

2014-2015

GLOBAL FOOD POLICY REPORT



IFPRI

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE



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The International Food Policy Research Institute (IFPRI), established in 1975, provides research-based policy solutions to sustainably reduce poverty and end hunger and malnutrition. The Institute conducts research, communicates results, optimizes partnerships, and builds capacity to ensure sustainable food production, promote healthy food systems, improve markets and trade, transform agriculture, build resilience, and strengthen institutions and governance. Gender is considered in all of the Institute's work. IFPRI collaborates with partners around the world, including development implementers, public institutions, the private sector, and farmers' organizations.

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International Food Policy Research Institute
2033 K Street, NW
Washington, DC 20006-1002, USA
Telephone: +1-202-862-5600
www.ifpri.org

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Preface

This *2014–2015 Global Food Policy Report* is the fourth in an annual series that provides a comprehensive overview of major food policy developments and events. In this report, distinguished researchers, policymakers, and practitioners review what happened in food policy in 2014 at the global, regional, and national levels, and—supported by the latest knowledge and research—explain why. This year’s report is the first to also look forward a year, offering analysis of the potential opportunities and challenges that we will face in achieving food and nutrition security in 2015.

The year 2014 was marked by advances and setbacks in agriculture, food security, and nutrition. The Millennium Development Goal of halving poverty by 2015 was achieved. World food prices fell to their lowest level since 2010. Nutrition remained prominent: the Second International Conference on Nutrition in Rome proposed actions to end malnutrition, membership in the Scaling Up Nutrition (SUN) movement expanded, and new research highlighted the importance of factors such as water and sanitation and the role of women in battling malnutrition. Debate began on the draft post-2015 Sustainable Development Goals, sharpening the world’s focus on the building blocks of food and nutrition security. Significant commitments to combating climate change were made, particularly by China and the United States. Middle income countries, home to the majority of the world’s hungry and malnourished people, continued their efforts to improve food security and nutrition at home, with Brazil and China, for example, expanding investments in agriculture and knowledge and technology transfers with the global South.

At the same time, 2014 also offered a reminder of the world’s continued vulnerability to shocks and risks. The largest-ever outbreak of Ebola in West Africa infected more than 20,000 and killed over 8,000 people. Equally important is that hundreds of thousands have suffered and will continue to suffer from hunger and malnutrition due to disruptions in food production, marketing, and trade. This will cause long-term damage to the potential health and wellbeing of poor and hungry people, particularly women and children. Conflict—including continued civil war in Syria and turmoil in Iraq, Libya, and Yemen—highlighted the security risks and deteriorating physical conditions faced not only by refugees but also inhabitants of neighboring countries. Extreme weather conditions and climate change threatened all regions of the world, from low rainfall in the Sahel to drought in Central America and natural disasters in Asia. Smallholder farmers, who produce much of the food consumed in Asia and Africa south of the Sahara, remain most vulnerable to these types of shocks.

The year 2015 now offers a window of opportunity to reshape the global development agenda. If the momentum garnered for food and nutrition security in 2014 can be leveraged into post-2015 Sustainable Development Goals that enhance or foster holistic and comprehensive nutrition investments, policies, and programs, the international community may soon have a chance to end hunger and malnutrition once and for all.

Topics covered in the *2014–2015 Global Food Policy Report* were the result of consultations with top experts in the field. For inclusion in this annual report, a topic has to represent a new development in food policy or a new way of looking at an important food policy issue; the topic has to be international in scope, such as by affecting several countries or stakeholders; and assessments and recommendations must be backed by evidence based on high-quality research results or expert judgment. It is for this reason that the chapters of this report capture the depth, relevance, and breadth of food policy issues in 2014 and provide an outlook on the major challenges and opportunities for 2015. Supplemented by our first-ever opinion survey on national and global food policies and hunger and malnutrition, the report paints a full picture of food policy for 2014–2015.

I hope that this report is met with interest not only by the decisionmakers who set the food policy research agenda for 2015 and beyond but also by media, nongovernmental organizations, and broad groups of civil society who have just as big a stake in food policies that benefit the world’s poorest and most vulnerable people.

I welcome your feedback, comments, and suggestions at ShenggenFan-GFPR@cgiar.org.

SHENGGEN FAN
Director General

Acknowledgments

The *2014–2015 Global Food Policy Report* was prepared under the overall leadership of Shenggen Fan and a core team comprising project coordinator Sivan Yosef, Andrew Marble, Rajul Pandya-Lorch, Gwendolyn Stansbury, Teunis van Rheenen, and Klaus von Grebmer.

Text and data contributions were made by Kamiljon Akramov, Perrihan Al-Riffai, Luz Marina Alvare, Suresh Babu, Ousmane Badiane, Su Baozhong, Miroslav Batka, Nienke Beintema, Clemens Breisinger, Joanna Brzeska, Kevin Chen, Denise Chin, Julia Collins, Ertharin Cousin, Xinshen Diao, Paul Dorosh, Olivier Ecker, Delia Grace, Lawrence Haddad, P.K. Joshi, Ravi Kanbur, Yifei Liu, Tsitsi Makombe, Siwa Msangi, Alejandro Nin-Pratt, Tolulope Olofinbiyi, Allen Park, Nilam Prasai, Danielle Resnick, Christopher Rue, Caitlin Shaw, Dean Spears, Gert-Jan Stads, Peter Timmer, Jean Francois Trinh Tan, Maximo Torero, Klaus von Grebmer, Indira Yerramareddy, Bingxin Yu, and Yumei Zhang.

Production of the report was led by IFPRI's Publications Unit under the guidance of Andrea Pedolsky. Team members include editorial coordinator Andrew Marble, Patricia Fowlkes, Heidi Fritschel, Corinne Garber, Michael Go, Lucy McCoy, Joan O'Callaghan, David Popham, Katarlah Taylor, Julia Vivalo, and John Whitehead. Chapter 1, which draws partially on other chapters in this book, benefited from research and writing assistance from Heidi Fritschel and Sivan Yosef. Tolulope Olofinbiyi, Christopher Rue, and Denise Chin contributed to Chapter 2, which also benefited from feedback from World Food Programme colleagues Ryo Koshikawa and Stanlake Samkange. Chapter 7 greatly benefitted from findings generated under the research project "Decreasing vulnerability to conflict in the Middle East and North Africa," which was funded by the International Fund for Agricultural Development and co-financed by the CGIAR's Policies, Institutions, and Markets Program.

The report underwent a thorough review by IFPRI's Publications Review Committee, chaired by Gershon Feder, as well as from the anonymous external scholars and experts who peer-reviewed the research and provided insightful comments on the preliminary drafts.



Strong Advances and Stubborn Setbacks

Shenggen Fan

SUMMARY The year 2014 saw mixed results for food and nutrition security: some countries made headway on policies to cut hunger, while in other countries conflict and health crises took a heavy human toll. Much of the year's discourse focused on potential priorities for the future global development agenda.

FOR THOSE OF US WORKING TO ENSURE SUSTAINABLE SOLUTIONS TO hunger and poverty, 2014 was a year of progress, vulnerabilities, and hope.

In many ways, human well-being continued to improve in 2014. The share of the world's people who are hungry and poor kept falling. The Millennium Development Goal (MDG) of halving global poverty has been achieved: the number of people living in extreme poverty fell by 700 million between 1990 and 2010—five years ahead of the 2015 target date.¹ The goal of cutting the share of hungry people by half seems nearly attainable, having been met by 64 developing countries since 1990. Global undernourishment has fallen drastically during the past two decades, from 19 percent to 11 percent.²

Yet events also reminded us of our serious and continued vulnerability to shocks, both natural and human caused, and other risks, including the Ebola epidemic, droughts and floods, conflicts, and the ticking time bomb of overweight and obesity. We have often not found effective ways of preventing, responding to, and overcoming risks and shocks that cross national borders and that do not fit neatly into the scope of existing institutions.

To cope not only with the existing challenges of poverty and hunger but also with additional challenges that are sure to come, policymakers from countries rich and poor, as well as development agencies and other actors, must recognize the need to bolster our systems and institutions. The global dialogue on how to meet these challenges continued on many fronts in 2014, and important global and national commitments were made on nutrition, trade, and climate. In a year of extensive activity related to nutrition, another hopeful sign was the increased recognition of the severity of not only micronutrient malnutrition (or “hidden hunger”) but also overweight and obesity, as well as a greater understanding of

the role of water, sanitation, and hygiene in nutrition. The year was also critical in setting the future development agenda at the global and national levels.

THERE WAS MUCH TO CELEBRATE IN 2014

Poor and middle income countries showed strong economic and agricultural growth in 2014. As of October 2014, annual growth of gross domestic product (GDP) in emerging market and developing countries averaged 4.4 percent—in contrast with just 1.8 percent in the advanced economies—according to the International Monetary Fund.³ To combat hunger and poverty, it will be important for this economic growth to raise the incomes and improve the well-being of the poorest people; we do not yet know whether this happened in 2014.

Food-importing developing countries also received a boon in the form of lower food prices. World food prices fell in 2014 to their lowest level



As of October 2014, annual growth of gross domestic product (GDP) in emerging market and developing countries averaged 4.4 percent—in contrast with just 1.8 percent in the advanced economies.

since 2010, according to the Food Price Index of the Food and Agriculture Organization of the United Nations (FAO). One contributor to lower food prices was the decline in the price of oil, which is an important component in global food production. Between June and December 2014, the price of oil fell by nearly half. By contributing to lower food prices, falling oil prices are likely to be, by and large, good for global food security and nutrition.

More important, much progress has been made at the country level. Countries in South Asia took a number of steps to combat poverty and hunger,

including various social protection measures. India's 2013 National Food Security Act, which calls for providing highly subsidized food grains to two-thirds of the country's population, was fully implemented by 5 of India's 29 states and partly implemented by 6 other states.⁴ The question remains how to manage the program better and target it more closely to the neediest people in order to reduce the overall cost and ensure that it promotes good nutrition. India also adopted a scheme to help the country's poor open 75 million bank accounts; although the accounts would start with a zero balance, they represent a first step in increasing poor people's participation in the financial system. Similarly, Pakistan aimed to bring the poor into the financial system by partly guaranteeing credit for smallholder farmers. Because such schemes have had mixed success in other South Asian countries, their effectiveness and long-term financial viability will need to be carefully monitored. Nepal adopted a new 20-year Agricultural Development Strategy designed to reduce poverty through agriculture-led growth. And despite the fact that genetically modified crops still generate much debate in the region, Bangladesh approved the commercial cultivation of genetically modified *Bacillus thuringiensis* (Bt) eggplant under government supervision. In 2014, 20 small eggplant farmers were given Bt seedlings for cultivation; the government plans to increase Bt eggplant cultivation in the next five years.⁵

Africa as a region showed solid economic growth and has slowly pushed down rates of poverty and hunger. Foreign direct investment in the region has been increasing in recent years, contributing to economic growth and development, and Africa's share of global trade and trade in agricultural products has been on the rise. At the African Union Summit in June, African heads of state and government adopted the Malabo Declaration, committing themselves to agriculture-led growth as laid out in the Comprehensive Africa Agriculture Development Programme (CAADP), launched in 2003. Also in the Malabo Declaration, these leaders committed to ending hunger and halving poverty by 2025 (see Chapter 9), tripling intra-African trade in agricultural commodities, and building agriculture's resilience to climate variability and shocks. Indeed, trade within Africa is already on the upswing, though from an admittedly

low baseline, and African markets account for 34 percent of African agricultural exports.⁶

Although conflicts still plague parts of the Middle East and North Africa, some countries, such as Egypt and Tunisia, experienced more stability, attracting domestic and foreign investment. Many countries in the region—including Egypt, Morocco, Sudan, and Yemen—cut fuel subsidies, saving money that could be reinvested in development. Some of these same countries supported increased production of staple grains (such as wheat) and built up their strategic grain reserves, potentially bolstering their resilience in the face of future price, trade, or production shocks.

East Asia grew rapidly in 2014, at 5.7 percent,⁷ and countries in the region took actions to strengthen food security and agricultural development. China's 2014 *Number 1 Central Document* signaled a shift away from the country's traditional emphasis on food self-sufficiency and toward heavier reliance on international trade to achieve food security aims, and also strengthened farmers' property rights. Indonesia reformed its rice safety-net program to reduce inefficiencies and waste, and the Philippines, Thailand, and Vietnam have also implemented extensive agricultural policy reforms. In September the region's food and agriculture ministers adopted the Beijing Declaration on APEC (Asia-Pacific Economic Cooperation) Food Security, reaffirming the region's commitment to cooperating on food security and food safety.

Latin America and the Caribbean, the world's largest net food-exporting region, remained a food production powerhouse in 2014. Argentina, Brazil, Paraguay, and Uruguay play large roles in global wheat, maize, and soybean markets. Still, although agricultural productivity has grown rapidly in Argentina, Brazil, Chile, Mexico, and Peru, productivity growth across the region overall has lagged behind that in the United States. At the same time, several countries in Latin America have excelled in implementing policies to reduce food insecurity and malnutrition. Examples include Brazil's Zero Hunger and *Bolsa Família* programs and Mexico's *Oportunidades*. These successes have led to opportunities for South–South learning initiatives, such as United Nations (UN) Secretary-General Ban Ki-moon's Zero Hunger Challenge.

Rich countries also unveiled initiatives and funding commitments in 2014 designed to help cut hunger and undernutrition. For example, the government of Germany, announced plans to spend €1 billion a year on food security and rural development through its new initiative titled One World, No Hun-

The EU has pledged to help reduce stunting in 7 million children under five years of age by 2025 and to mobilize €3.5 billion between 2014 and 2020 to contribute to this goal.

ger.⁸ The government of the Netherlands committed to develop initiatives on global food security, specifically eradicating hunger and malnutrition, promoting inclusive and sustainable agricultural growth, and achieving ecologically sustainable food systems.⁹ Similarly, the European Union (EU) has made food security, nutrition, and sustainable agriculture top priorities for development cooperation in the coming years. For instance, it has pledged to help reduce stunting in 7 million children under five years of age by 2025 and to mobilize €3.5 billion between 2014 and 2020 to contribute to this goal.¹⁰

As part of a major overhaul to its development cooperation system, the Italian parliament authorized the formation of a development agency and financing facility.¹¹ US funding for global health programs reached unprecedented levels, with US\$9.1 billion—an increase of more than \$400 million¹²—allocated for fiscal year 2014. And at the first-ever US–Africa Leaders' Summit held in Washington, DC, the US Agency for International Development (USAID) launched a \$100 million Global Resilience Partnership with the Rockefeller Foundation to help vulnerable people withstand shocks and crises.¹³

Progress was also made in reforming global trade rules, which can have large impacts on agriculture and farmers worldwide. World Trade Organization (WTO) negotiations in Bali in December 2013

2014 FOOD POLICY TIMELINE: ISSUES, ACTIONS & EVENTS

January

UN FOCUSES ON FAMILY FARMERS

United Nations designates 2014 as the International Year of Family Farming.

February

DISTORTED FARM SUPPORT CONTINUES IN THE US & EU

US passes Farm Bill, allocating up to US\$30 billion in annual support to US farmers, while the European Union implements its Common Agricultural Policy, distributing €40 billion per year to its farmers.



March

EBOLA HITS WEST AFRICA HARD

Outbreaks of Ebola occur in several West Africa countries, with subsequent grave impacts on agricultural production, trade, and household food and nutrition security.

April

EYES ON THE OCEANS

At the Global Oceans Action Summit for Food Security and Blue Growth, held in The Hague, governments, business leaders, and NGOs from 80 countries agree to take "unorthodox" steps to address overfishing, climate change, and ocean pollution.



May

SYRIAN REFUGEE CRISIS WORSENS

By this month, an estimated 3.2 million Syrian refugees face food and nutrition insecurity in neighboring Egypt, Iraq, Jordan, Lebanon, and Turkey.



June

AU COMMITS TO END HUNGER BY 2025

The 23rd African Union Summit culminates in the Malabo Declaration, recommitting African member states to devote 10% of their budgets to agricultural development, reduce stunting to 10%, and end hunger and halve poverty by 2025.

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July

FOOD SCARE IN ASIA

China is rocked by tainted meat scandal in fast food chains, which then spreads to Hong Kong and Japan.



October

WASTE OIL SCANDAL IN TAIWAN

Taiwan health minister resigns after hundreds of tons of "gutter oil"—recycled waste oil—is found in food products.

December

WORLD OIL PRICES HIT LOWEST POINT SINCE 2009

Oil prices declined sharply, falling by more than 40 percent since June 2014.



November

HIGH-LEVEL CONFERENCE ON NUTRITION

Delegates at the Second International Conference on Nutrition endorse the Rome declaration and framework for action for fighting global malnutrition.

September

FROM MDGs TO SDGs

With the expiration of the Millennium Development Goals imminent, the UN General Assembly adopts resolution to incorporate the Sustainable Development Goals into the post-2015 agenda.

CLIMATE-SMART AGRICULTURE BY 2030

Climate talks move ahead with the UN Climate Summit and the launch of the Global Alliance for Climate-Smart Agriculture.



AN AMBITIOUS CLIMATE PLAN

US and China reach historic bilateral climate deal, committing to reduce emissions after 2030.

A NEW GLOBAL TRADE PACT

US and India break WTO negotiations impasse, agreeing to move forward on Trade Facilitation Agreement.

resulted in a trade deal, but India blocked it out of concern that WTO limits on agricultural subsidies and food grain reserves would hamper its food security program. In November 2014 the United States and India reached a breakthrough to move the deal forward. The United States agreed not to challenge India's food security program until the dispute was formally resolved in the WTO.

Finally, thanks to an increasing understanding of the importance of nutrition and tireless work by nutrition advocates to increase attention to the issue, nutrition shot up to the top of the global development agenda in 2014. It has become clear that the factors that influence people's nutrition go well beyond food and agriculture to include drinking water and sanitation, the role of women, the quality of caregiving, and others. Malnutrition is now understood to include not just hunger and micronu-



It has become clear that the factors that influence people's nutrition go well beyond food and agriculture to include drinking water and sanitation, the role of women, the quality of caregiving, and others.

trient malnutrition but also overnutrition that manifests itself in overweight and obesity—conditions that pose increasing challenges not just in rich countries, but also in developing countries.

In a sign of the current high interest in nutrition, more than 2,200 people gathered at the Second International Conference on Nutrition (ICN2) in Rome in November—22 years after the first such conference. At the conference, government representatives and high-level officials endorsed 60 far-reaching actions designed to help combat all forms of malnutrition. Following the event, FAO created the Action for Nutrition Trust Fund to mobilize funds for nutrition interventions and help countries set up mechanisms to monitor their progress toward the

ICN2 nutrition targets. In addition, membership in the Scaling Up Nutrition (SUN) Movement, which brings together countries seeking to improve nutrition and share experiences, had climbed to 54 countries by the end of 2014.

CRISES AND CHRONIC VULNERABILITY WERE SEVERE IN MANY HOT SPOTS

National, regional, and global food systems are still subject to a wide variety of shocks, and 2014 provided ample evidence of this vulnerability.

The civil war in Syria, now in its fourth year of conflict, has sent shock waves through the region. Syria's economy contracted by more than 40 percent in 2011–2013,¹⁴ and an estimated 4.9 million people are now in moderate need of food assistance.¹⁵ Syria's neighbors are affected too. As of December 2014, Lebanon and Turkey each hosted more than 1 million Syrian refugees, and Jordan was home to more than 600,000. Because of a funding crisis, the World Food Programme (WFP) was briefly forced to halt assistance to Syrian refugees in neighboring countries in late 2014. An emergency appeal restored assistance, but funding remains a constant concern. In January 2015, Lebanon announced new visa requirements for Syrians. Although one cannot dismiss the historical, socioeconomic, and political factors associated with this conflict, it also appears that Syria's civil war stems partly from the government's failure to respond adequately to widespread droughts in 2006–2010 that destroyed the livelihoods of 50 percent of farmers and herders and pushed up bread prices (see Chapter 7). Elsewhere in the region, conflict also plagued Iraq, Libya, and Yemen, with serious implications for food security.

In West Africa, a food crisis emerged from a different kind of shock: the largest-ever outbreak of Ebola, which likely began with the consumption of bat meat (see Chapter 6). In 2014, the virus infected more than 20,000 people, of whom more than 8,000 died, mainly in Guinea, Liberia, and Sierra Leone. Besides destroying lives, the epidemic wreaked havoc on food systems, disrupting agricultural production, harvesting, transport, and markets and contributing to a rise in food prices. Price increases of up to 30 percent for rice and up to 150 percent for

cassava were estimated in some areas, though the data are still preliminary.¹⁶ The disease outbreak has unleashed broader risks in West Africa. As experience with HIV/AIDS has shown, poor health, malnutrition, and economic vulnerability can interact in a negative feedback loop. Malnutrition may make an illness more severe and exacerbate its socioeconomic impacts. Illness may also reduce people's work capacity and productivity, imperiling the food security of entire households.¹⁷

Episodes of extreme weather and climate change also struck in 2014. Large movements of refugees fleeing violence in the Central African Republic, Mali, and northern Nigeria were made worse by low rainfall in Benin, Burkina Faso, Niger, Nigeria, and Togo and by drought in Chad and Senegal. Lack of rain threatened the food and nutrition security and livelihoods of both hosting communities and refugees. Moreover, the co-occurrence of weather shocks and conflicts may not be coincidental: recent research by the International Food Policy Research Institute (IFPRI) has found that abnormally high temperatures in Sudan and South Sudan, which were embroiled in civil war in 2014, strongly raise the risk of conflict.¹⁸

East Asia faced threats to food and nutrition security from natural disasters, climate change, soil pollution, food safety issues, and zoonotic diseases (see Chapter 9).¹⁹ In the Philippines, Typhoon Hagupit struck in December, about a year after the devastating Typhoon Haiyan. The damage was severe: 3.9 million people were affected, and more than 41,000 homes were destroyed. This time, however, thorough preparation and evacuation of residents helped to drastically reduce the loss of life. In contrast with Typhoon Haiyan, which killed about 7,000 people, Typhoon Hagupit resulted in only about two-dozen fatalities. Also, a tainted meat scandal in China provoked a food scare in fast-food outlets across the country,²⁰ and Taiwan experienced food safety scandals related to tainted cooking oil and tofu.²¹

Not all countries experienced lower food prices in 2014, and in some countries, the prices of fruits and vegetables rose significantly. In China, as of November 2014, consumer prices for fresh fruits were 18.7 percent higher than one year before,

although vegetable prices were lower.²² In India, wholesale prices of fruits and vegetables were 23 percent higher in 2013–2014 than in 2012–2013.²³

Several shocks highlighted the vulnerability of Central America (see Chapter 9). In a region where 1.9 million people rely on coffee as their main source of income, a coffee rust epidemic in 2012 and 2013 led to estimated harvest losses of 20 percent. Demand for labor dropped by 16–32 percent,

Given the barrage of complex shocks in recent years, strengthening resilience was a major theme in the development community in 2014.

wages fell by 14–22 percent, and 160,000 people were faced with food insecurity. Because the disease destroyed so many coffee plants, heavy losses were also estimated for the 2013/2014 and 2014/2015 harvests. In addition, as a result of drought in 2014, maize losses were predicted to be 70 percent in both Guatemala and Honduras. Finally, the region experienced a surge in unaccompanied illegal child migrants to the United States. One estimate put the number at 90,000. Although many factors contributed to this migration, preliminary analysis suggests that the children came from the most food-insecure areas of El Salvador, Guatemala, and Honduras.

In Central Asia, although undernourishment has declined in most countries, relatively high levels of child stunting persist throughout the region (see Chapter 9). One of the region's major trading partners—Russia—faced economic difficulties owing to falling oil prices and economic sanctions by Western countries. Low global food and energy prices generally helped counter the resulting price inflation in Central Asia, and the region also benefited from opportunities to fill the market void left by the Russian ban on Western agricultural products. At the same time, the negative developments in the region and in Russia may result in fewer remittances from abroad and reduced wages at home, possibly

affecting staple food consumption, lowering dietary quality, and reducing expenditures on health.²⁴

Given the barrage of complex shocks in recent years, strengthening resilience was a major theme in the development community in 2014. Nongovernmental organizations implemented large-scale resilience projects in Ethiopia, Haiti, and Tanzania, to name a few.²⁵ Efforts made to better conceptualize, measure, and apply resilience included major events and publications by the UN, the World Economic Forum, the Resilience Alliance Network, and IFPRI. In May, IFPRI organized an international conference called “Building Resilience for Food and Nutrition Security.” The conference identified which emerging shocks pose the biggest threats to food and nutrition security, reviewed approaches and tools for building resilience to shocks, and highlighted the areas where research, policy, and programming need to be improved or scaled up to successfully build resilience to food and nutrition insecurity.²⁶

Among the people most vulnerable to shocks are those responsible for producing much of the world’s food: small farmers. The UN designated 2014 as the International Year of Family Farming. Family farms—many of which are small—account for nearly



Among the people most vulnerable to shocks are those responsible for producing much of the world’s food: small farmers.

nine out of ten farms worldwide, provide livelihoods for 2.5 billion people, and produce much of the food consumed in Asia and Africa south of the Sahara (see Chapter 4). Yet the productivity and efficiency of small farms vary, and policy approaches to small farms must vary as well. For example, in Africa south of the Sahara—where rural populations are large, agriculture is responsible for a large share of the economy, and growth in other sectors is weak²⁷—programs to strengthen small and family farmers are key. In 2014, African leaders recommitted to

the principles of the CAADP, including promoting employment opportunities for women and youth in agricultural value chains and investing in social protection programs.²⁸ In other countries, such as China and Vietnam, manufacturing and services are beginning to replace agriculture as economic drivers.²⁹ Here, the task is to make farming profitable for those with commercial potential while helping others move out of agriculture into other productive work.

EFFORTS AT AGENDA SETTING AND COOPERATION SHOWED PROMISE

Within the global development community, 2014 was marked by the first steps in the effort to renew the world’s development priorities. In September the UN-appointed Open Working Group, made up of more than 70 countries, put forth a draft set of Sustainable Development Goals (SDGs) designed to identify emerging global priorities while building upon the MDG commitments. The draft goals consisted of 17 SDGs, with 169 specific targets covering a wide range of topics—from poverty, hunger, education, and water and sanitation to infrastructure, energy, and urbanization.³⁰ While all of these areas directly or indirectly complement agriculture as building blocks of food and nutrition security, it remains to be seen whether so many goals and targets will allow for focused action or whether they will instead dilute efforts to meet the most essential goals. In December, UN Secretary-General Ban Ki-moon issued a report grouping the SDGs into six essential elements: people, planet, partnership, justice, prosperity, and dignity.³¹

As currently conceived, the SDGs differ from the MDGs in some important ways. Heavily focused on poverty, the MDGs applied mainly to developing countries. In contrast, the SDGs are envisioned to be universal, applying to rich and poor countries alike. This approach can help address such issues as inequality, climate change, and governance. It also recognizes that rich countries face serious levels of malnutrition. It will be crucial, however, not to neglect the needs of the poorest and most vulnerable people.

The MDGs and SDGs also treat food and nutrition differently. Whereas the MDGs combined food

and nutrition security with poverty in one goal, the SDGs treat each theme separately.³² Whether this strategy ensures that food and nutrition security receives the attention it deserves will depend on the targets used, funding commitments to food and nutrition, and the effectiveness of monitoring and evaluation efforts.³³ At present, the hunger and nutrition targets within the SDGs include the World Health Assembly's target of reducing the number of stunted children under age five by 40 percent by 2025, but there is surely room for more specific and ambitious goals related to food and nutrition security. Many issues will need to be resolved before the UN General Assembly votes on the final form of the SDGs in September 2015.

Although the draft SDGs include several references to climate change, the first real advance in years in terms of international cooperation on climate change took place in November 2014, when China and the United States made a landmark deal to cut greenhouse gas emissions. After years of stalemate between the world's two largest carbon emitters, the agreement specified that China's carbon emissions would peak around the year 2030 and that its share of non-fossil fuel energy would rise to about 20 percent. The United States is committed to cutting carbon pollution by 26–28 percent below 2005 levels by 2025.

Then, in December, the UN climate conference in Lima, Peru, resulted in a new approach to limiting greenhouse gas emissions. Under the accord, each country has six months to submit plans for curbing greenhouse gas emissions in 2015. This agreement will serve as the basis for further talks in Paris in 2015. Although it is hoped that the agreement will trigger further action to fight climate change, countries' plans for curbing emissions are voluntary, not binding, and are not likely to reduce emissions enough to keep global warming below 2° Centigrade—the level of increase beyond which scientists believe effects will be dangerous.

Efforts to combat climate change took place on other fronts as well, including agriculture. The concept of climate-smart agriculture has gained a foothold; the idea is to increase agricultural productivity sustainably, adapt and build the resilience of agricultural and food-security systems to climate change,

The first real advance in years in terms of international cooperation on climate change took place in November 2014, when China and the United States made a landmark deal to cut greenhouse gas emissions.

and reduce greenhouse gas emissions from agriculture. The International Fund for Agricultural Development (IFAD) and the World Bank announced that all of their agricultural investments, valued at about US\$11 billion, would be climate-smart by 2018. During the next decade, CGIAR will allocate \$10.2 billion to climate-smart agricultural research. And the launch of the Global Alliance for Climate-Smart Agriculture in September 2014 underlined the commitment of governments, non-governmental organizations, and the private sector to address climate change.

Finally, in 2014 IFPRI reiterated its Compact 2025, a call to end hunger and malnutrition by 2025. International organizations, such as WFP, IFAD, and FAO, echoed this bold call for action during the year and signaled their readiness to join forces. To end hunger and undernutrition by 2025, progress will need to be fast and substantial. Some of the best evidence that this goal is achievable comes from emerging economies (see Chapter 2 in the *2013 Global Food Policy Report*). China, for example, employed an agriculture-led strategy to help halve the prevalence of undernourishment and reduce the prevalence of child stunting by more than two-thirds in two to three decades.³⁴ In Brazil, social protection reforms and targeted nutrition interventions for its most vulnerable citizens helped cut the prevalence of undernourishment from 15 percent to less than 5 percent between 1990 and 2014 and the prevalence of child stunting from about 19 percent to 7 percent between 1989 and 2007.

2014–2015 GLOBAL FOOD POLICY REPORT SURVEY

Over 1,000 individuals representing 55 countries responded to an IFPRI survey on perceptions on where food security stands in 2014 and where it is headed in the future.

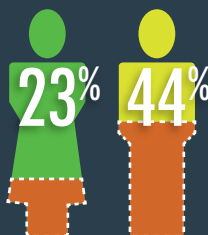
The respondents, the majority of whom work in the NGO, academic, and government/policy sectors, **expressed both gloom and hope**, with large differences in views depending on their sex, age, occupation, and region they represent. The majority of respondents perceived the state of global food and nutrition security and food policies in 2014 as **dissatisfying**.

GLOBAL FOOD POLICIES

Nearly two-thirds are dissatisfied with both global food policies and the food policies in their own countries.



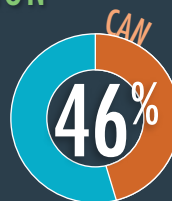
A perception gap exists between men and women.



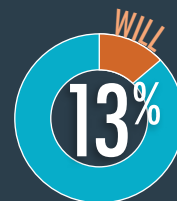
Yes, I'm satisfied with current global food policies.

HUNGER & MALNUTRITION

Almost half think that while the world has the means to end hunger and malnutrition, this will not necessarily translate into a hunger-free world by 2025.

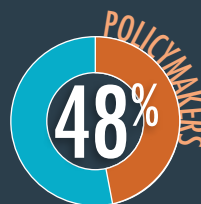


Yes, global hunger CAN be eliminated by 2025.



Yes, global hunger WILL be eliminated by 2025.

Policymakers are more optimistic about the long-term future.



Yes, global hunger and malnutrition will be eliminated by 2025.



FOOD PRODUCTION

Considering the prospect of increased food production in 2015, the majority of respondents are optimistic.



Yes, world food production will grow in 2015.

Younger people are more pessimistic about ending global hunger.



Yes, global hunger CAN be eliminated by 2025.



FOOD & NUTRITION SECURITY

While overall 3 out of 4 respondents are dissatisfied with the current state of global food and nutrition security...



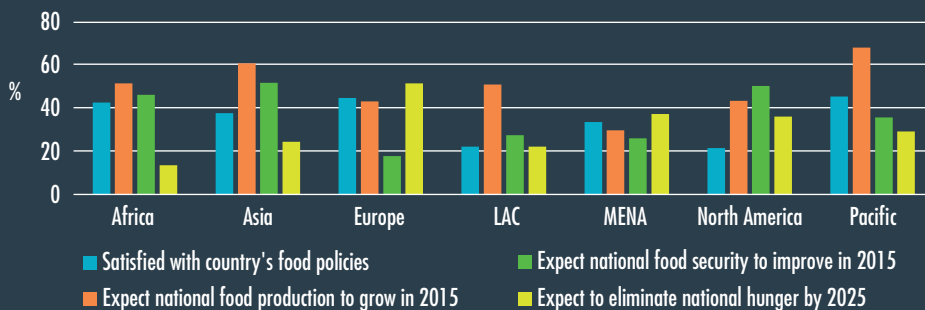
...those in developing countries are optimistic about 2015.



Yes, global food and nutrition security will improve in 2015.

REGIONAL PERSPECTIVES

Context does matter. Depending on region, satisfaction with and expectations for food policies and food and nutrition security vary dramatically.



Source: The survey occurred online, from January 7–14. IFPRI contacted over 15,000 individuals in over 55 countries, inviting them to participate. The sample of individuals was developed from a variety of mailing lists maintained by IFPRI. Complete survey questions and results are available at www.ifpri.org/gfpr/2014-2015.

LOOKING TO 2015

The year 2015 offers a rare chance to reshape the global development agenda through the Sustainable Development Goals. Food and nutrition security garnered much political attention in 2014. If this momentum can be leveraged into a post-2015 plan that includes holistic and comprehensive food and nutrition investments, policies, and programs, the international community may soon have a chance to end hunger and malnutrition once and for all. Of course, setting goals is one thing; achieving them is another. Until countries are committed to improving the well-being of all their citizens—and to developing the capacity to do so—they are not likely to attain the SDGs or any such goals. A conference on financing the post-2015 agenda will take place in Addis Ababa, Ethiopia, in July of 2015, and the final goals are expected to be hammered out at the UN General Assembly in September.

The outcome of global climate change talks in Paris in 2015 will also have critical implications for future food and nutrition security, and indeed for human well-being. Any climate change agenda must place people—particularly poor people—as the top priority and must be woven into the SDGs, rather than standing alone as an entirely separate commitment.

The Group of Seven (G7) countries will continue to play a large role as collective donors. Under Germany's leadership, the G7 countries must maintain the momentum created by Canada, the United Kingdom, and the United States to accelerate progress in reducing hunger and undernutrition. Yet the role of the G7 goes beyond aid. North–South and South–South knowledge sharing, learning, and cooperation provide even greater opportunities for progress.

