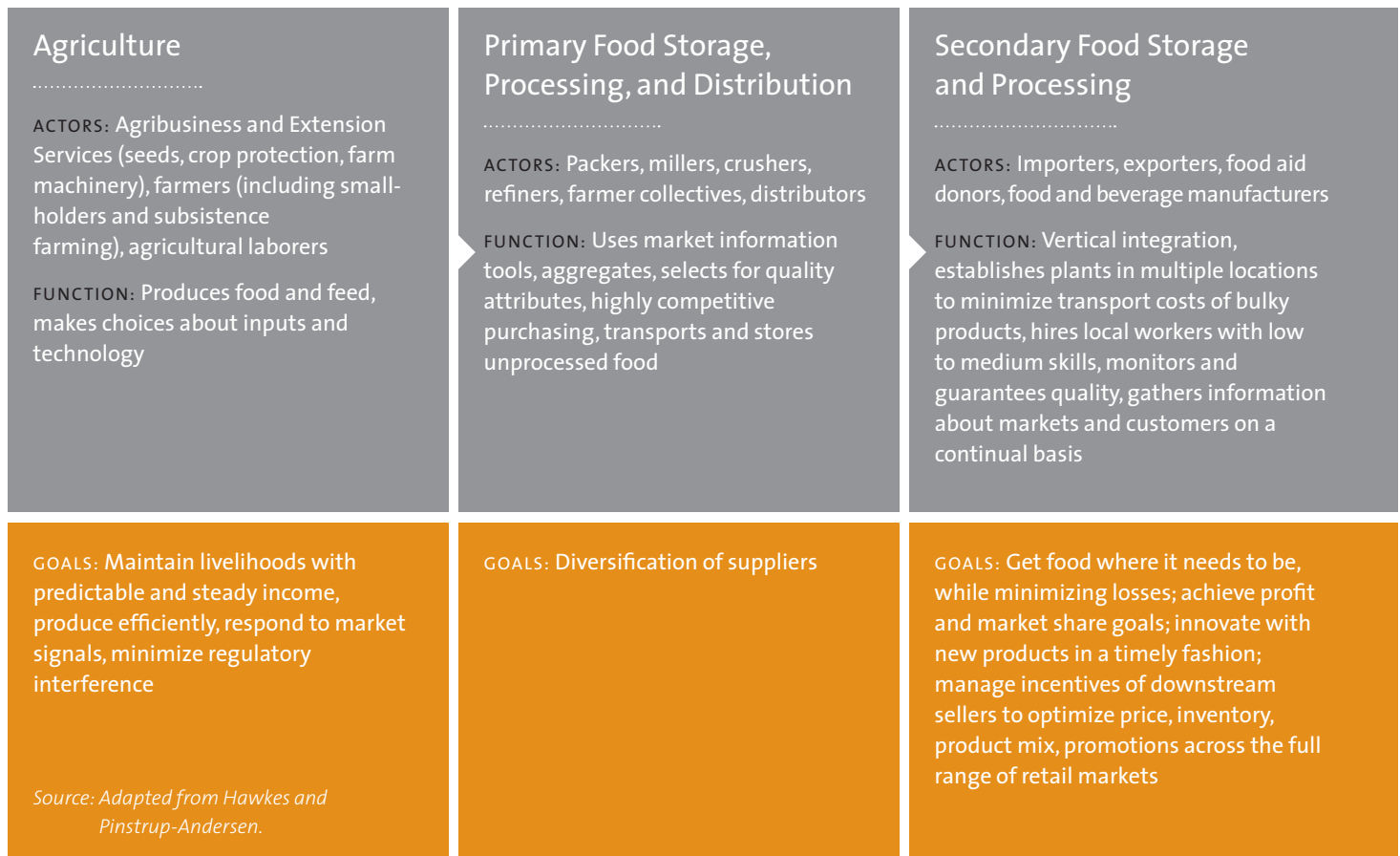
The agriculture and food system is capable of providing healthful food to people anywhere in the world. Some changes to link agriculture and food to better health are already being tried out by countries and private organizations. Farmers provide agricultural products directly to consumers as well as indirectly through processors to supermarkets, to small

bodegas in cities and towns, and even in roadside stalls in the poorest villages. For example, Walmart locally sources and stores vegetables that a vendor can sell on the streets of Lusaka, Zambia. The U.S. President's Emergency Plan for AIDS Relief provides tools and training to people with HIV/AIDS in Eldoret, Kenya, so they can grow food for their families and sell it in local markets for income. Danone's factory in Bogra, Bangladesh, developed a temperature-resistant nutritionally fortified yogurt that it now produces locally and serves to low-income children. These examples are still new and their impacts on health have not yet been rigorously evaluated,<sup>164\*</sup> but they offer the promise of a new relationship between farmers and consumers in the 21<sup>st</sup> century. More details are offered in boxes throughout this chapter.

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\* An exception is Finland where chronic diseases dropped dramatically following a multipronged intervention strategy and the results have been evaluated.

Figure 13 : Food supply chain



### Potential Impact of Food Aid on Nutrition and Health

Food aid reaches about 200 million people each year, largely through distributions from the World Food Programme and bilateral donors. From 2001 to 2003, food aid as a percentage of total food supply ranged from at least 5 percent in 19 countries, to 22 percent for the Democratic People’s Republic of Korea, to as much as 46 percent in Eritrea.<sup>172</sup>

While the majority of food aid is provided in response to short-term emergencies, the impacts of food aid may very well extend over the long-term, especially in regard to early childhood nutrition. In addition to providing relief from hunger during emergencies, food aid has contributed to lasting

improvements in child growth and development.<sup>173</sup> By ensuring that commodities not only provide sufficient calories but also the necessary nutrients, food aid can serve to meet early childhood nutrition requirements and potentially protect against chronic conditions later in life.

As the nutrition transition spreads to more areas of poor countries, food aid programs need to consider the risks of obesity and chronic diseases in the populations they are serving. Research from the Federated States of Micronesia has indicated that food aid programs have been one of the factors, albeit not the only factor, contributing to dietary changes from traditional

foods to refined and processed foods, which have in turn led to high levels of diet-related disorders, including vitamin A deficiency and chronic diseases.<sup>174</sup> The case of Micronesia is unique because food aid was provided over the long term through supplementary feeding programs, and a host of government policies also played a role in dietary and lifestyle changes. However, Micronesia does illustrate how food aid can have unintended negative health consequences, once again highlighting the importance of providing adequate food not only in terms of quantity, but also in terms of diet quality and nutrients.



## Food Wholesaling and Retailing

**ACTORS:** Street vendors, supermarkets, restaurants, fast food companies, public institutions (schools, prisons)

**FUNCTION:** Provides multiple venues for purchasing and eating food; creates new points of sale and packages of services and products

**GOALS:** Affordably provide people with what they want to eat at convenient and diverse locales

## Food Marketing

**ACTORS:** Advertising and communications agencies

**FUNCTION:** Chooses advertising and promotion, labeling, nutritional and health claims

**GOALS:** Maximize market share, company reputation, customer satisfaction

**Food wholesaling, retailing, and marketing:** these steps include delivering food to the final consumer and the advertising and information provided to consumers about food.

### Aligning Profitability and Good Nutrition

A normal production supply chain illustrates the choices made to satisfy business goals. It can shed light on the choices made in producing food that create value, such as higher yields, higher farmer income, or more benefits to consumers, and to show when and by whom those choices are made.<sup>165</sup> An enhanced version of a supply chain—sometimes called a **value chain**—reveals possibilities for achieving social, environmental, and health goals in the production process. The purpose of moving from a simple descriptive “supply chain” to a “value chain” is to allow analysis of the processes under way in each step and find points of leverage where greater value can be produced by the food system, either for private or for social benefit. In reality, using a supply chain to support improved health outcomes from the food system requires that actors in the chain be willing to negotiate with one another over how to produce those broader values, as well as to interact with consumers to balance nutritional goals with business objectives. It is not yet clear that the key decision makers in the public and private sectors will utilize this tool, but researchers and international organizations interested in broad social benefits are using value chains in agriculture to highlight possibilities for achieving gender, health, and environmental goals.<sup>166</sup>

Ultimately, food supply is heavily influenced by decisions made in the agrifood business sector. Because of their global reach, agrifood companies and wholesale suppliers are uniquely positioned to influence the types of food made available to consumers and, to an extent, price. For instance, some researchers are demonstrating the potential for agrifood businesses to have an impact on health and the environment with value chain analysis.<sup>167</sup> They point to opportunities

## From Farm to Fork: The Food Supply Chain

A useful tool for tracking how food gets from “farm to fork,” passing through the myriad food-consuming and -processing actors along the route, is the food supply chain. Food companies and other organizations that make and distribute products for consumers—whether food, cars, or vaccines—set up supply chains to manage the logistics of the process. An efficient supply chain produces greater income with fewer losses for the companies in the chain, as well as being responsive to the intended consumers. Figure 13 shows a generic food supply chain to illustrate the process of food production and the entities involved.

In the real world, each type of food has a distinct supply chain showing choices in the production and delivery processes. For instance, choices about primary processing, transportation, storage, and

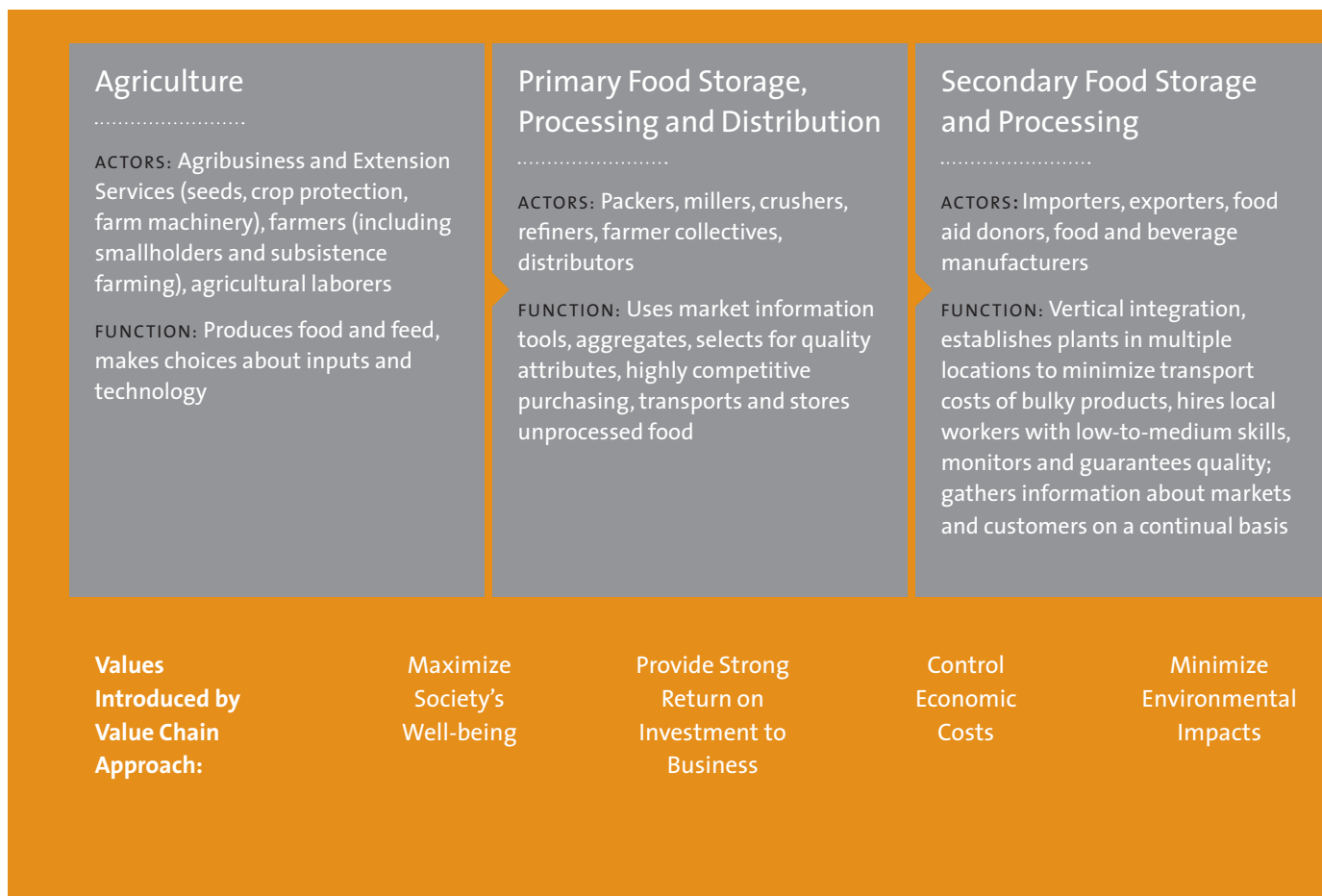
processing of a farm product are made along the supply chain and vary depending on the product, farm system, and other contextual factors. The supply chain depicted here is extremely simplified, but the following basic steps take place in farm and food production and delivery.

**Agriculture:** this step includes selecting and combining inputs (natural resources, technology, human effort) into crops, livestock, fish, or horticulture.

**Primary food storage, processing, and distribution:** these steps include moving agricultural products to storage and processing facilities, transforming them through crushing, milling, canning, etc., and delivering to intermediate or final consumers.

**Secondary food storage and processing:** this step includes manufacturing into food items that are typically packaged, uniform, and have a long shelf life.

Figure 14 : Incorporating values into food supply chains



to improve supply, stimulate demand, encourage multisectoral solutions to nutrition challenges, and address perceived trade-offs between the economic returns and nutritional benefits of food and agriculture. Figure 14 shows the food supply chain enhanced with “values” that may emerge from the food production process with additional analysis.