The year is also certain to bring challenges. Natural and human-caused shocks will strike, especially with the continuation of climate change. Oil prices remain a wild card dependent on the decisions of major oil producers. While lower oil prices

can boost the purchasing power of oil-importing countries and free up resources for other uses, they can conversely reduce government revenues in countries that depend on oil exports. Indeed, oil-producing countries in Africa and elsewhere have already felt the pinch of declining oil prices. If these governments respond to budget pressures by reducing or eliminating food subsidies, poor people in these countries will likely face greater hardship. If oil prices are volatile in 2015, they are likely to lead to more volatile food prices and thereby harm poor developing country producers and consumers, who have limited capacity to adjust to rapid price changes.

More broadly, evidence and experience make clear the need for policy changes. We need to produce more food, but our food production must be linked to better nutrition and must be accomplished sustainably. Only innovations in technology, institutions, and policies will make this feasible. We need more and better-targeted investments in social protection. Safety nets prevent 150 million people from falling below the \$1.25 poverty line every year, but 73 percent of the world's population still has no access to comprehensive social protection programs.³⁵ At the same time, it is important to curtail wasteful and poorly targeted agricultural and food subsidy programs in order to release national budget resources for more effective programs and investments. We need to better manage strategic food reserves so they are available to help buffer the impacts of food shocks. And it is abundantly clear that we must strengthen safeguards against the spread of zoonotic diseases.

We face a double imperative: we must end hunger and malnutrition, and we must do so sustainably. Our progress in improving global food security is fragile and in many ways environmentally unsustainable. Meeting both imperatives is doable, but it will demand more strategic use of resources, stronger responsibility and accountability, and more creativity from all of us. ■



REACHING THE MISSING MIDDLE

Overcoming Hunger and Malnutrition in Middle Income Countries

Shenggen Fan and Ertharin Cousin



SUMMARY Eliminating hunger and malnutrition around the globe cannot be achieved without a new approach to dealing with the problem in middle income countries. Here's why this is so, how the middle income countries should respond, and what the international community can do to help.

HUNGER AND MALNUTRITION ARE NOT PROBLEMS EXCLUSIVE TO low income countries. Middle income countries (MICs), despite some being global economic powerhouses, are home to the majority of the world's hungry and malnourished.¹ These vulnerable populations, the “missing middle,” tend not to either benefit from or contribute to the rapid economic growth that is characteristic of many MICs.

That is why the international community cannot realize its ambitious international agenda of achieving zero hunger and malnutrition without a renewed focus on MICs. That these countries have increased both their economic resources and their government capacities over the last two decades is a major boon to the development effort but not yet a victory. Economic progress must also be accompanied by sustained investment—from both governments and international partners—in reducing inequalities and improving human capital. This is particularly important in countries where just a relatively few policy and budget commitments can translate into significant progress in the food security and nutrition situation of millions of people.

The challenges and opportunities to end the burden of malnutrition within MICs are as diverse as the countries themselves. Yet several unique trends and corresponding opportunities can be identified if we focus on key MICs that have had or are currently experiencing periods of rapid economic growth while housing large populations of hungry and malnourished people. Brazil, China, India, Indonesia, and Mexico are among the world's most populous countries while also being ranked in the top 20 economies in terms of gross domestic product (GDP). They have each also made remarkable progress in addressing hunger and undernutrition. For example, between 1990 and 2014

Shenggen Fan is director general, International Food Policy Research Institute, Washington, DC.
Ertharin Cousin is executive director, World Food Programme, Rome, Italy.

hunger was reduced in Brazil by almost two-thirds and in China and Indonesia by more than one-half.² Child stunting improved significantly in China from 1990 to 2013 and in Brazil from 1989 to 2007, declining by about two-thirds in both countries.³

In 2014, MICs continued to implement policies to improve food security and nutrition at home. Brazil, for example, released new dietary guidelines to encourage consumers to limit the consumption of unhealthy foods.⁴ Additionally, the role of MICs as influential actors in global food policy continued to increase. Brazil and China, for instance, continued to expand investments in agriculture and share knowledge and technologies with the global South.⁵

Yet to assist the poorest and most vulnerable, even more action is required. Government food security and nutrition efforts are constrained by several challenges, many of which are not exclusive to MICs. If these challenges are properly addressed, these MICs and others can make a twofold contribution to significantly enhancing global food security and nutrition: first by alleviating hunger and malnutrition within their countries and second by

providing models for effective policies that could help other countries succeed. Moreover, investing in and implementing properly targeted social safety net and economic development programs can also provide the necessary conditions to achieve the kind of population-inclusive growth needed to avoid or escape the “middle-income trap,” a development situation whereby rapidly growing economies stagnate at middle-income levels. With the right policies and priorities that include a larger share of the population in economic growth, middle income countries will have the chance to sustainably and equitably grow their economies while increasing stability and prosperity, a feat only achieved so far by a handful of countries.

THE BURDEN OF HUNGER AND MALNUTRITION IN MICs

In countries like Brazil, China, India, Indonesia, and Mexico, despite the progress that has been made in reducing the number of those chronically hungry, there remains a potential threat to sustained, inclusive growth. Close to half of the world’s hungry, or 363 million people, live in these five countries

TABLE 1 Key characteristics of select middle income countries

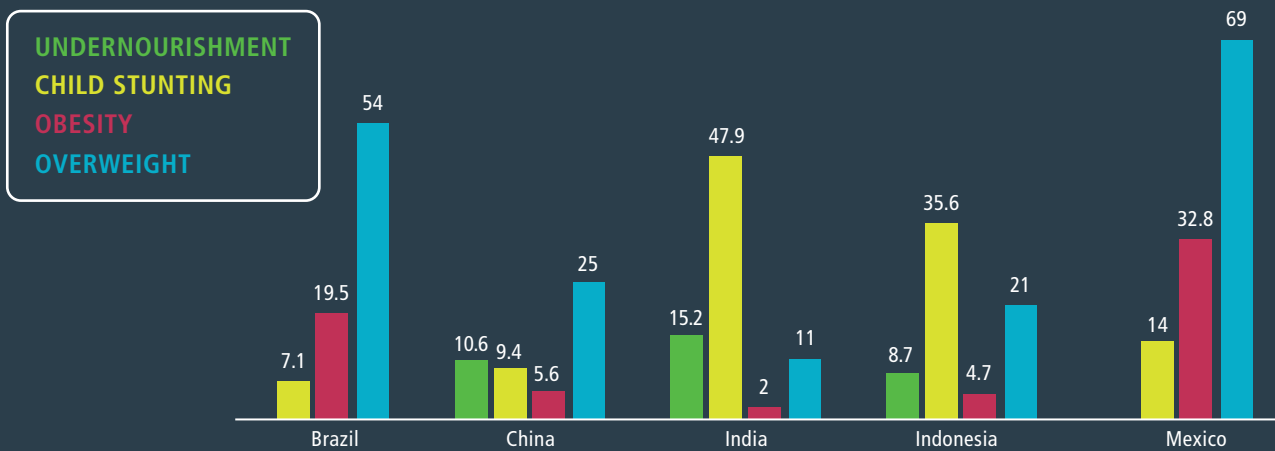
Country	GDP growth (2003–2013)	Gini coefficient [†]	Years in middle-income status	Total population (millions)	Population undernourished (millions)	Population overweight and obese (millions)
China	9.6	42.1	15	1,368	150.8	341.9
India	6.1	33.9	7	1,260	190.7	141.1
Indonesia	4.3	35.6	11	251	21.6	52.1
Brazil	2.5	52.7	>27	200	ns	105.6
Mexico	1.3	48.1	>27	120	ns	82.6
Subtotal				3,198	363.1	723.3
World	2.7	38.5		7,125	805.3	2,458.0

Sources: Data on GDP growth, Gini coefficients, years in middle income, and population are from the *World Development Indicators 2014* (Washington, DC: World Bank, 2013), <http://databank.worldbank.org/data/views/variableSelection/selectvariables.aspx?source=world-development-indicators>. Data on undernourishment are from the Food and Agriculture Organization of the United Nations, *The State of Food Insecurity in the World—2014* (Rome: 2014), <http://www.fao.org/publications/sofi/2014/en/>. Data on obesity are estimated by multiplying population by prevalence of obesity, found in the Food and Agriculture Organization of the United Nations, *The State of Food and Agriculture in the World—2013* (Rome: 2013), <http://www.fao.org/publications/sofa/2013/en/>.

Note: Use of ns refers to not significant.

[†]The Gini coefficient is a measure of inequality. A Gini coefficient value of 0 refers to perfect equality, while a value of 100 refers to perfect inequality—a situation where only one person has all of the income and everyone else has no income. Each Gini coefficient in Table 1 refers to a year from 2010 to 2012.

FIGURE 1 Hunger and malnutrition in Brazil, China, India, Indonesia, and Mexico, % of population



Sources: Data on undernourishment are from the Food and Agriculture Organization of the United Nations, *The State of Food Insecurity in the World—2014* (Rome: 2014). Data on child stunting, overweight, and obesity are from the Food and Agriculture Organization of the United Nations, *The State of Food and Agriculture in the World—2013* (Rome: 2013).

alone. Undernutrition, the result of prolonged inadequate intake of macro- and micronutrients, is also widespread.

At the same time, in each country, overnutrition (in the form of overweight and obesity) is high or rising. Various contributing factors are reported to include urbanization, demographic shifts, diet changes associated with increased income, low awareness about good nutrition, and increasingly sedentary lifestyles.⁶ Modernized value chains that have increased the availability of processed foods are also likely contributors.⁷

Malnutrition also imposes high economic costs. Micronutrient deficiencies, for example, cost India up to 3 percent of its annual GDP.⁸ Overweight and obesity increase the risk of such diseases as diabetes and heart disease, which in turn strain national budgets. In Mexico, noncommunicable diseases related to overweight and obesity were estimated to comprise 13 percent of total healthcare expenditures in 2008.⁹

The government in each of these countries recognizes the challenges these issues present. As a result they are implementing a variety of activities to address these issues while recognizing more action is required.

KEY FACTORS THAT CHARACTERIZE FOOD SECURITY AND NUTRITION IN MICs

Despite the diversity of MICs, a shared set of factors influences the scale and nature of their food security and nutrition. Many of these factors affect food security and nutrition in MICs according to each country's stage of economic development. For example, China and India, which are experiencing rapid growth, face a heavier burden of hunger and undernutrition while Brazil and Mexico also face a heavy trend of rising overweight and obesity.

Rising Inequality

Persistent or rising inequalities across wealth, gender, and access to education add to the burden of hunger and malnutrition. Impressive economic growth and poverty reduction can exist alongside the multiple burdens of malnutrition.¹⁰ Inequities in education, health, and nutrition impede human capital formation and jeopardize sustained, long-term growth.¹¹

Losses in human capital development brought about by malnutrition are deepened both by a lack of equal access to quality education and by gender gaps.¹² Unequal access to quality education has been shown to contribute to the dual burden of child stunting and obesity.¹³

Urbanization and Changing Consumer Preferences

As part of a global trend, rising urbanization and subsequent changes in consumer preferences from traditional cereal-based to protein-rich diets present new challenges, particularly for MICs that are facing or have faced rapid and at times massive urbanization.¹⁴ Rapid urbanization and shifting diets have contributed to modernized food value chains,¹⁵ which have had implications for food safety. Inconsistent standards and poor monitoring along the food value chain, as well as inadequate capacity of small enterprises, have also led to contaminated and unsafe food,¹⁶ which has consequently affected nutrition.

The modernized value chains that have resulted from urbanization and shifting consumer preferences have also put stress on scarce natural resources used for agricultural production. Growing appetite for meat in MICs means higher resource-intensive production.

Shifting diets (with sugary, salty, and fatty foods having risen in popularity) have had implications for obesity and resource use. In many MICs, access to food has often increased through social protection policies, yet often this assistance is not balanced with enough nutrition education and advocacy to promote balanced diets. Brazil's new dietary guidelines are promising, as they encourage consumers to limit processed, ready-to-eat foods that are commonly high in sugar, salt, and saturated fats.¹⁷ Similarly, China's high rates of obesity have led the government to introduce several guidelines to prevent and control overweight and obesity.¹⁸

Persistent Lack of Focus on Nutrition and Poor Targeting in Safety Nets

While most MICs have social safety nets in place, many lack integration with nutrition. Poor targeting and leakage are costly issues that also can sometimes weaken these well-intended safety nets. Targeted food security programs can effectively increase the wealth of recipient households but too often have little impact on child stunting and at times lead to increases in overweight and obesity.¹⁹ While access to food has increased through social protection policies, more can be done to incentivize and promote the adoption of healthy diets.²⁰

IMPROVING FOOD SECURITY AND NUTRITION IN MICs AND BEYOND

Middle income countries can learn from the experiences of other countries. South Korea and Chile have made great progress in eliminating hunger and malnutrition while promoting the kind of durable, inclusive growth that has helped them avoid being stuck in the middle income trap and moved them from middle- to upper-income status. Importantly, and as evidenced in this publication, success in working toward a more food-secure world is not the sole domain of high-income or developed countries; that is, MICs can and should learn from each other, as well as from other countries that have employed successful food security strategies and promoted inclusive growth.

Economic growth is not enough to substantially reduce hunger and malnutrition; efforts must also be made to reduce inequalities, improve human capital, and promote better nutrition and health outcomes. To achieve these objectives, MICs should support the following strategies and approaches that can help to overcome hunger and malnutrition:

► **Reshape the food system**, especially agriculture, for nutrition and health. The entire food system can make a greater contribution to nutrition and health.²¹ MICs should both increase incentives to produce, process, and market high-nutrient foods and reduce distorted incentives to produce just low-nutrient staple foods. For accelerated improvements in nutrition, investments in nutrition-specific interventions (such as micronutrient supplementation) should be combined with investments in nutrition-sensitive interventions (such as biofortification).²² By fortifying powdered milk with micronutrients, including iron, Chile reduced the prevalence of anemia by around 80 percent in less than three years.

Crucial will be adopting value chain approaches that go beyond creating economic benefits for actors along the entire chain to increasing the availability, affordability, and quality of nutritious foods for the poor.²³ To improve the efficiency of food value chains and reduce food loss and waste, it will also be important to ease market access constraints, invest in food

preservation technologies and better storage and handling infrastructure, and educate consumers on good eating habits. Reducing food safety risks along the value chain will require strong legal, regulatory, and institutional frameworks in addition to increased capacity for food safety monitoring.

- ▶ **Reduce inequalities with a focus on gender.** Addressing inequalities can improve the food security, nutrition, and potential for advancement of poor and vulnerable people. For example, improving access to quality education for disadvantaged groups can improve human capital, which is particularly needed in countries where an inadequate human capital base and skill mismatch are a rising challenge.²⁴ Given the importance of gender equity in improving food security and nutrition,²⁵ MICs should focus on empowering women. To close the gender gap, including in agriculture, MICs should increase access to physical, financial, and human capital for women and girls.²⁶
- ▶ **Improve rural infrastructure.** Rural infrastructure development can upgrade the non-farm rural sector by providing more opportunities for viable livelihoods and improving living standards, thus potentially stemming rural–urban divides.²⁷ MICs could also improve access to clean water, provide adequate sanitation, promote proper hygiene (WASH), and increase health clinics in rural areas. Investments in such rural infrastructure are particularly important where a lack of improved sanitation facilities greatly exacerbates undernutrition.²⁸
- ▶ **Expand effective social safety nets.** Scaling up properly designed and implemented social safety nets to protect the poorest is imperative if MICs are to address inequality, reduce hunger and malnutrition, and promote inclusive growth.²⁹ Governments can invest more in improving targeting and scaling up cross-sectoral social safety nets. These safety nets should be expanded for vulnerable groups to provide short-term cushion

for coping with livelihood shocks, as well as long-term productivity-enhancing opportunities or opportunities to exit out of agriculture. Mexico has had success in improving health, nutrition, and education for poor families,³⁰ as well as addressing inequality through its conditional cash transfer program, *Oportunidades*.³¹

- ▶ **Facilitate south–south knowledge sharing and learning.** To further contribute to the reduction of global hunger and malnutrition, MICs should focus on the mutual exchange of innovative ideas, technologies, and policies that have worked with each other and other developing countries. For instance, South Korea’s Knowledge Sharing Platform has promoted development of experience-based cooperation since 2004, and its successful New Community Movement is being integrated into development programs in Africa and Southeast Asia.³² For effective knowledge and technology transfer, it is imperative to bear in mind that country-specific conditions matter. For example, agricultural technologies used in China could be assessed for their applicability in countries with similar geoeconomic and political landscapes.³³

CONCLUSION

Eliminating hunger and malnutrition should be a top priority for MICs, particularly for those with increasing global influence and large numbers of hungry and malnourished people. Through mutual learning and the capacity to mobilize resources from domestic sources, MICs can accelerate the pace toward enhanced food security and nutrition in their countries. MICs can also play a critical role in helping to reduce hunger and malnutrition in other developing countries through investments, aid, and knowledge sharing. For MICs to best fulfill their vital role in supporting the elimination of global hunger and malnutrition, these countries must promote effective country-led strategies that will reduce hunger and malnutrition at home. ■



Why Sanitation Matters for Nutrition

Dean Spears and Lawrence Haddad



SUMMARY Water, sanitation, and hygiene can have a profound effect on health and nutrition. A growing base of evidence on the link between sanitation, child height, and well-being has come at an opportune time, when the issue of sanitation and nutrition in developing countries has moved to the top of the post-2015 development agenda.

THE YEAR 2014 WAS AN EXCITING TIME FOR NUTRITION RESEARCH and policy action related to water, sanitation, and hygiene, or WASH. In terms of research, during the past year, a wide range of studies began to converge on evidence that WASH can be critical in shaping key nutrition outcomes, such as child height, one of the most important measures of a population's well-being. The evidence regarding the nutritional consequences of sanitation was particularly strong,¹ especially for open defecation without using a toilet or latrine, which is the focus of this chapter.

The importance of WASH for nutrition should come as no surprise. Researchers have long known that nutritional outcomes reflect “net nutrition”: the nutritional resources that, after what is consumed by activity or disease, are absorbed and available to the body to support growth. Poor sanitation, and deficient WASH more generally, expose growing children to germs that cause disease and prevent children's bodies from putting their diets to the best possible use. This is why WASH has long been part of the United Nations Children's Fund (UNICEF) conceptual model of child nutrition.

In 2014, the issue of sanitation and nutrition also moved to the front of the development policy agenda. Sanitation now seems to be a global priority: ending open defecation is near the top of the world's post-2015 goals for sustainable development. This is particularly true for India—a country where half of all children are stunted² and a country home to half of the world's population of the one billion people worldwide who, according to UNICEF-World Health Organization (WHO) statistics, defecate in the open. India has made the rapid elimination of open defecation a policy priority.

Dean Spears is executive director of R.I.C.E. and visiting economist, Centre for Development Economics, Delhi School of Economics, India. **Lawrence Haddad** is senior research fellow, Poverty, Health, and Nutrition Division, International Food Policy Research Institute.

While open defecation has declined only very slowly in India, other countries have experienced faster improvements in WASH, which has sometimes contributed to improvements in child nutrition. Below, we review new evidence from such periods of rapid improvement in sanitation and highlight emerging biological research that is helping researchers better understand the mechanisms of the nutritional effects of WASH. We will especially focus on evidence that has emerged in the past year.

The chapter particularly focuses on the links between WASH and child height. A child's height reflects her health and nutrition in her first few years of life, including *in utero*. This is because children with a healthier start in life come closer to achieving their genetic potential height. Height is a marker for the development of bodies, brains, and skills—all of which are influenced by health and nutrition. On average, children who have the early health that allows them to grow taller are also likely to grow into healthier, more productive, and longer-lived adults. The average size of children predicts the health and human capital of the next generation of workers and parents.³ Thus, the impacts of WASH on child height are critical.

JUSTIFICATION FOR ACTION

The evidence base is now sufficient for policymakers to invest in improving WASH in contexts where exposure to fecal pathogens is an important threat to child nutritional outcomes. Much of this evidence comes from studies of entire populations—including both the current experiences of modern developing countries and the sanitary history of developed countries. This is appropriate because the effects of sanitation are population-level processes, where neighbors influence neighbors. Demographers, epidemiologists, and historians first documented the importance of fecal germs by studying urbanizing Europe.⁴ A new analysis of more than a century of adult male heights in 15 European countries found that the most important cause of the historical increase in European height was improvement in the disease environment.⁵

Disease still matters for nutritional outcomes in developing-country populations today. Preliminary research suggests that during the past 40 years,

improvements in water and sanitation have been one of the key drivers in reductions in child stunting across 116 countries.⁶ However, many countries still face a threatening disease environment. Demographic and Health Survey data show that differences in exposure to open defecation can statistically explain more than half of the variation in average child height across developing countries.⁷ Moreover, new research suggests that the longstanding puzzle of the “Asian enigma”—that children in India are shorter, on average, than much poorer children in Africa south of the Sahara—can be entirely statistically accounted for by the much greater density of open defecation to which children are exposed in India.⁸

Evidence from Changes in Bangladesh

Open defecation has fallen dramatically in Bangladesh over recent decades—from 34 percent of people defecating in the open in 1990 to 2.5 percent in 2012, according to data provided jointly by UNICEF and WHO. This important change has provided researchers with a special opportunity to investigate the nutritional consequences of changes in exposure to poor sanitation.

The fast improvement in child height in Bangladesh over recent years has been called the “other Asian enigma.” Particularly given that nutritional improvements in neighboring India have been so slow, why have children in Bangladesh grown so much taller so quickly?⁹ Data suggest that, alongside improvements in overall economic well-being and in parents' education, a reduction in the amount of open defecation to which children are exposed is among the important factors that can account for the improvement over time in average child height.¹⁰

Other recent research on Bangladesh uses Geographic Information System data to study differences in child height within small geographic areas. These studies pay special attention to an interaction between sanitation and population density because open defecation matters more for infant mortality and child height where population density is greater.¹¹ Bangladesh is relevant because population density is extremely high, and open defecation has declined dramatically. Evidence points to a strong association between reductions in the density of open defecation and improvements in child height.

Finally, one can learn from comparing children in Bangladesh with a very similar population of children: those just across the Indian border, in the neighboring state of West Bengal.¹² Children in West Bengal come from much richer households, on average, than Bangladeshi children, but are not much taller; indeed, at the same level of economic wealth, children in West Bengal are *shorter* than children in Bangladesh. Much lower levels of open defecation in Bangladesh are a key reason for this difference.

Environmental Enteropathy: An Emerging Biomedical Picture

Several biological mechanisms could link exposure to fecal germs to poorer net nutrition in children. Some of these, such as diarrhea and parasitic infections, have a long history in the biomedical literature. Another hypothesized mechanism called “environmental enteropathy” (EE) has been receiving increased attention recently, including from newly published studies and ongoing field experiments.

EE is a complex disorder of the intestines caused by an inflammatory response to ingestion of large quantities of fecal germs.¹³ EE could be an important cause of poor nutritional outcomes by reducing the ability of a child’s intestines to absorb nutrients—possibly without a child ever appearing to suffer from obvious illness, such as diarrhea. Although EE may prove to be an important cause of malnutrition globally, it is currently unclear exactly what causes EE and how it can be treated or prevented.¹⁴

In comparing children in Bangladesh exposed to better and worse WASH conditions, a new analysis found that poor WASH is associated both with biological markers of EE and with reduced child height.¹⁵ This study thus provides early evidence of a link throughout the biological pathway from WASH to EE to nutritional outcomes. Another large-scale study of children in eight developing-country settings worldwide similarly found that children who show measurable signs of EE go on to grow less tall over subsequent months.¹⁶ Finally, a third study found that EE is associated with stunting among infants in Zimbabwe and that effects may begin *in utero*.¹⁷ These observational studies all point toward an important role for EE in linking poor WASH to child stunting.

CLUES TO GUIDE ACTION

If WASH matters for nutritional outcomes, can programs designed to improve WASH also lead to better nutrition? Several ongoing randomized controlled trials are designed to estimate the effects of particular WASH interventions on nutritional outcomes, especially the SHINE (Sanitation, Hygiene, Infant Nutrition Efficacy) trial in Zimbabwe and the WASH Benefits trial in Bangladesh and Kenya.

Another experimental study that recently released preliminary results was a cluster-randomized controlled trial of a community-level campaign to promote latrine use that was implemented by the government of Mali with the support of UNICEF. This study showed that the program caused children under the age of five to be taller and less likely to be stunted.¹⁸ Although it may be surprising that improved sanitation had a detectible effect on child height in a country with such a low population density, the improvement in sanitation coverage was quite large, relative to other experimental studies of sanitation.¹⁹

Three other cluster-randomized field experiments have been led by the World Bank Water and Sanitation Program (WSP). One is a randomized intervention of the Indian government’s Total Sanitation Campaign in rural Madhya Pradesh, a state in central India.²⁰ Unfortunately, open defecation proved difficult to change: “the intervention led to modest increases in the availability of individual household latrines and even more modest reductions in open defecation.” Additionally, many treated villages received latrines only a few months before the follow-up survey. Therefore, the outcomes did not detect any effects on child height.²¹ Similar challenges emerged in a 2004 experimental implementation of the campaign by WSP and the government of Maharashtra.²² The experiment was only implemented in one of three intended districts, and the effect on latrine coverage was reported to be small. Because randomization occurred within districts, the study was able to identify a positive average effect of the program on child height in the implemented district; however, that district was the most developed of the originally identified three, and an econometric model suggests that the program would have had a much smaller effect if implemented in the other two districts.

A further randomized evaluation studied WSP's Total Sanitation and Sanitation Marketing program in rural East Java, Indonesia.²³ Like the findings in the other field experiments, the effect on open defecation was found to be small: the program was claimed to have caused an approximately 2 percentage point decline in open defecation overall, and a 5.8 percentage point decline among participants without sanitation facilities before the experiment. With such a small effect on sanitation, the experimenters could find improvements in child weight and height only among nonpoor households without sanitation at baseline, but not in the full sample.

The Difficulty of Estimating the Effect of Sanitation on Child Height from an Experiment

Researchers and policymakers often talk about “the” effect of an input or an intervention, such as the effect of open defecation on child height. Yet effects are, in fact, different in different contexts. This variation across places, programs, and populations means that the set of effect sizes available from experimental evidence will always be shaped by the contexts in which experiments can and do happen.

One important recent review surveyed impact evaluations of WASH interventions, focusing on the effects on child nutritional outcomes.²⁴ By design, the review excluded both population-level observational studies and indeed any research that did not study an intervention. Therefore, its view of the effects of WASH on child height was shaped by the interventions studied in the literature, and by the ability of those interventions to change WASH behaviors. The review identified 14 eligible studies, including interventions targeting solar disinfection of drinking water and hand hygiene. Yet the only studies pooled in a meta-analysis were the five studies that were randomized. The reviewers concluded that the studies collectively are suggestive of a benefit of these WASH interventions for child height, although they also cautioned the reader regarding the methodological quality of the reviewed studies.

The ability of intervention studies to illuminate the effect of sanitation on child height (stage 2 in Figure 1) will always depend upon the ability of available interventions to change sanitation behavior (stage 1 in Figure 1). For an extreme example, it

would clearly not be possible to learn about the effect of open defecation on child height from an intervention that does not reduce open defecation at all. This is a matter of practical concern: we have seen several examples of large-scale intervention studies that achieved only very small improvements in sanitation behavior.

Because 60 percent of the people worldwide who defecate in the open live in India, it is perhaps the context where understanding the effect of sanitation on nutrition would be most relevant. A recent survey of rural households in five north Indian states highlights a deep-seated, socially embedded aversion to latrine use.²⁵ Many people in rural north India believe that open defecation is part of a wholesome rural way of life. Perhaps more important, latrine use is discouraged by social notions of purity and pollution. As a result, many people living in households with working latrines do not use them, even in instances where another family member does. In a special challenge for sanitation policy, most people who live in a household with a government constructed latrine still defecate in the open.

There is every reason to expect that the effect of sanitation improvements on nutritional outcomes is not the same worldwide. For example, studies suggest that the effect on neighbors' health of moving from open defecation to latrine use might be greater than the effect of moving from simple latrines to better toilets.²⁶ We have seen evidence that population density interacts with sanitation to shape child health: open defecation seems to matter more where people live more closely together. All of these factors suggest that the effect of sanitation on child height may be especially large in densely populated India, where resistance to sanitation behavior change is strong.

PRIORITIES FOR RESEARCH

The initial priority is to address first-stage problems by improving the programmatic and policy tools available to change sanitation behavior. Indeed, even if we were not concerned with improving intervention studies of the nutritional consequences of WASH, learning how to be more effective at changing open defecation behavior into latrine use, particularly in India, would be a top priority for further

FIGURE 1 Evaluating WASH interventions



Source: Authors' schematic.

research. Similarly, much more research is needed on exactly how fecal germs contaminate children's environments. Which are the most important pathways, and how can they be interrupted?

If open defecation in rural India is indeed embedded in longstanding social forces, it may prove difficult to change. But this would be all the more reason to strive to better understand how to do so. Studies from a diversity of methodological approaches—from quantitative intervention experiments to qualitative fieldwork—are urgently needed to improve policy tools to eliminate open defecation.

Although clear evidence now links sanitation to child nutrition, another important open question asks about the effects of WASH on maternal nutrition. Maternal nutrition is a critical determinant of a child's birth weight, of neonatal mortality, and of subsequent nutritional and developmental outcomes. How much less do pregnant mothers weigh when they live in an environment of fecal germs, and what are the consequences for children?

POLICY IMPLICATIONS

A growing base of evidence supports the inclusion of improving sanitation—and particularly reducing open defecation—among nutrition-supporting policy priorities. This is especially true in places, such as rural India, where open defecation remains common amid high population density, leading growing children

to be especially likely to be exposed to fecal germs. Reducing open defecation requires urgent investments in learning *how* to reduce this practice. We must better understand how to change behavior and promote latrine use, especially in societies where open defecation is widespread and latrine use is resisted.

The importance of WASH for nutritional outcomes may or may not imply that WASH and nutritional programs should directly work together. Whether this is the case depends on two types of interactions: biological and pragmatic. Biologically, ongoing field experiments will provide evidence on whether certain ideally implemented nutritional and WASH interventions work best when implemented together. However, even if such a biological synergy exists, governance arrangements may be either improved or worsened by an attempt to converge WASH and nutrition programs.

This uncertainty illustrates the broader importance of governance constraints and limited state capacity. In some contexts where demand for latrine use is high, such as Bangladesh and Cambodia, sanitation has improved as households have purchased latrines from private suppliers. However, households are unlikely to purchase latrines from markets where demand for latrine use is low. In places such as rural India, building demand for latrine use is likely to require public action. Although the challenge is great, the benefits for improved child nutrition could be just as substantial. ■



THE BUSINESS IMPERATIVE

Helping Small Family Farmers to Move Up or Move Out

Shenggen Fan, Joanna Brzeska, and Tolulope Olofinbiyi



SUMMARY How can family farmers best contribute to their country's agriculture needs as well as broader development goals? First, we should determine which farmers can be profitable and assist them in doing so. Second, for those who aren't profitable, we need to help them shift to other economic pursuits.

THE UNITED NATIONS DESIGNATED 2014 AS THE INTERNATIONAL YEAR of Family Farming. The goal that year was to place the potential and challenges of small family farming firmly on the development agenda via various platforms at the national, regional, and global levels. Throughout the year, significant attention was placed on the potential, constraints, and needs of small family farms, as well as actions to support them.

To sustain the momentum built during the year, a number of forward-looking events were held. The Global Dialogue on Family Farming, organized by the Food and Agriculture Organization of the United Nations (FAO) on October 27–28, brought together diverse stakeholders to take stock of achievements during this International Year of Family Farming and set the tone for concrete actions beyond 2014. The Family Farming Knowledge Platform, to be launched in early 2015 and hosted by FAO, was presented at the Global Dialogue as a tool for sharing knowledge and data on family farming. This platform will be vital for policy dialogue and policymaking.¹ To help formulate better-targeted policies, FAO is also developing guidelines that will assist governments in defining family farming at the regional and national levels.

In many parts of the world, especially in developing countries, agriculture is mainly a small-scale, family-based activity. These small family farms play a significant role in achieving global food security and nutrition, yet they also employ some of the poorest and most food-insecure people in the world.

The important role of small family farms in enhancing global food security and nutrition should not be construed by policymakers as “small is always beautiful.” Smallholders are not a homogeneous group that should be supported at all costs but are rather a diverse set of households living in different

Shenggen Fan is director general, **Joanna Brzeska** is consultant, and **Tolulope Olofinbiyi** is senior program manager, International Food Policy Research Institute, Washington, DC.

types of economies. As a result, small family farmers can prosper either through a “move up” or a “move out” strategy. While some small farmers have the potential to undertake profitable commercial activities in the agricultural sector and expand their farm operation, others should be supported in exiting agriculture and seeking nonfarm employment opportunities.

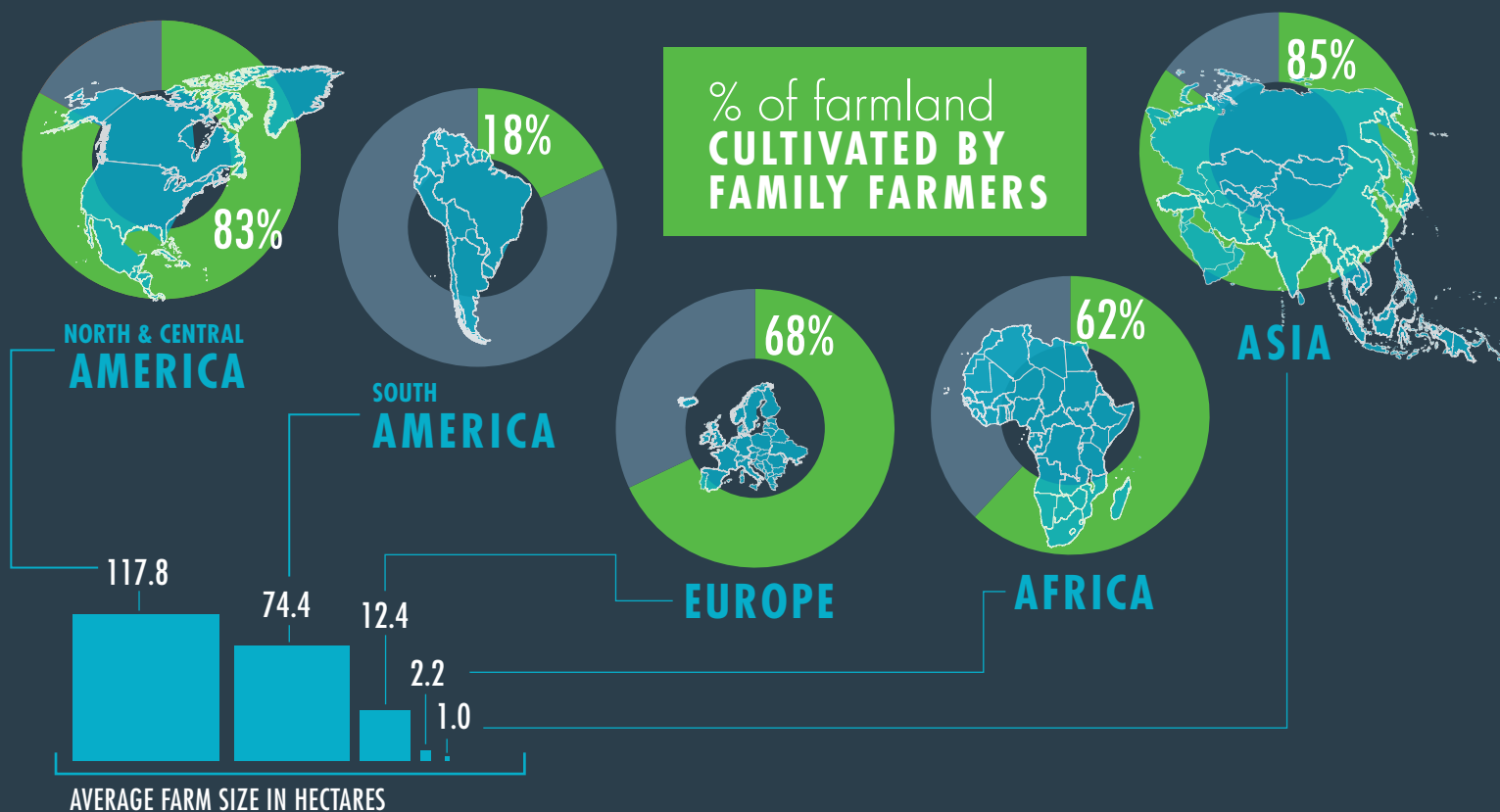
FAMILY FARMS ARE DIVERSE IN SIZE AND CHARACTERISTICS

There are 570 million farms in the world. Approximately three-quarters of the world’s farms are located in Asia, and 60 percent of these can be found in just two countries: China and India.² A closer look

at the characteristics of the world’s farms reveals a multifaceted portfolio with implications for global food security and nutrition. Agriculture is predominantly a family activity: an overwhelming majority (more than 90 percent) of the world’s farms are family farms. This means that these farms are owned, managed, or operated by family members who also provide a minimum share of farm labor. Family farms cultivate a large portion of global farmland (about 75 percent on average) and produce 80 percent of the world’s food.³ The share of land held by family farms varies across regions, ranging from 85 percent in Asia and 62 percent in Africa south of the Sahara to 18 percent in South America (Figure 1).

The majority of the world’s farms are small. There is a significant overlap between small farms and

FIGURE 1 Distribution of land held by family farms and average farm size by region



Sources: Food and Agricultural Organization of the United Nations, *Family Farmers: Feeding the World, Caring for the Earth*, infographic, 2014, www.fao.org/resources/infographics/infographics-details/en/c/230925; FAO, *2000 World Census of Agriculture: Analysis and International Comparison of the Results (1996–2005)* (Rome, 2013), www.fao.org/fileadmin/templates/ess/ess_test_folder/World_Census_Agriculture/Publications/WCA_2000/Census13.pdf.

family farms in the developing world, with the two terms often used interchangeably in Asia and Africa south of the Sahara—places where family farms have limited access to land. While more than 80 percent (475 million) of the world’s farms operate on less than two hectares of land, these farms account for only 12 percent of the world’s farmland.⁴ There are significant regional variations in farm size: farms in Asia and Africa average 1–2 hectares while, at the other end of the spectrum, farms in the Americas average 74–118 hectares (Figure 1).⁵

HOW SMALL FAMILY FARMS CAN IMPROVE GLOBAL FOOD SECURITY AND NUTRITION

Global and national food security and nutrition are closely tied to small family farms through a two-way relationship: small family farmers are likely to experience the three challenges of poverty, food insecurity, and undernutrition, yet they also play a crucial role in improving food security and nutrition. The three challenges are inextricably linked and remain primarily a rural phenomenon: approximately three-quarters of the world’s poor live in rural areas, and half of the world’s hungry are estimated to live on small farms.⁶

Agriculture remains the main source of income and employment for 2.5 billion people in low income countries: 60 percent of these people are members of smallholder households.⁷ At the same time, food production systems in many parts of the world are heavily dependent on small family farms.⁸ This is particularly true in Asia and Africa south of the Sahara, where small farms (which are mostly family operated) provide an estimated 80 percent of the regional food supply.⁹ Thus, the food security and nutrition of many small family farms depends (at least partly) on their involvement in the agricultural sector, either through the consumption of food from their own production or from income earned as a result of agricultural activities.

Empirical evidence shows that small family farms often have efficiency benefits—that is, higher land productivity (or higher farm output per unit of land) than large family farms.¹⁰ These advantages come from more intensive use of inputs, lower

labor supervision costs, and better local knowledge compared with their larger counterparts.¹¹ However, small family farms exhibit lower labor productivity than large family farms. This trend is reflected in an overuse of mainly family labor (as a result of both scarce alternative sources of employment and income and labor market imperfections) as well as in an underuse of modern farming technologies.¹²

The role of small family farms in advancing national and global food security and nutrition, as well as overall development, is increasingly seen in a broader context. The old wisdom of “small is always beautiful” because of efficiency gains cannot be universally applied. Research suggests that small is still beautiful in countries where nonfarm growth is weak and the rural population is increasing (such as in agriculture-based economies), but bigger is better where the nonfarm sectors are booming and the urban population is increasing (as in transforming and transformed economies).¹³ Thus, optimal farm size is a dynamic concept that changes as a country’s overall economy grows and as nonagricultural sectors develop.¹⁴

A SPECTRUM OF CHALLENGES HINDERS THE PROFITABILITY OF SMALL FAMILY FARMS

Small family farms are increasingly faced with a mix of challenges, including those that are naturally occurring and those that are caused by humans, that influence their capacity to increase production and move toward profitable farming systems. These challenges lead farmers to undertake lower-risk and lower-yielding agricultural activities that perpetuate a cycle of poverty, including that of little or no profit. Women on small farms—who account for an average of 43 percent of the agricultural labor force in developing countries—are particularly disadvantaged in accessing productive resources, such as land, livestock, agricultural inputs, technology, markets, and extension and financial services.¹⁵ Yet women play a vital role in improving agricultural output, enhancing food security and nutrition in the household, and promoting overall development. High production constraints also make agriculture unattractive to young people—the very ones who can bring energy,

vitality, and innovation into the agricultural labor force in many developing countries.¹⁶

Limited Farm Size

Over the past several decades, high population growth and inheritance-based land fragmentation have resulted in decreasing farm size and high population density in many Asian countries and parts of Africa.¹⁷ Recent trends indicate that Africa south of the Sahara will continue to experience declining farm size, but Asia is showing signs of farm consolidation.¹⁸ An analysis of the relationship between increasing rural population density and smallholder farming systems in Kenya shows that, in addition to declin-



Many small family farmers are excluded from productivity-enhancing financial services, such as loans and saving accounts, and are thus unable to secure much-needed capital and lack the buffer against adversity and shocks that financial services offer.

ing farm size and incomes, increasing rural population density is associated with decreasing agricultural labor productivity after a certain population density threshold.¹⁹ This inverse relationship is potentially the result of unsustainable agricultural intensification.²⁰

Access to Financial Services

Many small family farmers are excluded from productivity-enhancing financial services, such as loans and saving accounts, and are thus unable to secure much-needed capital and lack the buffer against adversity and shocks that financial services offer. An analysis of maize farmers in Ghana reveals that small farms face more credit constraints than large farms.²¹ In rural areas, where the majority of smallholders reside, access to formal financial services is particularly limited.²² Reasons for this include

dispersed demand and the high cost of service in low-population areas; weak administrative capacity of rural banks; agriculture-specific risks such as variable weather patterns, pests, and price fluctuations that affect whole communities; and lack of formally defined property and land-use rights to act as collateral for loans.

Climate Change

The growing incidence and intensity of extreme weather events increasingly threaten the global food system.²³ If business as usual continues and the world becomes 3–4°C warmer by 2050, crop yields could decline by 15–20 percent across Africa south of the Sahara.²⁴ In some countries, yields from rainfed agriculture could decrease by up to 50 percent by 2020, with small-scale farmers being hit the hardest.²⁵ In Malawi, smallholder farmers have experienced greater economic losses during droughts than have large landholders, in part because smallholders grew more drought-sensitive crops.²⁶ Small family farms are particularly vulnerable to more frequent extreme weather events because of such factors as chronic food insecurity, lack of access to formal safety nets, and high reliance on climate-dependent agriculture coupled with limited resources and capacity for mitigating and adapting to the effects of climate change.²⁷

Price Spikes and Volatility

Recent food price volatility and spikes have affected both producers and poor consumers. The complex set of factors behind the recent food price crises in 2007–2008 and 2011—including diversion of crops for biofuel, extreme weather events, low grain stocks, and panicky trade behaviors—is still present or has the potential to reemerge. The magnitude and direction of the impact on small family farms depend on several variables, including whether input costs increase, whether the farmers are net buyers or sellers of food, farmer capacity to step up production and to bring the increased output to market, and off-farm income.²⁸ Recent studies in Bangladesh and Malawi suggest that an increase in the price of staple crops (rice and maize) resulted in a higher welfare loss for small landholders compared with large landholders.²⁹

Access to Modern Markets

Profitable market access by small family farmers is challenged by a multidimensional set of factors. The participation of smallholders in modern market channels has a positive effect on their income, but participation is determined by a mix of non-land assets, with varied results on the role of farm size in determining participation. These non-land assets include rural infrastructure (such as road access and irrigation), membership in cooperatives, education, modern market participation of nearby farms, and rural nonfarm employment.³⁰ Lack of information (regarding price, supply and demand, and quality standards) leads smallholder farmers to face higher prices from opportunistic middlemen and traders as well as lower market participation.³¹ Amid rapid economic growth, urbanization, and globalization, food supply channels are becoming longer geographically but shorter in terms of participants.³²

SMALL FAMILY FARMERS NEED TO MOVE UP OR MOVE OUT

As stakeholders continue to deliberate on action plans for supporting sustainable small family farms, it is important to recognize that there is no “one size fits all” policy. The appropriate development pathway and livelihood strategies for each small family farm should reflect its particular characteristics and the level of transformation within the country’s economy (see Infographic on next page). Public policy should support small family farms in either *moving up* to commercially oriented and profitable farming systems or *moving out* of agriculture to seek nonfarm employment opportunities.

In agriculture-based economies, it is important to focus on advancing policies that move up small family farmers who have the potential to become profitable by increasing their productivity. In both transforming and transformed economies, it is equally imperative to help such family farmers move up by promoting high-value agriculture and improving links to urban and global markets. For small family farmers that are already profitable, policies that help scale up commercial activities are essential. Small family farms without profit potential, however, will require humanitarian assistance in the short run

and viable exit strategies out of agriculture to engage in urban and nonfarm economic activities in the long run.

To move small family farms with profit potential toward greater prosperity while at the same time improving global food security and nutrition and health outcomes, a number of steps must be taken, as outlined below.

Promote Land Rights and Efficient Land Markets

Institutional reforms are needed to facilitate the efficient transfer of land through the certification of land rights and through well-functioning and transparent land-rental and sales markets. Lifting restrictions on minimum or maximum landownership or land-rental markets and securing property rights improves agricultural productivity. It does so by encouraging the transfer of land from small and poor farmers who have less ability or willingness to undertake agricultural activities (but who stay in agriculture due to fear of unfair compensation for land transfers) to more efficient (but often still poor) producers with more interest and resources.³³

Enhance Risk-Management, Mitigation, and Adaptation Strategies

Small family farms urgently need better access to risk-management tools and strategies to increase their resilience to a spectrum of shocks, including weather and price shocks. Tools such as index-based insurance can help farmers take productivity-enhancing risks, although their commercial viability for a smallholder clientele is still being studied. In the face of volatile crop prices, collaboration is needed among the private sector, governments, and donors to design innovative and flexible market-based price stabilization tools—such as hedging in futures markets—that are suitable for small family farms.³⁴

In terms of climate-induced shocks, a pro-poor climate change policy that creates value for small family farms and integrates them into global carbon markets is essential, although a viable modality has not yet been developed.³⁵ Investments in triple-win agricultural practices and technologies can be effective in raising smallholder productivity alongside climate-change mitigation and adaptation strategies.³⁶

MOVE UP OR MOVE OUT

WHICH PATH?

Whether a small farmer should be targeted to “move up” in profitability or “move out” of agriculture depends on whether they face the hard constraints that inhibit profit potential:

SOFT CONSTRAINTS	MOVE UP	MOVE OUT
Limited access to markets and information	●	●
Limited financial capital	●	●
Limited access to infrastructure	●	●
Limited access to smallholder-friendly technologies	●	●
HARD CONSTRAINTS		
High population density		●
Low-quality soil		●
Low rainfall and high temperatures		●
Remote location		●

WHICH STRATEGY?

The best supportive strategies to aid farmers in either moving up or moving out depend on the type of economy:

AGRICULTURE-BASED ECONOMY	MOVE UP	MOVE OUT
Productive cross-sector social safety nets that combine long-term tools with short-term support	●	
Investment in infrastructure, agricultural research and extension, and smallholder-friendly and climate-smart technologies	●	
Access to innovative financial services	●	
Social safety nets		●
Nutrition-focused crop production for own consumption		●
Education and training for nonfarm employment		●
Migration to urban centers and other agriculture areas with greater profit potential		●
TRANSFORMING ECONOMY		
Flexible arrangements for land transfer	●	●
Risk reduction and management tools	●	
Access to market information (e.g., ICTs)	●	
Pro-smallholder, nutrition-sensitive value chains	●	
Social safety nets	●	●
Improved access to housing, education, and health services for rural migrants	●	●
Vertical and horizontal coordination to meet safety, quality, and quantity standards	●	
Enhanced role of farmers’ organizations, particularly for women farmers	●	
Education and training for nonfarm employment		●
TRANSFORMED ECONOMY		
Provide incentives for high-value production	●	
Reduced trade restrictions and subsidies	●	
Flexible arrangements for land transfer	●	●
Efficiency- and quality-enhanced production systems	●	
Vertical and horizontal market coordination	●	
Social safety nets		●
Improved access to housing, education, and health services for rural migrants		●
Education and training for nonfarm employment		●

Source: Adapted from Table 1, “Typology of Smallholder Farms and Appropriate Strategies and Interventions,” in S. Fan, J. Brzeska, M. Keyser, and A. Halsema, *From Subsistence to Profit*, IFPRI Food Policy Report (Washington, DC: International Food Research Institute, 2014), 4.

Support Efficient and Inclusive Food Value Chains

Linking small family farms to modern agrifood value chains is critical for improving agricultural productivity, food security, and nutrition. Overcoming barriers to accessing modern value chains requires institutional innovations for coordination among small family farms, including group lending and producer associations. Such mechanisms require strong institutional capacity in a stable policy environment that promotes private-sector investments that are adapted to the needs of small family farms. Information and communication technologies also offer the opportunity to link small family farms to markets, by helping them reduce transaction costs, increase their bargaining power, and acquire real-time market information. Financial services (bundled with, for example, insurance) and investments in rural infrastructure also need to be scaled up.³⁷

Furthermore, participation of small family farms in modern value chains can be leveraged for better nutrition and health. Greater investments in the development of nutrient-rich crop varieties accessible to the poor, coupled with public information campaigns and pricing policies, can help increase the availability and consumption of nutritious foods.³⁸ Sound regulatory and monitoring systems along the entire chain can also help to ensure that agricultural intensification does not harm people's health.³⁹

Close Gender Gaps and Develop Young Farmers

Addressing the inequity in access to productive resources, services, and markets for women farmers (who account for a large percentage of small family farmers) is not only a rights issue, but also an efficiency issue. Gender inequality also leads to inefficient allocation of resources, which in turn means reduced agricultural productivity and poor nutrition and health outcomes.⁴⁰ Closing the gender gap in agriculture has high returns that accrue to the entire society—not just women.⁴¹

Developing youth participation in agriculture is also essential to realize agricultural growth, improve food security and nutrition, and promote overall development. Interventions to increase

the profitability of small family farms should target young farmers. Such steps would include better agricultural training, improved land rights, and enhanced access to financial and nonfinancial services.

Scale Up Productive Cross-Sector Social Safety Nets

Productive cross-sector social safety nets that combine long-term tools (to build productive and resilient livelihood strategies) with short-term social safety support (to provide a cushion against shocks) can be of great benefit to small family farmers.

Ethiopia, for example, has created the Productive Safety Net Programme (PSNP) and Other Food Security Programme (OFSP)/Household Assets Building Program (HABP), which provide a portfolio of productivity-enhancing mechanisms. These programs are targeted at food-insecure households, most of which engage in small family farming,⁴² and are designed to ensure a minimum level of food consumption, protect and build assets, and assist households in boosting income generated from agricultural activities. Based on recent evidence, the PSNP reduced the length of the hungry season by one-third compared with households with no program benefits. Households with access to both PSNP and OFSP/HABP had even greater reductions in their hungry season and increases in their livestock holdings.

CONCLUSION

We must break the vicious cycle—of vulnerability, low-yielding activities, and food insecurity and undernutrition—that is plaguing small family farmers. While many smallholders can find more profitable livelihood opportunities outside of agriculture, others can transform their businesses into profitable and efficient agricultural enterprises. However, the group of potentially profitable small family farmers needs a policy environment that supports and nurtures this transformation and helps them overcome the increasingly complex challenges they face. Providing such a favorable environment for growth and prosperity should also contribute to the achievement of multiple Sustainable Development Goals. ■



MITIGATING RISK

Social Protection and the Rural Poor

Ravi Kanbur



SUMMARY People in developing countries—particularly the agricultural poor—face a host of risks to their lives and livelihoods, including those stemming from globalization, climate change, and weather shocks. These experiences highlight the importance of social protection, which can have a potentially significant impact on reducing poverty and vulnerability when implemented with the optimal design, targets, and resources.

THE FINANCIAL CRISIS OF 2008–2009 CRYSTALLIZED A “NEW NORMAL” in the global economic discourse. The vulnerability of national economies to global instability, and its implications for individual livelihoods, became clear to citizens and governments of developed countries as they struggled to cope with the biggest recession since the Great Depression. However, this new normal for developed countries is in fact the old normal for developing countries, where national- and individual-level vulnerability to shocks has been an ever-present reality.

As developing countries have integrated into the global economy, they have experienced not only enormous opportunities but also an intensification of risks of different types. These include the collapse of particular industries under a constantly shifting global market, the spread of infectious diseases through greater population mobility, and of course the global financial crisis. Climatic risks have also clearly worsened over the past few decades, which poses particular risk to countries dependent on agriculture.

The history of agriculture reminds us that even without intensification of risks at the global level, the poorest of the poor, always vulnerable to weather shocks, lead a precarious existence. Luck often plays a great role in determining even their basic survival. Going beyond weather shocks, individual-level shocks—such as poor health or accidents at work—can set off a spiral of ever-increasing indebtedness from which escape is near impossible. For poor households, financial traps are just one dimension of the spiral.

Ravi Kanbur is professor, Charles H. Dyson School of Applied Economics and Management, Cornell University, New York.

A key dimension of vulnerability, especially for the poorest households, is food and nutrition insecurity. The threat can be direct, where agricultural shocks threaten households that grow their own food for consumption. It can also be indirect, where loss of income due to a range of negative shocks threatens the capacity to purchase an adequate amount of food and nutrition in the marketplace. Added to the short-term downturn is the fact that poor nutritional intake during lean times can lead to worsening health and, especially for children, long-term developmental consequences.

With this background, it is surprising that in the discussion surrounding the Millennium Development Goals (MDGs) of 2000 so little attention was paid to vulnerability and thus to protection from risks. Reducing vulnerability was not introduced as an explicit goal among the list of the eight goals or even as a target or indicator. One could argue, perhaps, that it was present implicitly in the first goal of eradicating extreme poverty and hunger. Among the targets and indicators under this goal were the halving of a range of indicators: (1) the proportion of population trapped in “dollar a day” poverty, (2) the prevalence of underweight children under five years of age, and (3) the proportion of the population below the minimum level of dietary energy consumption. While these indicators are suggestive, they do not directly address the issue of risk and vulnerability. Measuring vulnerability is of course more difficult than just tracking such levels, which raises the unfortunate complication that outcomes that are not measured are often underappreciated in the policymaking context.

The global community is currently discussing the “post-2015” agenda, seeking to define the goals and targets that will succeed the MDGs. The Open Working Group tackling Sustainable Development Goals (SDGs) has submitted a proposal to the United Nations General Assembly for one year of discussion and negotiation before it will be adopted at the 2015 General Assembly.¹ While we are still early in the process of this new round of goal setting, it does seem that risk and vulnerability—and thus building resilience toward risk and vulnerability—are more present in this proposal for SDGs than they were in the MDGs.

Given the enhanced interest in vulnerability and social protection, this chapter considers the topic by focusing on concrete targets and policy actions needed to achieve them. First, it highlights why vulnerability and social protection are back on the agenda. It then discusses some possible targets for social protection based on global patterns of spending and their effectiveness. Next it addresses the challenges faced by policy interventions to meet targets for social protection. The chapter ends with a summary of the main policy conclusions.

VULNERABILITY AND ITS CONSEQUENCES

There is growing evidence that national-level vulnerability has increased as a result of both economic and noneconomic factors. On the economic front, global integration has brought not only opportunities for economic growth but also greater economic volatility. Thus some researchers found a strong association between greater trade openness and aggregate volatility, with the effect being much more pronounced for developing countries.²

The economic risks have been compounded by greater climate volatility. Thus the latest Intergovernmental Panel on Climate Change (IPCC) assessment concludes with “very high confidence” that “impacts from recent climate-related extremes, such as heat waves, droughts, floods, cyclones, and wildfires, reveal significant vulnerability and exposure of some ecosystems and many human systems to current climate variability.”³ The spread of infectious diseases in a world of greater labor mobility has added further to national-level risks, as shown by the experience of the spread of Ebola in Liberia and its neighbors.

Through their impact on the economy, agriculture, and health, these risks at the national level have consequences at the individual level.⁴ National-level shocks have gained attention in recent years, but they are merely additions to the risks of weak harvests that poor individuals have always faced due to climate, pests, and a variety of health and employment shocks. Together, the macro- and micro-level vulnerabilities can have significant impact on short-term poverty and medium-term development.

At the most basic level, sharp negative downturns in income, food intake, and nutrition all increase

measured poverty, hunger, and malnutrition. The greater the risk of downturn, the higher will be the probability of falling below critical thresholds in income, food, or nutrition. Panel data where household well-being is tracked over time reveal these patterns. In Vietnam, for example, while 30 percent of households moved out of poverty between 1993 and 1998, another 5 percent moved into poverty.⁵

If the negative effects of short-term shocks in the downward direction were fully compensated by the positive effects of shocks in the other direction, then volatility would not be as much of an issue. Unfortunately, this is not the case. Researchers have shown that the damage done in the downturn is not made up in the upturn; this is especially true in the case of shortfalls in food and nutrition.⁶

Furthermore, equally important is that the actions that households take to cope with shocks in the short term can actually be detrimental to the development in the medium or long term. A debt trap is built up, and households stick to low-return but less-risky crops and investments. For example, a study in Pakistan found “high incidence and cost of shocks borne by households, with health and other idiosyncratic shocks dominating in frequency, costliness, and adversity. Sample households lack effective coping options and use mostly self-insurance and informal credit. Many shocks result in food insecurity, informal debts, child and bonded labour, and recovery is slow.” Of course while both private and public safety nets can play a role, they almost always prove inadequate.⁷

Thus, just as macro-level volatility affects economic growth negatively, micro-level vulnerability leads to negative short- and medium-term effects for the poorest. Because existing and informal mechanisms are inadequate, and because these vulnerabilities are unlikely to decrease in the near future, “social protection” interventions have a clear role to play in addressing these risks and vulnerabilities. A range of studies has shown that safety nets provided by social protection can contribute to economic growth.⁸

SOCIAL PROTECTION AND POVERTY

Although high vulnerability to shocks can drive poor households deeper into poverty, hunger, and

undernutrition, the current informal mechanisms to address these insecurities are inadequate. The question thus arises whether such security can be provided socially by state interventions. Such social protection could address the short-term consequences of negative shocks to agriculture, employment, or health, and in doing so could also help to address the medium-term impacts on productivity and income growth.

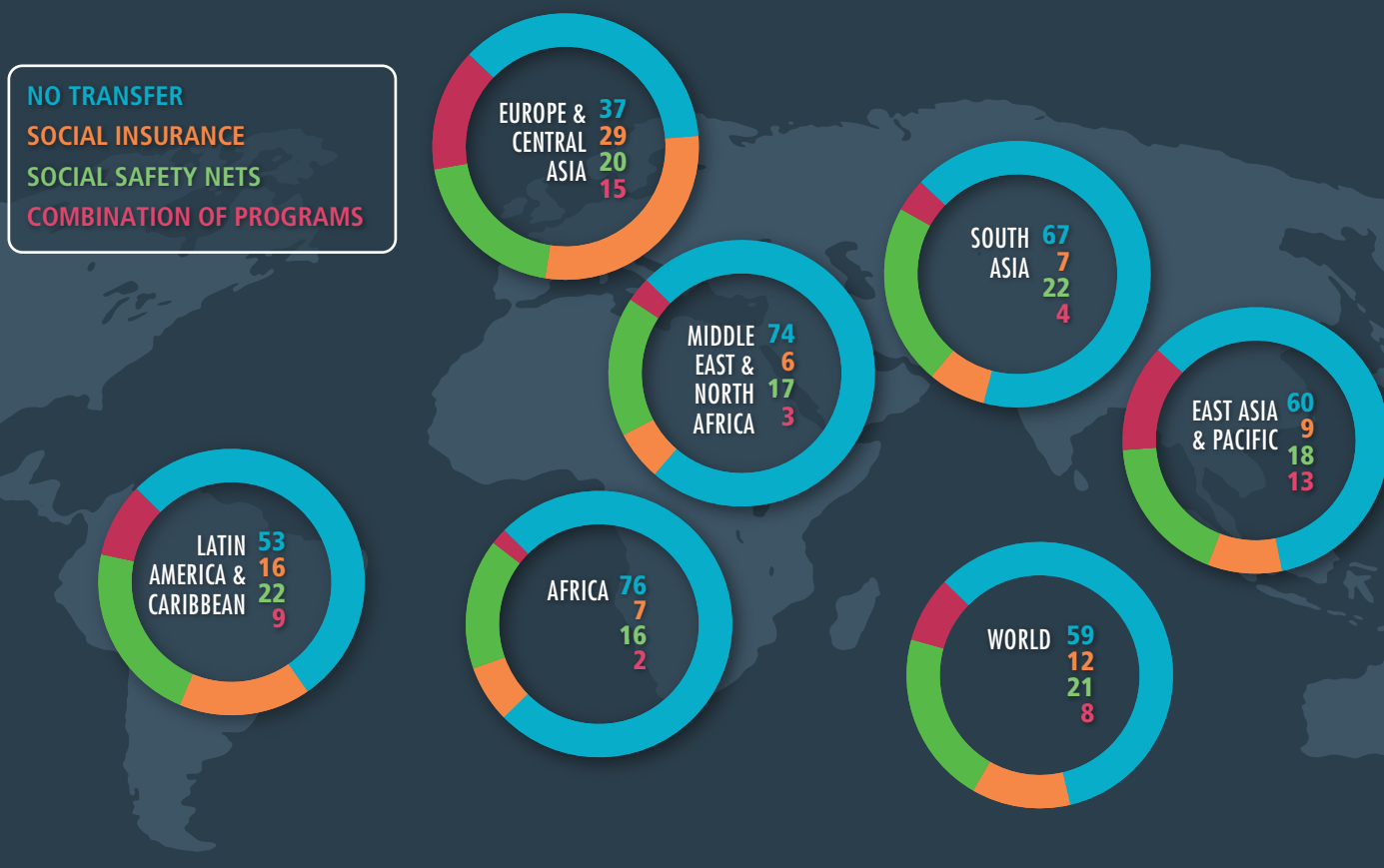
Social protection is broadly understood to encompass a range of public programs that provide insurance and transfers in cash or in kind. Sometimes the term “social security” is used interchangeably with “social protection.”⁹ Different programs are included in different sources of information, making comparability difficult. However, most definitions include both social insur-

Social protection could address the short-term consequences of negative shocks to agriculture, employment, or health, and in doing so could also help to address the medium-term impacts on productivity and income growth.

ance (such as contributory programs, principally pensions, or unemployment benefits) and noncontributory social assistance programs/social safety nets (including such programs as cash transfers, food stamps, school feeding, in-kind transfers, labor-intensive public works, targeted food assistance, subsidies, and fee waivers). Thus alongside insurance, social protection as commonly discussed also encompasses redistributive programs targeted to the poor and vulnerable. Indeed, as a practical matter it is difficult to separate out these two roles of social protection.¹⁰

The extent of social protection in the world is difficult to pin down because of definitional and data issues. One estimate suggests that between

FIGURE 1 Percent of population receiving transfers from social protection programs



Source: Figure 1 in A. Fiszbein, R. Kanbur, and R. Yemtsov, *Social Protection, Poverty and the Post-2015 Agenda*. Policy Research Working Paper #6469 (Washington, DC: World Bank, 2013).

0.75 billion and 1.0 billion people in low and middle income countries are recipients of some form of cash support.¹¹ However, the coverage of social protection is not comprehensive (Figure 1). As the *World Social Protection Report 2014/15* notes, “Only 27 percent of the global population enjoy access to comprehensive social security systems, whereas 73 percent are covered partially or not at all.”¹² Another estimate, using the World Bank’s ASPIRE data set and definitions, is that for developing and transition economies less than half of the population has access to social protection programs, with the number being less than one-third in South Asia and less than one-quarter in Africa south of the Sahara.¹³

Limited though they are, what is the poverty impact of social protection transfer programs in developing countries? If we focus on income poverty (because of the availability of data on a comparable

cross-country basis), one way to answer this question is to subtract the monetary value of social protection benefits and recalculate poverty on this basis. Of course this will be an overestimate to the extent that individual responses or other community mechanisms step in to fill the gap. However, to the extent that social protection improves medium-term income prospects through better handling of risk, this would be an underestimate. With these caveats in mind, and making assumptions to extrapolate from the ASPIRE data set to the global population, it has been estimated that around 150 million people annually are prevented from falling below the US\$1.25 per day poverty line worldwide as a result of existing social protection programs. Focusing on the sum of the gaps between income/consumption and the poverty line, estimates hold that social protection programs eliminate almost half of the total

poverty gap. However, the impact on numbers and on the gap is weakest in Africa south of the Sahara, which is not surprising, given the low coverage of population noted above.¹⁴

What determines the impact of social protection transfers on poverty? If we examine the total poverty gap, we intuitively see that there are two components to the impact. First is the total budget for social protection transfers relative to the pre-social protection poverty gap. Second is the fraction of the total budget that actually goes to the poor to fill the poverty gap. These are the twin determinants of the efficacy of social protection transfers in addressing poverty: budgetary adequacy and targeting efficiency. ASPIRE data show that average targeting efficiency for the countries in the sample is 8 percent. This is very low, but compares with the best value of 40 percent and an average value for the top quartile of countries of 21 percent.

Clearly, improving targeting efficiency will increase the poverty reduction impact of social protection transfers. Suppose that we were to set a social protection goal of halving the poverty gap. Suppose further that we were to set an ambitious goal of having every country reach the very top targeting efficiency in the world: 40 percent. It has been shown that improving targeting efficiency is not enough to attain the poverty reduction goal. Only 73 percent of all countries in the sample would achieve the goal of halving the poverty gap. For low income countries, only half would achieve the target even with the very best targeting efficiency seen in the world. In other words, the problem is as much one of budgetary adequacy as it is one of targeting efficiency. The total budget as a fraction of the poverty gap does not exceed 20 percent in low income countries in the sample, which is clearly insufficient to address poverty, no matter how well it is targeted.¹⁵

The above calculations are for the impact of social protection on income poverty. Some aspect of the insurance role of social protection is also captured in these calculations to the extent that insurance prevents negative shocks from driving households into poverty. However, the insurance role can also have beneficial long-term effects, which are not captured directly in the short-term impact calculations.¹⁶

CHALLENGES OF SOCIAL PROTECTION

Adequate budgets are a major challenge of social protection programs, but the design of social protection poses additional hurdles. Targeting of benefits to the poor is of course another obstacle. Fine targeting to the poor and only the poor is an even greater challenge. There are at least two issues that such fine targeting raises. First is the informational and administrative difficulties of identifying the poor and separating them from the nonpoor to receive the transfer. Recent improvements in information technology, such as biometric identification or electronic banking, could help to address this problem.¹⁷ There is also the political economy challenge of finding a support program that only benefits the poorest—one reason why less well-targeted programs are prevalent is because they enjoy the support of middle-income groups as well.

Even beyond targeting, social protection raises a further set of impediments to design.¹⁸ The first is the interaction between formal social protection programs and preexisting family, community, and informal mechanisms of insurance and transfers. A challenge for the design of state-supported social protection is how these programs and mechanisms will respond. If informal mechanisms decline in response to state provision, then the net effect of state intervention is less than the gross effect. This has to be taken into account in evaluating the success of social protection.

A second challenge is conceptual and has political implications. Is social protection best thought of as insurance or is it redistribution? Insurance has greater support than redistribution, especially among middle- and upper-income groups, but in practice separating one out from the other is difficult.¹⁹ Thus, for example, a progressive tax system, or a cash transfer scheme to the poor financed from the general fiscal revenue, is redistributive. Yet at the same time it also provides insurance through lower taxes or even transfers when incomes are low, just as it is financed by higher taxes when incomes are high. By the same token, programs that are labeled as social insurance but actuarially require transfers from the fiscal budget are redistributive without this being appreciated by the public. Any pension schemes for

public-sector workers are of this type—they redistribute toward the beneficiary group on average. The estimation of the insurance versus the redistribution component of such schemes represents an analytical hurdle.

A third challenge in the discourse on social protection is that of conditional cash transfers.²⁰ There are two parts to the challenge—payment in cash and conditioning of the transfer. There is a vigorous debate between those who favor transfers in cash versus those who favor transfers in kind. Transfers in cash are argued to be administratively easier—with recent advances in mobile banking and electronic transfers, which do not require the government to manage vast food stocks, being one example. They are also argued to be economically efficient because they allow the individual to make the choice of what the cash is spent on. However, the counter argument is that payment in kind makes it more likely that the benefits will flow to the household and to the vulnerable members of the household. The jury is still out on this debate. Preliminary research results by scholars at the International Food Policy Research Institute suggest that the relative effectiveness of different modalities may depend heavily on contextual factors, such as the severity of food insecurity and the prevalence of markets for grains and other foods.²¹

On conditioning of the transfer, there is some evidence that this strategy works. For example, the goal of keeping children in school usually improves when conditional cash transfers are used. But conditioning is not useful everywhere; it can also discriminate against households that need support but cannot meet the conditions, and also adds administrative and monitoring burdens.²² Despite its problems, however, conditioning can be more politically viable because it draws the support of the middle class and the decisionmaking authorities.