How and whether companies employ value chains will vary. Standard business practice militates against it with a focus on minimizing costs and producing greater profits as the perceived recipe for corporate success. Where this narrow kind of thinking is dominant, government regulation may be the only way to assure that businesses consider social, health, and environmental welfare in their practices and product choice. However, in other instances, industry action is motivated by

corporate social responsibility or, increasingly, a broader conceptualization of the corporate role in society’s well-being. This suggests that pursuing social benefits and increasing profits can be mutually reinforcing rather than mutually exclusive. Agrifood businesses, such as Walmart, Nestlé, and Unilever, are increasingly embracing the concept of “shared value,” defined as business practices that simultaneously advance economic and societal well-being.<sup>168</sup> Burgeoning corporate involvement to address global NCD problems reflect the same vision.\*

Several examples of companies that are leveraging their business objectives at different points along the value chain to improve nutritional outcomes are shown

\* See Medtronic support for the NCD Alliance, the Global Business Council, Novo Nordisk, and others.

in boxes throughout this chapter. While encouraging, these kinds of corporate ventures should not be accepted at face value as beneficial to nutrition and health. And they remain the exception. There is a range of approaches that companies may adopt in response to nutrition and health needs—from actively resisting change to aggressively developing new products and marketing better nutrition.

Decisions in the agrifood industry emerge from a complex mix of company leadership and goals, technology, competitive environment, and government policies. For example, nutrition strategies are at times developed and implemented or accelerated in response to government regulation. Following the 2006 U.S. Food and Drug Administration regulation that trans fat levels must be included on nutrition labels, the food industry sped

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## Food Marketing

**ACTORS:** Advertising and communications agencies

**FUNCTION:** Chooses advertising and promotion, labeling, nutritional and health claims

Ensure  
Worker Safety

Maintain  
Food Safety

Increase  
Food Security

Satisfy  
Consumer  
Desires for  
Multiple Food  
Attributes

up efforts to find substitutes to reduce trans fat content in foods. Similarly, in response to the 2005 U.S. Department of Agriculture dietary guidelines recommending increased whole grain consumption, the food industry, particularly cereal companies, began developing more whole grain products.<sup>169</sup>

Business strategies to address nutrition concerns also vary by market and geographic region. Companies respond to their perception of what sells and agri-food businesses seek to understand consumer behavior just as they seek to drive it. Businesses provide consumers with information to facilitate healthy choices, such as better product labeling, tips for healthy lifestyles, or recipe suggestions; alter products within an existing line, such as developing low-fat, low-sodium, or diet versions of a product; and reformulate

products by measures, such as removing unhealthy ingredients like trans fat from products. Fortification of commodities and staple foods with essential nutrients is another strategy, largely used in food aid or development.

The full landscape of business practices across countries is too diverse for further generalization, but both positive and negative encouragement from government and civil society will hasten a stronger industry sense of responsibility. The impetus for change can be driven by a number of factors: enlightened leadership, regulatory pressure, consumer demand, perceived market niches, etc. One example is the International Food and Beverage Alliance described in the box on page 44. It sets an example for corporate commitment to healthy nutrition in its products and improved transparency, and

it needs to continue those commitments. Conversely, some food manufacturers engage in well-documented practices to mislead consumers about the nutritional value of their products.<sup>170</sup>

Companies not yet demonstrating any commitment to improved nutrition and health should be challenged to do so by civil society and regulators. The industry role in better diet and health will become stronger with a level playing field that doesn't create competitive disadvantages for doing the right thing.

Companies may choose to pursue nutrition strategies independently or in collaboration with other stakeholders along the value chain. They may focus efforts on the total value chain within their purview or on one component. As companies move forward with various business models, their efforts will need independent evaluation and monitoring to demonstrate whether they are effective in increasing healthy choices and improving consumer health in the long term. Ultimately, any business strategies to improve nutrition and health will be guided by the bottom line. As one former agrifood business executive observed about nutrition, "You might do it for the right reasons, but if there is no bottom line, you won't do it."<sup>171</sup>

### The Role of Policy in Health and Nutrition

A range of sectoral and fiscal policies can be used to alter both production and consumption of food to encourage better health. Some measures intervene directly in the agricultural sector, but food policy, fiscal policy, and public health and food safety regulations can all play an important role. Finally, government can encourage voluntary private sector actions for social benefit. Specific country conditions dictate the feasibility of the policy mix across countries. Use of economic tools, such as taxes and subsidies, require strong institutions and fiscal capacity. Regulations, such as labeling, and marketing restrictions and information to improve nutrition, such as dietary guidelines, require expertise within and outside government and effective monitoring

## Dietary Challenges and Opportunities for Subsistence and Smallholder Households

In agricultural economies, where subsistence and smallholder farming is dominant, production has direct implications for diet quality. Subsistence farmers wholly depend on what they can produce or purchase in local markets, with limited means to achieve dietary diversity. Locally grown staples, largely cereals and starchy tubers, predominate in local diets.<sup>175</sup>

Subsistence and smallholder farming holds a great deal of potential, however—60 percent of the rural population in the developing world has good access to markets, with opportunities for smallholders to

diversify production to participate in new markets for nonstaple cash crops or newer high-value products such as flowers or fish, while improving the quality of the farm family's diet.<sup>176</sup> Opportunities also exist to capitalize on local products that are rapidly being taken up as specialty health items in the developed world—such as quinoa and the acai berry. Unanticipated consequences of market growth can also impact diets. In the case of quinoa,<sup>177</sup> an expanding market raised prices locally in Bolivia, making it harder for the local people to maintain their diet.

vegetable production; integration of “secondary” crops such as millet, sorghum, pulses, and root crops into farming systems; and education and awareness campaigns to celebrate and promote local foods. Supporting production and distribution of a greater variety of local foods could improve dietary diversity and accessibility in emerging agricultural systems. Moreover, the development community's advocacy for local and regional purchase of food assistance<sup>183</sup> could present new market opportunities for nutrient-rich, locally grown foods (see box on page 38). Examples in boxes on page 42 and 43 show how agricultural development can promote better nutrition and health. Domestic policymakers in Stage 1 countries should concentrate on economic and trade policies that allow diets to become more diverse.<sup>184</sup>

In developed and middle-income countries that can afford them, subsidies for public goods that favor certain commodities can help make those products more affordable.<sup>185</sup> Stage 2 and 3 countries can improve nutrition and health, for example, with investments in transport and storage facilities and training to increase food quality and reduce postharvest losses of fresh fruits and vegetables.

Although opportunities highlighted can be considered for all countries at any stage in development, the steps suggested might be especially feasible in low- and middle-income countries where agriculture and food systems are in the process of modernizing and the effects would be greatest.

The previous chapter showed the difficulty of ascertaining the long-term effects of agriculture and nutrition policies on food price and consumption. Making a causal connection to health is yet more difficult.<sup>186</sup> This section suggested policies for agriculture that in the long run can shift resource use and commodity mix toward more healthy food. Still, the effect of those changes on diets and health will depend to a very large extent on choices

and enforcement. In poor countries with less capacity to make and enforce regulations, food policy may largely consist of food safety rules, with nutrition goals carried out through direct food subsidies to consumers where affordable. In those countries, additional policies supported through agricultural development programs will be critical.

### What Can Agricultural Policy Do?

The current combination of global financial conditions and global policy attention to NCDs provides an opportune moment in the United States and European Union as well as middle- and low-income countries to guide agricultural policy toward meeting broader goals, including nutrition and its health consequences.

Farm policy debates in the United States have increasingly focused attention on the effects of agricultural policy on obesity and nutrition-related chronic diseases. Change has been slow but the

pressure is building.<sup>180</sup> Although nutrition programs receive almost half of the spending allocated in the 2008 United States Farm Bill, consumer groups are calling for greater policy support for fruits and vegetables and healthy eating programs.<sup>181</sup> Specific recommendations include programs to protect fruit and vegetable farmers from natural disasters in a manner comparable to programs that are available for farmers producing major commodity crops such as corn, soybeans, and wheat; increased data collection on fruit and vegetable prices and yields; loan and conservation programs aimed at fruit and vegetable producers; and better targeting of nutrition programs for healthy child feeding.<sup>182</sup>

Agricultural development programs in low-income Stage 1 and 2 countries can incorporate health and nutrition needs in a variety of ways. Examples include investments in improved postharvest technologies; research on indigenous

made by food processors and manufacturers, and a different set of policies is needed to influence those decisions.

### The Track Record on Regulations to Improve Nutrition

Effective and affordable interventions have been identified by health experts to prevent diet-related NCDs, improve health outcomes, and slow future health expenditures. These policies are focused on influencing consumption, and include government programs to encourage fruit and vegetable consumption, regulations to improve nutrition labeling, and advertising restrictions on unhealthy foods directed at children.

Most research suggests that a combination of interventions would be the most

cost-effective way to improve nutrition.<sup>187</sup> One estimate shows that a prevention package including mass media campaigns, food taxes, subsidies, labeling, and marketing restrictions to address unhealthy diets and physical inactivity would range from an annual cost of US\$0.35 per person in India to US\$0.99 per person in South Africa.<sup>188</sup>

Policy measures aimed at food manufacturing include voluntary or mandatory reductions in salt and trans fat content of foods and limitations on sales and marketing of high-sugar products to children.<sup>189</sup> Policies such as these have been adopted and implemented to various degrees in several countries. A growing number of countries has imposed voluntary or mandatory restrictions on certain

dietary components and advertising of certain foods. Most have been developed to address single ingredients in processed food products, particularly salt and trans fat. For example, industrially produced trans fat—usually found in processed foods, spreads, and frying oils—increases the risk of developing cardiovascular disease and diabetes.<sup>190</sup>

Denmark restricted the content of trans fat in foods starting in 2003, and by 2006, industrially produced trans fat was almost eliminated from the food supply and consumption was down to an average of less than 1g a day per person. Starting in 2005, Canada began mandatory labeling of trans fat and encouraged the food industry to use healthier fats as replacements. The government also

## Malawi: The Power of Tomatoes

### Shifting from Subsistence Production to Smallholder Cultivation for Healthy Consumption and Commerce

Agriculture is an important sector in Malawi because it employs about 87 percent of the population and comprises 40 percent of the country's gross domestic product. Reliance on the sector means that pressure from climate change, the loss of labor due to disease, and weak policies pose a serious threat to people's income and food security. Oxfam has been working for over 20 years in Malawi, particularly with smallholder farmers, to ensure that poor people have food and income security.

With initial support from Oxfam, the farming village of Mnembo pools its labor to harvest and sell farm products in bulk. In addition to bigger and better maize harvests, the newly irrigated land enables the community to diversify and grow cash crops. They now grow wheat, rice, and tomatoes.

Tomatoes are the most profitable crop. The community harvests twice a year and sells as a cooperative to the Mulanje Peak Foods Canning Factory (which sells canned tomato juice and tomato puree in supermarkets throughout Malawi). Last year, with no support from Oxfam, the community harvested over 100,000 tons of tomatoes profitably.

“When I was growing up, agriculture was not as advanced as it is now,” says Leyla Kayere. “We didn't know anything about irrigation. We only used to grow cassava and millet—to eat, not to sell. I couldn't live without tomatoes now. When you cook without them, the food tastes awful.”

—Taken from: Oxfam

Author's note: Tobacco is the largest cash crop and a major component of the national economy in Malawi. It is also a major driver of chronic disease that diverts agricultural production from nutritious, risk-reducing food

crops. FAO has begun to investigate how a reduction in smoking to prevent chronic disease would impact the national economy. The Oxfam project demonstrates the need and potential to develop production of fruit and vegetables. Tobacco production is an economic mainstay in many developing countries and presents a stark conflict between agriculture and health goals that requires high-level response. Donors and international organizations should work with leaders of those countries to find alternative economic opportunities for farmers that don't harm the long-term health of populations.

## International Food and Beverage Alliance

The International Food and Beverage Alliance (IFBA) is a group of global food and beverage companies that organized in response to the World Health Organization's Global Strategy on Diet, Physical Activity and Health. The IFBA formed in 2008 with a letter to the World Health Organization signed by the CEOs of General Mills, Kellogg's, Kraft, Mars Inc., Nestlé, PepsiCo, Coca-Cola Company, and Unilever committing to support strategy in five areas for five years:

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### **Product Composition and Availability:**

Continue to reformulate products and develop new products that support the goals of improving diets.

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### **Nutrition Information to Consumers:**

Provide easily understandable nutrition information to all consumers.

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### **Marketing and Advertising to Children:**

Extend responsible advertising and marketing to children's initiatives globally.

---

### **Promotion of Physical Activity and Healthy Lifestyles:**

Raise awareness on balanced diets and increased levels of physical activity.

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### **Partnerships:**

Actively support public-private partnerships that support the WHO's Global Strategy on Diet, Physical Activity, and Health.

Although established in anticipation of increased government scrutiny and regulation, the IFBA is an example of cross-industry and cross-sectoral collaboration to achieve balanced diets. Its membership base, with a combined 2010 revenue of over \$350 million, has the potential to change the way business is done around the world. Progress is not tied to specific targets, but the IFBA reports publicly through its members' annual reports and directly to the WHO. It also undertakes independent surveys on member companies' health and nutrition initiatives and engages auditing services to monitor and report on members' compliance with specific pledges. However, simply forming a public relations alliance is not sufficient. The IFBA members must actively promote IFBA goals within their own professional associations, such as the American Beverage Association and the Grocery Manufacturers Association, both of which spend substantial sums to avoid nutrition and health regulations.