This is related to a fourth challenge, that of sustainability. Finance ministers in particular are concerned about what might become an open-ended commitment to transfers without an “exit.” Conditioning on human capital accumulation could aid this exit for individuals and households.

A fifth and final challenge in the social protection discourse is developing social protection in

low income countries (LICs). Although not easy to establish quantitatively, not least because of the difficulties of cross-country comparability in what comes under the umbrella of social protection, there seems to be a consensus that social protection programs are more widespread in middle income countries (MICs). We have already noted that coverage in Africa south of the Sahara is much lower than in the world as a whole and that the budgetary allocations to social protection are much lower in LICs. Another indirect indicator is that taking World Bank lending as a whole, 13 percent of World Bank projects in MICs were devoted to social safety nets, while the figure for LICs was 6 percent.²³

The challenge lies in the argument that this is the “natural” order of things. In fact, LICs cannot “afford” social protection. Countries have to first grow and then develop social protection. The counter-argument is that it is precisely in these countries that the need for social protection is greatest, and that without social protection negative shocks can trap both the poor into a cycle of poverty and their countries into a path of low growth. There is also further evidence that social protection interventions do not fare any worse in LICs than in MICs. The World Bank’s Independent Evaluation Group finds that in terms of the performance of social safety net projects, LICs performed no worse. In fact, according to the World Bank’s well-established evaluation scale, 88 percent of projects scored “moderately satisfactory” or better in LICs, while the number was 85 percent for MICs.²⁴

POLICY CONCLUSION

Social protection was largely missing from the MDG discourse, which was shaped in the 1990s. The experience of the last two decades has emphasized the importance of social protection, especially in the face of growing economic and noneconomic risks at both the individual and the national levels that exacerbate poverty, hunger, and undernutrition. The United Nations Open Working Group on Sustainable Development Goals has proposed 17 goals and a more detailed set of targets under each goal; the first three goals encompass social protection explicitly (Table 1).²⁵

TABLE 1 Proposed social protection–related targets under the United Nations Open Working Group on Sustainable Development Goals

Sustainable Development Goal		Social protection–related target
1	End poverty in all its forms everywhere.	Implement nationally social protection systems and measures for all, including floors, and by 2030 achieve coverage of the poor and vulnerable.
2	End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.	Ensure access by all people, in particular the poor and people in vulnerable situations including infants, to safe, nutritious, and sufficient food all year round.
3	Ensure healthy lives and promote well-being for all at all ages.	Achieve universal health coverage (UHC), including financial risk protection, access to quality essential health care services, and access to safe, effective, quality, and affordable essential medicines and vaccines for all.

Source: United Nations Open Working Group Proposal for Sustainable Development Goals, <https://sustainabledevelopment.un.org/focussdgs.html>.

Most countries have programs that can be classified as falling under social protection. These can have a significant impact on reducing poverty. But there is inadequate coverage of the population, especially in low income countries. Of course better targeting of a given budget will enhance the poverty reduction of social protection. Yet for many countries, especially low income countries, the problem is one of adequacy of budgetary resources. Beyond targeting and budgetary resources, social protection programs also face a series of design challenges that need to be addressed, and they need to be seen as a system rather than as individual programs.

The first step for countries and for the international community should be to institute a Social Protection Assessment Program (SPAP) for each country, led by the country’s government with support from development partners. Analogous to the Financial Sector Assessment Program of the International Monetary Fund and the World Bank, such an assessment would look at the social protection programs as a collectivity. Through “stress testing” with respect to a range of micro-level risks and macro-level crises, SPAP would assess the system as a whole not only as a poverty-reduction device but as a safety net. For example, the assessment would ask whether the system as a whole can provide support in the face of a drought or an external economic crisis that affected the local economy. Based on such an analysis, the assessment would identify gaps and recommend additions, subtractions, and improvements to the design of individual programs and the system as a whole.

Such an assessment would in turn lead to a specific program of investments to strengthen the system to deal with a range of individual-level shortfalls and risks as well as national-level shocks. Most of the resources for these improvements in the first instance will have to come from the outside, especially for low income countries. However, just as important for reforming and building up the collectivity of programs as a system is the rapid response to the financing needed when national-level shocks hit a country. For this, a global facility is appropriate. A number of instruments are currently available, such as the “deferred drawdown option” in International Bank for Reconstruction and Development loans that disburse when certain triggers are breached, confirming that a crisis is at hand. For low income countries, the International Development Association has a Crisis Response Window, but more is needed to develop the facility further and to streamline it to provide an automatic response when a crisis is identified.²⁶

Broadly construed, social protection—encompassing elements of both insurance and targeted transfers to the poorest and most vulnerable—is now recognized as a cornerstone of development policy. This is especially true given the greater degrees of economic and noneconomic risks faced by developing countries and their populations in the wake of global integration and climate change. National governments supported by the international community need to design efficient programs as a system and provide adequate finance for social protection. ■



Queen
BÀ LỘC
CƠM TẤM
STEAM BROKEN RICE

- SƯỜN CHÈ (PORK RIBS) VND 12.000
- CÁ LƯU HỒI (GRILLED SALMON) VND 28.000
- CÁ NHÚT (GRILLED TUNA) VND 20.000
- CÁ NGŨ (GRILLED TILAPIA) VND 15.000
- CHICKEN (GRILLED CHICKEN) VND 15.000
- TÀ HỒI (GRILLED SAUSAGE) VND 10.000
- CHICKEN (GRILLED CHICKEN) VND 15.000
- SƯỜN CHÈ (PORK RIBS) VND 12.000
- CÁ LƯU HỒI (GRILLED SALMON) VND 28.000
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Reducing and Managing Food Scares

Delia Grace and John McDermott



SUMMARY A series of high-profile food-related scares around the globe has drawn attention to the issue of food safety and other health risks associated with agriculture. Because the scope of the problem is different at different levels of economic development, we need nuanced policy options to promote safer food production systems worldwide.

FOODBORNE DISEASES RESULT FROM THE INGESTION OF CONTAMINATED or naturally hazardous foods. They include a broad range of illnesses caused by pathogens and chemicals. The most important causes of foodborne diseases are biological (caused by parasitic and microbial infections), but while most infectious diseases in humans are declining, incidences of foodborne diseases appear to be increasing.¹

What were the high-profile foodborne disease events in 2014? What do they tell us about the different patterns of foodborne disease characteristic of different levels of development, particularly for emerging economies? We answer these questions below; discuss other food- and health-related issues, such as antimicrobial resistance; and close with suggestions on how food safety can be better managed.

FOODBORNE DISEASE EVENTS IN 2014

In 2014, as in previous years, foodborne disease received much media and policy attention. In Denmark, an outbreak of listeriosis associated with pork sausages killed 12 people, and the small firm producing the sausage meat was closed down. In Canada, revised estimates of the burden of foodborne disease suggested that one in four Canadians is affected each year. More than 90 percent of this burden is caused by just four pathogens and, as is often the case, most (three out of four) of the pathogens responsible are transmissible between animals and

Delia Grace is lead, Program on Food Safety and Zoonoses, International Livestock Research Institute (ILRI), Nairobi, Kenya. **John McDermott** is director, CGIAR Research Program on Agriculture for Nutrition and Health (A4NH), International Food Policy Research Institute, Washington, DC.

people (zoonotic). In the United Kingdom, a report on a major food fraud scandal that broke out in 2013 revealed how a highly competitive and under-regulated industry allowed firms to adulterate beef



In China, trading centers in Hunan came to a standstill when cadmium was found in rice, a legacy of cultivation in polluted soils. In a separate incident, thousands of dead pigs were reportedly dumped in rivers and reservoirs, further undermining trust in the safety and wholesomeness of pork.

with horsemeat, which although posing no threat to human health did undermine general confidence in the food system.²

Meanwhile, cholera—which is both water- and foodborne—broke out in the Cameroon, Cuba, Ghana, and South Sudan. For Cuba, it was the first outbreak in more than a century. The government of Ghana responded to its national outbreak by attempting to ban street food vending.

In China, trading centers in Hunan came to a standstill when cadmium was found in rice, a legacy of cultivation in polluted soils. In a separate incident, thousands of dead pigs were reportedly dumped in rivers and reservoirs, further undermining trust in the safety and wholesomeness of pork. Problems were not confined to the indigenous industry. An American-owned meat factory operating in China was found selling out-of-date and tainted meat to clients, including McDonald's and Starbucks. McDonald's expects that this will reduce the company's global earnings by US\$0.15–0.20 per share.

Across the strait, a scandal in Taiwan erupted over the use of “gutter oil”—recycled oil from

restaurant waste and animal byproducts. The premier of Taiwan apologized and the chief executive officer of the Taiwanese company responsible was arrested.

As 2014 drew to an end, the largest-ever outbreak of Ebola hemorrhagic fever in West Africa was ongoing. The most likely initial source of this outbreak was exposure to bats.

Other events of 2014 were more in keeping with the overall long-term progress being made around the globe in better managing infectious diseases—advances that have resulted from better education, information, technology, and institutions. For instance, data from the *Global Burden of Disease* report released by the World Health Organization (WHO) in June 2014 showed that diarrheal disease in 2012 decreased by 38 percent from the year 2000.³

In 2014 technologies to better manage high-priority diseases continued to be developed and released. One example is the development of encapsulated fecal transplants for *Clostridium difficile*. This unpleasant disease has increased rapidly in the last few decades, and food is considered a potential transmission route. As much as 90 percent of cases that do not respond to antibiotic treatment improve when feces from healthy people are transplanted to the victim. Going forward, this sometimes-difficult treatment process will be facilitated by encapsulating the feces to be transplanted in an easy-to-swallow pill.

Food safety reform took place in several countries, notably Taiwan, which created a food safety agency, and the United States, which began implementation of its 2011 Food Safety Modernization Act—the country's most sweeping reform for food safety in 70 years. High-level policy coordination on food safety included an Organisation for Economic Co-operation and Development meeting on the future of agriculture, which identified food safety as a major concern, and a World Trade Organization workshop on risk analysis for food safety, which summed up the progress and challenges since the previous workshop in 2000. WHO released preliminary results of a reference group study on foodborne disease attribution,⁴ and a book was published covering the results of a decade of CGIAR research on food safety in the informal markets of Africa.⁵

THREE WORLDS OF FOOD SAFETY CONCERNS

The notable food safety events of 2014 summarized above illustrate both the complexity and the diversity of food safety issues. From these examples we can identify three “worlds” characterized by different food safety concerns:

- ▶ **Developed economies**, where foodborne diseases are of high concern but impose relatively small health burdens
- ▶ **Least developed economies**, where foodborne diseases, although prevalent, are not among the highest priorities of public health officials
- ▶ **The emerging economies**, where foodborne diseases are both highly prevalent and highly prioritized

We examine each below in turn.

Developed Economies: The “Worried Well”

As exemplified by the events in Europe cited above, foodborne disease remains an important public health problem in high income countries. This is mainly because other infectious diseases in this part of the world have been successfully brought under control. (Less than 7 percent of the disease burden in high income countries is caused by infection, compared with 43 percent in low income countries.)⁶

There are, of course, differences among developed economies. For example, some countries with relatively advanced animal and human health systems are reported to have made little progress over the last decade in the control of zoonotic foodborne pathogens (the United States is one example), while others have had notable success with some diseases (such as control of salmonellosis in the European Union).⁷ From a global perspective, however, an epidemiological transition has occurred in the countries of this group, and the main health problems associated with food are obesity and the contribution of diets to cardiovascular disease and cancer.⁸

Yet paradoxically, as the absolute burden of infectious disease decreases, the cases that do occur receive more attention from the media, the public, and policymakers. A single outbreak of

Escherichia coli (a pathogen commonly associated with meat and raw milk) that killed one child and sickened three others led to the restructuring of the national food safety system in Australia. Moreover, in developed economies the cumulative cost of even occasional illness in terms of treatment and lost income is high. Foodborne disease has been estimated to cost the US economy US\$14–16 billion each year⁹ and to set Australia back \$1.2 billion annually.¹⁰ Improvements in food safety along the value chain, especially on farms, have been shown to be realistic and economically feasible. For example, the cost of achieving a salmonella-safe compound feed in Europe was estimated at €1.8–2.3 per ton of feed.¹¹

Developed economies are experiencing an increasing number of concerns over nonsafety food attributes, including animal welfare, environmental sustainability, provenance, and food crime. With the European horsemeat scandal of 2013, adulteration and food fraud reemerged as a major issue. The extensive media coverage of the scandal revealed not only widespread fraud but also

Foodborne disease remains an important public health problem in high income countries. This is because other infectious diseases in this part of the world have been successfully brought under control.

the complexity of the European meat supply chain and the extent of meat imports. There is widespread public distrust of the industrial agrifood complex, and many consumers remain unconvinced of the safety of genetically modified foods despite a lack of scientific evidence of risk. There is also a widespread belief in the greater safety of organic and local products, which is also not well supported by evidence.

The Least Developed Economies: “The Cold Spots”

In the least developed economies, foodborne disease is probably common but largely underreported. We know that diarrhea is the third most important cause of disease burden in low income countries,¹² most of which is associated with contaminated food and water.¹³ The exact contribution of foodborne disease to the burden of gastrointestinal disease in developing countries is unknown but will likely increase as communities rapidly gain access to safe water while most of their food remains contaminated. However, the poorest consumers are to some degree protected from foodborne disease by their limited access to the foods most often implicated as the source of foodborne disease (such as livestock products, fish, and leafy vegetables), the short value chains for these products, and indigenous practices (such as fermentation and lengthy cooking) that mitigate risk.

Conversely, the poorest are more at risk from contaminants associated with staple foods, such as aflatoxins (fungal toxins that are especially prob-

filth-associated, and other diseases of neglect and poverty. In the least developed countries, food safety is apparently not a dominant concern of either the public or policymakers, and attempts to impose food safety regulation may on occasion create more harm (such as by increasing transaction costs and reducing food availability) than benefit.¹⁴

The Emerging Economies: “The Hot Spots”

The third and arguably most important set of food safety concerns is seen in emerging economies. They are characterized by rapidly growing demand for the riskiest foods (animal source foods and vegetables), rapidly intensifying agriculture to meet these demands, but lagging food governance systems. Marked by both a high absolute burden of foodborne disease and a high level of concern, these countries are what can be called the foodborne disease “hot spots.”

Emerging economies have rapidly changing food systems, with urbanization creating bigger markets and longer and more complex food chains. In countries where infrastructure is lacking, the growth of cities stimulates urban and peri-urban production of perishable foods, including livestock products and vegetables. Indeed, to promote food security China has actively encouraged agricultural production within city limits.¹⁵ Predictably, placing large, dense human populations in close proximity to large, dense livestock populations brings both public health and environmental hazards—risks that are compounded by poor agricultural practices (such as lack of traceability and reliance on veterinary drugs to mask poor husbandry) and lack of effective regulation.

The avian influenza pandemic revealed the generally low levels of biosecurity on farms, as well as the unsanitary conditions in slaughter, processing, and retail facilities in South Asia and Southeast Asia. Other major concerns are farming where industrial pollution is high, the use of gray water (domestic wastewater excluding sewage) is widespread, and management of livestock waste is poor. As a result, biological and chemical hazards are widespread in these systems, as well as the food emerging from them. Most studies of the farms and wet markets of emerging countries reveal high levels of pathogens and contaminants.



Marked by both a high absolute burden of foodborne disease and a high level of concern, middle income countries are what can be called the foodborne disease ‘hot spots.’

lematic in maize, sorghum, and groundnuts). While around 4 billion people in tropical countries have uncontrolled exposure to aflatoxins, most of the known burden (hepatic carcinoma compounded with high rates of hepatitis B infections) is seen in the minority of countries (mainly African) where dietary diversity is low and reliance on staples, particularly maize, is high.

Moreover, in the poorest countries it is difficult to disentangle foodborne disease from the complex of waterborne, vector-borne, contagious,

Given the combination of poorly regulated intensification, high levels of concern, and relatively advanced ability to detect and analyze contaminants, as well as communicate them through mass and social media, it is not surprising that some of the most serious and widely publicized food safety problems are now occurring in emerging markets. The incidents of 2014 mentioned above are just the latest in a long series of food safety scares, which also includes the deliberate addition of melamine in milk that sickened thousands and killed six infants in China in 2008. (Melamine is a nitrogen-rich chemical that, because it shows up as protein on tests for milk quality, was added by middlemen so that manufacturers would buy their product.)¹⁶ This practice of criminally adding melamine to milk began in response to China's setting of higher standards for protein levels following a scandal in 2004 when 13 babies died after drinking nutritionally inadequate formula. The melamine scandal well illustrates the challenges of improving food quality and safety in rapidly changing food systems in which regulatory capacity and private-sector incentives and compliance are weak.

Such episodes lead to lack of trust in food, which in turn spurs greater reliance on imported and processed food. And the massive markets for livestock products in Asia, whether because of or in spite of these scandals, are not following the predicted trajectory in which informal markets are rapidly replaced by formal markets ("supermarketization"). In Vietnam, for example, 97 percent of pork is sold in traditional wet markets.¹⁷ Even in Malaysia, where incomes are higher and supermarkets are commonplace, traditional markets remain the preferred place for buying fresh meat.¹⁸ In east and southern Africa, informal markets currently supply 85–95 percent of the food purchased, and are predicted to predominate well into the next decades.¹⁹

Food safety can also have an impact on food exports and imports. The increasing introduction of food safety standards could create barriers to market access for small-scale producers, while at the same time leading to advantages for domestic producers who produce high-value products for export at competitive prices. Emerging economies are well placed to predominate in these kinds of markets.

Most experts believe that the emerging markets will eventually converge with the richer countries.²⁰ Indeed, panic over food safety can be a driver for improvement. In the United States, Upton Sinclair's

Predictably, placing large, dense human populations in close proximity to large, dense livestock populations brings both public health and environmental hazards—risks that are compounded by poor agricultural practices and lack of effective regulation.

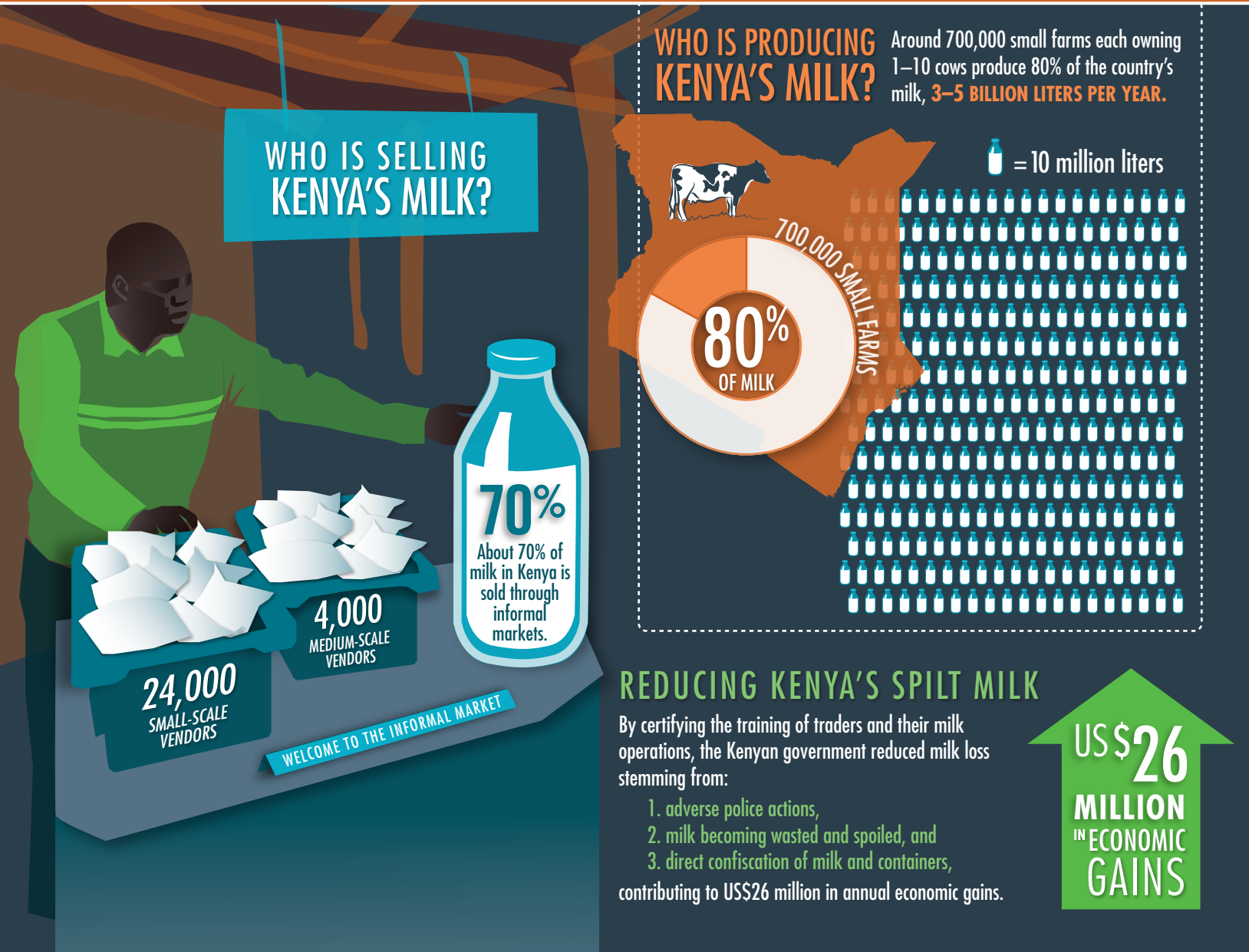
1906 book *The Jungle*, which exposed the shocking unsanitary practices in the Chicago meat yards, sparked widespread public outrage that eventually led to the establishment of the US Food and Drug Administration.²¹ From this perspective, the situation in China—where a widely publicized finding is that half the establishments undergoing food inspections fail to pass—may be more positive than the situation in India, where no reports on food safety inspection or results are publicly available.²² Governance and transparency are a more general problem in emerging economies, however, and it is unlikely that food safety will be a leading area of good governance unless there is concerted public pressure to make it so.

OTHER HEALTH IMPACTS OF AGRIFOOD SYSTEMS

Foodborne disease is not the only impact agriculture has on human health. Since reliable records began in the first half of the 20th century, diseases have been emerging from agroecosystems at the rate of one every four months; three-quarters of these are zoonotic.²³ Historically, most of the diseases that are transmissible between animals and humans emerged

THE INFORMAL MARKET: DON'T OVERLOOK IT

Policies banning or ignoring informal milk markets are counterproductive. Kenya is a positive example of how introducing improved technologies and standards to milk producers and traders can boost food safety and generate economic returns.



Source: S. Kaitibie, A. Omore, K. Rich, B. Salasya, N. Hooten, D. Mwero, and P. Kristjanson, "Policy Change in Dairy Marketing in Kenya: Economic Impact and Pathways to Influence from Research," in CGIAR Science Council, *Impact Assessment of Policy-Oriented Research in the CGIAR: Evidence and Insights from Case Studies*, a study commissioned by the Science Council Standing Panel on Impact Assessment (Rome, CGIAR Science Council Secretariat, 2008).

in the intensive animal industries of Europe and the western United States. More recently there appears to be a shift toward developing countries in Southeast Asia and South America, possibly tracking the rapid intensification in these regions.²⁴

Once again, emerging antimicrobial resistance threatens to leave humanity highly vulnerable to infectious diseases, which before the modern era were responsible for the majority of human deaths. Antibiotics are widely used in livestock and fish production, both to promote growth and to treat

or prevent illness, and antimicrobial resistance is widely present in bacteria in animals, animal environments, and animal source foods. There is increasing consensus that resistance to antimicrobials of human importance has been generated in animals and has since spread to humans.²⁵ At present, there is little evidence regarding the contribution of livestock and fish farming to the burden of human disease resulting from antimicrobial resistance. However, creation of antimicrobial resistance is likely to be especially problematic in emerging economies, where large amounts of antibiotics are manufactured and used with minimal regulation or reporting.²⁶ One study estimated that the Asia-Pacific region has nearly half of the global antimicrobial market by volume (although only 8 percent by revenue).²⁷

Other health impacts of agriculture include occupational disease, poisoning from plant toxins, the creation of environments suitable for disease or disease vectors, and contributions to climate change with indirect effects on disease dynamics.²⁸

GLOBAL FOOD SAFETY

In an increasingly globalized world, a food safety problem created in one place can easily spread to others. Food safety and the prevention of emerging diseases can be seen as global public goods whose management requires international coordination and effort. Since the World Trade Organization agreement of 1994, which established an international framework for assessing food safety and disease introduction risk, there has been increasing consensus on the need for risk-based approaches and coordination between the standard setters for plant and animal health and food safety. These bodies include WHO, International Plant Protection Convention, World Animal Health Organization (OIE), and Codex Alimentarius Commission, a joint committee of the Food and Agriculture Organization of the United Nations (FAO) and WHO. There has been some progress in improving global surveillance, but underreporting remains a major problem in most countries.

In developed economies, most notably in Europe, private standards for food, whether for export or

domestic consumption, are often more stringent than public standards. Producers have incentives to ensure the quality and safety of their products because “food scandals” can have serious negative

Once again, emerging antimicrobial resistance threatens to leave humanity highly vulnerable to infectious diseases, which before the modern era were responsible for the majority of human deaths.

economic, legal, and reputational consequences. This concern is increasingly being felt around the globe, including in developing countries. One example of this is the International Food Standard (IFS), originally developed by retailers and wholesalers in Germany to ensure the safety of own-brand products. Version 6 of IFS Food, which is the latest version, is a collaboration of retail federations from all over the world.²⁹

TOWARD BETTER MANAGEMENT OF FOOD SAFETY

Fortunately, foodborne disease is largely a fixable problem, as illustrated by developed economies. Food safety systems came into being more than a hundred years ago. The first systems relied on visual inspection at retail, during processing, and on farms. But with time came codes of good practices (for both agriculture and manufacturing), voluntary standards, regulatory limits, testing for hazards, and methods for ensuring that food-handling processes remain within safe limits. However, these methods require expertise and incur costs, and uptake has been limited in many emerging and least developed economies.

Food safety management has traditionally relied on “control and command”—the setting of strict standards and the enforcement of these standards by

both inspection and credible threats. In developed economies, these approaches are being supported by greater reliance on self-regulation and industry buy-in. Initiatives such as the industry-led Global Food Safety



Most surveys indicate that the general public is most worried about pesticide residues, food additives, hormones, and other chemicals in food. Yet research shows that most outbreaks of foodborne disease are associated with microbiological contamination.

Initiative and the World Bank–led Global Food Safety Partnership are gradually being extended to emerging and even least developed economies.

Risk-based approaches for prioritization can improve the efficiency and effectiveness of food safety management. The great majority of the disease burden is caused by a small number of hazards (mostly zoonotic pathogens), and typically a small number of actors and products create a disproportionate amount of risk. This pattern means that targeting the riskiest products, pathogens, and practices can lead to greater risk mitigation at lower cost. Currently only a few countries consistently use risk targeting (notably Australia and Canada). Extending this approach could have many benefits, especially in resource-poor contexts. Risk-based approaches also include methodologies for structured assessment of the public health impact of a food safety problem and the options for managing it. The Codex Alimentarius Commission is the global standard setter for food safety and provides detailed information on the risk-based approaches that are now the gold standard.³⁰

In developing countries, regulations have been largely ineffective in the domestic markets where most people buy and sell the riskiest perishable products. This failure can be attributed to poor

governance, inappropriate food safety systems, and a lack of information, incentives for compliance, and resources. Approaches that are possibly more promising involve working with the informal sector to gradually improve practices and building systems with positive incentives for compliance.

One example is the informal dairy sector in Kenya (see Infographic on page 46). In Kenya, around 700,000 smallholders owning 1–10 cows produce 80 percent of the milk (3–5 billion liters per year). Around 70 percent of milk is sold through the informal sector, comprising about 4,000 medium- and 24,000 small-scale operators. A CGIAR research project found that policies banning informal milk markets act as a barrier to the uptake of improved technologies among producers and traders. A model was developed whereby traders would receive training and then be given a certification allowing their operation. This policy was recognized by the governing and regulatory bodies in Kenya. Evaluations showed that trained hawkers (market agents) produced safer milk, the informal sector had no worse compliance than the formal sector, and the changes in policy led to economic gains of US\$26 million annually.³¹

Management of food safety is complicated by its emotive nature. There is a remarkably wide divergence in how the public and experts assess food risk. For example, food safety experts consider marine toxins to be a serious concern and pesticide residues a minor concern; for the general public, however, these estimates are completely reversed. Most surveys indicate that the general public is most worried about pesticide residues, food additives, hormones, and other chemicals in food. Yet research shows that most outbreaks of foodborne disease are associated with microbiological contamination: people are many times more likely to become ill as a result of microorganisms in food than as a result of pesticide residues.

Technology and marketing innovations have potential to continue to improve food safety. Consumers universally demand food safety, but it is largely a “credence good”—consumers cannot directly assess its presence. Some steps, such as ongoing research on packages that change color when pathogens are present or market-side tests for adulteration or pathogens, could allow consumers

and market agents to detect and refuse unsafe food, thereby pushing quality assurance up the supply chain. Some cheap and effective technologies already exist for reducing health risks, yet nonscientific fears concerning the “unnaturalness” or lack of safety of the technique have meant that they are by and large not being used. (Examples of this include lactoperoxidase for milk preservation or irradiation of food to eliminate pathogens.) Other technologies are under development, some of which may prove to be acceptable as well as effective. Additionally, attitudes toward existing solutions may turn more favorable if food availability worsens. Mobile phones and Internet tracking are already providing more comprehensive and accurate surveillance, and molecular epidemiology allows tracking of pathogens from the victim to the source. Also, continued innovation in intensive farming systems can reduce hazards at the source, mitigate environmental damage, and dampen the development of antimicrobial resistance.

CONCLUSIONS

A series of high-profile foodborne disease events, along with concerns over the ecological and animal

welfare impacts of agriculture, has led consumers in developed and emerging economies to become increasingly wary of industrial agrifood systems and their products. At the same time, consumers (especially the less rich) are increasingly dependent on the abundant, cheap, and generally safe foods these intensive systems produce.

Some consumers are demanding a total reconfiguration of agrifood systems, the reconceptualization of food as a commons rather than as a commodity, and a complete dismantling of current food systems.³²

However, it seems most likely that growing concern over food safety will result in increased safeguards for intensive production that better assure consumers of food safety. Improved production methods may also reduce the emergence of diseases from agroecosystems.

A positive evolution of agrifood systems will require better governance and continued technological innovation. Food safety and prevention of disease emergence from agroecosystems are global public goods requiring international cooperation and investments in safer foods and agriculture by the international community as well as national governments. ■



How Do We Break the Links?

Clemens Breisinger, Olivier Ecker, and Jean Francois Trinh Tan



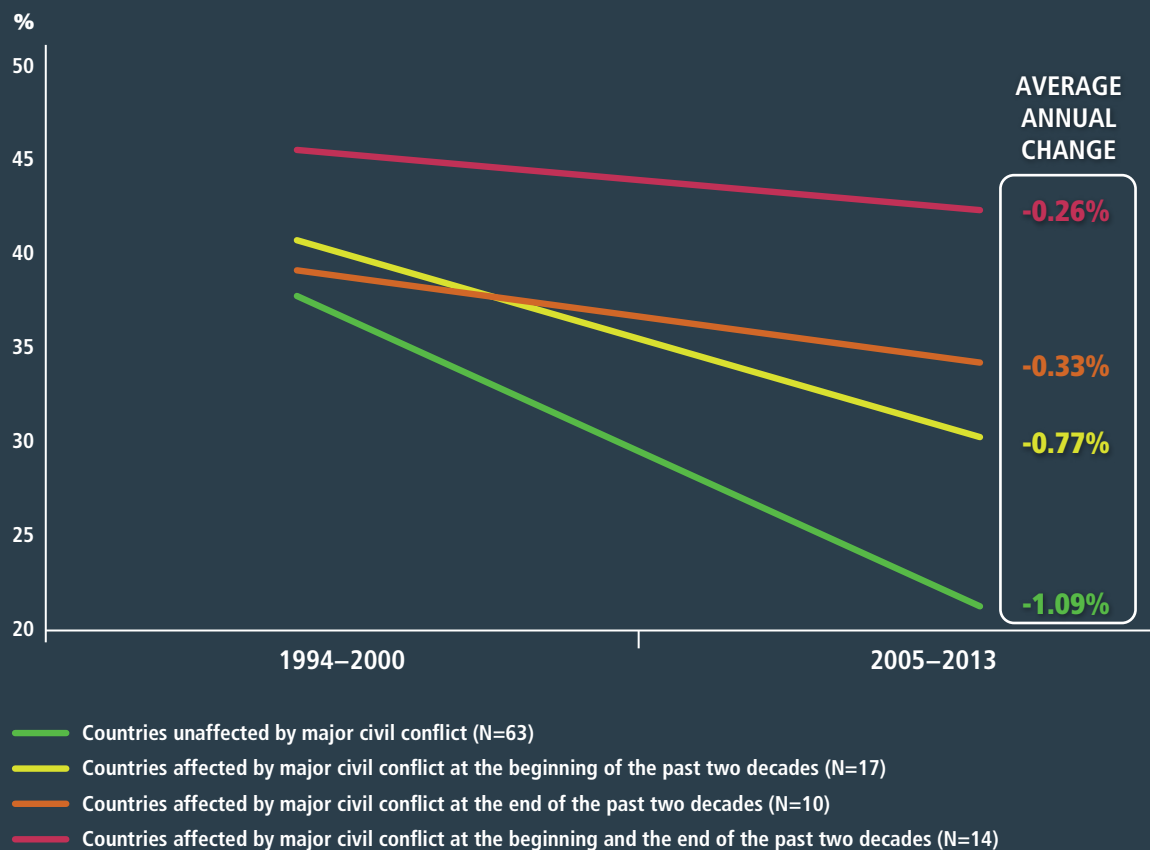
SUMMARY Food and nutrition insecurity are becoming increasingly concentrated in conflict-affected countries, affecting millions of people. Policies and interventions that build resilience to these shocks have the power to not only limit the breadth and depth of conflict and violence around the world, but also strengthen national-level governance systems and institutions.