Taken from: International Food & Beverage Alliance

committed to monitoring and publishing the food industry's progress, and the media played a role in raising awareness of the issue. The trans fat content of foods was significantly reduced using healthier fats as replacements, and research has indicated some reduction in trans fat intake as well. Efforts to reduce trans fat content in Argentina began with an inquiry to assess whether agricultural production and the fats and oils industry could develop and supply enough healthy oils as replacements. The efforts were successful, and there was an increase in healthy alternatives on the market. As small companies began reformulating their products, and press coverage about trans fats increased, larger companies followed. As a result, there was a 40 percent reduction of trans fats in the food supply.<sup>191</sup> Russia's national strategy on NCDs includes a health education component, as well as regulations on food processing, packaging, and labeling.<sup>192</sup>

Countries across several WHO regions (Europe, Americas, and Western Pacific Region) have implemented programs to reduce salt consumption. Most of the programs have been led by government and include clear targets for individual daily salt intake, population-level communication campaigns to reduce salt, and industry involvement to reformulate foods. Most also relied on voluntary participation rather than mandatory legislation to implement their targets. Five countries—Finland, France, Ireland, Japan, and the United Kingdom—have shown reduced salt intake, reduced salt content in foods, or shown increased public awareness about salt consumption. In one instance, the French government requested that the food industry reduce the amount of saturated fat, sugar, and salt and increase the amounts of complex carbohydrates and fiber content in their food products. A number of companies have been willing to cooperate and are beginning to make changes, such as reducing the amount of salt in bread.<sup>193</sup> These initiatives, too, were largely government led and included public awareness campaigns, labeling, and product reformulation.<sup>194</sup>

Voluntary policies to add nutritional information to food labels have sometimes proven effective. For example, the United Kingdom developed a voluntary labeling scheme to better identify the fat, saturated fat, sugar, and salt content in food. The “traffic light label” on the front of packages indicates whether food products have high (red), medium (yellow), or low (green), content of these ingredients. As manufacturers and retailers adopt the scheme voluntarily, the system encourages consumers to purchase healthier products. Food companies are now reformulating their products to allow them to receive a healthier color code. For example, a baked chicken dish with three red signals was reformulated to reduce the amount of fat and salt in the product, leaving it with one red signal.<sup>195</sup> In Sweden, a national program introduced a keyhole symbol in 1989 to identify foods with reduced fat, sugar, or salt and with greater fiber content than other, similar foods. The voluntary labeling program encouraged companies to alter their products, by such changes as introducing more low-fat cheeses into the Swedish market. These public-private partnerships demonstrate that government and industry can sometimes work in tandem to achieve nutritional objectives.

Providing opportunities for public and private actors to identify mutual objectives and complementary strategies for agriculture, food, and industry policies and practices can be a powerful step forward to improving nutrition. These are important changes, but not sufficient and certainly not easy.<sup>196</sup> They need to be underpinned with scientific and product-specific research and coordinated with nutritional needs of population and special target groups, such as children and the poor, and they require cooperation between the public sector and industry, along with strong public awareness and support, in order to be successful.<sup>197</sup> Voluntary strategies—on the part of both food seller and food buyer—may not go far enough. There is a danger that such actions create the perception of

action without really changing consumer choices or behavior.

More aggressive policy actions are often suggested by consumer and civil society groups.<sup>198</sup> The most popular are taxes aimed at “unhealthy” food and beverages, along with mandatory limits on marketing and stronger labeling requirements. “Fat taxes” are a popular solution to obesity-related health problems in both developed and developing countries, promoted all the more because they actually produce revenue for governments. “Thin subsidies” are supported by some economic research as more effective but require government expenditures that are

not feasible in many countries.<sup>199</sup> There is not much actual experience yet with fiscal policies aimed at changing the mix of what people eat, especially in developing countries, and economic analysis is not definitive about how much change in consumption can be expected from increases in prices of high-fat or sugared foods or decreases in prices of fresh fruits and vegetables.<sup>200</sup>

## The Role of Consumers in Improving Diets

Consumers everywhere need to be encouraged to take responsibility for the health of their diets and to indicate clearly to food producers and manufacturers

### Danone—Value Chain and Product Innovation

Groupe Danone, a French multinational corporation, produces goods ranging from mineral water, to food products, to advanced medical nutrition, with 45 percent of its business located in the developing world. As part of its strategy to build the company’s emerging market portfolio and expand sales in an undeveloped market, it entered into a joint venture with Grameen Bank in 2005 to establish Grameen Danone in Bangladesh. Danone set up a factory in the northern city of Bogra to produce yogurt fortified with vitamin A, iron, zinc, and iodine to meet the dietary needs of undernourished Bangladeshi children. The venture was uncharacteristic of the corporation. The Bogra facility produces only one-hundredth of what other Danone plants do. The simple, low-cost model is adapted to available infrastructure and local capital—simpler recipes require less skilled labor and less complicated inputs and result in a more affordable product for the local market. Danone’s business model in Bangladesh is not profit-driven at this stage. The company

hopes to break even and will reinvest any profits into similar socially driven initiatives. Operating in a bottom-of-the-pyramid market has resulted in unexpected product innovations that could help the company expand its customers beyond the 5 to 10 percent of consumers in the developing world it currently reaches—typically the richest households in these areas. In Bangladesh, Danone discovered an enzyme that preserves fresh milk, unrefrigerated, for up to four hours—solving a cold storage and product distribution problem in this developing country that could be applicable elsewhere.

Taken from: Barbara Kiviat, “Danone’s Cheap Trick,” *Time.com*, August 23, 2010

Helen Coster, “Danone and Grameen Bank: Partners in CSR and Marketing,” *The CSR Blog*, May 21, 2010

that they want healthy choices. But they are entitled to reliable information about the health effects of their choices, as well as supportive government policy and responsible and transparent private sector actions. In short, consumers have a right to a healthy food environment.

Consumers can demand greater transparency concerning the content of food.

Industry has at times promoted the fallacy that its decisions are simply based on consumer demand. Indeed, consumers as a whole are a primary influence on industry behavior, but that doesn't mean that individual consumer needs are being adequately supported or encouraged. Individual consumers often find they have limited food choices, especially for fresh and nutritious food.

Alarming, consumption trends are moving in the wrong direction. Growing income, increased eating outside the home, and other lifestyle changes have shifted diets in low- and middle-income countries toward meat, dairy products, fats, and oils. Easier access to packaged and processed foods is also the norm. These trends pose significant risks in developing countries where health

## Walmart: Building Health and Nutrition into Value Chains

Walmart's potential influence on diet and commerce is immense, with more than 8,700 retail facilities under 59 different banners in 15 countries. Under a new, five-year nutrition charter, launched in January 2011, the company is altering its way of doing business in order to provide healthier food while still enabling the company to meet its bottom line of profit. The five-pronged, U.S.-based initiative commits Walmart to provide healthier and more affordable food choices. Key elements include reformulating everyday packaged food items, making fruit and vegetables more affordable, developing a simple front-of-package nutrition information seal, providing solutions to address food deserts in underserved communities, and increasing charitable support for nutrition programs.

In 2008, consumer research indicated that Walmart customers desired healthier but affordable and convenient food choices. To meet these new consumer demands, Walmart is reducing sodium, sugars, and trans fat within key products in its own private brand and is collaborating with top suppliers along its value chain to reformulate some of the top national brands Walmart retails. By 2015, it aims to reduce sodium by 25 percent

and sugar by 10 percent in key products and remove industrially produced trans fat in all packaged food items it sells. Walmart expects to identify healthy options in its own branded food with a front-of-the-package seal, which it will also offer to qualifying suppliers. At the same time, Walmart is attempting to address the high cost of produce by adapting centralizing sourcing of fresh fruits and vegetables. Walmart is seeking to "buy big and buy local" by working with farmers to increase production of specialty crops and try out new crops in an attempt to "re-regionalize" production systems. Through these new supplier relationships, Walmart aims to cut dollars out of the value chain and pass the savings—and nutrition in the form of locally sourced produce—to its customers.

There are risks and challenges inherent in changes to "business as usual." Coordinating with actors along its value chain is a strategy for Walmart to diminish risk as customers adjust to new tastes of reformulated products. As Walmart's products change, so will a number of other familiar brands its customers are accustomed to. The company will track changes and sales and meet regularly with suppliers to discuss progress. In order

to locally source produce, Walmart is working with the USDA to support co-ops and product-washing stands that will enable local small growers to meet the necessary safety and quality standards to enter into the company's sophisticated supply chains. There is also a threshold for the changes Walmart will make—if customers respond negatively to reformulated products or don't buy new produce offerings, the company will adjust to maintain profits. And its suppliers and producers will likely respond in kind.

Taken from: "Walmart Launches Major Initiative to Make Food Healthier and Healthier Food More Affordable," Walmart press release, January 20, 2011

Tres Baily, Senior Manager of Agriculture and Food, Federal Government Relations, Walmart



systems are not well prepared to diagnose and treat NCDs. As concerns about the consequences of unhealthy diets spread, there are signs of change, including growing interest in healthy eating, along with greater efficiencies in supply chains for fresh and small-scale production. But demand for healthy and sustainably produced food is still in nascent stages and predominates among higher-income people.<sup>201</sup>

### “Mutual Metrics” and Other Mechanisms for Cross-Sectoral Collaboration

One of the new challenges facing the agriculture and food sector is how to establish political processes for bringing together different sectors in government and society to solve complex problems. Whether in rich or poor countries, health outcomes are heavily influenced by decisions taken in other sectors and greater attention is needed to the consequences of those links.<sup>202</sup>

As discussed earlier in this report, the agriculture and health sectors have limited opportunities to work together at all levels—local, regional, national, and international. Far better mutual understanding is needed in order to have the private sector, government policy, and individual consumers making policies and choices that support both agriculture and health and avoid working at cross purposes. A good place to start is with organizations that already pursue objectives in both agriculture and health sectors—including national governments responsible for setting priorities across ministries and sectors, bilateral and multilateral organizations with cross-sectoral programmatic missions in development, philanthropies working across sectors, and agrifood research and development companies. These organizations, working together and individually, can examine current practices and develop new ones that begin to take cross-sectoral impacts into account. The food value chain is a tool for such examination. Setting and measuring progress toward stated *common* targets is another.

One way to make the link more apparent is to agree on “mutual metrics” that indicate the status of key conditions affected by both agriculture and health. Mutual metrics are progress indicators that can be shared by the agriculture and health sectors. They suggest that those sectors have some overlapping objectives and can potentially align policies and practices. Additionally, agreement on mutual

metrics can be used to bring greater cooperation and understanding to these issues between public and private sector actors. Organizations working in both agriculture and health can select indicators to measure progress toward and signal what each sector contributes. For instance, they can select the volume of fresh fruits and vegetables delivered in a timely fashion to consumer markets or the

### Archer Daniels Midland: Helping Smallholder Farmers

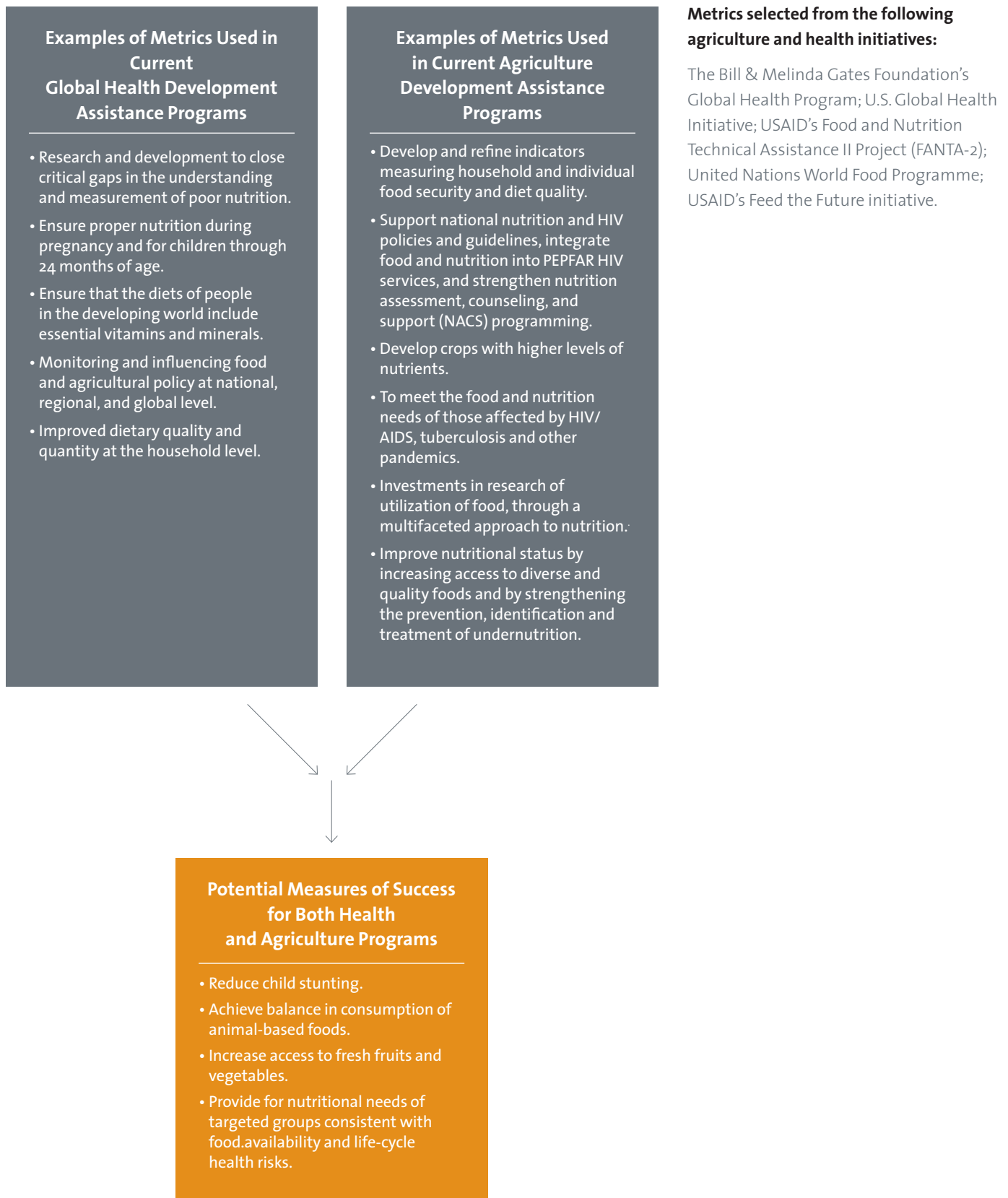
A recent FAO study reports that 1.3 billion tons, or roughly one-third, of food produced for human consumption is lost or wasted every year.<sup>178</sup> Food losses in developed countries are 10 to 20 times as much as food losses in developing country regions, but both are substantial.<sup>179</sup> The Archer Daniels Midland (ADM) Institute for the Prevention of Postharvest Loss at the University of Illinois at Urbana-Champaign was founded as a corporate social investment of ADM to help preserve the millions of metric tons of staple crops lost to pests, mishandling, and other factors. This new institute engages in education, research, and outreach functions including promoting technological advancements and improvements in supply chains and establishing a Web-based clearinghouse and resource center on postharvest loss data. The institute works to help smallholder farmers in the developing nations, which lack infrastructure, technology, and training needed to prevent spoilage and waste. In announcing the investment, ADM chairman, CEO, and president Patricia A. Woertz noted the scant amount of agricultural research devoted to postharvest handling and infrastructure. The institute aims to be a leading research hub for preserving the global harvest of corn, oilseeds,

wheat, and rice. ADM has made other investments in developed countries to improve storage along their supply chain, including a grant for a pilot project in India to establish a farmers’ cooperative and build a grain bin. The investment addressed a problem the company encountered along its supply chain—inputs from crops ADM hoped to process were often stored exposed in burlap sacks. Left to the elements, they became unusable. While ADM’s work focuses on cereals, the main input for its processing business, fruits and vegetables are particularly vulnerable to spoilage and waste. Improving storage and distribution of highly perishable, but highly nutritious, food products is a future challenge on the pathway from the farm to good health.

Taken from: “ADM Gives US\$10 Million to Found Institute to Reduce Global Postharvest Loss of Grains, Oilseeds,” ADM Press Release, January 19, 2011

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Figure 15 : Establishing mutual metrics for development assistance programs in agriculture and health



## General Mills: Meeting the Needs of Small and Medium-Sized Food Processors in Developing Countries

As part of its corporate social responsibility portfolio, General Mills's Partners in Food Solutions project lends technical and business expertise to help small and medium-sized mills and food processors in Kenya, Malawi, Tanzania, and Zambia. Company volunteers provide assistance in determining the best nutritional mix of local ingredients, developing new types of locally sourced products, designing facilities and systems, and improving the quality of food processing procedures. These specific activities aim to improve the ability of small companies to produce high-quality, safe, and nutritious food that is

affordable—connecting smallholder inputs more effectively to markets.

General Mills hopes to scale up the two-year-old initiative by partnering with other companies and nonprofits. Identifying areas to improve the value chain to transform local agricultural inputs into affordable, attractive food products for consumers holds potential for increased cross-sectoral cooperation.

Taken from: General Mills Corporate Social Responsibility Report 2011

substitution of healthier oils for palm oil in processed foods.

In the past decade, the international development field has aggressively adopted results indicators to measure progress in meeting goals. Evaluation of global health programs and practice has surged through initiatives to bring greater evidence and rigor to foreign assistance spending (the UN's Millennium Development Goals, the "3iE" International Initiative for Impact Evaluation, the Institute for Health Metrics and Evaluation, the Massachusetts Institute of Technology's "J-PAL" Abdul Latif Jameel Poverty Action Lab). In addition, donors have committed to better coordination of programs to reduce the burden on developing country governments (the Organization for Economic Cooperation and Development's Paris Declaration on Aid Effectiveness, the Accra Agenda for Action, the International Health Partnership and related initiatives,

the L'Aquila Statement on Global Food Security). These innovations in development practices can incubate new approaches to multisectoral programming in agriculture and health. They can use evaluation to show whether policies are synchronized. Real changes in policy and programming will be more likely to occur if overlap, or at least complementarity, can be identified in operational goals and targets. Especially during the current period of diminishing foreign assistance budgets, both donor organizations and developing-country governments should favor programs that can achieve improvements in multiple sectors.

To illustrate the potential for international development organizations to use mutual metrics, four recent agriculture initiatives and three global health initiatives from the United States and United Kingdom were reviewed for overlap in their objectives (see Figure 15).<sup>203</sup> Most of those reviewed are U.S. initiatives, but the process of identifying overlap in objectives

can be just as easily applied to other bilateral and multilateral agencies and programs, as well as to individual countries' domestic ministries.

There is a high degree of overlap in the stated goals of the initiatives analyzed, as Figure 15 shows. The agriculture initiatives aim to increase output of nutritional crops and achieve greater food quality and diversity. The health programs aim to improve understanding of nutritional needs and ensure that diets provide for them. Both agriculture and health donor initiatives aim to conduct better measurement of diet and target special populations. Examples of "mutual metrics" that would further those aims in both sectors—and that would benefit from greater collaboration across sectors—include reducing child stunting, balancing animal-based foods, and increasing consumption of fresh fruits and vegetables, especially across the life cycle and for targeted groups. These four are highlighted to show the potential overlap between goals to reduce risk factors for nutrition-related chronic diseases and nutrition goals from global health and agricultural development initiatives. These could serve as operational goals within the programs above, while simultaneously lowering chronic disease risk.

This chapter has pointed to a range of policies and actions that can be carried out in the agriculture and food sectors to improve nutrition and health. The specifics vary across countries at different stages of development, with emphasis in the poorest countries on actions from international organizations and donors. It also suggests better coordination and evaluation of policies and stronger cross-sectoral collaboration through the use of mutual metrics. Finally, the chapter discusses the centrality of the agriculture and food industries in contributing to improved health through policies and practice that inculcate a clear social ethos. The food value chain is a useful tool to identify opportunities to improve social and health outcomes.

Agricultural transition occurs alongside improvements in diet that offer more diversity and protein which, in turn, drives the epidemiological transition from conditions of undernutrition to overnutrition and noncommunicable diseases.

## Brazil



### A Snapshot of Agriculture and Health in Brazil

“I am from Brazil. I live in a densely populated city and am not employed in the agriculture section. I have completed secondary school.<sup>204</sup> I am 29 years old<sup>205</sup> and have one child.<sup>206</sup> My annual income is equivalent to \$10,920,<sup>207</sup> and I spend just under a fifth of my monthly household budget on food.<sup>208</sup> Most of my food is purchased at a traditional street market called a Feira Livre or a supermarket or shopping center. I always have enough to eat.<sup>209</sup> My family and I consume more industrially processed convenience foods and soft drinks and less traditional food than my parents’ generation.<sup>210</sup> I usually purchase bread, eggs, milk, and other dairy products; meat and poultry; cereals, oils, and fat; vegetables, including tomato, pulses, and potatoes; and some fruits.<sup>211</sup> Our favorite foods are pasta dishes and rice.<sup>212</sup> In general, my family gets enough protein, but sometimes we don’t eat fruits or vegetables every day—overall we get a third less than the recommended daily allowances of six servings of fruit and vegetables. I know we should do more to cut back on sugar and saturated fats—sugar is about 12 percent of what we eat and saturated fats are about 10 percent.<sup>213</sup> In the past two years, I’ve learned from the government’s health promotion ads that we should adjust our diet to improve our health.<sup>214</sup>

I expect to live until 73 years of age.<sup>215</sup> I am more likely to suffer from NCDs than from communicable conditions.<sup>216</sup> I am a little overweight and I have a 40 percent chance of developing high blood pressure and high cholesterol.<sup>217</sup> I am also more likely to die from a noncommunicable condition, such as heart disease, than I am from an infectious disease.”<sup>218</sup>

A typical person living in Brazil has enjoyed several years of stable economic development and growth, low inflation, and improved social well-being,<sup>219</sup> but many Brazilians are suffering from the health problems that come along with this security. Brazil has sufficient food available, though 6 percent of Brazilians are still undernourished.<sup>220</sup> Since the 1970s, undernutrition amongst Brazilian children has gone down while obesity has replaced undernutrition among adults.<sup>221</sup> Four times as many men and twice as many women are obese now, compared to just over a generation ago.<sup>222</sup> Countries at this stage of development have most essential infrastructures in place, along with varying degrees of private investment, including foreign direct investment. Although political capital, government capacity, and financial outlays to provide public services are adequate by this stage of development, government systems are challenged to deliver essential services to the poor, while still supporting private investment and private service delivery in the health and agrifood sectors.<sup>223</sup> Public investment in Brazil is largely for public services for disadvantaged populations. Brazil has high rates of foreign direct investment, and global agrifood businesses such as Danone, Nestlé, and Kraft are long established in the country.<sup>224</sup>

The Brazilian government has engaged in one of the most participatory and cooperative processes involving government, civil society, and business<sup>225</sup> to develop a national food and nutrition policy. Former president Luiz Inácio Lula da Silva (2003–2010) was recognized with the 2011 World Food Prize<sup>226</sup> for his political leadership to address food and nutritional security, an

agenda he established as both a right<sup>227</sup> and a government policy priority. A wide range of programs aimed at improving nutrition and health was implemented. Nutrition-related initiatives include legislative and regulatory actions, mass communications, and capacity-building to address patterns of poor dietary and physical activity. Specific policies have included cash aid to families for food purchases if the families receive health checkups; a food purchase program so consumers can acquire food directly from smallholders; food distribution through schools and other public institutions; a food supply and distribution program for low-income urban populations; new labeling regulations; changes in serving sizes; advertising restrictions on food marketing to children; “shop smart” software campaigns to educate consumers on supermarket purchases; and nutrition education for teachers and public health workers. Smaller-scale community programs supplement national efforts.<sup>228</sup>

Although agriculture represents less than 10 percent of GDP, it is an important source of foreign exchange and rural employment. About 83 percent of those in rural areas are employed in agriculture.<sup>229</sup> Brazil has transformed itself from a food importer to the largest exporter of orange juice, sugar, coffee, poultry, and beef. Government policies have particularly stimulated soybean production including foreign direct investment and growth in the oil processing industry.<sup>230</sup>

Brazil illustrates a range of agriculture and public policy approaches that can be pursued to improve production, nutrition, and health outcomes, together or separately. Not all of them have been successful. For example, soybean promotion led first to substitution of vegetable oils for animal fats in domestic diets, but later to increased consumption of trans fat as it was increasingly used in processed foods. However, Brazil is exercising political leadership to take risks and embark upon a full range of policies and investments.



# 3

## A Collective Call to Action: Aligning Agriculture and Food with Health

Forty years ago, life expectancy in the poorest countries was 15 years lower than in rich countries,<sup>231</sup> nearly 35 percent of people in the developing world were hungry,<sup>232</sup> and child mortality rates were almost seven times higher in developing countries than in wealthy countries.<sup>233</sup> Now health and development conditions are converging globally.<sup>234</sup> Developing world hunger is at 16 percent<sup>235</sup> and life expectancy has risen an average of more than 10 years.<sup>236</sup> Child mortality has declined by more than one-third in just two decades.<sup>237</sup> Only 35 countries are categorized as low-income by the World Bank.<sup>238</sup>

In most places in the world, even poverty is not quite as poor as it once was, with many people having greater access to education and consumer items such as mobile phones.<sup>239, 240</sup> Accelerating economic growth in many developing countries builds upon the equalizing effects of global communication, information, and transportation networks.

Agriculture and diets across the world have also converged. Earlier chapters of this report briefly summarized the trajectory of global and regional agriculture and food production and consumption in the past few decades. This trajectory began with a stark dichotomy between rich and poor countries in almost every respect, including agricultural production, access to nutritious food, and health. That dichotomy has softened into a global agriculture system of countries at different stages of agricultural development, as the country model in this report suggests, but with blurred lines between stages depending on links to external markets, government policies, and the diversity and efficiency of the farm sector.

Long-term human and environmental health should also be goals of agriculture. Food and agriculture must play a role in reversing recent trends that have the potential to stall or reverse the economic and health advances seen in developing countries in the last 40 years.<sup>241</sup> This chapter offers recommendations to each of the major institutions and actors that, collectively, can prevent dramatic increases in premature deaths from diet-related chronic disease in developing countries. Institutions—government, industry, civic organizations, international organizations, and donors—need to stop working in isolation, or worse, at cross-purposes, and together provide for environments that encourage healthy eating. Together, these proposed steps will go far to reduce the preventable burden of diet-related chronic disease.

The path toward a healthier food and agriculture environment has some clear signposts. Recent decades have seen a fast pace of change in many of the factors that influence human health. Some of those trends are expected to continue,

though more slowly in recent years. On the positive side, infectious diseases will continue to drop and more people will live long enough to experience chronic diseases and their precursors. Rising income will move more countries into the ranks that can sustainably feed their populations. Research will produce new technologies for agriculture that will reduce environmental stress and increase productive capacity. Better understanding of what constitutes good nutrition at all stages of life and in different food environments will inform individual behavior and policies.

Other trends will continue to present public health and development dilemmas. Both rich and poor countries will struggle with the costs and management of chronic diseases,<sup>242</sup> and it will take time to create new models of health care that emphasize health promotion and disease prevention and disperse care into the community and to individuals for self-management. Reduced productivity from chronic diseases will slow, and perhaps stall, economic growth in poor

Figure 16 : Recommendations for national governments

To improve:	National governments should:
Governance	Align government policies across sectors in ways that support prevention of nutrition-related chronic diseases.  Conduct a cross-sectoral dialogue among government ministries—especially agriculture, trade, infrastructure, and health—led by a supraministerial body and reporting to the head of state.
Policy	Use fiscal, trade, and regulatory instruments where feasible and proven effective.  Define and pursue mutual metrics that can be used to measure and evaluate the contributions of each relevant sector to improving diet and health outcomes.
Research and Education	Include food and health links in nutrition, food, and agricultural science education at all levels.
Financing	Build incentives into socially financed health care and insurance that encourage all covered people to eat healthy diets, tailored to their age and sex.

countries and infringe on rich countries' ability to spur global development.<sup>243</sup> Very difficult political bargains are needed to answer questions about the use of genetically modified organisms; the role of the agriculture sector in contributing to and ameliorating climate change; and how to balance national and international responsibility for public health.