THE YEAR 2014 WAS A STARK REMINDER THAT CONFLICTS OFTEN worsen food and nutrition insecurity. Millions of lives were affected, even lost. Reports of destroyed houses, roads, schools, and hospitals in Gaza, Iraq, Nigeria, Syria, Yemen, and other conflict-affected places permeated the news throughout 2014. In addition to the humanitarian tragedies associated with these conflicts, the destruction of infrastructure, together with disruptions in access to markets, often renders goods and services prohibitively expensive or makes them unavailable altogether. Both investors and tourists often abandon conflict-affected areas, and clashes between conflicting parties force millions of refugees to flee either to safer places within the affected countries or across the border to neighboring countries. As a result, economies often contract, instability and insecurity spill over national borders, and food and nutrition insecurity rises. For example, almost the entire population of Gaza is in need of assistance, and about half of the people in Syria and Yemen are suffering from severe food insecurity.¹

It is clear then why conflicts are likely to seriously threaten our ability to achieve the ambitious development goals that the international community has been discussing in the context of the post-2015 agenda, including the goal of eradicating hunger and malnutrition by 2025. While some countries—like Bangladesh, Brazil, China, and Vietnam—have demonstrated that rapid reduction in hunger and chronic child undernutrition is possible, there is a general perception that reaching these goals may be particularly difficult in countries affected by civil conflict and political instability. As of 2013, an estimated 46 percent of the developing world's population lived in countries affected by civil conflict—compared with 38 percent two decades ago. With this as background, what then

Clemens Breisinger is senior research fellow, **Olivier Ecker** is research fellow, and **Jean Francois Trinh Tan** is research analyst, Development Strategy and Governance Division, International Food Policy Research Institute, Washington, DC.

FIGURE 1 Prevalence of child stunting and annual average change in developing countries by civil conflict status



Source: Authors' estimation based on data from the World Health Organization's Global Health Observatory, the Uppsala Conflict Data Program, and the United Nations Department of Economic and Social Affairs databases (accessed September 23, 2014).

Notes: A country is classified as affected by major civil conflict if it experienced an average of more than 100 battle-related deaths or fatalities in nonstate conflicts or other clashes over a period of three years. The beginning of the past two decades spans the period 1994–1996, and the end of the past two decades, the period 2011–2013. N is the number of countries. The country averages are calculated based on population weights. The child-stunting rates used are the first and the last estimates taken in the past two decades.

are the recent trends in food and nutrition security in countries with various degrees of civil conflict? What are the major causes of conflicts and how do various types of shocks aggravate or trigger civil conflict? We answer these questions below, and conclude with policy options.

CONFLICT AND CHILD STUNTING

Because food and nutrition insecurity can be both a cause and a consequence of civil conflict,² global chronic undernutrition becomes increasingly

concentrated in conflict-affected countries. Over the past two decades, the number of stunted children in conflict-affected countries in the developing world increased from an estimated 97.5 million (equivalent to 46 percent of all stunted children in developing countries) to 112.1 million (equivalent to 65 percent). In relative terms, the child stunting rates in conflict-affected countries declined at a much slower rate compared with more stable countries (Figure 1). Moreover, countries that experienced major civil conflict at the beginning of the past two decades and then managed to establish civil peace achieved faster

reduction in child malnutrition than did countries affected by major civil conflict at the beginning and the end of the observation period or countries that slipped into major civil conflict.

For example, child stunting declined at an annual average rate of more than 1 percentage point in Angola, Cambodia, and Tajikistan, all countries that suffered from major civil conflict at the beginning of the past two decades and that have also been relatively stable in recent years. In contrast, countries with an increase in conflict fatalities—such as the Central African Republic, Pakistan, and Syria—also experienced an increase in the prevalence of child stunting. Child stunting rates also increased in Mali and Somalia, which have been continuously affected by civil conflict throughout the past two decades. Although this simple analysis suggests that changes in the prevalence rate of child stunting are associated with changes in the intensity of civil conflict across countries, it does not allow for drawing conclusions about the impact of civil conflict on nutrition outcomes because factors not related to conflict may have caused the observed changes in the prevalence of child stunting.

BUILDING RESILIENCE TO SHOCKS IS EVEN MORE IMPORTANT IN CONFLICT-AFFECTED COUNTRIES THAN IN MORE STABLE COUNTRIES

The root causes of conflict vary greatly with each case and are often the consequence of a combination of political, institutional, economic, and social stresses. The literature across academic disciplines points to a broad set of potential factors. These include ethnic tension, religious competition,³ real or perceived discrimination,⁴ poor governance and state capacity,⁵ competition for land and natural resources,⁶ population pressure and rapid urbanization,⁷ and economic factors such as poverty,⁸ youth unemployment,⁹ and food insecurity.¹⁰

But conflicts are also often related to shocks, including natural disasters, epidemics, and food price crises. While such shocks may sometimes aggravate or even trigger civil conflict, others—such as food price hikes—are often a result of civil conflict and can themselves spark conflicts. Examples of

drought-fuelled civil wars include Somalia¹¹ as well as Sudan and South Sudan,¹² and the ongoing Syrian civil war, which broke out in the wake of a major drought. The current Ebola epidemic is spreading in Guinea, Liberia, and Sierra Leone—all countries

While shocks may sometimes aggravate or even trigger civil conflict, others—such as food price hikes—are often a result of civil conflict and can themselves spark conflicts.

that have experienced civil war in recent years. In Nigeria and other countries, the escalation of violence has increased food prices and food insecurity.

How can we break the links between food insecurity and conflict? We argue that building resilience to economic, environmental, and health shocks is even more important in conflict-affected countries than it is in more stable countries, although a resolution of an ongoing or latent civil conflict often requires tackling the underlying socioeconomic and political tensions.

Climate and Weather-Related Events Increase the Risk of Civil Conflict

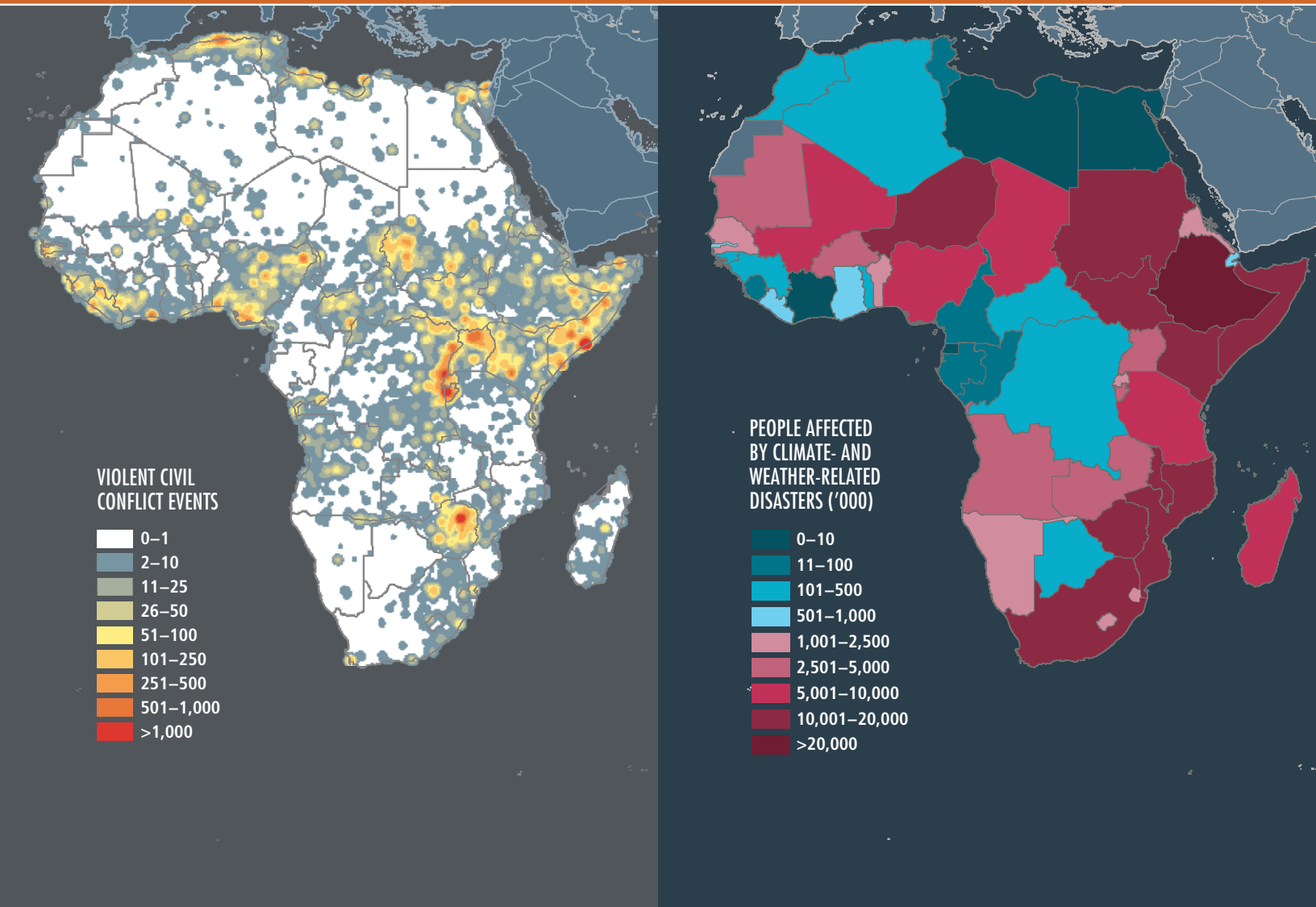
There is ample evidence suggesting that natural disasters—particularly droughts—contribute to aggravating existing civil conflicts in several ways.¹³ Such disasters can intensify social grievances by increasing the scarcity of available resources or by deepening inequalities among groups.¹⁴ The mass disruption caused by a natural disaster can also become a source of economic opportunity for criminal activities, including looting. Governments can further exacerbate these grievances either by providing inadequate or insufficient responses to disasters or by adopting discriminatory practices in the allocation of ex ante protective measures and ex post humanitarian aid.¹⁵ In extreme cases, disasters can provide a convenient pretext for advancing political or military objectives.¹⁶

In Mali, for example, arid and semi-arid conditions and changing desert boundaries have often led to deadly clashes between agricultural farmers and pastoralists. In addition, policies favoring agricultural expansion to the detriment of pastoralists, restrictions on the access to natural resources, the use of repressive force by the government, and the perception that the government misappropriated international humanitarian aid for drought have all been factors that

have unmistakably deepened the grievances of pastoralists.¹⁷

A conflict in Mawai in 2012 also coincided with a regionwide drought that affected 3.5 million people. The combination of both the drought and the political turmoil eventually led to the displacement of nearly 300,000 people, including more than 160,000 who fled to neighboring Burkina Faso, Niger, and Mauritania. With tens of thousands of cows and sheep wiped out by the drought

FIGURE 2 Frequency of violent civil conflict events and severity of climate- and weather-related disasters in Africa, 2000–2014



Source: Authors' estimation based on data from the Armed Conflict Location & Event Data Project and the International Disaster Database (accessed October 4, 2014).

Note: Climate- and weather-related disasters include droughts, extreme temperatures, floods, storms, wildfires, and insect infestations.

and the absence of government relief for pastoralists, the livelihoods of many Tuaregs (a pastoralist ethnic group) were devastated, leaving masses of people living in extreme poverty and food insecurity, which in turn allowed the ranks of the armed rebel factions to swell and coerced others to steal and loot.

Figure 2 confirms that, on a broader scale, violent civil conflict events on the African continent were more frequent in countries that were also harder hit by climate- and weather-related disasters.¹⁸ The total number of people affected by such disasters in 2000–2013 is significantly correlated with the total number of violent civil conflict events ($p = 0.33$) as well as the number of fatalities in these events ($p = 0.33$).¹⁹ Of course, correlation does not imply causality. Countries that were particularly vulnerable both to climate- and weather-related disasters as well as to violent civil conflicts include most countries in the Greater Horn of Africa (Ethiopia, Kenya, Somalia, South Sudan, and the Sudan), Mali, Nigeria, and Zimbabwe.

There is also anecdotal evidence that climate- and weather-related disasters—and specifically the inability of governments to mitigate their impacts—have contributed to civil conflict in Middle Eastern countries. The Syrian civil war, for example, broke out after the country faced devastating droughts between 2006 and 2010. With such vast proportions of territory unsuitable for agriculture and herding, 80 percent of the cattle died by 2009, while water shortage and arid weather destroyed the livelihoods of more than 50 percent of the farmers and herders, sparking mass migration toward the cities. The reduced availability of wheat and barley also pushed up bread prices and increased food insecurity, especially among the drought-affected population.²⁰ In total, 2–3 million people were affected by the drought, 800,000 of whom became vulnerable to extreme poverty, losing almost everything. Inadequate responses by the Syrian government to the crisis further antagonized the population. Although it is likely that the government's failure to adequately respond to the 2006–2010 drought was one of the factors that triggered the protests in March 2011, it is important to consider this event alongside a list

of longstanding political, social, and economic grievances.²¹

Epidemics Spread More Easily in Countries Plagued by Political Instability and May Increase the Risk of Civil Conflict

Despite the global progress in medical research, coverage of vaccination against common infectious diseases, and the reduction in malnutrition rates, the recent Ebola outbreak in Guinea, Liberia, and Sierra Leone has underscored not only the lack of health system capacity to deal with highly infectious diseases in these countries, but also the threat that health shocks can pose to social and political stability.

In most cases, the risk of social unrest is not related to the occurrence of a health shock per se, but is rather associated with the perception of inadequate responses and policies by governments and international actors. For example, the Liberian government's August 2014 decision to impose a

Violent civil conflict events on the African continent were more frequent in countries that were also harder hit by climate- and weather-related disasters.

quarantine in Ebola hot spots of the capital, which was made against the recommendations of international health experts and local health officials, has resulted in violent clashes between the army and residents of these communities. Although isolating Ebola-affected areas was a successful strategy used in some rural areas in past outbreaks in the Democratic Republic of Congo,²² the implementation of a quarantine in densely populated urban areas presents a whole new set of challenges and may even help spread the disease as people in these areas are forced to crowd together for humanitarian aid.²³ With quarantined residents already living in precarious conditions, the failure of public authorities to effectively deliver basic human services to these communities,

as reported by the press, has antagonized the population, leading to sporadic outbreaks of violence in these areas.²⁴

Misinformation and the reliance of the population on unverified community information could also be singled out as a potential trigger of civil unrest. In Guinea, for example, there were media reports that health workers were targeted on several occasions by mobs and rioters who believed



Inclusive policies and interventions that build resilience to shocks, as well as well-targeted and effective ex post responses following shocks, have the potential to defuse grievances by limiting the breadth and depth of their consequences.

they were spreading the disease.²⁵ Moreover, the food supply for some regions in all three countries has been critically disrupted because of restrictions on movement and travel to and from quarantined areas; schools have been closed, shutting down critical feeding programs for children; some farmers have abandoned their fields, partly because they wrongly fear being infected by water in irrigation channels; and some people in cities have been panic-buying. At the same time, imported food has not been making its way to rural areas because of restrictions on movement and rising transportation costs. As a result, accounts from multiple media outlets have reported that the prices of food and other essentials, as well as food insecurity more generally, are rising, especially in the quarantined zones.²⁶

The mishandling of the Ebola epidemic by these governments may provoke social unrest and threaten to destabilize these countries that are still recovering from years of intense civil conflict.

Civil Conflict Often Increases Food Prices and Food and Nutrition Insecurity

Although the example of violent riots during the 2007–2008 global food price crisis shows that (external) food price shocks can fuel civil conflict, the effects of the recent escalation of violence in the northeast of Nigeria is an example of the flip side: civil conflict aggravating food and nutrition insecurity. Hundreds of thousands of people have been displaced as result of clashes between Boko Haram fighters and Nigerian government forces, leaving many in the states of Borno and Yobe precariously short of food.²⁷ The conflict activities and the resulting mass displacement of people have led to reduced food supply from food-producing areas and increased food demand in relatively safe (urban) areas; this in turn has led to sharp food price rises in local markets.²⁸

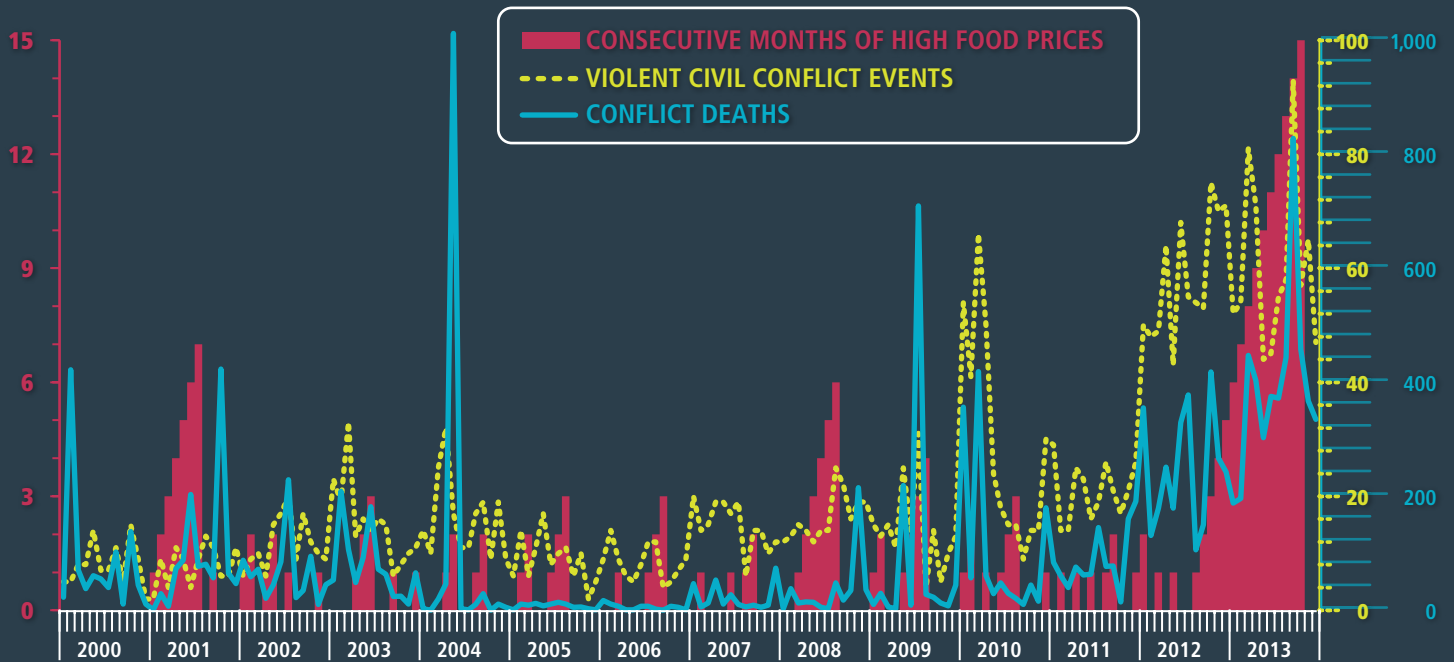
The looming threat of attack from insurgents in the rural northeast has tangibly disrupted agricultural activities because some farmers are afraid of planting their crops while others have completely abandoned their land in the course of fleeing the violence. Those who remain must cope with a decreasing supply of farm labor and reduced access to fertilizer, seeds, and fuel. Food prices in the affected conflict areas increased as a result of both limited market activity and reduced trade flows that have resulted from more road checkpoints (and perhaps more bribes), curfews and vehicle restrictions in certain areas, high transportation costs because of high fuel prices, and fear by traders to even show up at markets.²⁹

In fact there has historically also been a close co-movement of food price hikes and the intensity of civil conflict in Nigeria (Figure 3). The number of consecutive months with abnormally high food prices from 2000 to 2013 highly correlates with both the number of violent civil conflict events ($p = 0.53$) and the number of fatalities in these events ($p = 0.52$).

POLICIES AND PROGRAMS FOR CONFLICT-AFFECTED COUNTRIES

Findings noted above and elsewhere in the literature highlight the importance of governments

FIGURE 3 Food price hikes and intensity of civil conflict in Nigeria, 2000–2013



Source: Authors’ estimation based on food consumer price index (CPI) and conflict data from the Food and Agriculture Organization of the United Nation’s Statistical Division (FAOSTAT) and the Armed Conflict Location & Event Data Project (accessed September 27, 2014).

Note: High food price months are months that have food price inflation rates higher than normal. The food price inflation anomaly is calculated over the period 2000–2013 as: $A = \frac{dCPI_{y,m} - \mu^{dCPI}}{\sigma^{dCPI}}$.

responding adequately to crises. However, as reforming institutions can be more challenging in conflict-affected countries, the *World Development Report 2011* describes the following possible steps for successful reform: “First is the need to restore confidence in collective action before embarking on wider institutional transformation. Second is the priority of transforming institutions that provide citizen security, justice, and jobs. Third is the role of regional and international action to contain external stresses.”³⁰

Focusing on the last point—the containment of “external stresses” and shocks more generally—we present below lessons from successful interventions and elsewhere in the literature to inform resilience-related policy- and decisionmaking. While the examples from these experiences do not necessarily show a direct impact of resilience-building

or impact-mitigating interventions in avoiding or reducing civil conflict, they are likely to be helpful to the affected (or potentially affected) communities, thereby contributing to a more stable society.

Policies and Programs

Inclusive policies and interventions that build resilience to shocks, as well as well-targeted and effective ex post responses following shocks, have the potential to defuse grievances by limiting the breadth and depth of their consequences.

Natural disasters: In both Mali and Syria, it appears that the government could have played a key role in mitigating the impacts of droughts either through more inclusive policies aimed at building resilience or by better-targeted sustained humanitarian interventions.³¹ In other countries, however, there have

been instances where governments have actively taken measures that specifically aim to enhance resilience to natural disasters.

For example, the government of Kenya recently established a National Drought Management Authority to manage its country plan, and in Ethiopia the government is implementing policies that prioritize early livestock interventions ahead of drought, including commercial destocking and fod-



As food and nutrition insecurity become increasingly concentrated in conflict-affected countries, discussions on the post-2015 agenda need to focus on the questions of how realistic achieving those goals may be for conflict-affected countries and how approaches for achieving those goals may need to differ for those countries.

der interventions.³² Furthermore, food aid programs such as the Employment Generation Schemes and a program of free food distribution in Ethiopia have had a positive impact on welfare and food security for many households following the drought in 2002.³³ Other policies and programs that improve households' adaptive capacity include measures for establishing price information and disaster early-warning systems, expansion of credit and insurance markets, and promotion of effective (government) institutions.

Health shocks: Lessons from the Ebola outbreak in West Africa suggest that early reaction and the implementation of comprehensive strategies to contain infectious diseases (health shocks) play a key

role in abating the risk of civil unrest. Nigeria, for example, seems to have successfully contained the spread of the disease through an effective and timely response in spite of its weak health infrastructure and limited public resources. One factor leading to this success was the establishment, only within days of the first confirmed case of Ebola in the country, of a national coordination system to guide the government's public health response and consolidate decisionmaking.³⁴ A second factor was the ability of Nigerian public health officials to quickly track and monitor people who had been in contact with infected patients.³⁵

Food price shocks: Governments may take several measures in the face of food price shocks. In the short run, public reserves and diversified sources of food can help safeguard against global food price volatility, especially for countries that are heavily dependent on food imports. Evidence from India,³⁶ Kenya,³⁷ and Zambia³⁸ indicate that national reserves can be effective for stabilizing prices over time. Effective social safety nets that can be scaled up in times of crises, such as the Productive Safety Net Programme in Ethiopia or the Hunger Safety Net Programme in Kenya, can help to protect the poor against food price shocks. Such measures can take the form of (conditional) cash transfer and (flexible) food voucher systems, assistance for livelihood asset accumulation, and nutrition and health interventions. Policies that improve households' and communities' *transformative capacity* include structural (economic and social) policies and infrastructural investments. Governments should also foster agricultural growth by increasing the productivity and income of smallholder farmers. This can be achieved, for instance, by facilitating their access to inputs such as seeds and fertilizers, extension services, and weather-based crop insurance.³⁹

GOING FORWARD

In 2015, much effort will be devoted to negotiations and finalizing the post-2015 agenda. As food and nutrition insecurity become increasingly concentrated in conflict-affected countries, discussions on the post-2015 agenda need to focus on the questions

of how realistic achieving those goals may be for conflict-affected countries and how approaches for achieving those goals may need to differ for those countries. And although there is a general consensus on the need to draw special attention to conflict-affected countries,⁴⁰ it is still uncertain how conflict itself will be integrated. Nonetheless, in addition to measures that improve security, build confidence

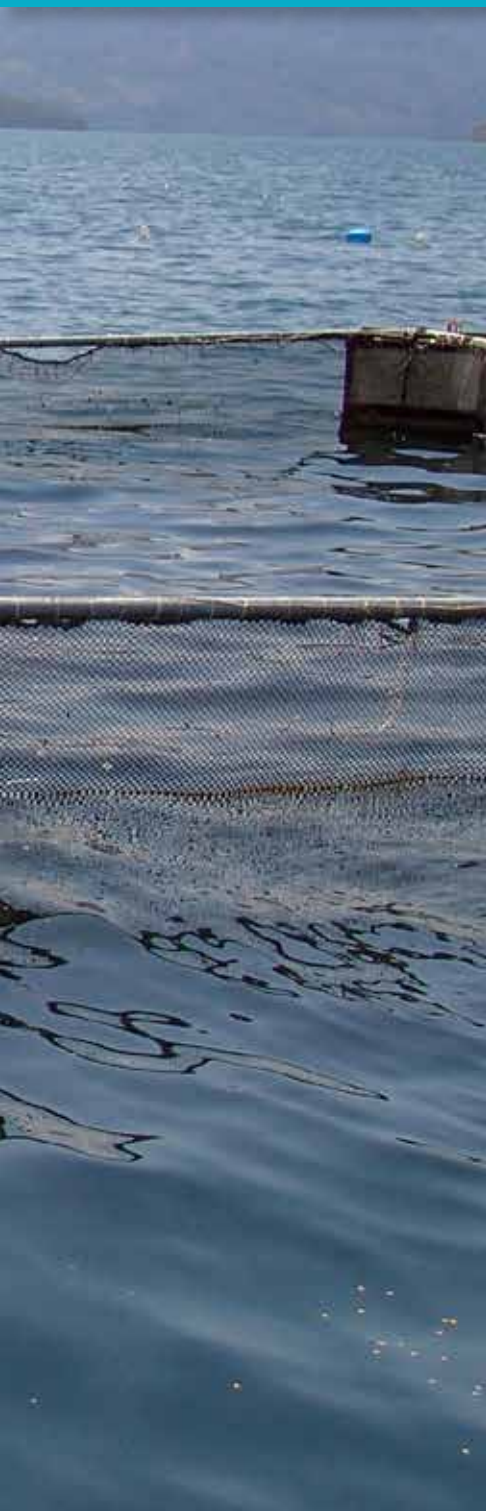
and institutions, and foster economic growth, building resilience to shocks should become a top priority within international and national development strategies. And while the negative impacts of such shocks are often extremely painful, such events also have the potential to unite the people and thus provide an opportunity to tackle long-neglected reforms and build necessary infrastructure and institutions. ■



THE RISE OF AQUACULTURE

The Role of Fish in Global Food Security

Siwa Msangi and Miroslav Batka



SUMMARY Appetite for fish continues to expand around the globe, despite the stagnant levels of capture fish production. What is the role that aquaculture can play in supplying the world with adequate animal protein? What lessons can be drawn from dynamic Asian aquaculture producers that might guide emerging fish farmers in Africa and elsewhere?

IN MANY OF THE DEVELOPING AND DEVELOPED REGIONS OF THE WORLD, the demand for fish has continued to grow. Given population growth, expanding urbanization, and rising incomes in the developing world, this trend is expected to continue. Because levels of capture fish production have stagnated over the past decades,¹ the world will thus be more dependent on aquaculture in the coming decades. For the first time in history, more fish for human consumption have originated from farms than from wild capture, having reached almost parity in 2012 according to the latest global report from the Food and Agriculture Organization of the United Nations (FAO).² The fishery and aquaculture sector is therefore finding itself at critical crossroads, and at a time when it is facing rapid technological change, increasing demand, and rising feed prices.

The importance of fish and fishery-based activities to food security in less-developed countries is particularly prominent in those communities engaged in small- to medium-scale operations in Africa and Asia. This is the result of both the consumption of fish that takes place in the households engaged in fishing operations as well as the income that these households generate. It has been noted that within populations engaged heavily in fishing activities, the fish from small-scale fisheries represent an essential component of animal protein intake and also provide a wide array of essential nutrients.³ The intake of fish from consumption by producers is often underestimated in global statistics, which tend to ignore the catch levels that come from small-scale fisheries—especially those that are inland.⁴

A report from a high-level panel of experts shows that, given that more than 80 percent of global aquaculture production is produced by small- to

Siwa Msangi is senior research fellow and **Miroslav Batka** is research analyst, Environment and Production Technology Division, International Food Policy Research Institute, Washington, DC.

medium-scale enterprises (that are heavily concentrated in Asia), the importance of fisheries to food security applies equally to small-scale aquaculture operations and to small-scale capture fisheries.⁵ Numerous studies have shown that the food security of households engaged in such aquaculture enterprises is enhanced through the cash that these operations generate, as well as from the increased availability of fish products for their consumption. This has been observed systematically in cases covering Bangladesh and India as well as in places in Africa south of the Sahara (like Malawi), where small-scale aquaculture has been taken up by local communities.

Given the importance of animal-based proteins to providing nutrients for human health (especially the types of micronutrients found in fish-based proteins, like omega-3 fatty acids), it is clear that fish comprise an essential component of a food-secure future. Considering both the limits to expanding rangelands for

arena, there is agreement on many important ongoing trends. The overexploitation of capture fisheries is evident: estimates published by FAO in 2014 hold that the share of world wild stocks that are overexploited is on the rise—with nearly 29 percent of fish stocks exploited at biologically unsustainable levels in 2011.⁶

Other methodologies and approaches to estimation paint an even more pessimistic picture. The record-high capture harvest in 2013 notwithstanding, the longer-term perspective is clear: the total global capture production has plateaued, remaining stagnant for the past two decades. Additionally, in many of the world's fisheries, catches increasingly consist of lower-value fish, indicating potential further depletion of the stock.⁷ Furthermore, the stagnant harvest comes at both an ever-increasing effort⁸ and cost (especially in fuel). Therefore, it is unlikely that capture fisheries will be able to provide significantly more fish in the future than they do now.

The rapid growth of aquaculture carries with it some major tradeoffs and constraints. Despite fast improvements in feeding technology, the sector requires growing volumes of feed. It is expected to continue crowding out other sectors for fishmeal and fish oil, and it is also expected to require large amounts of vegetable-based feeds, primarily soy-based, although there is ongoing research on other sources, such as dried distillers grains and solubles. As world prices of fishmeal remain at unprecedented highs, the aquaculture sector continues to search for ways to use fishmeal and fish oil more as strategic additives during specific stages of growth rather than using them as an exclusive feed source.

While presenting a great opportunity, aquaculture development must be conducted with high regard for the sustainability of the intensification of aquaculture. Efforts must be made to exploit synergies and to integrate aquaculture with existing farm activities and crops, while relying on native fish species wherever possible. A careful choice of the species produced should result in lower dependence on (usually imported) feed, fertilizer, and antibiotics; lower risk of disease and environmental degradation; and improved resilience to disease and climate change. El Niño is expected to occur by the end of the year 2014 and last through spring 2015.



Estimates published by FAO in 2014 hold that the share of world wild stocks that are overexploited is on the rise—with nearly 29 percent of fish stocks exploited at biologically unsustainable levels in 2011.

livestock and the ecological constraints to increasing capture fishery production, aquaculture represents the next and perhaps even the last-remaining frontier of large-scale animal protein production. This chapter thus focuses on the dynamic role that aquaculture continues to play in providing animal proteins in human diets worldwide—and especially in fast-emerging regions of Asia.

KEY DEVELOPMENTS IN 2014

While there is significant uncertainty and debate about several issues in the fishery and aquaculture

Although it is expected to be a weak event this time around, repercussions of such shocks on marine ecological systems are not negligible, and the effects on both marine-based capture and aquaculture are felt globally.

Agreements on Sustainable Seafood

Improved management and oversight of the global fishing sector is absolutely critical and is an issue with relatively broad agreement across key stakeholders. The seriousness of the overexploitation of wild fisheries is well demonstrated by the proliferation of international initiatives and other efforts to address them at all of the major international political and development organizations. A few are highlighted below:

- ▶ The United Nations (UN) convened two working group meetings in 2014 to discuss the possibility of adding more instruments protecting biodiversity to the UN Convention of the Law of the Sea (UNCLOS).
- ▶ FAO has in place a Blue Growth initiative as a cohesive approach to the sustainable, integrated, and socioeconomically sensitive management of the oceans.
- ▶ The Organisation for Economic Co-operation and Development (OECD) promotes its own Green Growth Strategy.
- ▶ The World Bank's Global Partnership for Oceans has organized a pioneering blue ribbon panel and recently published a report that offers guidance on how best to enable and spread the uptake of sustainable practices in the fisheries value chain.⁹ The panel represents a significant dialogue between academic experts, major policy institutions like the World Bank, and key private-sector representatives.
- ▶ On January 1, 2014, the European Union began implementing its new Common Fisheries Policy, which aims to ultimately eliminate discards and set capture production at the maximum sustainable yield in order to conserve stocks.

If the efforts listed above prove to be successful, the benefits of improved management could be significant. FAO estimates that rebuilding wild stocks

TABLE 1 Projections of fish production to 2030 under baseline scenario

	2010–2030 increase in production (million tons)	2010–2030 increase in production (%)	Share of 2010–2030 increase coming from aquaculture (%)
Africa south of the Sahara	0.3	4	64
Middle East and North Africa	0.8	22	97
India	4.8	60	98
Other South Asia	2.4	32	82
Southeast Asia	7.9	38	97
Japan	(0.5)	–9	–
China	16.5	31	101
Other East Asia and Pacific	0.3	7	105
Latin America and Caribbean	2.1	11	94
North America	0.2	4	103
Europe and Central Asia	0.8	6	122
Rest of the world	0.0	1	60
Global total	35.7	24	100

Source: S. Msangi, M. Kobayashi, M. Batka, S. Vannuccini, M. M. Dey, and J. L. Anderson, *Fish to 2030: Prospects for Fisheries and Aquaculture*, World Bank Report No. 83177-GLB (Washington, DC: World Bank, 2013).

Note: For Japan, there is an overall decrease in production (indicated by the parentheses). For that reason, the share of increase coming from aquaculture has been omitted.

would result in an additional global catch worth \$32 billion annually.¹⁰

PROSPECTS FOR FISH AND AQUACULTURE IN EMERGING ECONOMIES

Global Prospects to 2030: Implications for Nutrition

In the recently published global outlook report entitled *Fish to 2030*, the overwhelming majority of the projected increase in global fish production is expected to come from aquaculture—as it has for the past several decades.¹¹ Table 1 shows the production gains from various regions of the world and the share that comes from aquaculture.