Finally, new challenges exist in the nexus between agriculture and health. An important one is how to establish political and technical processes for bringing together different sectors in government and in society to solve complex problems. In rich and poor countries, health outcomes are heavily influenced by decisions taken outside the health sector and greater attention is needed to understand the consequences of those links.<sup>244</sup> There are major unknowns in the interplay between consumers and agriculture and food companies to determine which takes the lead in defining what a nutritious food supply should provide and how companies can tailor global business plans to local needs and conditions. No one has the answer to how long it will take and what impetus will be required for a sufficient number and range of companies—both transnational and national—to seriously develop food value chains that

incorporate human health and nutrition as objectives.

But it is possible, indeed imperative, to set a new agenda for better interaction between the agriculture, food, and health sectors—policymakers, business leaders, analysts, and advocates. It must be an agenda for new dialogue, partnerships, research, policy development, and action. The parameters of the agenda are broad and ill-defined, and many actors are needed to make it happen. The time horizon is also a long-term one, but there are numerous opportunities—both incremental and revolutionary—to making improvements now.

It is well understood that the health sector alone is not equipped with adequate tools or resources to shift the trends of diet-related chronic disease. Even relatively well-resourced countries cannot hope to provide enough medical treatment to overcome the current levels of disease within their populations; low- and middle-income countries are even less well equipped. Prevention through healthier lifestyles is especially crucial for low- and low-middle-income countries to avoid foisting another disease epidemic on their overburdened health sectors.

### Recommendations for National Governments

National governments are the most important decision-makers influencing the agriculture and health sectors in developing countries. Except for the poorest countries, national governments are the largest financers of health and have much to gain in savings and increased economic output if they encourage agriculture and food systems to offer healthy diets to their populations. It is especially important in these countries, where those within health systems grapple daily to make choices about which lives to save, that policies in the agriculture and food sectors are designed to reduce modifiable health risks due to poor nutrition and keep people out of the health system.

A central role belongs to the head of state or his or her designee. Only he or she can hold each of the responsible ministries accountable for its contribution to the health goals outlined in the national NCD strategy. Advancement across sectors will be augmented with agreed indicators to demonstrate progress. Therefore, mutual metrics should be developed to give specific guidance while each ministry retains autonomy to determine how to contribute to the common goals. All ministries can take credit for the eventual gains.



Figure 17: Recommendations for international institutions

To improve:	International institutions should:
Governance	Develop mutual metrics to guide operational programs toward agricultural and health policy alignment and common goals.
Policy	Form cross-sectoral technical assistance teams to devise development plans and policies in countries that go beyond coordination to mutual support and accountability.
Technology	Provide farmer organizations and contract farmers with financial and market risk-reduction tools and training.
Research and Education	In research departments, prioritize research on the connections among agriculture, food, and nutrition-related chronic diseases in order to better calibrate policies at the country level.  Conduct research on how diet-related chronic diseases affect economic development prospects.
Financing	Provide a supplement to countries and incentives to the technical staff when they make development loans following the principles of policy alignment across agriculture and health.

Leadership to address NCDs is hard to find in most countries. The rare NCD office within the health ministry in a developing country is staffed with only one or two officials. It is difficult to find expertise on diet-related chronic diseases and more difficult to identify partners in other sectors, including the agriculture, transportation, and environment sectors. A member of Parliament, Peter Anyang' Nyong'o, of Kenya, became the face of NCDs in his country when he shared his experience with prostate cancer in the news, including a three-part television documentary after he returned from three months of treatment abroad. He has become a vocal advocate for establishing a cancer registry in Kenya and raising awareness of other chronic conditions.<sup>245</sup> In the United States, Mayor Bloomberg of New York City stands out. He has been willing to challenge myths and put his own funds into the effort to reduce the burden of NCDs through food and tobacco policies. He has demonstrated that change is more probable than the technical experts predict, and changes in trans fats in fast-food restaurants, smoking, and calorie labeling that began in New York City have spread around the country.

Where possible, governments should take both fiscal and regulatory actions.

Experience in how to apply policies that generate real results is growing among countries at different income levels.<sup>246</sup> Clear targets of regulatory policy include reducing salt and trans fats in food processing, with the goal of eventually eliminating them; switching to healthier fats and oils; limiting children's exposure to marketing of unhealthy food; providing clear and practical dietary guidelines; and helping local communities to support healthy retail food and sustainable local agriculture. The speed and manner in which the above regulatory actions can be taken will vary from country to country.

Government programs that provide health-care services to the public, either directly or through financial support, must incorporate health promotion and chronic disease prevention where possible. For instance, socially financed insurance should offer financial incentives, tailored to age and sex, to all covered people to eat healthy diets, by adjusting premiums according to risk behavior. Health service providers should give the public information and tools, such as pedometers and locally specific food and nutrition advice, to increase health knowledge and influence behavior. Programs should monitor individuals at high risk for diet-related

conditions and reward them for verifiable progress on identified health indicators.

Governments must better coordinate policies across sectors to support prevention of diet-related chronic diseases. This applies especially to the many ways in which agriculture, transport and infrastructure, research, housing, and even education sector policies have missed opportunities to create greater capacity to produce healthy food. Leveraging actions in one sector with those in other sectors will produce overall greater impact. Leveraging the public policy arsenal to influence private sector decisions to produce and sell more healthy food—and less high-risk food—is another way to increase impact. Multisectoral bodies, such as the National Commission on NCDs in Grenada, are needed to develop national strategies on NCDs.

Government can work with willing private sector partners to produce greater social, environmental, and health results using a value chain approach. Starting with very clear objectives for agriculture's contribution to a country's specific health needs, ideally derived from a multisectoral priority-setting process, governments and industry can identify opportunities for strategic investment to better achieve nutrition and health goals.

Figure 18 : Recommendations for official and private donors of foreign assistance

To improve:	Donors should:
Governance	Facilitate country and civil society cross-sectoral planning and programming between agriculture and health.
Policy	Redesign nutrition programs to reflect an understanding of the dual burden of malnutrition in countries and households and the early origins of health and development.  Source food aid locally where possible and appropriate to meet the nutritional needs of those in crisis.
Technology	Adopt and develop low-cost technologies for primary processing that retain nutrient values.  Develop local solutions to postharvest food losses.
Research and Education	Support operations research on how a “nutrition-sensitive” agriculture can address the dual burden of malnutrition.  Require and fund rigorous evaluations of agriculture and health programs in a transparent and comparable manner.
Financing	Directly support the national NCD planning process in developing countries only if it is multisectoral.
Personal Behavior	Assess structural and programmatic opportunities for linked programming among agriculture, nutrition, and health programs.

Technological and other research-based innovations are the basis for improving the efficiency and sustainability of agriculture, but research investment and knowledge vary from country to country and commodity to commodity. Governments in developed countries have invested in research to improve agricultural capacity for decades, with astounding increases in yields. In Africa, international organizations such as the World Bank and the Consultative Group on International Agricultural Research join national agricultural research programs to build knowledge and expertise on agriculture in developing countries, but the results have been uneven and failed to build on Africa’s natural agricultural biodiversity and human capital.<sup>247</sup> Further, they have rarely connected the outcomes of agriculture and food systems to human health.<sup>248</sup> Agriculture development programs are becoming more oriented toward utilizing a country’s own human and natural resources to fulfill food needs and should be clearly linked to food and

health conditions in developing countries. To take advantage of investments in national research and innovation to support public health goals, educational curricula in agriculture, nutrition, and food sciences should include courses that link those fields to health outcomes.

Figure 16 shows the steps needed at the national level.

### Recommendations for International Institutions

International development institutions provide essential support to developing countries in pursuing national goals in agricultural and health. For the global community, they set standards, provide guidelines, conduct research, and offer technical support in a range of sectors.

Through their broad technical responsibilities and their role in advising countries, international institutions such as the World Bank, International Monetary Fund, and regional development banks

are uniquely well placed to work across sectors like agriculture and health. Development banks have been involved for a long time in agriculture and infrastructure development and are increasingly staffed with health specialists that work with national governments. It is time for those sectoral divisions within international organizations to be crossed in more formal ways. Mutual metrics offer the means to do so. For example, if the president of the World Bank asked the agriculture and health departments of the World Bank to develop results indicators of common interest to both, pure self-interest would push managers in those departments to think creatively about programming between agriculture and health. The result could be loans with similar cross-sectoral goals and activities, the volume and success of which could become a measure of impact for both departments.

With minor modifications, numerous proven agricultural development interventions can be oriented toward explicit

Figure 19: Recommendations for agrifood businesses

To improve:	Agrifood businesses should:
Governance	Use value chain analysis to identify places where mutually beneficial partnerships with NGOs and governments create feasible commercial opportunities to shift sourcing from unhealthy to healthy food ingredients.  Support the development of national and international norms, standards, policies, and guidelines in the agriculture and food sector that are designed to improve nutrition and health.
Policy	Define a value chain for each major product and work with suppliers and customers to maximize private and social values.  Maintain high food-safety standards and procedures throughout global dispersed operations by building compliance capacity in low-resource settings.
Technology	Set targets and deadlines for developing and reformulating a product lineup with greater nutritional benefits appropriate to the needs of the customer base and consistent with national dietary and health guidelines.  Work with researchers in developing countries to characterize the food supply and composition of the diet.
Financing	Make achievement of targets a criterion for management compensation and build employee enthusiasm by rewarding tactical innovations that can accelerate progress toward goals.
Personal Behavior	Build a shared value ethos into media and government relations operations.

health benefits. They include mechanisms to enhance capacity of women and other farmers to produce fruits, vegetables, and other healthy foods; farmer collectives that provide horticultural training and technical assistance to connect to food supply chains; contract farming linking smallholder farmers to high-value markets; backup power supplies for small-scale producers of fresh products; marketing and financial tools;<sup>249</sup> and better storage and transportation infrastructure to reduce postharvest losses.

Numerous similar examples might emerge if the World Bank incorporated assessment of multisectoral opportunities and constraints into standard mid-term assessment reviews of operations within a country. For example, an assessment might discover a woman smallholder in Kenya who wishes to switch from coffee production to fresh vegetables because of unstable and falling coffee prices. A development program could provide her with technical assistance that begins by looking at the local

communities where she wishes to market her product and advice on what crops are especially missing or in high demand, or a link to an export supply chain and the proper method to assure quality, uniformity, and safe handling of her crop to get the best price possible.

In a process similar to reviewing the food value chain for opportunities, the development banks and other international organizations could review their own practices—whether lending, technical assistance, standard-setting, or research—to identify where mutual metrics or other practice changes suggest levers for change. Banks could take the lead in seeking ways to combine environmental and health goals, such as developing oilseed production to provide healthy alternatives to palm oil for the food manufacturing industry and reducing destruction of forests in environmentally sensitive areas.

Figure 17 shows recommendations for international organizations.

### Recommendations for Official and Private Donors of Foreign Assistance

With few exceptions, donors do not link their agriculture and health programs even when they work in both fields. These separate structures are reflected in the design and implementation of programs, and in the flow of donor funds to countries. Donors should reappraise their internal structures and functions to find opportunities for joint programming or program mergers. They should select and test mutual metrics to better align goals within their organizations and, once those metrics are identified, help grantees and recipient countries adapt them to their own contexts.

Donors deliver emergency food and nutrition assistance to the lowest-income countries. Donors should source food aid from local farmers when it can improve nutrition, and support the livelihood of local farmers and sustainability of local farming. In addition, nutrition programs should be redesigned to better address the needs of populations that

Figure 20: Recommendations for consumers and their representatives

To Improve:	Consumers and their representatives should:
Governance	Work with businesses to better connect retail food outlets with consumer needs for more affordable, healthy options
Policy	Actively select food and beverage companies that share health goals and work together to build political will for policy change. The civil society role is especially important for educating policymakers about the risks and costs of unhealthy diets.  Prepare model policies to regulate the food industry that can be adapted to country conditions where appropriate.
Research and Education	Include food and health links in nutrition, food, and agricultural science education at all levels.
Personal Behavior	Apply knowledge about individual and community-based cognitive and behavior change to encourage healthy eating.  Reduce food losses and waste in the community by finding ways to utilize perishable foods.

are experiencing the dual burden of malnutrition in countries and households, including recognizing the strong scientific evidence on how malnutrition early in life impacts later risk of chronic disease. Donors should explore the possibility of utilizing mutual metrics, such as food security indicators, to focus on preventing stunting. These prospects can be explored through the work of the UN System High-Level Task Force on the Food Security Crisis and the REACH partnership.<sup>250</sup>

Figure 18 shows recommendations for official and private donors.

### Recommendations for the Agrifood Private Sector

Through the global reach of their supply chains, food companies and wholesale suppliers are uniquely positioned to influence the types of foods made available to consumers. Developing countries will need capacity to set quality and safety standards, monitor compliance and results, and comply with international food safety regulations as they increase fresh food production, including meat. They also need to better understand what is in their food supplies, including the nutritional composition of specific processed products.

Typically, there is minimal capacity in poor countries for those studies. As the private sector establishes manufacturing and other operations in low- and middle-income countries, it can work with local researchers and food agencies to better understand the food supply, including health risks and nutritional content, and work with local farmers to provide healthy ingredients and food. Companies should support, rather than oppose, international standard-setting in the agriculture and food sectors that improves nutrition and health.

Long-term structural shifts in agriculture will continue to influence diets and health for years—it’s not just today’s agricultural policies and prices that influence what agrifood business provides to consumers and at what price, but the effects of decades of subsidies or taxes on specific commodities. It is crucial for governments to engage industry in a longer-term discussion of the cost and other barriers to delivering healthy food to consumers. This would also include a dialogue on how government can assist industry in providing for healthy food—for example, by providing sound nutritional guidelines and standards, or by establishing land use policies that facilitate production and

distribution of fruits and vegetables. This could be accompanied by good analysis of how policies can encourage that discussion. Toward that end, major agrifood business companies and associations should reexamine their political engagement strategies and seek common ground with health advocates whenever possible to become positive forces for healthy food and nutrition.

Figure 19 shows steps that agrifood businesses should take.

### Recommendations for Consumers and Their Representatives

The ability of companies to use food value chains to support greater health and social values ultimately depends on consumer demand. Consumers are constantly making choices about what, where, and how much they eat and drink based on price, as well as on convenience, taste, cultural norms, and nutritional knowledge. Those factors are influenced by product formulation and marketing, as well as by family, education, community, and other sources of information. The oft-stated public health goal to “make the healthy food choice the easy choice” is a worthy reminder that consumers respond to many different factors and

need to be encouraged and supported in multiple ways, through multiple channels, to eat well. Agribusiness interacts daily with consumers to cue certain eating behavior. It should work with consumer organizations and government agencies to develop mass media campaigns for improved nutrition.

Individuals and those who make food decisions on their behalf—their families, schools, employers, and other organizations—should utilize the many cultural, mental, behavioral, and emotional dimensions of people’s decision making to identify ways to promote a healthy diet. They need to become aware of what triggers unhealthy eating behavior, whether it’s sweet-laden festival tables in India or popular fruit-based drinks with added sweeteners in Mexico, and design appealing alternatives. In institutions such as schools and the workplace, decision makers can help consumers make healthy decisions—whether they are the head of the canteen deciding what is on the menu and installing a weighing scale near the entrance, or the school principal or factory head deciding how much time is available for lunch and what vending machines may contain. These examples and many other small features of the eating environment influence people’s diets and their overall health, and should be scrutinized for opportunities to encourage healthy eating.<sup>251</sup>

As mentioned previously, people’s ability to eat healthily away from home is essential to health and nutrition in the world. A study conducted in Ouagadougou, Burkina Faso, found that foods purchased outside the home accounted for almost 50 percent of women’s total energy intake and included high proportions of sugar. Improving the quality of ready-to-eat foods could increase micronutrient intake among these women. Habits learned at home do not always transfer well. In a retail environment, consumers are more limited in their choice of foods and portions than in their homes and often consume greater quantities of lower-quality

food than at home. Consumers should know when to say “better in a box than in my belly,” and take away leftovers from restaurants, or “better wasted than on my waist,” if there is no other choice. Children growing up in an environment of greater food abundance and more unhealthy choices should be empowered at home to not clean their plates so they can train themselves to recognize when their hunger is satisfied. Consumer organizations, schools, worker unions, industrial designers, and retail food businesses can all incorporate healthy eating triggers into their operations that subtly alter the food environment and lead consumers to choices guided more by their heads than their appetites.

The broadening use of food value chains suggests new opportunities to serve lower-income and marginalized populations that are particularly vulnerable to poor diets in both rich and poor countries. In the United States, First Lady Michelle Obama initiated a partnership among food retailing companies, including Walgreens and Walmart, to open new stores that offer fresh fruits and vegetables close to low-income urban populations.<sup>252</sup> In other countries, small-scale urban gardening is a source of both fresh food and income for the mostly women farmers; with training and supplies, they can become connected to commercial food value chains<sup>253</sup> or simply increase their productivity for local sales.<sup>254</sup>

Consumer representatives should partner with private sector companies that have demonstrated commitment to improving the food and nutrition environment, and work with them to educate policymakers and build political support for policy change.

Food retailers should also work with local charitable organizations to provide aging but still palatable perishable fruit and vegetables, that otherwise would be wasted, to low-income people who can’t easily access fresh food. Cities might consider sponsoring community awards and other incentives to recognize and encourage

retailers that work with charitable organizations, such as rewards for restaurants with low volumes of food waste.

Figure 20 shows steps that consumers and their representatives should take.

## Conclusion

Agriculture and food systems are fully capable of providing healthy food to people anywhere in the world, but they are not doing it. As the four country case studies in this report demonstrate, consumers almost everywhere are connected by economic, demographic, and epidemiological shifts that create common nutrition and health challenges. The ubiquity of chronic health conditions, such as heart disease and diabetes, is not cause for quiescence; instead, it creates opportunity fueled by urgency to find common solutions and share them widely. The urgency should be felt everywhere. Rich countries like the UK are spending an alarming percent of their GDPs on health care. Poor countries are contending with dual burdens of malnutrition and disease, such as in rural Bangladesh, where one of the highest rates of low birth weight in the world coexists with a 3,500 percent increase in heart disease over 20 years.<sup>255</sup> These are not sustainable circumstances in either case.

Many institutions need to address the nexus of agriculture and health. This report has emphasized the international development aspects of the issue. This section offers recommendations for international, national, and local institutions and actors to play their role in creating and supporting an agricultural and food system that extends and improves people’s lives with interesting, affordable, and healthy diets.

The report offers practical and achievable solutions to growing nutrition-related chronic diseases that are tailored to local needs and that can be globally implemented. The agriculture and food sectors can play a pivotal role in the prevention of diet-related chronic disease; the time to call on them to act is now.

## United Kingdom



### A Snapshot of Agriculture and Health in the United Kingdom

“I am a citizen of the United Kingdom. I am a 39-year-old man, and I live in a house on the outskirts of a major metropolitan city with my wife and two children.<sup>256</sup> I work in the service industry and my annual income is \$36,580.<sup>257</sup> I have a significantly greater risk of developing a NCD than contracting an infectious disease.<sup>258</sup> I expect to live to 78. However, I am overweight, not very active, and I have high blood pressure and high cholesterol.<sup>259</sup> I am likely to die from a noncommunicable chronic condition, such as a respiratory disease, cardiovascular disease, or cancer.<sup>260</sup> My family spends about 9 percent of our budget on food.<sup>261</sup> We always have access to food, and we prefer to purchase our food at the local supermarket.<sup>262</sup> I can purchase a wide variety of food. My diet mainly consists of cereals, pasta and rice, white bread, low-fat milk, chicken, turkey, beef, cooked vegetables, fried potato products, fat spreads, fruit juice, soft drinks, coffee, and tea.<sup>263</sup> I know I should eat healthier foods so I try to stick to the “UK 5 A Day” plan of five fruits or vegetables daily, as well as eating low-fat versions of food products.<sup>264</sup> But when it comes down to it, I consistently purchase almost as much high-fat food and high-sugar drinks as I do fruits and vegetables.”<sup>265</sup>

This is the story of a typical person living in the United Kingdom—a developed, high-income country, which throughout history has been one of the most industrial and socially developed countries in the world. Although urban areas cover only 8.9 percent of its landmass, nearly eight out of every ten people in the country live in urban areas.<sup>266</sup> The United Kingdom has the sixth-largest economy in the world and the second-largest economy in the European Union, and it provides its citizens with extensive social welfare services.<sup>267</sup>

Countries like the United Kingdom have extensive food and agriculture production infrastructure. Since World War II, the United Kingdom has set a national priority to become self-sufficient in providing its citizens with food.<sup>268</sup> Agriculture accounts for 0.8 percent of the GDP,<sup>269</sup> and annual food exports, consisting of raw and processed food, are valued at approximately £13 billion.<sup>270</sup> Food production and manufacturing produces £22.8 billion in gross value-added and employs 14 percent of the national workforce.<sup>271</sup> Since 1973, agriculture and food production have been guided by the European Union’s Common Agricultural Policy, a system of European Union subsidies and programs. In the last decade, the system has shifted to promote agri-environmental interventions, which include national regulation of the maintenance of soil, habitats, and the overall agricultural landscape.<sup>272</sup> These new policies also emphasize strict standards for food safety and animal welfare. World market conditions are the new drivers of agricultural commodity prices, and reforms are moving toward decoupling rural income support from levels of farm production, reducing subsidy dependence, and minimizing the inefficient buildup of agricultural surplus.<sup>273</sup>

The United Kingdom imports food from a diverse range of countries, although currently 52 percent of the country’s food supply is produced domestically. Five other countries in the European Union

account for an additional 20 percent of food consumed in the United Kingdom.<sup>274</sup> The majority of citizens purchase food products from major supermarket chains.<sup>275</sup> The country’s largest four food and drink retailers made up 62 percent of the market share for food and drink sales, with one company commanding 25 percent of the market share.<sup>276</sup> These large food retailers have a significant impact and influence on the food and agriculture industry. Although most supermarkets provide consumers with over 40,000 choices of food products, including fresh fruits and vegetables, consumers favor ready-to-eat meals and environmentally friendly food products.<sup>277</sup> The Food Standards Agency has reported underconsumption of fruits and vegetables, with only 28 percent of men and 32 percent of women consuming five portions of fruits and vegetables per day. When food waste is taken into account, the average 4.1 portions of fruit and vegetables purchased per person per day in the United Kingdom result in only an average 2.7 portions consumed per person per day.<sup>278</sup>

Chronic NCDs, such as cardiovascular disease and cancer, claim the lives of over 500,000 citizens in the country each year.<sup>279</sup> The National Health Service provides public education on healthy lifestyles and disease prevention, including the “5 A Day” campaign that advocates consumption of five portions of fruit and vegetables a day. The campaign includes a number of tools to help consumers budget and shop for healthy foods.<sup>280</sup> Other government programs to encourage good health and mitigate disease include improving conditions for safe walking and cycling.<sup>281</sup> Legislators have also attempted to introduce “fat taxes,” such as a 2009 proposal for a tax on chocolate purchases, in an attempt to counter obesity rates.<sup>282</sup> None of these policy efforts has measurably improved health in the United Kingdom, and debates continue about optimal policy choices.

As the nutrition transition spreads to more areas of poor countries, development assistance and food aid programs need to consider the risks of obesity and chronic diseases in the populations they are serving.

# Biographies



## Rachel A. Nugent

PhD, Senior Research Scientist, Department of Global Health

University of Washington

Rachel A. Nugent, PhD, is Senior Research Scientist in the Department of Global Health at the University of Washington and Director of the Disease Control Priorities Network. She was formerly Deputy Director of Global Health at the Center for Global Development, Director of Health and Economics at the Population Reference Bureau, Program Director of Health and Economics Programs at the Fogarty International Center of NIH, and Senior Economist at the Food and Agriculture Organization of the United Nations. She has advised the World Health Organization, the U.S. government, and nonprofit organizations on the economics and policy environment of NCDs. She was a member of the Institute of Medicine Committee on the Cardiovascular Disease Epidemic in Developing Countries, the World Economic Forum Global Agenda Council on Chronic Diseases and Well-Being, and a contributor to the Disease Control Priorities Project in Developing Countries, published in 2006. Her recent research includes tracking donor funding on NCDs. She received her M.Phil. and PhD degrees in economics from The George Washington University in Washington, D.C., USA.

## Pamela Anderson

Director General, International Potato Center  
Consultative Group on International  
Agricultural Research

Pamela Anderson has been Director General of the International Potato Center (CIP) since May 2005. CIP is one of 15 international agricultural research centers supported by the Consultative Group on International Agricultural Research (CGIAR). Prior to becoming Director General, she served as the Deputy Director General of Research at CIP (2002–2005) and as Senior Entomologist at the International Center for Tropical Agriculture, in Cali, Colombia (1997–2002). She received a M.Sc. in Entomology from the University of Illinois; a M.Sc. in Human Ecology from Harvard University; and a D.Sc. in Populations Sciences/ Vector Entomology from the Harvard School of Public Health. A leading expert on emerging plant diseases, her research has also included extensive work in agricultural entomology and plant virus epidemiology related to food security and income generation for resource-poor populations. She has worked in Latin America for 35 years and spent two decades working within national agricultural research systems before joining the CGIAR.

## Donna Barry

Advocacy and Policy Director  
Partners In Health

Donna Barry, RN, MSN, MPH, currently serves as the Advocacy and Policy Director at Partners In Health (PIH) and is appointed as a Researcher with the Division of Global Health Equity (DGHE) at the Brigham and Women's Hospital, a teaching affiliate of Harvard Medical School. She is guiding PIH's advocacy and policy efforts related to health and hunger, socioeconomic development in Haiti, increased funding for global health, maternal mortality, tuberculosis, and health system strengthening. She has participated in briefings and hearings in the U.S. House of Representatives on Haiti debt relief, multi-drug-resistant tuberculosis (MDR-TB), and reproductive health. Previously, she led the PIH project to treat MDR-TB in Russia and was Co-Director of PIH's women's health programs in Haiti.

Donna also coordinates PIH's and DGHE's nursing activities and continues to provide clinical and program advice to PIH's women's health

programs. Donna received her RN and MSN with certifications in women's and adult health from the Massachusetts General Hospital Institute of Health Professionals in 2001 and earned master's degrees in International Affairs and Public Health, specializing in reproductive health, maternal and child health, international development, and the former Soviet Union, from Columbia University in New York in 1992.

## Louise O. Fresco

Distinguished University Professor, University of Amsterdam

Louise O. Fresco is an authority in agriculture, food, and environmental issues. She is currently a university professor in Amsterdam, writes a syndicated newspaper column, and is an adviser to the Dutch government on socio-economic policy, science, and sustainability, including sea-level rise. Her career has involved more than ten years of field work in tropical countries, travel to over 80 countries, a PhD *cum laude* in tropical agronomy, chairs, and lectureships at prestigious universities, such as Wageningen, Uppsala, Louvain, and Stanford. She held several leading positions within the FAO of the UN. She has a strong commitment to international development, agriculture, and food. She has also published eight books and more than a hundred scientific articles. She serves as a nonexecutive director of Unilever, Trustee of the Shell Foundation, and on the supervisory board of Rabobank. She is a member of the Trilateral Commission, a vice chair of the Board of the UNU and a member of the Council of Advisors of the World Food Prize. In May 2010 she became a member of the independent review committee of the Intergovernmental Panel on Climate Change (IPCC) of the InterAcademy Council at the request of the United Nations.