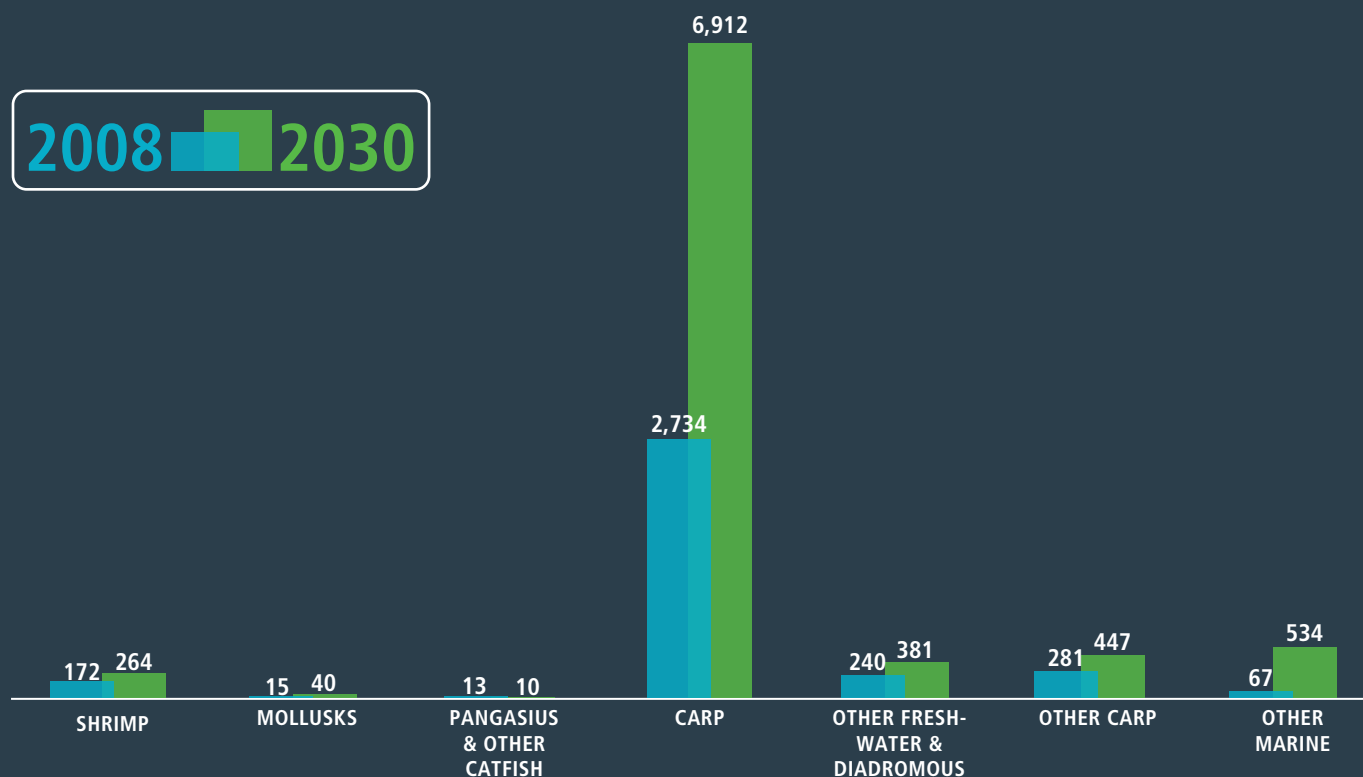
While small gains in capture production are feasible in a limited number of regions, it is projected that

any significant amount of additional fish production globally will come from aquaculture. Approximately half of the projected increase in aquaculture production, and thereby total fish production, is projected to take place in China alone, while all of Asia combined will comprise almost 90 percent of the growth in global fish production. In regions that Table 1 indicates will contribute more than 100 percent to future production increase, aquaculture is more than offsetting actual decreases in capture production. At any rate, in any region with significant projected increases in production, the contribution of aquaculture is generally close to 100 percent.

This snapshot shows the strong role that emerging regions in both Asia and Latin America play in contributing to global fish supply. A few key countries, like China, are at the epicenter of this growth. Yet other regions, like Southeast and South Asia, also have a major role to play. One of the key factors of China's success in maintaining a highly

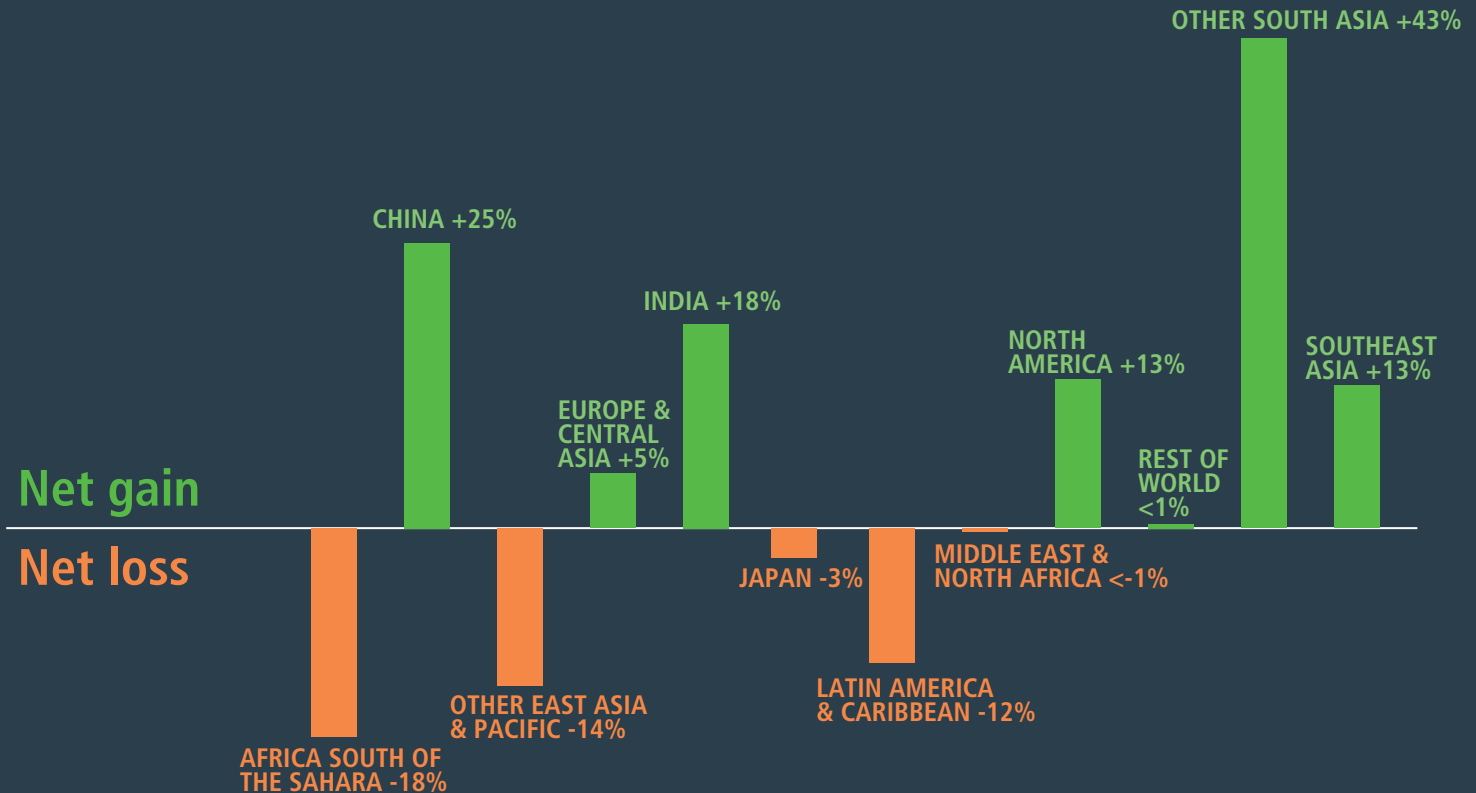
productive aquaculture sector is that it has maintained a national extension system for aquaculture that has continued widespread outreach to producers through well-trained and qualified staff. In the wider Asia region, there is also a strong network of training programs that support the development of the aquaculture sector. These include the Network of Aquaculture Centers in the Asia-Pacific (NACA), the Southeast Asian Fisheries Development Center (SEAFDEC), the Asian Institute of Technology (AIT), as well as such CGIAR institutions as the WorldFish Center.¹² The numerous fish training centers and service centers oriented toward shrimp producers have boosted the productivity of that sector in Bangladesh. In Indonesia, the creation of a separate Ministry of Marine Affairs and Fisheries (MAF) in 2000 was a key step in developing a strong sectoral development strategy. The strategy included the creation of development zones for aquaculture, where the intensification of production could be

FIGURE 1 Projected aquaculture production in India by major species groups ('000 tons)



Source: S. Msangi, M. Kobayashi, M. Batka, S. Vannuccini, M. M. Dey, and J. L. Anderson, *Fish to 2030: Prospects for Fisheries and Aquaculture*, World Bank Report No. 83177-GLB (Washington, DC: World Bank, 2013).

FIGURE 2 Projected change in per capita protein intake from fish, 2010–2030



Source: Author calculations based upon IMPACT model projections in S. Msangi, M. Kobayashi, M. Batka, S. Vannuccini, M. M. Dey, and J. L. Anderson, *Fish to 2030: Prospects for Fisheries and Aquaculture*, World Bank Report No. 83177-GLB (Washington, DC: World Bank, 2013).

supported with the development of private hatcheries, distribution and marketing channels for fish and fingerlings, training, better information systems, support for product certification, and access to capital. These types of concrete policy-driven developments are behind the strong growth in production that is reflected in these projections.

Figure 1 shows the projected growth in aquaculture production in India, which dominates fisheries production in South Asia.

The biggest share of fish production in India is likely to remain in the categories of carp production, which have relatively low feed intensities compared with other aquaculture species like pangasius (catfish) or tilapia. Despite their low intensity and relatively low value in trade, carp remain a highly important source of food for fish-eating populations in both South and East Asia, and are important for food security in those regions.

To understand what this picture means for nutrition, it is helpful to translate the global increases in fish production and consumption from the *Fish to 2030* projections into changes in the per capita protein intake, tracking across major regional groupings of the world.

Figure 2 shows that the greatest projected percentage increases are in South Asia (especially countries besides India, like Bangladesh) and China, with Southeast Asia increasing almost as much in percentage as North America. Africa and Latin America show a significant decrease in per capita intake of protein from fish, given that their per capita consumption of fish is projected to decrease over the 2010–2030 period by 1.0 percent and 0.6 percent, respectively, in terms of annual average growth rates of per capita consumption.¹³ Currently, about 80 percent of global fish production goes to meet human consumption needs,

which does not change significantly over the projection horizon to 2030.

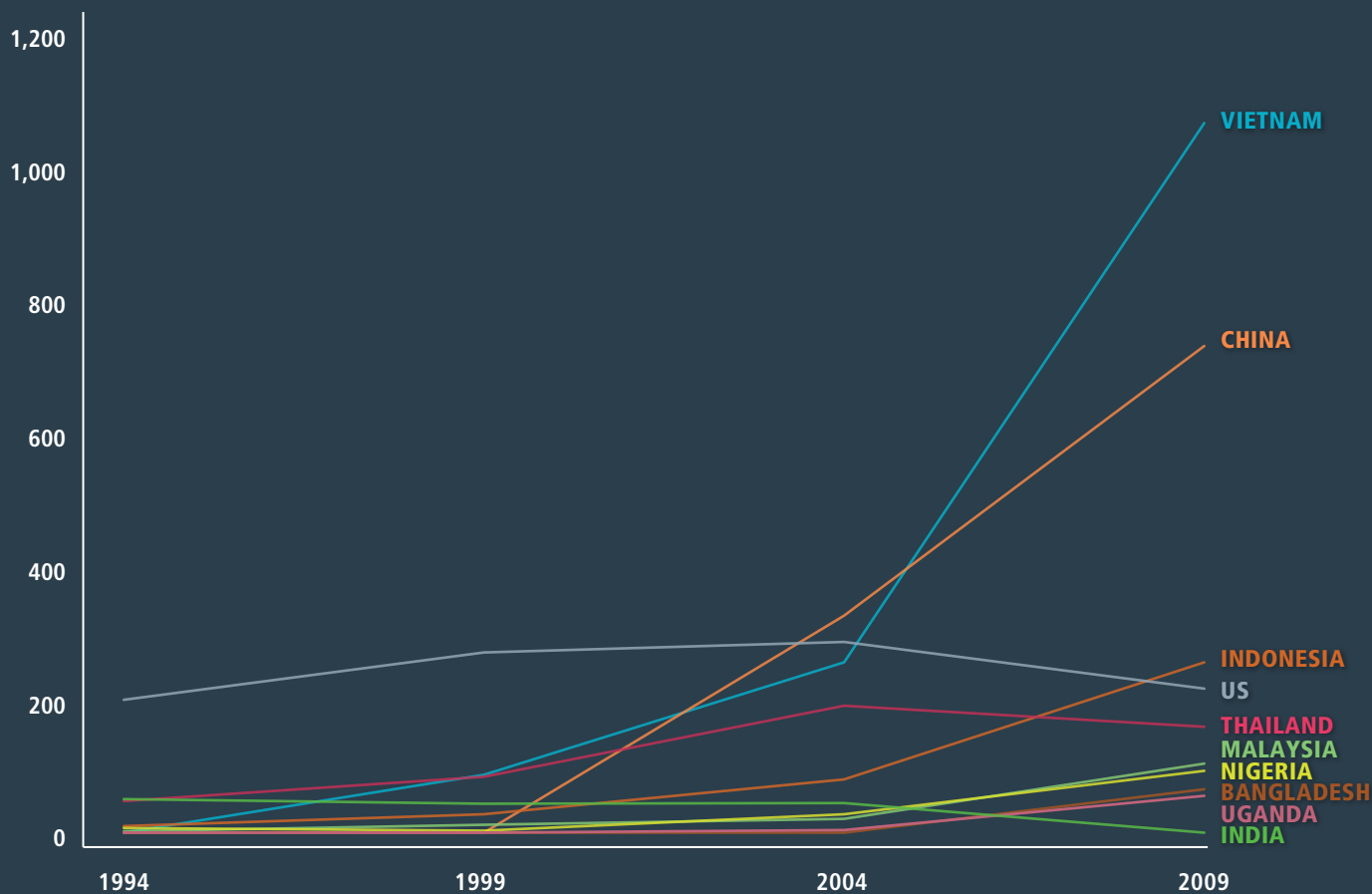
Aside from considerations of food security, a key question that remains with regard to the anticipated boom of fish farming is the issue of the environmental effects of such large-scale expansion stemming both from inland freshwater aquaculture and farms in sensitive coastal areas. Even despite the negative environmental impacts that can occur from fish farming activities, it is our view that aquaculture is an efficient way to source the necessary animal protein and that it compares favorably with other livestock systems.¹⁴ Aquaculture is also a comparatively young sector compared with land-based livestock operations. At the same time there have been tremendous improvements within the industry in terms of

controlling disease while lowering the use of antibiotics, as well as in improving feeding efficiencies across all species of aquaculture. There is also ongoing work at CGIAR centers to identify strategies and technologies that can sustainably achieve the future of aquaculture envisioned in this chapter.¹⁵

Continuing Growth in Asia: Rapid Sectoral Change

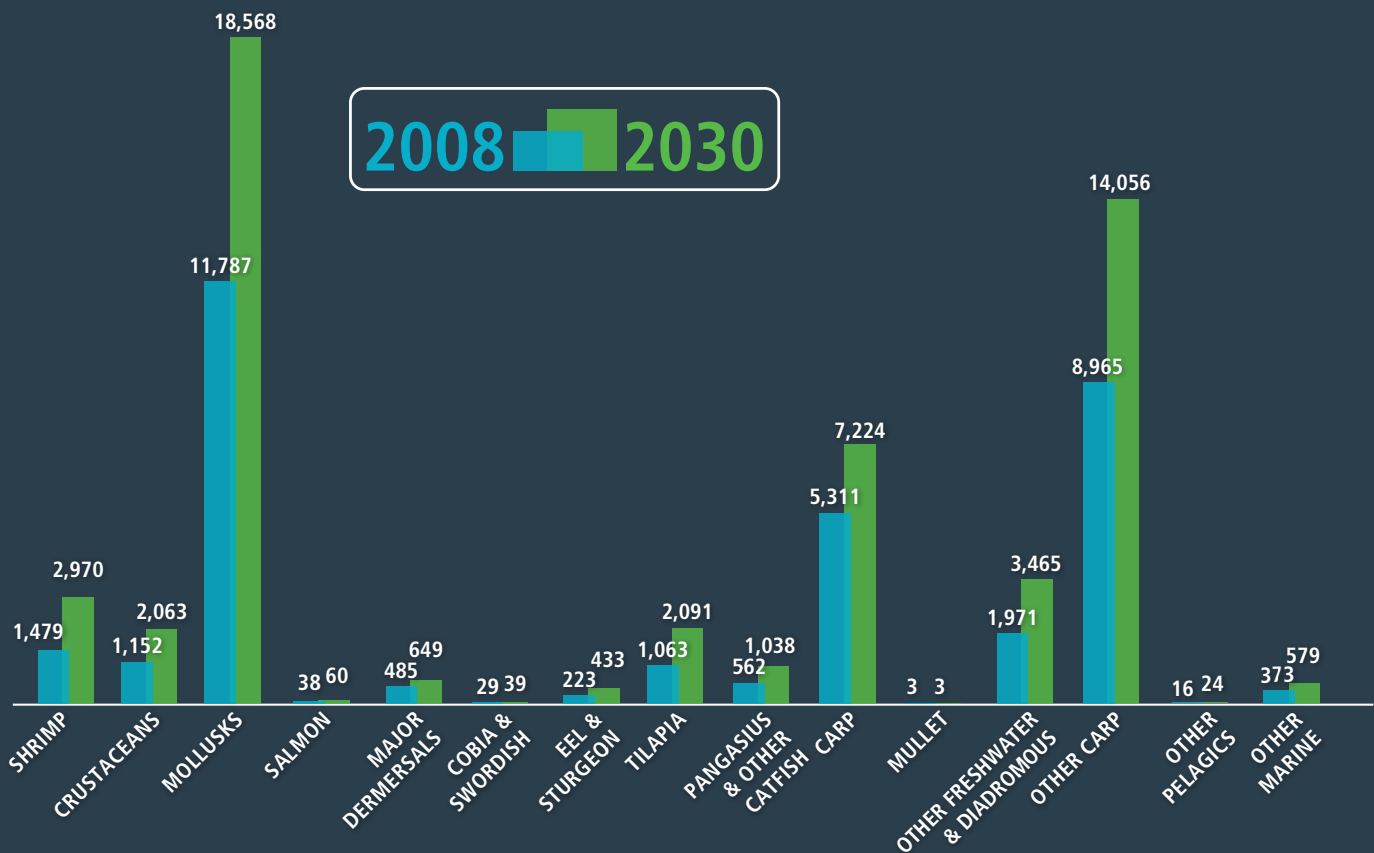
One of the remarkable aspects of global fish markets over the past 20 years is the phenomenal growth of aquaculture production in Asia, including the emerging economies of South and Southeast Asia. Countries like Thailand and Vietnam are global leaders in high-value aquaculture, supplying a significant share of global production for species like shrimp, tilapia, and pangasius. By focusing on the global

FIGURE 3 Major producers of pangasius (catfish) from aquaculture ('000 tons)



Source: Author calculations based on Food and Agriculture Organization of the United Nations, FIGIS—FishStat database (latest update: January 31, 2014), <http://data.fao.org/ref/babf3346-ff2d-4e6c-9a40-ef6a50fcd422.html?version=1.0>.

FIGURE 4 Projected aquaculture production in China by major species groups ('000 tons)



Source: S. Msangi, M. Kobayashi, M. Batka, S. Vannuccini, M. M. Dey, and J. L. Anderson, *Fish to 2030: Prospects for Fisheries and Aquaculture*, World Bank Report No. 83177-GLB (Washington, DC: World Bank, 2013).

distribution of the aquaculture-based production of pangasius, Figure 3 demonstrates the rapid sectoral change that is emerging in Asia.

Figure 3 also shows that countries that were not producing any significant levels of pangasius in 1994 (such as Vietnam) were not only already sizable producers five years later but continued to grow to a point where they represented a third of the global market by 2009.

The strong influence of Asia can also be seen on the demand side. In the scenarios presented in *Fish to 2030*, the authors explored the implications of continued (and even accelerated) demand for fish in Asia—the region that still represents the majority of both consumption and production of fisheries products. The important role of China in the global balance of fish supply and demand was noted in *Fish to 2020*, an earlier study by the International Food

Policy Research Institute (IFPRI), and remains a focal point of interest in any analysis of the global fish economy.¹⁶ Figure 4 shows the production projections for various fish species in China, using a baseline scenario under which China reaches a total aquaculture production level across all species of just more than 53 million tons by 2030. This level constitutes about 57 percent of the global aquaculture production in 2030, representing a nearly 46 percent increase in aquaculture production over the 2010–2030 projection period.

In the *Fish to 2030* report, a scenario in which there is an accelerated shift of consumer preferences toward higher-value fish was explored as a way of illustrating the potential impact of China's evolving consumer economy on the overall global balance of fish demand and supply. Under this scenario, the per capita consumption of higher-value fish products



A rapid shift in consumer preferences, income, or policy in China would have immediate and wide-ranging effects on the global market of fishery products. The situation in China could (and likely will) single-handedly determine the future of the entire global market.

like shrimp and other crustaceans, as well as salmon and tuna, was projected to increase three times as fast over the projection horizon to 2030, compared with the baseline case. For other medium-value fishery products, such as mollusks, the growth in per capita demand was doubled relative to the baseline level, while the preferences for other fishery products remained the same.

TABLE 2 Projected difference in food demand and net trade levels in China by major species groups in 2030 under accelerated demand scenario ('000 tons and % change from baseline)

	Food Demand		Net Trade
Shrimp	8,838	211%	-7,139
Crustaceans	3,079	205%	-1,250
Mollusks	18,506	105%	-12,513
Salmon	1,905	196%	-1,900
Freshwater and diadromous	783	3%	-615
Tuna	328	199%	-328
Other pelagics	19	-13%	-275
Major demersals	225	-4%	223
Other marine	63	-4%	59

Source: S. Msangi, M. Kobayashi, M. Batka, S. Vannuccini, M. M. Dey, and J. L. Anderson, *Fish to 2030: Prospects for Fisheries and Aquaculture*, World Bank Report No. 83177-GLB (Washington, DC: World Bank, 2013).

Under this scenario, the authors projected an overall increase in the global fish supply of nearly 23 million tons by 2030, with most of the incremental production gain coming from North America, Japan, and the rest of the East Asia and Pacific region. Table 2 illustrates the implications of this scenario for consumption and trade in China for various fish species.

The simulated scenario of higher food demand in China results in additional demand in 2030, almost equivalent to the total expected global increase in fish production in the next 20 years. While the scenario assumes significant growth in demand in China, it demonstrates that a rapid shift in consumer preferences, income, or policy in China would have immediate and wide-ranging effects on the global market of fishery products. The situation in China could (and likely will) single-handedly determine the future of the entire global market. Given the very large share that this region has in the overall global demand for fisheries products, further explorations of economically and demographically driven demand growth in Asia on regional and global fish markets are warranted.

The Needs for Investment in Africa: The Role of Aquaculture in Agricultural Intensification

Within the developing world, the region that possesses some of the greatest unexploited potential for aquaculture growth is Africa. In the *Fish to 2030* report, growth in aquaculture production for Africa was projected to be very low (as was shown in Table 1). This is first and foremost because the growth trend has been very small in the past. Of course, it is possible that aquaculture could take off in parts of Africa, as was seen in the case of countries like Vietnam. But it is difficult for any model to predict and simulate rapid structural change leading to a significant takeoff (as was seen in Asia). If this indeed were to happen, significant levels of investments would be needed, and such a path would only begin to manifest itself after successive years of sustained growth in the sector.

The tremendous potential for such a trajectory exists, though it is coupled, undoubtedly, with significant—but not insurmountable—challenges. Aside from the necessary growth in production

itself, sufficient attention needs to be paid to meeting the quality standards required for achieving the growth in exports needed to drive the future growth of the aquaculture sector in Africa. Egypt is a good example of a country that, despite offering strong policy support to its aquaculture sector, saw its development of exports of sea bream and sea bass significantly hindered by its inability to conform to the European market's phytosanitary standards.¹⁷

While some countries might face constraints in adopting more capital-intensive types of aquaculture, there are places, such as in Africa south of the Sahara, that are home to aquaculture much lower in capital intensity. Certain types of aquaculture, like tilapia, can be low in capital intensity and relatively accessible for nascent sectors to produce, compared with higher-intensity species, like salmon. Under certain circumstances and with the right choice of species, aquaculture can become the most efficient way of producing animal protein.¹⁸ Several key species of fish (including carp) can be produced with minimal inputs, while even species that use modest quantities of fishmeal can yield significant amounts of protein and valuable fatty acids for human nutrition. As such, aquaculture products can be very nutritious and affordable, especially in combination with small, native species that can be eaten whole—such as the *dagaa* species of the Lake Victoria region.

That aquaculture development and expansion are well within the capacity for developing countries is demonstrated by the past success of aquaculture in Southeast Asia, South Asia, and Central America. Given certain investments and an enabling policy environment, a similar success story should also be possible in Africa south of the Sahara—with key countries like Ghana, Kenya, and South Africa being possible leaders in that trend.

A key factor for success is the selection of the right species to grow. This includes considerations of the optimal mix of feed intensity, yield, disease resistance, and ease of obtaining fingerling stock. Given the relatively high transportation costs that African producers will continue to face relative to their Asian competitors, it is likely that the aquaculture sector in Africa will focus on high-value species and those with high value added to the economy.¹⁹

To support this goal, policymakers need to encourage the flow of outside capital into the sector. This is necessary for establishing large-scale operations with the appropriate technologies for feed and disease management. There is also the need for a dedicated aquaculture bureau or ministry to help coordinate investments, finance, and regulations with other parts of national policy. The efficacy of this approach has been demonstrated in Madagascar, which has been successful in attracting investors to its shrimp sector. South Africa's commitment to supporting aquaculture is another example to follow: it established an aquaculture park to attract foreign investors, an approach modeled on the dedicated aquaculture zones set up in Asia to concentrate investment and facilitate technical outreach and uptake.

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Aside from addressing the lack of investment in the aquaculture sector, there is also a strong need for policy and regulatory reforms in the oceans that harbor Africa's capture fisheries—the region's main fish supply. The encroachment of foreign fleets into the coastal waters of African countries inhibits the full potential of capture fisheries in the region. This is because these fishing zones suffer the same open-access and unregulated overexploitation of fish stocks that plagued many of the world's fisheries prior to the stabilization that tradable quota schemes and other policy measures brought to the Atlantic and Pacific waters. Some studies identify African coastal waters as the regions with some of the largest decreases in catch, noting the large uncertainties over the actual state of the fish stocks.

The development of a more advanced and efficient fish farming sector has the potential to partly offset these problems in the future by providing an



The strong demand for fish products from emerging countries is expected to continue growing, yet the ecological constraints of ocean-based ecosystems means that the traditional capture fisheries sector will not be able to increase its supply beyond historical levels. The aquaculture sector will thus need to sustainably intensify its production.

alternative source of supply to ocean-capture fish. This would help reduce the price of fish for consumers, while also reducing the incentives for ocean fishing fleets to overexploit populations of fish, thus giving them the chance to rebuild their stocks and regain their bioecological equilibrium. Rather than being seen as a competitor to the traditional capture fisheries sector, aquaculture should be embraced as a complementary activity with large potential synergies.

Trade in Fish: Tensions and Tradeoffs between Export Value and Local Nutrition

Several issues related to trade in fish deserve a special mention. Fish are heavily traded, a trend that will continue into the future. The fish trade is crucial for developed and developing countries alike. According to FAO's *The State of World Fisheries and Aquaculture 2014* report, fish exports top the list of developing country agricultural exports by dollar value.²⁰ Without a doubt, an opportunity exists for

developing countries to capitalize on the fish trade. Yet this opportunity inherently carries a tradeoff between export value and local nutrition. These tradeoffs are not unlike those in other agricultural sectors, and they are closely related to the tensions between large- and small-scale fisheries.

Certain aquaculture products, especially the higher-value ones like salmon and shrimp, are predominantly destined for exports to higher-income countries, where a larger, mostly urban, middle class exists. As such these exports can provide a large stream of export revenue. The production of some of these higher-value species tends to be more capital intensive, which presupposes a high level of foreign investment and technology transfer, as well as economies of scale. Carnivorous species particularly require more feed, especially fishmeal, and are therefore more input intensive. Such inputs might also need to be imported. If the fishmeal is sourced locally—by crushing small local species that would otherwise have been consumed directly—a tradeoff exists between export value and local nutrition.

Thus, governments of developing countries need to be cognizant of these conflicts when drafting their aquaculture development programs and strategies. In some cases it might be advisable to focus on less capital-intensive species, especially those with a more vegetable-based diet. Such a strategy would alleviate some of the concerns that have been expressed about the “food vs. feed” competition between the lower-value species that would otherwise go to human nutrition in poorer households, on the one hand, and their use in making fishmeal to feed higher-value species for consumption by higher-income consumers, on the other.

CONCLUSION

This chapter has pointed to some of the key challenges faced by countries that aspire to grow their fishery and aquaculture sectors. The strong demand for fish products from emerging countries is expected to continue growing, yet the ecological constraints of ocean-based ecosystems means that the traditional capture fisheries sector will not be able to increase its supply beyond historical levels. Therefore, to meet this demand, the aquaculture

sector (as an aggregate entity of private producers) will need to sustainably intensify its production. Additional improvements in feed and disease management will have to materialize for this to happen.

This is already occurring among both mature and emerging producers in Asia and Latin America in response to the strong price signals generated by increasing demand. By continuously adopting a variety of best practices in their production operations, these producers are competing successfully with their counterparts in North America and Europe.

The outlook is less certain for Africa. In the future, the region's very low aquaculture production might reverse itself if Africa can replicate the rapid scale-up that has been seen in Southeast Asia and Latin America. However, this will require the private sector to provide the needed technology and expertise gained from the experience in these other regions. Such a change will only come about if policy-driven incentives are provided to the private sector in a way that establishes dedicated zones for production, coupled with secure rights and access to capital and technical assistance. The strong professional networks that support aquaculture production in Asia (such as NACA and SEAFDEC, as noted earlier) are also badly needed in Africa south of the Sahara. Such networks can facilitate the technical training of producers and accelerate the uptake of productivity-enhancing practices and technologies. The role of international centers, including the WorldFish Center, in facilitating the spread of knowledge and best practices is also important in supporting the growth of the aquaculture sector in Africa. So too is the additional support that could come from bodies

Through a combination of national-level strategy setting and prioritization, private-sector investment, and multilateral assistance and support, a strong and vibrant aquaculture sector could begin to emerge in key African countries and contribute to the strong global growth that has already been occurring in recent decades.

like the World Bank and the International Finance Corporation. Apart from providing direct support to the private sector through loans and credit facilities, these multilateral institutions can also give African countries both direct technical assistance and guidance in improving the governance of the fisheries sector and in the design of public-sector institutions.

In sum, through a combination of national-level strategy setting and prioritization, private-sector investment, and multilateral assistance and support, a strong and vibrant aquaculture sector could begin to emerge in key African countries and contribute to the strong global growth that has already been occurring in recent decades in other parts of the developing world. ■



Regional Developments

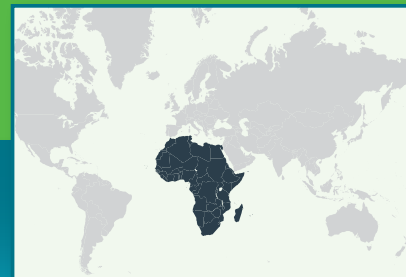


IN ADDITION TO GLOBAL DEVELOPMENTS AND FOOD POLICY CHANGES, 2014 also saw important developments with potentially wide repercussions in individual countries and regions. This chapter offers perspectives on major food policy developments in various regions including Africa, the Middle East and North Africa, Central Asia, South Asia, East Asia, and Latin America and the Caribbean. The individual regional sections cover many critical topics:

- ▶ Renewed focus on the role of agriculture in broad economic growth, poverty reduction, and food and nutrition security in Africa
- ▶ Policy reforms in fuel subsidies, agriculture, and food trade in the Middle East and North Africa
- ▶ Economic challenges and opportunities for Central Asia's food system
- ▶ Responses to high food inflation and climatic risk in South Asia
- ▶ Laying of the groundwork for multilateral cooperation on food policy in East Asia
- ▶ Progress in South-South learning initiatives in Latin America and the Caribbean tempered by weather and other shocks

Africa

Ousmane Badiane, Julia Collins, and Tsitsi Makombe



THE YEAR 2014 WAS DESIGNATED BY THE African Union as the Year of Agriculture and Food Security and as an occasion to mark the first decade of the Comprehensive Africa Agriculture Development Programme (CAADP), a continentwide framework for accelerating agricultural development.

RECENT GROWTH AND DEVELOPMENT TRENDS

Following CAADP's launch in 2003, Africa's economic performance has been strong. Gross domestic product (GDP) and GDP per capita for Africa as a whole rose, respectively, from 3.9 and 1.8 percent in 1995–2003 to 5.2 and 1.9 percent in 2003–2012.¹ Agricultural growth has also been strong for Africa as a whole, expanding at 6.2 percent in 1995–2003 and falling slightly to 5.1 percent in 2003–2012. Although more recently the growth fell short of CAADP's 6 percent annual growth target, seven countries met or exceeded the target during 2003–2012.² Public agricultural expenditures, which are critical to sustaining the recent growth, grew at a remarkable 7.7 percent for Africa as a whole in 2003–2008. However, such expenditures declined by 1.34 percent in 2008–2013 in the aftermath of the 2007–2008 global food and financial crises, which shrank governments' fiscal revenues and overall expenditures. Africa's share of public agricultural expenditures in total public expenditures decreased from 3.7 percent in 2003–2008 to 3.1 percent in 2008–2013, falling short of the CAADP 10 percent target. Nonetheless, seven countries did meet the budget share target or came very close to it, having agricultural expenditure shares of more than 9 percent.³

External flows, and especially foreign direct investment (FDI), play an increasingly important role in Africa's economic growth and development. FDI to Africa increased from US\$51.7 billion in 2012 to \$56.6 billion in 2013 and was projected to reach \$60.4 billion in 2014.⁴ While FDI has remained concentrated in a few mostly large resource-rich countries, nonresource-rich countries have also seen their share of FDI flows in total GDP increase in recent years.