## Joyce Kinabo

Professor of Human Nutrition, Department of Food Science and Technology  
Sokoine University of Agriculture

Joyce Kinabo is a Professor of Human Nutrition in the Department of Food Science and Technology at the Sokoine University of Agriculture in Morogoro, Tanzania. Joyce holds a B.Sc. in Agriculture with a major in Food Science and Technology from the University of Dar es Salaam, Tanzania, and a M.Sc. in

## Biographies

### Advisory Group

Food Science from Leeds University, UK. She obtained her PhD in Nutritional Physiology from Glasgow University in 1990. Joyce has been a lecturer at Sokoine University of Agriculture for the past 26 years, where she instructs students on human nutrition, nutritional physiology, body composition, and energy balance, nutritional epidemiology, maternal and child nutrition, and food and nutrition security. Her research activities have focused mainly on energy balance studies, maternal and child nutrition, adolescent nutrition, food-body interactions, and nutritional status.

She is actively involved in community nutrition research, focusing on developing nutrition interventions within communities that enhance their capacity to solve their unique nutritional problems. Joyce has participated in drafting the food security policy and food security strategy for Tanzania; the CAADP pillar III: Framework for African Food Security; and the food and nutrition security section in the Tanzania Agriculture and Food Security Investment Plan. Currently, she is leading a team of scientists from universities in Malawi, Tanzania, and Leeds in a project to develop and test Eco-Nutrition guidelines to enable communities to best respond to the challenges of food insecurity, inadequate care, and inadequate environmental quality in the context of climate change. Recently, Joyce was appointed Ambassador of Partnership for Nutrition in Tanzania (PANITA) and will work closely with other stakeholders on Scaling Up Nutrition initiatives to promote nutrition activities in Tanzania and globally.

### Jean Lebel

#### Director, Agriculture and Environment International Development Research Centre

Jean Lebel is the Director of the Agriculture and Environment program area at the International Development Research Centre (IDRC). He is an environmental health specialist by training and contributes extensively to the development of ecosystem approaches to human health, an innovative way of implementing sustainable development principles into an action research framework. Dr. Lebel earned a master's degree in occupational health sciences and a graduate diploma in industrial hygiene from McGill University in Montréal, as well as a PhD in environmental sciences from the

Université du Québec à Montréal. Dr. Lebel is Associate Editor of the *Ecohealth Journal*. He is also the IDRC representative to the board of the International Institute for Sustainable Development, and the representative of the Foundations (Syngenta, Rockefeller, Ford, and IDRC) on the Fund Council of the Consultative Group on International Agricultural Research (CGIAR).

### J. Stephen Morrison

#### Senior Vice President and Director, Global Health Policy Center

#### Center for Strategic & International Studies

J. Stephen Morrison is director of the Center on Global Health Policy and a Senior Vice President at the Center for Strategic and International Studies (CSIS). With support from the Bill and Melinda Gates Foundation and other foundation and corporate contributors, the Center seeks to advance a long-term strategic U.S. approach to global health, cultivate new global health champions, enrich understanding of the security and foreign policy dimensions of global health, and link Washington-based work to emerging policy expertise in key developing and middle-income countries. Beginning in the spring of 2009, Dr. Morrison directed the CSIS Commission on a Smart Global Health Policy, comprising 25 diverse high-level opinion leaders. Its findings are detailed in the final report *A Healthier, Safer, and More Prosperous World: Report of the CSIS Commission on Smart Global Health Policy*, published in March 2010.

Dr. Morrison writes widely, testifies often before Congress, has directed several high-level task forces and commissions, and is a frequent contributor in major media on U.S. foreign policy, global health, Africa, and foreign assistance. He served for seven years in the Clinton Administration, four years as committee staff in the House of Representatives, and taught for 12 years as an adjunct professor at the Johns Hopkins School of Advanced International Studies. He holds a PhD in political science from the University of Wisconsin and is a magna cum laude graduate of Yale College.

### Dariush Mozaffarian

#### Co-Director, Program in Cardiovascular Epidemiology, Associate Professor of Medicine, Brigham and Women's Hospital and Harvard Medical School

#### Associate Professor of Epidemiology, Harvard School of Public Health

Dariush Mozaffarian, MD, DrPH, is a cardiologist and epidemiologist; Co-Director of the Program in Cardiovascular Epidemiology; Associate Professor of Medicine in the Division of Cardiovascular Medicine, Brigham and Women's Hospital and Harvard Medical School; and Associate Professor in the Department of Epidemiology at the Harvard School of Public Health. His research focuses on the effects of lifestyle, particularly dietary habits, on cardiovascular and metabolic health and disease.

Dr. Mozaffarian has authored numerous original scientific publications and research studies relating to fatty acids, foods, carbohydrate quality, and other dietary and lifestyle factors and cardiometabolic health. He has served on several national and international committees and advisory boards, including the American Heart Association Epidemiology and Prevention Leadership Committee, Nutrition Committee, Statistics Committee, 2020 Goals Committee, and Trans Fat Initiative Committee; the Joint United Nations Food and Agriculture Organization/World Health Organization Expert Consultation on Fats and Fatty Acids in Human Nutrition and Expert Consultation on the Risks and Benefits of Fish Consumption; the World Health Organization Nutrition Guidance Expert Advisory Group; the Pan American Health Organization Task Force on Trans Fat Free Americas; the Canadian Health Measures Survey Expert Advisory Committee; the U.S. Department of Agriculture Seafood Education Project Advisory Group; and the Gates Foundation/World Health Organization Global Burden of Diseases Nutrition Expert Group.

A Fellow of the American College of Cardiology and Fellow of the American Heart Association, Dr. Mozaffarian received a BS in biological sciences from Stanford University (with Honors, with Distinction, Phi Beta Kappa), an MD from Columbia University (Alpha Omega Alpha), an MPH from the University of Washington, and a Doctorate in Epidemiology from the Harvard School of Public Health. He is board certified in Internal Medicine and Cardiovascular Medicine.

## Robert Paarlberg

**Betty Freyhof Johnson Class of 1944 Professor of Political Science, Wellesley College**

**Adjunct Professor of Public Policy, Harvard Kennedy School of Government**

Robert Paarlberg is the Betty Freyhof Johnson Class of 1944 Professor of Political Science at Wellesley College, Adjunct Professor of Public Policy at the Harvard Kennedy School of Government, and an Associate at Harvard's Weatherhead Center for International Affairs. He received his BA in government from Carleton College in Minnesota and his PhD in government from Harvard. He has served as visiting professor of government at Harvard, as a legislative aide in the U.S. Senate, and as an officer in the U.S. Naval Intelligence Command.

Paarlberg's principal research interests are international food, agriculture, and science policy. His 2008 book, *Starved for Science: How Biotechnology Is Being Kept Out of Africa* (Harvard University Press, March 2008), explains why poor African farmers are denied access to productive technologies, particularly genetically engineered seeds with improved resistance to insects and drought. His 2010 book, from Oxford University Press, is titled *Food Politics: What Everyone Needs to Know*.

Paarlberg's recent research focus has been on the regulation of modern technology, including biotechnology. In 2004–05, he published articles on the competitive posture of scientific research in the United States and on the global stem cell research competition. He has worked most intensively on policies toward genetically modified crops and foods in developing countries. In recent years, he has done research on this topic in Kenya, Zambia, Brazil, Cameroon, Senegal, India, China, and Argentina. He has also recently completed major studies of regional policy harmonization toward biotechnology in eastern and southern Africa, for the Common Market of Eastern and Southern Africa (COMESA) on the politics of accepting biofortified food crops in developing countries, commissioned by the Bill and Melinda Gates Foundation, and on U.S. international agricultural development policy, for the Chicago Council on Global Affairs.

Paarlberg was recently a member of the Board of Agriculture and Natural Resources at the National Research Council of the National Academies, and he has been a member of the Board of Directors of Winrock International,

a member of the Emerging Markets Advisory Committee at the United States Department of Agriculture, a scientific liaison officer to the International Food Policy Research Institute from the U.S. Agency for International Development, and a consultant to the National Intelligence Council, USAID, IFPRI, and the World Bank.

## Per Pinstrup-Andersen

**H. E. Babcock Professor of Food, Nutrition and Public Policy**

**Professor of Applied Economics, Cornell University**

Per Pinstrup-Andersen is the H. E. Babcock Professor of Food, Nutrition and Public Policy, the J. Thomas Clark Professor of Entrepreneurship, and Professor of Applied Economics at Cornell University. He is past Chairman of the Science Council of the Consultative Group on International Agricultural Research (CGIAR) and Past President of the American Agricultural Economics Association. He has a BS from the Danish Agricultural University, an MS and PhD from Oklahoma State University, and honorary doctoral degrees from universities in the United States, United Kingdom, Netherlands, Switzerland, and India. He is a fellow of the American Association for the Advancement of Science and the American Agricultural Economics Association. He served 10 years as the International Food Policy Research Institute's Director General and seven years as department head; seven years as an economist at the International Center for Tropical Agriculture, Colombia; and six years as a distinguished professor at Wageningen University. He is the 2001 World Food Prize Laureate and the recipient of several awards for his research and communication of research results. He teaches and advises graduate and undergraduate students on globalization and poverty and a social entrepreneurship approach to government policy for the global food system. His research includes economic analyses of food and nutrition policy, globalization and poverty, agricultural development, and research and technology policy. Dr. Pinstrup-Andersen's publications include "Seeds of Contention," co-authored with Ebbe Schiøler and published in five languages, and more than 400 other books, refereed journal articles, papers, and book chapters, including a book on Ethics, Hunger and Globalization, co-edited with Peter Sandøe; a book on Agricultural

Trade Liberalization and the Least Developed Countries, co-edited with Niek Koning (both published in 2007); and *The African Food System and Its Interaction with Human Health and Nutrition*, published in 2010. A textbook on food policy co-authored with Derrill Watson, will be published in September 2011.

## Michael Roberts

**CEO, LYFE Kitchen**

Mike Roberts is the principal owner of Westside Holdings, LLC, and the former Global President and Chief Operations Officer for McDonald's Corporation. He also served on their Board of Directors. As President, Mr. Roberts was responsible for more than 31,000 restaurants in 118 countries. Before assuming this position in 2004, his previous positions at McDonald's Corporation included Chief Executive Officer, McDonald's USA, and President, West Division, McDonald's USA. As President of McDonald's USA, Roberts's team developed the plan that turned the company around after it experienced its first-ever losing quarter in 2001. He later went on to lead the execution of his "Plan to Win" strategy on a global scale from 2004–06. His determination for corporate responsibility, consumer relevance, and strong operations helped achieve one of the biggest business and financial turnarounds in history.

Currently, Roberts is the CEO of LYFE Kitchen. LYFE Kitchen is a transformational, socially responsible "lyfestyle" brand, whose acronym stands for Love Your Food Everyday. The LYFE Kitchen mission is to answer one of America's greatest unmet consumer needs by providing great-tasting, affordable, good-for-you food while making a positive impact on all of the communities we serve.

In 2009, Roberts was the Vice Chairman and a Board Member of the Chicago 2016 Olympic Committee. He was responsible for overseeing all marketing and communications activities for the bid from the board level. In addition to marketing and communications, he was also active in the areas of sponsorship, advertising, grassroots marketing and building the bid's national and international presence in support of Chicago's candidacy. Mike Roberts is on the Board of Directors of W.W. Grainger, Inc. (GWW), Qwest Communications (Q), Standard Parking (STAN), and is on the board of the Chicago Council on Global Affairs.

#### Samuel C. Scott III

**Retired Chairman and CEO, Corn Products International, Inc.**

Samuel C. Scott III is the retired Chairman, President and Chief Executive Officer of Corn Products International, Inc. Scott serves on the board of Motorola, Inc., where he is Chairman of the Compensation and Leadership Committee. He also serves on the Board of Directors of The Bank of New York, Mellon Corporation, Abbott Laboratories, Northwestern Memorial HealthCare, The Chicago Council on Global Affairs, and the Chicago Urban League. He also serves as Chairman of the Chicago Sister Cities International Program. Scott received both a bachelor's degree in engineering in 1966 and a master's degree in business administration in 1973 from Fairleigh Dickinson University in Teaneck, New Jersey. He is a native of Jersey City, New Jersey, and presently resides in Chicago, Illinois.

#### Robert L. Thompson

**Visiting Scholar, School of Advanced International Studies, Johns Hopkins University**

**Senior Fellow, The Chicago Council on Global Affairs; Professor Emeritus of Agricultural Policy, University of Illinois at Urbana-Champaign**

Dr. Robert L. Thompson is a Visiting Scholar at Johns Hopkins University's Paul H. Nitze School of Advanced International Studies in Washington, D.C. He is Professor Emeritus at the University of Illinois at Urbana-Champaign, where he held the Gardner Endowed Chair in Agricultural Policy. He is also Senior Fellow, global agricultural development and food security, with the Chicago Council on Global Affairs and serves on the USDA-USTR Agricultural Policy Advisory Committee for Trade, the International Food and Agricultural Trade Policy Council, and the Land O'Lakes board of directors.

Previously, Dr. Thompson served as Director of Rural Development and Senior Advisor for Agricultural Trade Policy at the World Bank (1998–2002); President and CEO of the Winrock International Institute for Agricultural Development (1993–1998); Dean of Agriculture (1987–1993) and Professor of Agricultural Economics (1974–1993) at Purdue University; Assistant Secretary for Economics at the U.S. Department of Agriculture (1985–1987); and Senior Staff Economist for Food and Agriculture at the President's Council of Economic Advisers (1983–1985).

Thompson, who received his BS degree from Cornell University and his MS and PhD degrees from Purdue University, holds honorary doctorates from the Pennsylvania State University and Dalhousie University (Canada). He is a fellow of the American Agricultural Economics Association and the American Association for the Advancement of Science and a foreign member of the Royal Swedish Academy of Agriculture and Forestry and of the Ukrainian Academy of Agricultural Sciences. He is a former president of the International Association of Agricultural Economists.

In January 2011, the American Farm Bureau Federation presented him with its highest honor, the Distinguished Service to Agriculture Award.

Raised on a small family dairy farm in New York State, Dr. Thompson has extensive international experience and has lectured, consulted, or conducted research in more than 90 countries worldwide, including extended periods in Denmark, Laos, and Brazil.

#### Ricardo Uauy

**PhD, MD, Professor of Public Health Nutrition, London School of Hygiene and Tropical Medicine**

Dr. Ricardo Uauy is board certified in pediatrics, neonatology, and perinatology. He is currently a professor of public health nutrition at the London School of Hygiene and Tropical Medicine. During part of his tenure with the London School of Hygiene and Tropical Medicine, he served as the University

Regional Coordinator for Latin America with the United Nations' Food and Nutrition Program. He received his medical degree from the University of Chile and a doctoral degree in nutritional biochemistry and metabolism and international nutrition planning from Massachusetts Institute of Technology (MIT).

Dr. Uauy has also worked at the Institute of Nutrition and Food Technology (INTA) at the University of Chile. He headed up both the institute's Clinical Nutrition Unit and Human Nutrition Area and its Training Programs. He was recognized for his leadership and commitment to nutrition and the INTA mission, and promoted to Director, a position he held until accepting the professorship at the prestigious London School of Hygiene and Tropical Medicine. Dr. Uauy started his career at INTA as the Director of the Clinical Research Center. He continues to hold a professorship in nutrition and pediatrics at the University of Chile.

Dr. Uauy's influence is substantial and he is a highly respected advisor to the UN, WHO, and FAO. His expertise is wide-ranging and includes basic nutritional science, applied biomedical research, and population-based intervention programs. His areas of interest span the age spectrum from infants to the elderly, and the social spectrum from poverty to affluence. He was honored with the Presidential Award (Chile) in Science for his research into the effects of essential fatty acids on gene expression during retinal and brain development in 1997. He received the E.V. McCollum Award from the American Society of Nutritional Sciences USA in 2000 and was elected Member of the Chilean Academy of Medicine in 2001. He received the A. Horwitz Award from PAHO/WHO in 2005 for leadership in Public Health in the Americas and in 2006 the American Society for Nutrition Kellogg's award for International Nutrition. He is the President of the International Union of Nutritional Sciences IUNS 2006–10. He has edited/co-edited eight books and has published over 300 original scientific publications.

## David Nabarro

**United Nations Secretary-General's  
Special Representative for Food Security  
and Nutrition**

**Coordinator of the United Nations System  
High-Level Task Force on Global Food Security**

Born in London on August 26, 1949, David Nabarro trained as a doctor and worked for six years in child health and nutrition programs in Iraq, South Asia, and East Africa; taught for six years at the London and Liverpool Schools of Tropical Medicine; and served as Director for Human Development in the British Government's Department for International Development (DFID).

In 1999, he was selected to lead Roll Back Malaria at the World Health Organization (WHO). In 2003, he moved to WHO's Department for Health Action in Crises, and in September 2005, he joined the office of the UN Secretary-General as Senior Coordinator for Avian and Pandemic Influenza.

In January 2009, he was also asked to coordinate the UN System High-Level Task Force on the Global Food Security Crisis, and in October 2009, Ban Ki-moon, UN Secretary-General, appointed David Nabarro as his Special Representative for Food Security and Nutrition.

## David Pelletier

**Associate Professor of Nutrition Policy,  
Division of Nutritional Sciences, Cornell  
University**

David Pelletier is an associate professor of nutrition policy in the Division of Nutritional Sciences at Cornell University. He received a BA in anthropology and a BS in biology from the University of Arizona, and his MA and PhD in biological anthropology from Pennsylvania State University. He is a member of the American Society for Nutrition, the Association for Public Policy and Management, the American Public Health Association and the Society for the Policy Sciences.

Dr. Pelletier's research, teaching, and public engagement focuses on improved methods for the analysis and design of nutrition policy, tools for the scaling up nutrition interventions and the application of implementation science to nutrition. The topical focus includes the causes, consequences, and solutions related to maternal and child malnutrition, the prevention of childhood obesity in the U.S., the science, law, and politics in the FDA's regulation of genetically engineered foods, the analysis of policy options for addressing iron overload in the United States and the political dynamics in nutrition policy agenda-setting, policy formulation, and implementation. He has conducted or supervised such research and project work in the United States and in Ethiopia, Kenya, Tanzania, Malawi, Mozambique, Lesotho, Nigeria, Indonesia, China, Kyrgyzstan, Bolivia, Guatemala, Peru, and Haiti.

In addition to his research, Dr. Pelletier has advised on nutrition policy and strategy development with the World Bank, USAID, UNICEF, the World Health Organization, the UN Standing Committee on Nutrition, the Scaling Up Nutrition initiative, the Bill and Melinda Gates Foundation, the Academy for Educational Development, the International Food Policy Research Institute, and U.S. Institute of Medicine. His current and most recent projects include the Mainstreaming Nutrition Initiative, the Micronutrient Program Assessment Project, the scaling up of nutrition programs in Bolivia, Haiti, and Mozambique, and a study of policymaker perspectives on noncommunicable diseases in Nigeria.

## K. Srinath Reddy

**President, Public Health Foundation of India**

Professor K. Srinath Reddy is presently President of the Public Health Foundation of India, and until recently headed the Department of Cardiology at the All India Institute of Medical Sciences (AIIMS). Professor Reddy has been involved in several major international and national research studies, including the INTERSALT global study of blood pressure and electrolytes. He is Coordinator of the Initiative for Cardiovascular Health Research in the Developing Countries, a global partnership program that serves to strengthen research related to prevention of cardiovascular diseases in the developing countries. He has served on many WHO expert panels. Professor Reddy graduated from Osmania Medical College, Hyderabad, and later trained at AIIMS, Delhi, where he received his MD (Medicine) and DM (Cardiology) degrees. He is a clinical cardiologist also trained in epidemiology (at McMaster University, Canada) and has a career commitment to preventive cardiology and public health. He has published widely in international and Indian peer-reviewed journals.

Glossary

End Notes

References

## Glossary

**Agricultural inputs:** Resources used in agricultural production. Natural inputs consist of climate, soil, geology, etc. Human inputs consist of fertilizer, pesticides, seeds, etc.

**Agricultural outputs:** Items that agriculture produces, such as grains, eggs, milk, etc.

**Agribusiness:** Agriculture conducted on commercial principles, especially using advanced technology.

**Balanced diet:** A diet consisting of a wide variety of foods and drinks from all food groups while limiting saturated fat, trans fat, cholesterol, refined sugar, salt, etc.

**Biological risk factors:** Physical factors such as age, race, and gender that can contribute to higher occurrences or increased chances of getting a specific disease.

**Body mass index:** The measure of body fat based on height and weight.

**Cash crops:** Crops grown for direct sale; crops grown for profit.

**Common Agricultural Policy:** A system of European Union agricultural subsidies and programs. The CAP combines payments for crops and land, which may be cultivated with price support mechanisms, including guaranteed minimum prices, import tariffs, and quotas on certain goods from outside the EU.

**Diet-related diseases and conditions:** Conditions such as obesity, cardiovascular disease, and high cholesterol caused by poor eating habits.

**Dietary diversity:** Variety of food in food groups to ensure adequate intake of essential nutrients and to promote good health.

**Dietary factors:** The consideration of dietary factors as a variable in disease incident, transmission, and control, particularly intake of cholesterol, sodium, saturated and trans fats, vitamins, minerals.

**Dietary patterns:** The composite characteristics of an individual's or population's diet over time.

**Dual burden of disease:** The combining of diseases of the developing world (infectious diseases affected by poverty) with those of the developed world (noncommunicable conditions, such as cardiovascular disease and diabetes).

**Dual burden of malnutrition:** The issue of dealing with undernutrition while also dealing with the rise of obesity and diet-related illnesses.

**Food aid:** Providing food and related assistance to tackle hunger, either in emergency situations or to help with longer-term hunger alleviation and achieve food security.

**Food groups:** Collections of foods that share similar nutritional properties or biological classifications (grains, fruits and vegetables, animal source foods, dairy).

**Food security:** The availability of food and one's access to it. "Food secure" means that one is not living in hunger or fear of starvation.

**Food supply chain:** A network of food-related business enterprises through which food products move from production through consumption, including preproduction and post-consumption activities.

**Food value chain:** An enhanced version of the food supply chain used to identify points of leverage where greater value can be produced by the food system, either for private or for social benefit.

**Foreign direct investment:** Investments of foreign assets into domestic structures, equipment, and organizations. An investment abroad, where the company being invested in is controlled by a foreign corporation.

**Gross Domestic Product:** The market value of all final goods and services produced in a given period.

**Gross National Product:** The total value of all goods and services produced by the residents of a country in a given year.

**International Monetary Fund:** An international organization created for the purpose of surveying and monitoring economic and financial developments, lending funds to developing countries, and providing technical assistance and training for countries requesting them.

**Low-income country:** Country with a per capita income less than \$1,005.

**Maternal and child health:** Medical and association social issues concerned with mothers and children. Maternal and child health programs focus on prenatal and postnatal services, safe delivery, family planning care, and pediatric care in infancy.

**Metabolic risk factors:** Physiological factors (high cholesterol, high blood pressure, high BMI) that increase the chances of noncommunicable diseases (NCDs), such as cardiovascular diseases and diabetes.

**Micronutrients:** Nutrients required by humans and other living things in small quantities to orchestrate a whole range of physiological functions but which the organism itself cannot produce.

**Middle-income country:** Country with a per capita income between \$1,006 and \$12,275.

**Millennium Development Project:** An initiative that focuses on research implementing the organizational means, operational priorities, and financing structures necessary to achieve the goals to reduce poverty, hunger, disease, illiteracy, environmental degradation, and discrimination against women.

**Modifiable risk factors:** A variable associated with an increased risk of disease or infection (smoking, diet, physical activity).

## Glossary

**Mutual Metrics:** Progress indicators that can be achieved through collective action, cross-sectoral, and other partnerships by the agricultural and health sectors to invent new programs and policies, and greater responsibility and transparency in food choices throughout society; Progress indicators that can be shared by the agriculture and health sectors. They suggest that those sectors have overlapping objectives and can potentially align policies and practices to provide healthy choices and promote good health.

**Noncommunicable diseases (NCDs):** Medical conditions or diseases that are noninfectious (heart disease, diabetes).

**Nongovernmental organizations:** Legal organizations that operate independently from any government.

**Nutrition transition:** Increased consumption of unhealthy foods compounded with increased prevalence of obesity in middle- to low-income countries. Foods rich in vitamins, minerals, and micronutrients have been substituted by foods heavy in sugar, saturated fats, and sodium.

**Organization for Economic Cooperation and Development:** An organization of countries that promotes policies that will improve the economic and social well-being of people around the world. It works to stimulate economic progress and world trade.

**Paris Declaration:** An agreement resulting from a high-level forum held in Paris in 2005 on how to make aid more effective, focusing on five principles: ownership, alignment, harmonization, managing for results, and mutual accountability.

**Peri-urban:** An area of high concentration of houses located between the suburbs and the countryside while less served by public transportation.

**Perinatal conditions:** Conditions starting with the period before birth to one to four weeks after birth.

**Processed foods:** Real food that has been altered to lower its production cost, lengthen its shelf life, make it look more appealing or makes you want to eat more of it. This results in the reduction of its nutritional content and/or the increase of toxins.

**Pulses:** Legume used for food or animal feed. Crops harvested solely for the dry seed.

**Smallholder farmer:** Farms supporting a single family with a mixture of cash crops and subsistence farming. In many developing countries, a smallholding is a small plot of land with low rental value, used to grow crops.

**Soil degradation:** When soil quality deteriorates by losing its nutrients and organic matter due to human activity, toxins, or the soil structure breaking down.

**Staple crops:** A staple food is a food that can be stored for use throughout the year or produced fresh any time of the year and forms the basis of a traditional diet.

**Subsistence farmer:** Farming that provides for the basic needs of the farmer without surpluses.

**Surveillance:** The ongoing, systematic collection of health data essential to the evaluation, planning, and implementation of public health practice, closely integrated with the timely dissemination of data as required by higher authority.

**UN Food and Agriculture Organization:** The United Nations agency leading efforts to defeat hunger. It provides information to help countries improve agriculture, forestry, and fisheries practice in order to ensure good nutrition and food security.

**Undernutrition:** Inadequate nutrition, either due to a lack of food or to the inability of the body to absorb its nutrients.

**USAID:** The United States federal government agency primarily responsible for administering civilian foreign aid.

**USAID-Tanzania Agriculture Productivity Program:** A USAID effort designed to increase incomes for small farmers and rapidly expand Tanzania's agriculture sector.

**Whole-of-government approach:** A holistic approach to public policy that involves coordination between multiple branches, departments, and/or ministries to address issues from a shared perspective. In the context of this report, an approach that advocates developing plans, policies, and programs to affect good health through cooperation between agriculture, health, nutrition, and other stakeholders within government.

**World Bank:** An international financial institution that provides loans to developing countries for capital programs. Its official goal is to reduce poverty.

**World Food Programme:** United Nations food aid branch dedicated to addressing hunger worldwide and helping people who are unable to produce or obtain enough food for themselves or their families.

**Worldwide Fund for Nature, Conservation International and World Conservation Union:** An international conservation organization dedicated to finding sensible and realistic solutions to environmental issues.

**WTO phytosanitary and sanitary standards:** World Trade Organization standards regulating food safety and animal and plant health, as agreed to under the 1995 Agreement on the Application of Sanitary and Phytosanitary Measures (the "SPS Agreement").



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