Poverty and hunger reduction saw steady but slow improvement. For Africa as a whole, the percent of the population living below the US\$1.25/day poverty line decreased from 44.4 in 1995–2003 to 41.0 in 2003–2012. The percent of the population that is undernourished fell faster, decreasing from 24.6 to 20.6 between the two periods. Meanwhile, the prevalence of child malnutrition (underweight) declined from 23.1 percent in 1995–2003 to 20.9 percent in 2003–2012. The pace of poverty and hunger reduction has been too slow to prevent the absolute number of poor and hungry from rising, and, on average, Africa as a whole will not meet the first Millennium Development Goal of halving 1990 poverty and hunger rates by 2015. However, there are indications that progress is accelerating: the rates of decline in 2003–2012 were higher than in 1995–2003.

At the country level, progress in meeting key nutrition targets has also remained rather slow. In Africa, only 21 and 8 countries, respectively, are on track to meet one or two of the World Health Assembly targets on nutrition.⁵ Sixteen are not on track to meet even a single target.

On the trade front, Africa's share in the world trade of goods and services and of agricultural products, after dropping sharply in the 1990s, began to rise in the 2000s. During the 2000s, agricultural

Ousmane Badiane is director for Africa, International Food Policy Research Institute (IFPRI), Dakar, Senegal. **Julia Collins** is research analyst and **Tsitsi Makombe** is senior program manager, West and Central Africa Office, IFPRI, Washington, DC.

exports from Africa increased fourfold, but imports rose 2.5 times faster, widening the agricultural trade deficit.⁶ African countries are reported to have also increased their competitiveness and gained shares in regional and intra-African markets for agricultural products.⁷ Because of the sharp declines in prior decades, African countries still have a long way to go either to reach their 1960 shares of global trade or to raise intra-regional trade to levels that have been reached by other developing regions.

PROMOTING BETTER NUTRITION, INCREASING INTRA-AFRICAN AND GLOBAL TRADE, AND TRANSFORMING AFRICA'S ECONOMIES

The focus of the African Union's 2014 Assembly of Heads of State and Government was on transforming Africa's agriculture and agriculture's role in stimulating broad-based growth and poverty reduction. At the close of the assembly, African leaders issued the Malabo Declaration, recommitting their respective countries to CAADP's agricultural expenditure and growth targets; principles and values, including the pursuit of agriculture-led growth, regional cooperation, evidence-based planning, dialogue, review, and accountability; and inclusive partnerships with multiple stakeholders, including farmers, the private sector, and civil society. Leaders committed to the ambitious goals of ending hunger and halving poverty in Africa by 2025 through increased agricultural productivity, employment opportunities for both women and youth in agricultural value chains, and effective social protection programs. They also pledged to reduce child malnutrition by lowering the rate of stunting and underweight in children under five years to 10 and 5 percent, respectively, by 2025.⁸

The pledge will help to further drive efforts by countries to scale up nutrition interventions. In 2014, five African countries joined the Scaling Up Nutrition (SUN) movement, bringing the total number of African countries in SUN to 36 (out of a total of 54 SUN members). The five countries are Guinea-Bissau, Lesotho, Liberia, Somalia, and Togo. By joining the movement, countries have committed to put in place nutrition-sensitive policies and to work with all

key stakeholders and mobilize resources needed to scale up specific nutrition interventions.

As part of the Malabo Declaration, African leaders committed to tripling intra-African trade in agricultural products and services by 2025. This is to be accomplished through investments in trade and market infrastructure and through policy and institutional changes, including establishing a Continental Free Trade Area.⁹ These goals and actions will facilitate the trade-related aspirations of the African Union's Agenda 2063, which envisions the free movement of people, capital, goods, and services, as well as significant increases in trade and investments among African countries.¹⁰

The Regional Strategic Analysis and Knowledge Support System (ReSAKSS) *2013 Annual Trends and Outlook Report*, launched in October at the ReSAKSS Annual Conference, underlines the potential of regional trade to contribute to food security by buffering individual countries' food supplies from shocks. The report states that intra-African trade is increasing, but from a low base: only 34 percent of agricultural exports from African countries stays within the continent. In analyzing three major regional economic communities, the report observes significant potential for regional trade expansion, which could play a greater role in reducing volatility in national food supplies. Its simulation results also suggest that regional trade could be increased significantly through moderate reduction in overall trading costs and removal of nontariff barriers to cross-border trade.¹¹

ECONOMIC PARTNERSHIP AGREEMENTS AND TRADE RELATIONS BETWEEN AFRICA AND THE EUROPEAN UNION

In 2014, significant progress was made in advancing Economic Partnership Agreements (EPAs) between the European Union (EU) and several African regions. Replacing the former unilateral preference arrangements, EPAs are reciprocal but asymmetric free trade agreements: African countries receive full access to European markets and open the majority of their markets to the EU over time while maintaining the ability to protect their sensitive products.¹² West Africa, comprising the 15 member countries of the

Economic Community of West African States plus Mauritania, approved its EPA on July 10, 2014. The South African Development Community EPA group initialed its EPA on July 15, and the East African Community initialed its EPA on October 16. The agreements must still be ratified and implemented.

The benefits of EPAs for African countries remain controversial. Proponents of these agreements suggest that liberalizing trade will benefit producers and consumers by lowering the prices of inputs and other imported goods, and that the stability provided by the agreements will make African countries more attractive for investors.¹³ They have also suggested that the asymmetry principle allows African countries to keep tariff and quota protection for the most sensitive goods, which are often in agriculture. Detractors argue that (1) increased competition from European imports will hurt producers, undermine local food production and food security, and slow industrialization in Africa,¹⁴ (2) African governments will face decreased revenue from tariffs,¹⁵ and (3) EPAs may impede regional integration efforts within Africa.¹⁶ Others suggest that the real effect of these agreements will be smaller than expected and will not be felt for years.¹⁷

THREATS TO FOOD SECURITY FROM DISEASE AND CIVIL UNREST

Several serious crises occurred in 2014 that threatened food security and development prospects in the affected and surrounding areas. These included conflicts in northern Mali, northern Nigeria, South Sudan, and the Central African Republic, several of which led to humanitarian emergencies. In addition, West Africa was struck by the largest outbreak in history of the Ebola virus disease, resulting in thousands of deaths and jeopardizing the food security of many more people. The Ebola outbreak, which began in late 2013, spread from Guinea to Sierra Leone and Liberia throughout the spring and summer of 2014. As of February 10, 2015 there were an estimated 9,177 deaths out of 22,894 reported cases, but the actual death rate was thought to be much higher.¹⁸

The economic impact and the effects of this outbreak on food security could be disastrous. In a

report issued in January 2015, the World Bank estimated that the outbreak would reduce 2014 economic growth in Liberia by 3.7 percentage points, in Sierra Leone by 7.3 percentage points, and in Guinea by 4 percentage points. The effects will continue to be felt throughout 2015.¹⁹ As of October 2014, Ebola was reported to have killed hundreds of farmers and caused many others to abandon their farms; trade in the affected countries and the larger region had also been disrupted by market and border closures.²⁰ Many were forced to reduce their food intake, and disruptions to farming practices and markets led to food shortages, thus increasing food prices further.

At the time of this writing, the Ebola outbreak still had not been contained. While addressing the urgent health needs, measures to prevent the Ebola outbreak from inducing a food crisis are also needed. Possible options include food and cash transfers to affected households and keeping trade open to the extent possible. And at whatever point the crisis finally abates, there will be a need to restore agricultural production capacities, including by providing farmers access to seeds, fertilizer, and other inputs.

In 2014, food security was also severely threatened in countries facing civil insecurity and unrest. For example, civil unrest in northern Mali, northern Nigeria, and the Central African Republic caused significant displacement of people from their homes and countries, led to elevated food prices, and caused a deterioration of the food and nutrition security situation in the affected and surrounding countries. For example, cassava prices in southern Chad rose sharply as a result of disrupted trade flows and the arrival of refugees from Central African Republic; at the same time high rates of acute malnutrition were reported among Central African Republic children in Cameroonian refugee camps.²¹

Cognizant of the increasing threat posed to Africa's food security by various crises and especially the effects of climate change, African leaders also committed themselves during the Malabo Summit to enhancing the resilience of their populations by investing in social security for vulnerable groups and mainstreaming resilience and risk management into their policies and investment programs.

IMPROVING AGRICULTURAL SECTOR GOVERNANCE AND POLICY PROCESSES

A key tool in enhancing mutual accountability and improving policy effectiveness and outcomes at the country level are agricultural joint sector reviews (JSRs). JSRs are inclusive platforms in which multiple stakeholders review agricultural sector progress and hold each other accountable for commitments.

In 2014 an initial group of seven countries took part in efforts to improve agricultural sector review processes in terms of comprehensiveness, inclusivity, and technical robustness. National teams, facilitated by the International Food Policy Research Institute and ReSAKSS, prepared JSR assessments with input from multiple stakeholders that evaluated current agricultural review processes against JSR best practices as well as sector performance and progress against commitments made by governments, donors, and other stakeholders. Most assessments found that countries were making significant progress in advancing mutual accountability, but called for further improvements in inclusivity of agricultural reviews.

Findings of the JSR assessments have been incorporated in countries where JSR processes are ongoing, while in others new JSR processes that reflect JSR best practices have been developed. For example, Malawi's JSR report, launched at its October 2014 JSR meeting, reviewed all the key elements recommended by the assessment. Based on the findings of its JSR assessment, Senegal drafted a new ministerial decree to establish a JSR process laying out coordination, key activities, reporting procedures, and roles and responsibilities of stakeholders. Meanwhile Burkina Faso revised the language establishing a JSR to enhance its inclusivity and operations. In addition, findings of the JSR assessments were used in drafting the country-level and overall New Alliance for Food Security and Nutrition reports for 2013–2014.

2015 AND BEYOND

The outlook for Africa's economic and agricultural performance in 2015 is generally positive.

Economic growth for Africa south of the Sahara is projected to remain strong, growing at an estimated 5.8 percent in 2015.²² The growth would largely be driven by continued strong performance in the agricultural and service sectors as well as by investments in infrastructure. In addition, Africa's agricultural trade is expected to continue to expand, owing to recent improvements in economic growth.²³

In particular, as incomes increase, agricultural imports are projected to continue to rise faster than exports, thus widening the trade deficit.²⁴ This represents the challenges and opportunities faced by Africa as a result of its recent growth. Recent research on the emerging middle class in Eastern and Southern Africa suggests that income growth is leading to dietary changes and rapid increases in the amounts of processed and perishable foods consumed. Over the next decades, households' own production will likely account for decreasing shares of household consumption as purchased food increases and as supermarkets account for a rising share of food purchases. Although these changes present huge opportunities for the expansion of agribusiness and agribusiness employment, taking advantage of the opportunities while ensuring that smallholders and microenterprises are not left behind will require continued investments and careful policy choices.²⁵

The year 2015 promises to be one of intense action taken to both translate the various provisions of the Malabo Declaration into implementable programs and expand efforts to establish comprehensive and regular JSRs to more countries. While Africa's economic prospects for 2015 are strong, the recent Ebola outbreak, if not brought under control soon, could result in even larger negative impacts in the affected and surrounding countries, especially in terms of increased food insecurity and reduced trade and investment. Similarly, protracted civil unrest in northern Mali, northern Nigeria, and the Central African Republic could perpetuate and eventually worsen the negative impacts on livelihoods in the crisis zones. ■

Middle East and North Africa

Clemens Breisinger, Perrihan Al-Riffai, Olivier Ecker, and Danielle Resnick



IN 2014, STABILITY, OR THE LACK THEREOF, continued to be a key factor for development and food security outcomes in the Middle East and North Africa (MENA) region.¹ While several countries saw a resurgence or aggravation of conflicts, Egypt and Tunisia enjoyed increased stability. Despite, or sometimes because of, often difficult security and fiscal conditions, several countries implemented policy reforms, including fuel subsidy cuts. With a main focus on 2015 and beyond, this essay emphasizes how improving capacity for implementation as well as mechanisms of accountability can play a critical role in increasing confidence in government performance and thereby enhance the positive impacts of ongoing and future policy reforms.

STABILITY REMAINS A CHALLENGE TO DEVELOPMENT AND FOOD SECURITY

In recent years civil conflicts and their spillover effects have continued to limit progress in improving economic development and food security in several MENA countries. Syria's ongoing civil conflict caused the economy to contract by more than 40 percent between 2011 and 2013,² and perceived food insecurity continued to worsen in 2014 (Table 1). In neighboring Iraq, recent advances made by the Islamic State in Iraq and Syria (ISIS) are threatening economic progress and raising sectarian tensions across the region. In Yemen, the modest progress in improving food security made in 2013 has likely been reversed by the instability related to the recent insurgency by the Houthis. Similarly, the resurgence of fighting in Libya resulted in negative per capita growth in 2013 and 2014. Such civil conflicts as these often have implications for security

and stability in other countries of the region. For example, because of the challenges posed by hosting sizable numbers of refugees, peoples' perceptions of law and order have sharply deteriorated in Jordan and Lebanon (Table 1).³ Additionally, in parts of Lebanon fighting has actually broken out among groups with sympathies to opposing combatants in Syria.

In contrast, transitions in Egypt and Tunisia have helped lead to greater stability and economic development. In Egypt, a strongly improved perception of stability has re-attracted domestic and foreign investment. The most recent data on gross domestic product (GDP) confirm that investment in 2014 was about 20 percent higher than in the previous year, and the economic recovery has been accelerating. National confidence was demonstrated when the US\$8.5 billion needed for financing the expansion of the Suez Canal was raised domestically in only eight days. GDP expanded by 3.7 percent in the second quarter of 2014, compared with 2.5 percent year-on-year during the same period of 2013.⁴ These positive developments are consistent with the favorable changes in popular perceptions in Egypt about the economy and food security (Table 1). Amid relative stability in 2013 and 2014 and the largely peaceful elections in October 2014, Tunisians also became more optimistic about the economy and employment (Table 1).

MAJOR FOOD POLICY CHANGES AND DEVELOPMENT

In 2014, several countries implemented significant policy reforms in the areas of fuel subsidies, agriculture, and food trade.

Clemens Breisinger is senior research fellow, **Perrihan Al-Riffai** is senior research analyst, **Olivier Ecker** is research fellow, **Danielle Resnick** is research fellow, Development Strategy and Governance Division, International Food Policy Research Institute, Washington, DC.

TABLE 1 Perceptions of changes in political, economic, and social conditions in MENA countries, annual averages between 2012 and 2013 or 2014

	(1) LAW & ORDER	(2) NATIONAL ECONOMY	(3) EMPLOYMENT	(4) FOOD SECURITY
MENA COUNTRIES	●	■	●	●
Low and middle income countries	●	●	●	●
Egypt (2014)	●●●●●	●●●●	●●	●●●●●
Iraq (2014)*		●●	●●●●	●●●●
Jordan (2014)	●●●●	●	●●●●●	●●●●
Lebanon (2014)	●●●●	●	●	●●●●
Mauritania (2013)	●●●●	●●●●	●	●
Morocco (2013)	●●●●●	●	●	●●
Palestine (2014)*	●	■	●	●●●●
Syria (2013)	●●●●●	●	●●●●●	●●●●●
Tunisia (2013)	●	●	●	●
Yemen (2014)*	●●●●	●	●●	●●●●
High income countries		●●●●	●●	●●●●
Bahrain (2013)		●	●●●●	●●●●
Kuwait (2013)		●●●●●	●	
Saudi Arabia (2014)		●●●●●	●●●●●	●●●●●
UAE (2014)		●●●●●	●	●●●●●
NON-MENA COUNTRIES	●	●	■	●
Low and middle income countries	●	■	■	■
High income countries	●	●●	●	●

Source: Authors' representation based on data from Gallup Analytics (accessed October 10, 2014, www.gallup.com/products/170987/gallup-analytics.aspx).

Note: *Survey was conducted before the recent conflicts. The reported indicator changes measure the percentage point changes in the response rates to the perception-based questions on (1) "feeling safe walking alone," (2) "economic conditions in the country," and (3) "not enough money for food" as well as in (4) Gallup's (un)employment index. †No significant change (falls within the standard survey error range of 1–3). All numbers are rounded.

Fuel subsidy reduction reforms are often viewed as a "triple win" policy: they tend to bring down unsustainably high budget deficits, increase public investments, and improve private investors' confidence. In a drastic move, on July 4, 2014 the Egyptian government increased prices for different types of fuel between 40 and 78 percent, saving an estimated 44 billion Egyptian pounds (US\$6.14 billion).⁵ In September 2013, Morocco partially indexed its energy prices to the international market price, and in January 2014, it removed all the subsidies on petrol and fuel oil and also significantly cut diesel subsidies.⁶ In late 2013, Sudan introduced fuel

subsidy cuts, and the prices of fuel and its derivatives increased between 68 and 75 percent.⁷ In July 2014, Yemen increased the prices of gasoline and diesel by 60 and 95 percent, respectively, in an attempt to reduce its unsustainable fiscal burden. Public outcry resulting from these reforms varied from nonexistent or minimal in some countries, such as Morocco and Egypt, to violent riots in others, including Sudan. At the extreme end of the spectrum is Yemen, where these reforms likely exacerbated the ongoing civil conflict.

In the face of continuously rising food imports, governments have continued to emphasize the

importance of agriculture and food trade for building resilience to food price shocks. In 2014 Egypt prepared several laws related to the support of farmer associations, contract farming, crop insurance schemes, and health insurance for farmers.⁸ The government has also supported the cultivation of new land, with the aim of producing more food and creating jobs. To encourage new production efforts, both Egypt and Jordan introduced higher government procurement prices for wheat during 2014.⁹ The Jordanian government also increased its strategic wheat reserves more than threefold to a 10-month reserve. To protect the price of local wheat, Morocco continues to control the customs duties of wheat and subsidizes local wheat importers. Following the 40 percent reduction in global wheat prices in 2013, the government raised wheat tariffs from 17 to 45 percent in 2014. By 2015 Saudi Arabia plans to increase its strategic grain reserve capacity by close to 75 percent in order to cover a larger share of its growing annual consumption of wheat.¹⁰ While these policies and public investments are likely to help build resilience, the fiscal sustainability and efficiency of these measures remain uncertain.

At the regional level, progress has been made in improving access to development-related information with the launching of the first blog on food and nutrition security for the region (www.arabspatial.org) at the Committee on World Food Security meeting on October 17, 2014.

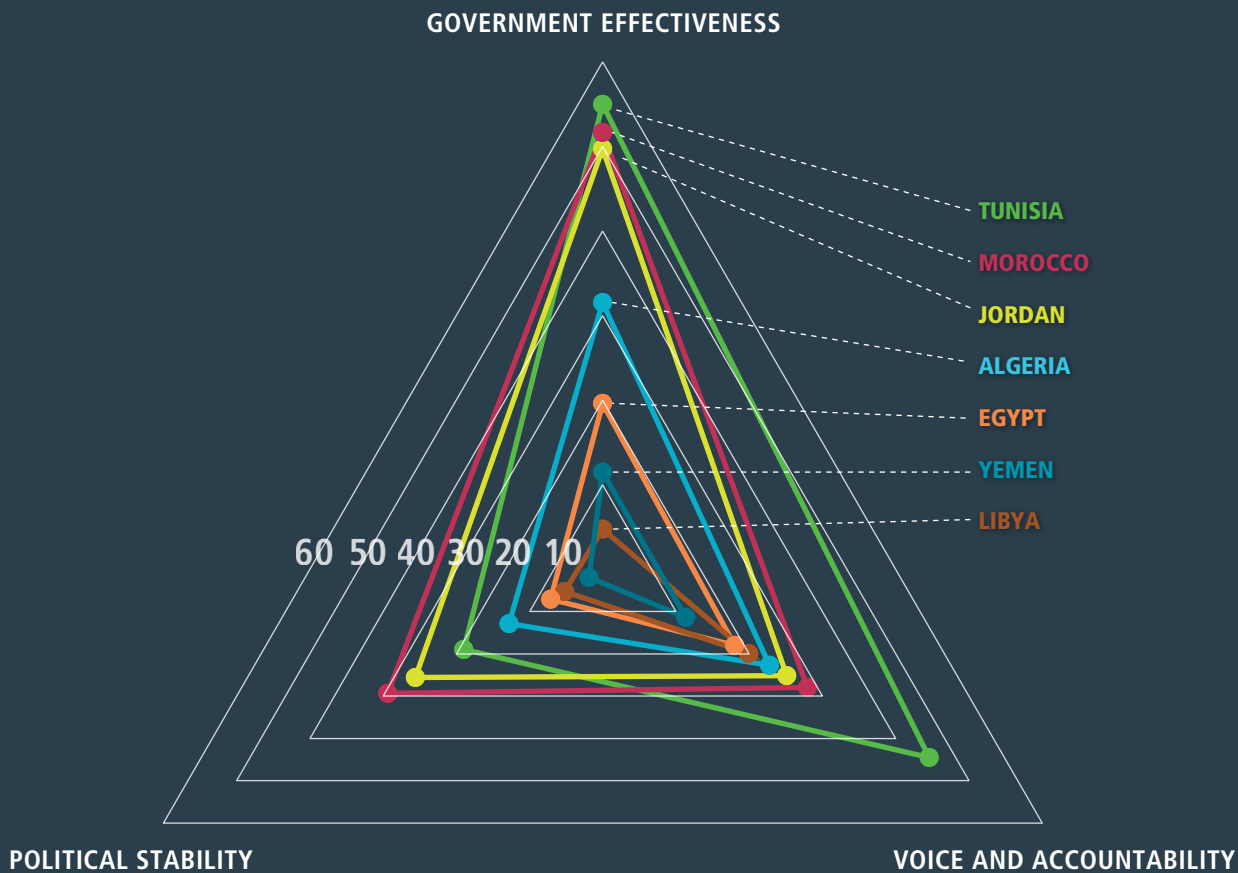
2015 AND BEYOND

Looking ahead in 2015, enhancing stability and good governance will likely become even more important for improving food security. Surely, many of the policy actions that need to be urgently tackled remain the same as before the Arab awakening, such as fostering economic transformation and growth that creates jobs, improving the business climate, shifting from subsidies to targeted income transfers, developing innovative solutions for agriculture and water constraints, improving trade and market integration, and leveraging health, nutrition, and education for food security.¹¹ Posing a challenge to these pro-poor reforms, however, are persistent problems of governance within the MENA region.

For the most part, policy reforms with redistributive consequences, such as those related to food and fuel subsidies, are contentious because they result in winners and losers, be they real or perceived. Therefore, to gain public support for such reforms, citizens need to have sufficient trust that their government can effectively implement reforms and that the promised benefits from reform will materialize. Furthermore, analyses of successful subsidy reform programs suggest that the reforms involve extensive sequencing and potentially multiple government agencies.¹² To ensure that vulnerable households are not adversely affected, more targeted instruments for beneficiaries (such as smart cards) or the concurrent implementation of social protection policies (such as cash transfers) may need to be introduced. For example, the gradual approach to fuel subsidy elimination that Morocco took in 2014 involved mitigation policies that expanded the coverage and amount of its social safety net and retained subsidies on wheat, sugar, and cooking gas. Egypt, weary from three years of social turmoil, also coupled its fuel subsidy cuts with an expanded and larger safety net, which included increasing the number of subsidized commodities under the food ration program. In juxtaposition, when the Yemeni government reneged on its promise to redirect the savings from fuel subsidy cuts, public outrage ensued and created grievances on which the Houthis mobilized, aggravating civil conflict and lowering fuel prices to pre-reform levels.

One could conclude that successful policy reforms seem to require at least three factors: (1) confidence in government, (2) adequate state capacity for implementation, and (3) effective mechanisms of accountability. Taking these three elements into account reveals the broad diversity of governance quality within the MENA region. For those countries that underwent regime change in the wake of the Arab awakening, trust in government is a particular challenge because current ruling parties and leaders, relatively new and unknown to citizens, do not have a proven track record. But the Tunisian case highlights that low levels of confidence in government can co-exist with relatively high levels of state capacity. According to the World Bank's Governance Indicators, in 2013 Tunisia remained the region's highest-ranked country for the quality

FIGURE 1 Comparisons of governance quality in select MENA countries, 2013



Source: Calculated from World Bank’s Good Governance Indicators, <http://info.worldbank.org/governance/wgi/index.aspx#home>.

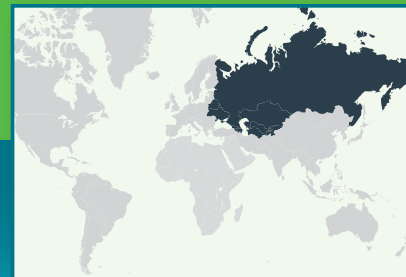
Notes: *Government effectiveness* captures the quality of public services, the professionalism of the civil service and its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government’s commitment to such policies. *Voice and accountability* reflects whether citizens can select their government and whether they have freedom of expression, association, and a free media. *Political stability* is the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means. Good Governance Indicators range on a scale from 0 to 100; a country with a score of 60 would rank better than 60 percent of the world’s countries.

of the civil service and for policy formulation and implementation, followed by Morocco and Jordan.¹³ In addition, as highlighted in Figure 1, the country has the highest rankings for voice and accountability, aided by (albeit flawed) multiparty elections and novel tools, such as the *Marsoum 41* website, which allows citizens to directly access public documents.¹⁴ At the other extreme are Libya and Yemen, which are among the lowest ranked in terms of capacity and remain plagued by high levels of social polarization and instability.

Thus, in addition to more commitment for policy reform—as highlighted in the *2013 Global Food Policy Report*—more emphasis needs to be put on tailoring these reforms to countries’ existing governance characteristics. For example, where confidence in government is problematic, mechanisms to facilitate consensus and spur buy-in from all major political factions may be necessary. Where state capacity is low, less technical options that involve very gradual changes, such as small-scale pilot reforms, may be the only feasible pathway. ■

Central Asia

Kamiljon Akramov and Allen Park



CENTRAL ASIA IS BRACING FOR THE RIPPLE effects of falling commodity prices and declining migrant remittances from Russia, which may undermine the region's recent gains in economic growth and food security. Some Central Asian countries have depended heavily on these now-faltering engines to drive their economic growth during the last decade. This could have important consequences for the region's households, that have recently enjoyed improved food security along with declines in poverty and undernourishment. The prevalence of undernourishment has declined from approximately 17 percent in the late 1990s and early 2000s to less than 6 percent in Kyrgyzstan and Uzbekistan in 2014. In Kazakhstan and Turkmenistan, the rate declined to less than 5 percent. However, the prevalence of undernourishment in Tajikistan continues to persist at high levels (32 percent in 2014).

All countries of the region are facing overlapping burdens of different forms of malnutrition. For example, Tajikistan is struggling with stunting for children under the age of five as well as with anemia among women of reproductive age (WRA). At the same time, Kazakhstan, Kyrgyzstan, and Uzbekistan are having overlapping burdens of WRA anemia and adult overweight.¹ Additionally, all Central Asian countries continue to face various forms of micronutrient deficiency–related public health threats.²

Furthermore, stunting rates for children under five—a common measure of chronic malnutrition—remain relatively high throughout the region, varying from 13 percent in Kazakhstan to 26.8 percent in Tajikistan, according to the most recent data from UNICEF, the World Health Organization, and the World Bank.³ Nationally representative data for Kyrgyzstan and Tajikistan, released in 2014, reveal

new insights about the prevalence of stunting in the region's two poorest countries. In Tajikistan, stunting rates for children under five declined from 39 percent in 2007 to 26.8 percent in 2012. On the other hand, stunting rates in Kyrgyzstan remained around 18 percent, representing virtually no change between 2006 and 2012. The evidence also suggests that stunting rates are significantly higher among rural children and those born to mothers with less education. The rates also appear to rise most rapidly for children during the transition period between breastfeeding and solid food consumption, typically between 6 and 24 months.⁴

Downward trends in global food and energy prices helped Central Asian countries to keep food price inflation in check through most of 2014. While stable or declining food prices positively influenced the food security situation in general, declines in global commodity markets, capital outflows from emerging markets, and geopolitical tensions significantly weakened the economies of their major trading partners, particularly Russia. This confluence of events has important implications for regional food policy. Below, we highlight some major external risks that these developments pose for food policy in Central Asia, and also briefly discuss important developments toward the diversification of the agricultural sector in the region.

MAJOR DEVELOPMENTS IN FOOD POLICY

Currency Issues

External factors dominated Central Asia's food policy situation in 2014. Leading among them were the spillover effects of events in Russia. The ruble, which had already been facing downward pressure since

Kamiljon Akramov is research fellow and **Allen Park** is research analyst, Development Strategy and Governance Division, International Food Policy Research Institute (IFPRI), Washington, DC.

2013 as part of global capital outflows from emerging markets, plunged further to new depths in 2014, largely as a result of western sanctions and tumbling oil prices. By mid-December, the ruble had lost more than 75 percent of its value against the dollar over 12 months. More than half of the loss took place after the last week of October, coinciding with a similar decline in oil prices. Kazakhstan was also compelled to perform a 19 percent devaluation of its currency in February 2014. This has important implications for the economies of Central Asia through remittances (Kyrgyzstan, Tajikistan, and Uzbekistan), trade (all countries), and direct investment (Kyrgyzstan and Tajikistan).

Remittances

Economic growth in Central Asia has been blunted by deteriorating economic conditions in the Russian Federation, the region's main trading partner and source of remittances. Preliminary data on cross-border money transfers from the Central Bank of Russia suggest that remittance flows from Russia to the region have already begun to decline. For example, in the third quarter of 2014 remittance flows to Uzbekistan declined by about 10 percent compared with the same period in 2013.⁵ The economic slowdown in Central Asia also reflects falling global energy and commodity prices. For example, average prices of gold, a major export commodity for Kyrgyzstan and Uzbekistan, declined by more than 15 percent in 2014.

Effects on Food Security

It is too early to accurately assess the impact of these negative developments on household food insecurity in Central Asia. However, past experiences suggest that they may manifest themselves in the region through fewer remittances from abroad, condensed employment opportunities, and reduced wages at home. Past experience also suggests that households are likely to reduce staple food consumption, lower diet quality, and cut health expenditures.⁶

Fallout from the geopolitical impasse between Russia and western countries, which has exacerbated pressure on the Russian economy, presents mixed consequences for Central Asian households. Those reliant on migrant remittances are clearly left

vulnerable by the Russian slowdown. On the other hand, the Russian ban on western agricultural products has created a void that Central Asian farmers could fill, particularly for fruits and vegetables. The resumption of northward trade, which was common during Soviet times, would require considerable investment in both export infrastructure and quality control but could further encourage agricultural diversification in Central Asia. This could generate new opportunities for the region's horticulture and livestock sectors, especially in combination with growing domestic demand for fruits, vegetables, meat, and dairy products. Steady economic growth in the past decade, a growing population, and increased urbanization have all contributed to an increased domestic demand for these products.

In fact, agricultural diversification through allocation of more arable land to horticulture and feed crops has received increased government priority in recent years. For example, Uzbekistan's horticultural products are rapidly becoming an important source of the country's export earnings. Still, wheat and cotton remain the centerpiece of agriculture in countries like Tajikistan and Uzbekistan; a move toward higher-value products could have an especially positive impact on household incomes there. Agricultural diversification may also provide the added benefit of improving household dietary diversity, including nutrition outcomes for children and rural households.⁷ Moreover, the arid climate that prevails throughout much of Central Asia (with the notable exception of northern Kazakhstan) lends itself well to a variety of popular water-sparing horticultural products, which may prove crucial in a region fraught with water issues. For these reasons, countries such as Kazakhstan, Tajikistan, and Uzbekistan are making efforts to diversify their agricultural production.

Other Challenges

Considerable barriers remain, however, affecting all aspects of the value chain in the horticulture and livestock sectors. These barriers include limited knowledge of modern technologies and farm practices, inadequate infrastructure and market information systems, weak food-processing and storage capacity, and limited institutional and technical capacity to

meet phytosanitary and food safety standards, which are especially crucial for meat and dairy products. National governments, together with development partners, such as the US Agency for International Development (USAID) and the World Bank, are working to address these obstacles. For example, Tajikistan is working with USAID's Feed the Future initiative to boost horticulture and livestock production and agricultural diversity, thereby improving food and nutrition security. These programs plan to accomplish the latter goal by boosting household income and increasing dietary diversity in households in Tajikistan's poorest southern districts.

Similar efforts are also under way in Uzbekistan, where the government is also promoting a movement toward horticulture. In June, the government sponsored a conference of high-level policymakers from Uzbekistan and numerous experts from abroad that specifically sought to find ways to increase horticultural production in the country. The meeting also produced policy recommendations aimed at enhancing research and technology sharing, improving seed breeding and production, and encouraging investment throughout the agricultural sector. Shortly thereafter, the Uzbek government completed a US\$150 million loan agreement with the World Bank for a horticulture development program.

2015 AND BEYOND

In 2015, Central Asia's food systems will likely remain vulnerable to external risks. The risks in this regard stem from economic developments in major trading partners, particularly Russia, and trends in global energy and commodity markets, such as gold, aluminum, cotton, and cereals. Uncertainties in the Russian economy as a result of international sanctions, low oil prices, and the country's overall weak

performance will most likely have associated effects in the form of lower remittances, affecting macro- and household-level food insecurity in Kyrgyzstan, Tajikistan, and, to a lesser extent, Uzbekistan. At the same time, these countries can take advantage of the Russian ban against agricultural imports from European countries by increasing their exports of fruits and vegetables to Russia. Policymakers will have to take food price inflation into consideration while managing economic growth and employment opportunities.

Regional governments appear to be taking action to buffer their economies from looming problems. In November, Kazakhstan's president, directly citing geopolitical events affecting the region, announced a three-year \$9-billion infrastructure development program financed by the country's national reserve fund. In addition, national governments in the region are attracting Chinese investments to develop their infrastructure and counterbalance external risks associated with both the anticipated slowdown in Russia and the downward trends in global commodity markets. China, which has secured bilateral strategic partnerships with all five Central Asian countries, offers both risks and rewards.

On the other hand, poor cooperation among the Central Asian countries themselves is a major constraint undercutting food security in the region. In addition to policy and regulatory constraints, regional road infrastructure is weak, with all countries in the region scoring less than three on a scale of seven in the World Economic Forum's Global Competitiveness Index for 2014–2015.⁸ Furthermore, Kyrgyzstan is scheduled to join the Eurasian Economic Union of Russia, Belarus, and Kazakhstan in 2015. This could further complicate regional dynamics and pose new challenges for food security in the region. ■

South Asia

P. K. Joshi



DESPITE HAVING MADE SUBSTANTIAL efforts to ensure food availability for the poor, South Asian countries still face the key challenges of improving food and nutritional security and reducing poverty.

On the plus side of the ledger, the region has improved its position on the International Food Policy Research Institute's 2014 Global Hunger Index (GHI), with its nutritional outcomes ranking having moved from "alarming" in 2013 to "serious" in 2014 (a rise from 18.2 to 20.7 on the index). India in particular has made significant strides in boosting its nutritional outcomes. The proportion of the undernourished population declined from 21.5 percent in 2004–2006 to 17 percent in 2011–2013. Similarly, the prevalence of underweight in children under five years of age also decreased from 43.5 percent in 2004–2005 to 30.7 percent in 2011–2013.

Yet South Asia is still home to about one-third of the world's poor, ensuring that food and nutritional security remain at the top of the region's agenda. Among the biggest challenges faced by South Asian countries during 2014 were high food inflation and intense climatic risk. Average food inflation during 2014 ranged between 7 and 9 percent—a rate much higher than general inflation. The region also experienced delayed monsoons, which led to both floods and droughts that adversely affected food production. Particularly serious floods in Bangladesh, India, and Pakistan displaced large numbers of people, affecting their livelihood opportunities and decreasing food production. These twin stressors of high food inflation and climate risk may even work to dampen the ability of countries in the region to pursue accelerated economic growth, alleviate poverty, and end hunger.

This essay summarizes the main country-specific events that occurred in South Asia during 2014 and

concludes with a look at likely developments in 2015 and beyond.

INDIA

Governmental Elections in India

A major change in the region in 2014 was the election of a new government in India. The 16th general elections for parliament were held April–May, with the National Democratic Alliance, led by the Bharatiya Janta Party, defeating the ruling United Democratic Alliance. India is the largest democratic country on the planet; close to 814.5 million people (about 64 percent of the population) were eligible to vote in the election.¹ The key issues were: (1) food inflation, (2) "black money" and corruption at high levels of government, (3) youth unemployment, and (4) reforms for inclusive and equitable development. The biggest outcome of the election was that it brought an end to the coalition era, in place since 1989, that had obstructed the governmental decisionmaking process. The one-party majority that has resulted may move a long-awaited reform agenda forward. The elections are also expected to lead to enhanced regional cooperation in South Asia; the government has already begun developing bilateral relations with neighboring countries with an eye toward building trust through trade and knowledge exchange.

Mainstreaming Financial Inclusion of the Poor

The new government's reform agenda is also seeking to step up investment, accelerate economic growth, and enhance welfare measures. Goals include reforming labor, insurance, and the financial sector to generate more employment opportunities and enhance financial inclusion for the poor.

In terms of financial inclusion, most notable is the new mega program "Pradhan Mantri Jan-Dhan

P. K. Joshi is South Asia director, International Food Policy Research Institute, New Delhi, India.

Yojana,” or the Prime Minister’s Plan for People’s Wealth.² The goal here is to provide universal access to bank accounts that provide overdraft protection as well as accident and life insurance. The prime minister hopes that by January 2015 at least 75 million such bank accounts, which have a zero balance requirement, will be opened in both rural and urban areas. Encouragingly, in a period of less than three months, 82.62 million bank accounts were already opened with more than US\$1.076 billion in deposits.³ The scheme is considered to be a prelude for direct cash transfers for food and fuel to the targeted beneficiaries in selected market-developed areas—transfers that will reduce the subsidy burden and minimize leakages. The current food, fuel, and fertilizer subsidies, which continue to increase, are imposing heavy pressure on the government exchequer. Such subsidies cost US\$41 billion in 2014–2015—the equivalent of nearly 15 percent of total spending and about 2.5 percent of India’s gross domestic product (GDP).⁴ It is expected that direct cash transfers to beneficiaries, especially for food and fuel, will significantly reduce public expenditure. Additional savings can be gained by encouraging greater participation by the private sector, reducing transactions costs, and minimizing leakages.

FDI in Multi-Brand Retail

Unfortunately, the new Indian government took action to reverse the decision taken by the previous government in 2013 to allow foreign direct investment (FDI) in multi-brand retail. At present, 100 percent of FDI in single-brand retail is allowed. Single-brand retailing limits the ability of foreign retailers to offer competing products from multiple brands to consumers. The previous government had sought to relax this regulation and also to encourage vertical supply-chain integration that links farmers with retailing, thereby reducing the transaction costs of moving agricultural value-added products from the farm to consumers’ plates. However, the new government has put on hold those rules that sought to allow FDI in multi-brand retailing. It should reconsider this decision, given that the original measure was expected to (1) bring improved technologies for modernizing food value chains, (2) increase investment in the back end to improve delivery systems, (3) improve

marketing efficiency and better integrate markets, (4) reduce problems of adulteration and bring about increased compliance with food safety standards, and (5) promote agroprocessing and generate employment opportunities for rural youth.⁵

NEPAL

Nepal has recently assembled a constituent assembly to draft a new constitution for the country. In terms of agriculture, the country has already developed an Agricultural Development Strategy. Looking out 20 years, this strategy seeks to reform the country’s agricultural policies and double its investment in agriculture. Nepal is largely an agrarian economy: the agriculture sector contributes about one-third of gross GDP and is the country’s major source of employment. Implementation of the strategy is expected to significantly reduce poverty, improve food security, and achieve sustainable development. To accelerate agricultural growth, Nepal is undertaking efforts to reform such key sectors as seeds, fertilizer, and agribusiness and trade.

PAKISTAN

In 2014 Pakistan introduced a new credit guarantee scheme of financial inclusion for small and marginal farmers, one that encourages banks to lend to those who previously have not had access to banking facilities. This program guarantees that up to 50 percent in credit will be given by the financial institution to farmers who own up to five and ten acres, respectively, of irrigated and unirrigated land. Another program introduced that year is a crop-loan insurance scheme to cover the risk posed by natural calamities, climate change, and plant disease.

These programs are expected to increase private investment in agriculture and enhance the risk-taking ability of farmers seeking to adopt improved technologies. Given that similar schemes in other South Asian countries have had mixed outcomes in the past, the effectiveness and long-term financial viability of these programs will need to be carefully monitored. In terms of agricultural insurance, India is now considering expanding its weather-based and index-based insurance products to

“agricultural income insurance.” Such a move would protect farmers’ income in the event of a fall in prices of food commodities while also guarding against climate risks in production.

BANGLADESH

South Asian countries have had a mixed record in terms of encouraging the development and commercialization of genetically modified (GM) crops. This is true despite the existence of biosafety policies, especially in terms of GM-crop cultivation. Earlier, India allowed the commercial cultivation of *Bacillus thuringiensis* (Bt) cotton but did not approve the release of Bt eggplant. The Bangladeshi government made the bold decision in 2013 to allow farmers to grow genetically modified Bt eggplant commercially under government supervision. In 2014, 20 small eggplant farmers were given Bt seedlings for cultivation under government supervision in four representative regions well suited to the varieties. Earlier studies have shown that Bt eggplant increased yields by 30 percent and reduced pesticide use by about 70–90 percent, resulting in a net benefit of about US\$1,868 per hectare.⁶

The government plans on bringing about 40 percent of the total 50,000-hectare eggplant area under Bt eggplant cultivation in the next five years.⁷ The Indian government, though, has not approved the commercial release of Bt eggplant, citing concerns about food safety and biodiversity. However, there is no scientific evidence to substantiate such concerns, and the initial Bangladeshi experience (although it is based on a very small sample) suggests the potential for significant benefits to small farmers. This common vegetable is largely grown in high poverty-ridden areas by farmers who cultivate very small plots. Savings on pesticide costs, increases in yields, and low crop damage all result in higher returns to farmers. Higher yields and lower costs of production for farmers can also result in lower prices of this vegetable, thereby benefiting consumers. This small technological intervention may therefore be a win-win proposition for farmers as well as consumers.

Progress has also been made in terms of non-GM crops, such as how Bangladesh, in collaboration with the International Rice Research Institute, developed

and released zinc-biofortified rice for cultivation.⁸ The non-GM biofortified rice variety contains 19 milligrams of zinc⁹ and 9 percent protein per kilogram. It is worth mentioning that a large part of the population in South Asia is trapped by hidden hunger,¹⁰ lacking key minerals, including zinc. Because rice is the main staple food crop in Bangladesh, this zinc-rich rice can help reduce child mortality and stunting rates by decreasing the incidences of diarrhea and pneumonia in the country.

SRI LANKA

Sri Lanka intends to amend its Seed and Planting Material Act, which mandates compulsory registration for farmers and certification of all seed and planting material by the government’s Seed Certification Service. The act prohibits sharing or exchanging seeds and planting materials, unless farmers are registered with the service. The aim of the act is to protect farmers’ interests from the seed industry—to avoid the marketing of their seed and plant material produced without sharing the benefits with the farmers.

2015 AND BEYOND

A main challenge facing South Asian countries is to reduce both poverty and undernourishment. Higher subsidies are a major constraint in investment in creating productive assets and ensuring food and nutritional security. Major reforms are needed to boost investment in agriculture, generate employment opportunities, and improve social safety net programs. The challenge for reforms in 2015 is how to better target the poor for various social safety net programs, and how to improve the efficiency of such programs. The reform process needs to increase the participation of the private sector in agribusiness, rural development, and grain management. It would be desirable to (1) reallocate government priorities and resource allocations away from direct input subsidies and toward such areas as agricultural science and rural education, (2) remove some of the governments’ more distortionary market interventions, and (3) improve the ease with which private firms can invest in input and commodity markets as well as engage in value-added activities in the sector. ■

East Asia

Kevin Chen and Peter Timmer



EAST ASIA IS THE FASTEST-GROWING region in the world in terms of growth in gross domestic product, and is also the most successful in reducing hunger and undernutrition.¹ At the same time, however, the region is increasingly challenged by a wide array of threats to its food security. For example, the industrialization that helped fuel East Asia's outstanding growth over the past several decades is argued by some observers to have also brought increased concern over soil pollution and food safety.² High-profile food safety and transboundary animal disease incidents included the Shanghai Hushi expired meat scandal and the outbreak of AH7N9 in China.³ Although such food safety scares also struck the region in 2013, sales estimates for companies involved in scandals for both 2013 and 2014, such as McDonald's, were more discouraging in 2014 (falling from sales growth of -1.4 percent for 2013 to -9.9 percent).⁴

Meanwhile, the region has long been vulnerable to natural disasters, including typhoons, earthquakes, floods, and tsunamis. With accelerating climate change, stronger typhoons and floods could further threaten the significant food security gains made thus far.⁵ The region's continued economic development and population growth will likely exacerbate existing resource scarcity and environmental stress, and the region is expected to become much more dependent on food imports in the coming decades.⁶

Many East Asian countries are also struggling with obesity rates so severe that the problem has been labeled "Asia's nutrition time bomb."⁷ There is a need for the formulation of a nutrition-based food security strategy that will involve a significant expansion of the traditional mandates of the region's ministries of agriculture.

Despite all these emerging challenges, traditional food security issues such as hunger and undernutrition have not been completely solved in the region. True, according to the 2014 Global Hunger Index (GHI), over the past 20 years the region has achieved the greatest percentage reduction (54 percent) in its GHI score (which is based on proportion of underweight children, proportion of undernourished people, and child mortality rate).⁸ However, the total number of people who continue to be afflicted by hunger persists at above 220 million—or more than 10 percent of the world's population.⁹ Reaching these remaining poor and hungry households will be increasingly difficult as the region's food system has become much more diversified and complex.

One area that has recently gained increased attention is the risk that threatened fish populations pose to East Asian diets.¹⁰ Fish has played a critical role in improving China's food security and nutrition, as it also has in other East Asian countries. A report released at the end of 2013 by the World Bank, the Food and Agriculture Organization of the United Nations, and the International Food Policy Research Institute highlights the importance of fish for global food security and nutrition.¹¹

MAJOR THEMES IN FOOD POLICY IN 2014

Sound policy will be the key to ensuring the region's food security. In 2014 there were a number of encouraging developments along the food policy front. For example, regionwide commitment on food security and safety cooperation has been reaffirmed by the Beijing Declaration on Asia-Pacific Economic Cooperation (APEC) Food Security and the APEC Food Safety Beijing Statement of 2014.

Kevin Chen is senior research fellow, Development Strategy and Governance Division, International Food Policy Research Institute, China. **Peter Timmer** is emeritus professor of Development Studies, Harvard University, Cambridge, Massachusetts.

There were also policy developments in individual countries:

- ▶ In China, the 2014 Number 1 policy document signaled a move away from the country's traditional food self-sufficiency stance and toward increased reliance on international trade. It also highlighted reform of the land tenure system, the strengthening of farmer property rights, and the entrance of private capital into cropping.
- ▶ In Indonesia, several aspects of rice policy are receiving attention. Foremost is a redesign of Raskin, a large, expensive, and mostly ineffective program that physically delivers rice to the poor. The program was implemented by the new government, led by President Joko Widodo ("Jokowi"), which is clarifying its agenda for the food and agricultural sector. There is also a clear need to revise the role of BULOG (the state logistics agency), not just in light of the Raskin reforms but also because the agency's role in setting rice prices has come to the attention of Indonesia's powerful Anti-Corruption Committee. However, the dominant role of food and agriculture populist themes in the presidential campaign—and especially the repeated promises to achieve self-sufficiency in rice, sugar, and corn within three years—raises serious concerns about Indonesia's commitment to the 2015 integration of the Association of Southeast Asian Nations (ASEAN), which requires open trade in all goods, except for a small handful of designated special commodities. The ASEAN community will be following developments in Indonesia very closely.
- ▶ In Viet Nam, a major new policy aims to restructure the agricultural sector action plan. Agriculture in Viet Nam faces several key challenges, including a low income level for current agricultural laborers, scattered land holdings suitable only to small-scale production, a low rate of return of investment in agriculture, and environmental degradation. The key aim of agricultural restructuring is to build a modern, effective, and environment-friendly agricultural sector with high added value that will generate jobs, provide

high income for farmers, and ensure food security in a sustainable manner.

- ▶ In Thailand, which could soon resume its position as the world's top rice exporter,¹² the new military government that came to power is pushing through major agricultural policies related to the dissolution of the failed rice subsidy scheme.¹³ Under this scheme a stockpile of 18 million tons of rice had been procured by the government from farmers at inflated prices, resulting in losses totaling US\$9.9 billion.¹⁴
- ▶ The Philippines has pushed back its rice self-sufficiency target to 2016 and continues to struggle with the damage to its food supply caused by super-typhoon Haiyan.¹⁵
- ▶ The opening of Myanmar and the restructuring of its agricultural sector continue to address a number of institutional, policy, and structural constraints¹⁶ that have hampered the country's agricultural growth. However, the political situation domestically remains delicate.¹⁷ Myanmar's reliance on rice exports to China has also raised concerns. The exports are legal from the point of view of Myanmar but have been called into question by Chinese authorities. This lack of clarity has likely depressed rice prices in Myanmar to a level that is forcing farmers to curtail cultivation.

2015 AND BEYOND

The groundwork for future food policy cooperation is also being built up across a range of multilateral arenas. There are positive indications that policymakers across the region are shifting into higher gear not only to reduce hunger but to eliminate it altogether. A number of countries in East Asia are implementing the Zero Hunger Challenge at the national level, following global and regional initiatives. The challenge was initially launched by United Nations Secretary General Ban Ki-moon. In 2014, the first in the region to launch this challenge was Timor-Leste. Myanmar, Nepal, and Viet Nam have also committed to joining the challenge.¹⁸ Current achievements in reducing hunger and undernutrition in China and Viet Nam have demonstrated that it is feasible for the world to end hunger and undernutrition by 2025.¹⁹

Within the ASEAN community, an Ad Hoc Task Force on Development of Vision, Objectives, and Goals for ASEAN Cooperation in Food, Agriculture, and Forestry (ATF-FAF) toward 2020 has been established. The imminent creation of the ASEAN Free Trade community (in 2015) is on the committee's agenda, as are the relevant implications of the ASEAN plus THREE for regional rice buffer stocks. The 2014 release of the FAO regional rice strategy identified six key objectives: (1) increasing productivity, nutrition value, and sustainability, (2) enhancing value chains and reducing post-harvest losses, (3) mitigating/adapting to climate change and reducing risk, (4) conserving the environment and heritage, (5) promoting fair and efficient markets and trade, and (6) improving

organization of production and empowering youth and women.²⁰ The strategy has already gained traction and has likely inspired related national-level initiatives as well, such as in the reforms in Indonesia and Viet Nam described in the preceding section.

Looking toward the future, the region continues to focus on major food security challenges caused by the 2008 food price crisis, although a certain sense of satisfaction is justified as the region has not experienced another rice price spike, even though global markets for wheat and corn have been quite unstable. Part of this success is arguably attributable to effective multilateral cooperation, especially through ASEAN and its "plus 3" partners, which helps ensure both regional and global food security.²¹ ■

Latin America and the Caribbean

Maximo Torero



LATIN AMERICA AND THE CARIBBEAN (LAC) are home to one third of the world's fresh water, the most of any developing region when measured on a per capita basis, and to more than one quarter of the world's medium- to high-potential farmland.¹ Little wonder that the LAC region as a whole is the largest net food-exporting region in the world. As shown in Figure 1, the region's total share of exports has increased more than 7.5 times since 1991, while imports measured in calories have increased by 3.5 times in the same period. In 2013 and 2014, these trends were reflected in the roles that Argentina, Brazil, Paraguay, and Uruguay played in increasing the world's supply of wheat, corn, and soybeans.

Given the important role LAC plays in global food production, this essay explores developments in the region's food policy in 2014 and then suggests policy directions for 2015 and beyond.

MAJOR DEVELOPMENTS IN 2014

In recent years, several countries in the LAC region—and notably Brazil's *Fome Zero*² and *Brasil sem Miséria*³ programs in particular—have excelled in the implementation of policies to reduce food insecurity and malnutrition. This has led to several South–South learning initiatives, such as the World Food Programme's Purchase for Progress program or the Zero Hunger Challenge, launched by UN Secretary General Ban Ki-moon, which led to the second International Conference on Nutrition. The conference took place in November 2014 and put nutrition and sustainable food systems at the forefront of the international development agenda.⁴

Despite the aforementioned successes, and as shown in Figure 2, agricultural productivity is still behind in the region.⁵ Three major shocks in 2013

and 2014 served to illustrate just how vulnerable Central America still is within the LAC region:⁶ a coffee rust epidemic, a significant drought, and the child migration crisis. The third shock, in part a product of the first two, was also a consequence of significant deficiencies faced by El Salvador, Guatemala, and Honduras, which include a lack of access to infrastructure, health services, and security as well as severe malnutrition and stunting.

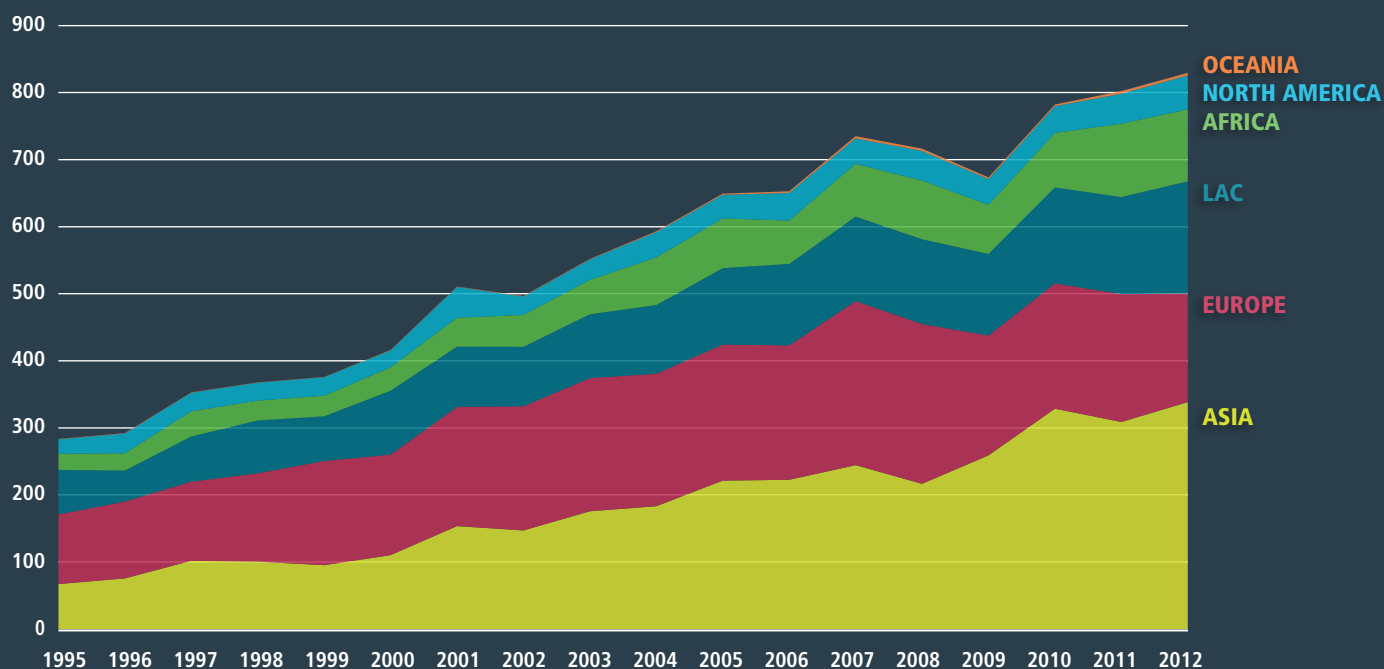
Extreme Vulnerability within the LAC Region

Coffee rust was not the first serious epidemic ever to hit the region, as previously severe cases were observed in Costa Rica (1989/1990), El Salvador (2002/2003), and Nicaragua (1995/1996). It was, however, the first to strike hard and wide in several agricultural-producing countries simultaneously. Some climatic factors could explain this unusual behavior, especially higher temperatures or increases in rainfall.⁷ The resurgence of the disease was also associated with a 30 percent reduction in coffee prices during 2012,⁸ and when prices could not cover production costs, producers stopped investing in preventive or palliative treatments.

On average, 80.4 percent of the coffee plantations in the region are susceptible to rust varieties, which have caused large losses in coffee production. As reported by PROMECAFE,⁹ estimated harvest losses for Central America for 2012/2013 were approximately 20 percent—the equivalent of 2.8 million bags of coffee lost to the disease. The most affected countries were El Salvador, Guatemala, and Honduras, having faced production cuts of 15–31 percent during the 2012/2013 harvest. This epidemic heavily defoliated and destroyed enough branches that nearly 30 percent of the area that produces Central American coffee had to undergo severe pruning or be put directly in renewal,

Maximo Torero is director, Markets, Trade, and Institutions Division, International Food Policy Research Institute, Washington, DC.

FIGURE 1 LAC exports to the world in trillions of calories



Source: L. Deason and D. Laborde, *Trading Food: A Nutritional Assessment*, IFPRI Discussion Paper (Washington, DC: International Food Policy Research Institute, forthcoming).

implying additional losses for crops in 2013/2014 and 2014/2015. The numbers tell the story: because 1.9 million Central Americans rely on coffee as their main source of income,¹⁰ when demand for labor during this period decreased by 16–32 percent while wages decreased by 14–22 percent, 160,000 families found themselves facing food insecurity.¹¹

The year 2014 was also critical for weather shocks, with organizations including the World Meteorological Organization, Famine Early Warning Systems Network (FEWS NET), and experts at the XLIV Foro del Clima de América Central all predicting El Niño to bring severe droughts in the region. By the close of July, it was estimated that the droughts had already affected 40,000 households in Guatemala

and 72,000 in Honduras. By the end of August, the estimate for Guatemala had risen to 250,000 households, according to Secretaría de Seguridad Alimentaria y Nutricional (SESAN). Maize losses that July were predicted to be 10 percent in El Salvador, 40 percent in Guatemala, and 70 percent in Honduras. By August, the estimate for Guatemala was updated to 70 percent, according to SESAN.

The droughts—particularly the negative economic consequences they imposed on rural households’ income-generating activities and purchasing power—may have constituted an important additional factor behind the wave of unaccompanied alien children’s migration to the United States. The number of such children from Central America

seeking entrance to the United States has been increasing rapidly in the last few years and surged in 2014, prompting President Obama to declare the “wave of unaccompanied children across the US-Mexican border an *urgent humanitarian situation*” on June 2, 2014.¹² In the first eight and half months of 2014, the number of apprehensions climbed to 52,000 children. If extrapolated at the same rate to the end of the fiscal year, the figure would reach roughly 73,000, but news reports have cited an internal Department of Homeland Security memorandum estimating that for 2014 apprehensions could have totaled 90,000.¹³ The challenge of housing tens of thousands of unaccompanied Central American migrant children while the US government decides whether to unite them with US-based family members or deport them is overwhelming policymakers at every level in both the United States and the children’s countries of origin.¹⁴

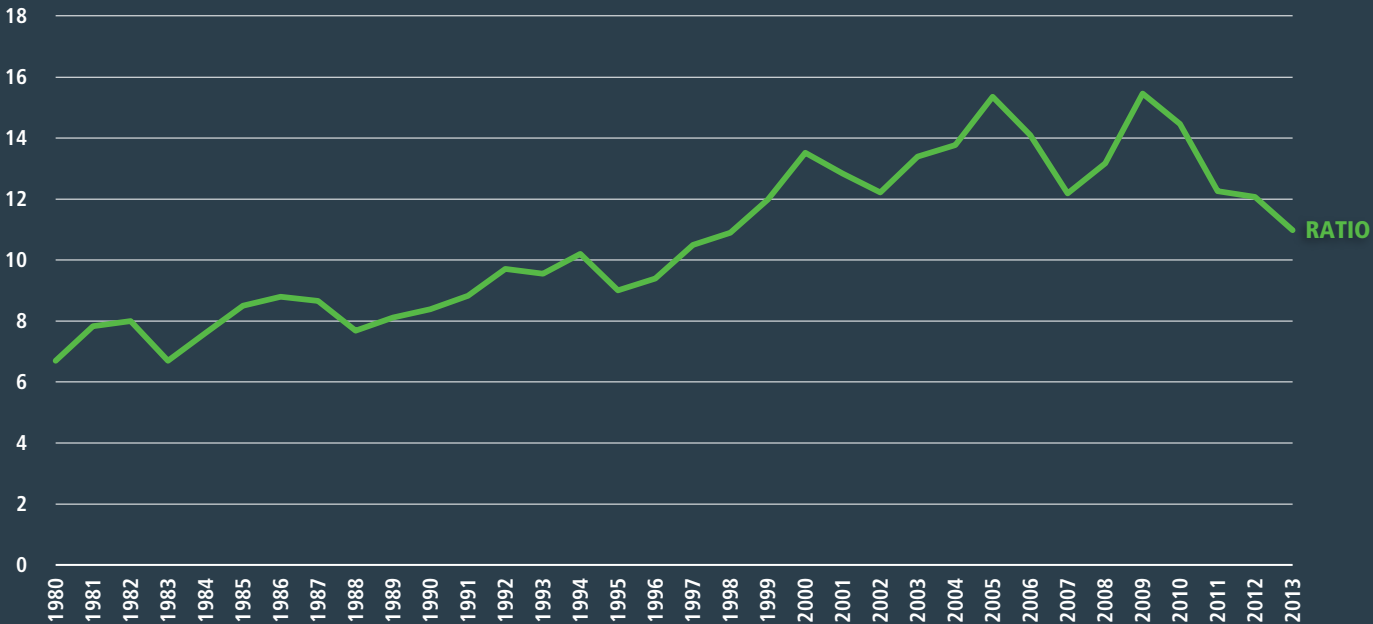
Although there are important push-and-pull factors behind the increase in such migration, focusing on the key regions where the children originate from

suggests that these children come from the most food-insecure regions in El Salvador, Guatemala, and Honduras.¹⁵ The Human Development Index for 2013 ranks El Salvador 115th, Guatemala 125th, and Honduras 129th among 187 countries, outranking only Nicaragua (132nd) in the LAC region.¹⁶ This is particularly troubling in the case of Guatemala, considering it is the biggest economy in Central America (with a gross domestic product of US\$53.8 billion in 2013).

2015 AND BEYOND

The Brazilian experience shows that if we want a strategy to address food security going forward, it is essential not to rely on what is normally known as sustainable economic growth. The decline of stunting from 37.1 percent to 7.1 percent over the last 33 years in Brazil was particularly steep in the last 10 years of the period (1997–2007).¹⁷ This was a time when the gaps between poor and wealthy families with children under age five were also reduced in

FIGURE 2 Ratio of agricultural productivity in the United States to that in Latin America and the Caribbean



Source: World Bank, *World Development Indicators, 2013* (Washington, DC, 2013).
 Note: Agricultural productivity is measured as agriculture value added per worker in constant 2005 US\$.

terms of purchasing power, reproductive health indicators, and access to education, health care, and water and sanitation services. Despite this success in implementation and South–South learning, it is important to mention that in the case of Brazil, poverty has fallen; however, based on the literature, it is impossible to know the impacts of the various interventions on well-being among smallholders. Impact evaluations among agricultural interventions have been nearly nonexistent; this is true even for *Programa de Aquisição de Alimentos*, Brazil’s food purchase program, which has now been exported to five African countries. The major program that does not have this caveat is *Bolsa Família*, which solely distributes cash to families that fall below the poverty line and meet the program conditions.

The first policy recommendation is to improve the way government interventions are targeted and prioritized within the countries. This includes (1) creating a typology of microregions that allows us to capture the heterogeneity of small farmers to better target interventions; (2) strengthening the institutional and infrastructural base necessary to respond to heterogeneity among smallholders; (3) helping rural smallholders become more competitive in the production and marketing of their products; and (4) improving knowledge about the impact those complementary investments in rural institutions and infrastructure, both capital-intensive infrastructure (roads, electricity, potable water and drainage, water for irrigation, and telecommunications) and

post-harvest technologies (storage services, processing infrastructure, and the like) may have on market development and poverty reduction.¹⁸

Second, governments should focus on five pillars: agricultural technology, agricultural health and food safety, rural infrastructure, rural labor, and facilitating the provision of risk-coping mechanisms for poor populations and providing access to two key financial services—financial markets and insurance mechanisms.

As a third recommendation, Central America needs to improve its food and nutrition security by, as in the case of Brazil, significantly reducing the gaps between poor and wealthy families. This should be done not only by reducing the difference in terms of purchasing power but also by increasing the poor’s access to education, health care, water and sanitation services, and reproductive health facilities. Clear examples of such programming already underway in the region are in Costa Rica and the Dominican Republic, as well as Guatemala’s Hunger Zero Pact.

In summary, it is important to increase South–South learning within the LAC region—success stories need to be spread across the region. It is also essential that Central America invest significantly in a common policy among countries to strengthen their resilience to the effects of diseases like coffee rust and of shocks like drought. Finally, if properly executed to the scale and public budgets of other countries, good comprehensive programs like those in Brazil can be implemented cost-effectively. ■

FOOD POLICY INDICATORS: TRACKING CHANGE

DECISIONMAKERS AND POLICY ANALYSTS NEED SOLID EVIDENCE AND TIMELY INFORMATION to develop and implement effective food policies. The International Food Policy Research Institute (IFPRI) develops and shares global public goods—including datasets, indicators, and indexes—as part of its mission to provide research-based policy solutions that sustainably reduce poverty and end hunger and malnutrition. This information can be used to gauge the impact of policy changes and the progress made on specific aspects of development.

This section provides updates on data generated by IFPRI research in 2014, including indicators on investments in agricultural research, public spending in agriculture, food policy research capacity, and agricultural total factor productivity, as well as a hunger index at the country level. All indicators are available online and present an interactive display of the data.

Agricultural Science and Technology Indicators (ASTI)

Policymakers increasingly recognize that greater investment in agricultural research is an essential element in raising agricultural productivity. Data on the size and scope of research capacity and investments, as well as on the changing institutional structure and functioning of agricultural research agencies, enhance our understanding of how agricultural research promotes agricultural growth. Indicators derived from such information allow the performance, inputs, and outcomes of agricultural research systems to be measured, monitored, and benchmarked.

The International Food Policy Research Institute's Agricultural Science and Technology Indicators (ASTI) initiative is the main source of statistics and other information on agricultural research in low and middle income countries. Working with a large network of country-level collaborators, ASTI conducts primary surveys to collect data from government agencies, institutions of higher education, nonprofits, and private for-profit companies involved in agricultural R&D in close to 80 developing countries worldwide. ASTI publishes quantitative and qualitative information and identifies trends in funding sources, spending levels and

allocations, and human resource capacities, at both country and regional levels.

Table 1 presents only a fraction of the available ASTI indicators. The ASTI website (www.asti.cgiar.org) offers additional indicators—including national-level timeseries data on researcher capacity by qualification level, age bracket, and commodity—as well as a detailed breakdown of agricultural R&D investment by funding source and cost category. The interactive country pages on the ASTI website allow users to access country-level timeseries data, make cross-country comparisons, create graphs, and download country datasets. The country pages also feature recent ASTI factsheets, other country-level publications, and detailed institutional information on agencies involved in agricultural R&D. Moreover, the interactive benchmarking tool on the ASTI website is a convenient map-based instrument allowing users to make cross-country comparisons and rankings based on a wide set of financial and human resource indicators. The detailed ASTI datasets are available in an easy-to-use data download tool. Finally, detailed spending and human-capacity data for CGIAR centers are also available.

Download data: www.asti.cgiar.org

Contact: Nienke Beintema (n.beintema@cgiar.org), Gert-Jan Stads (g.stads@cgiar.org), and asti@cgiar.org

TABLE 1 ASTI data

Low and middle income countries by region	Latest year available	Agricultural research spending		Agricultural research spending as a share of AgGDP (%)	Agricultural researchers (FTEs)	Agricultural researchers (FTEs) per 100,000 people economically engaged in agriculture	Female share of total agricultural researchers (%)
		2011 PPP dollars (million)	2011 US dollars (million)				
Africa south of the Sahara							
Benin	2011	32.4	14.7	0.62	155.7	9.6	12
Botswana	2011	18.4	10.2	2.63	123.8	38.4	29
Burkina Faso	2011	29.9	13.5	0.42	218.0	3.1	11
Burundi	2011	12.8	4.3	0.50	132.3	3.5	15
Cape Verde	2011	3.6	2.2	1.44	21.0	65.6	38
Central African Republic	2011	3.4	1.9	0.17	134.0	10.6	19
Chad	2011	17.0	9.0	0.14	123.3	4.1	7
Congo, Democratic Republic of	2011	20.0	11.4	0.21	423.9	2.9	9
Congo, Republic of	2011	7.5	4.6	0.94	104.0	19.8	18
Côte d'Ivoire	2011	59.1	28.6	0.42	130.6	4.6	13
Eritrea	2011	2.9	1.1	0.30	116.8	7.3	7
Ethiopia	2011	87.2	25.4	0.20	1,876.6	5.8	9
Gabon	2011	0.9	0.6	0.08	42.6	23.1	24
Gambia, The	2011	5.2	1.7	0.86	65.9	10.6	14
Ghana	2011	138.3	64.0	0.68	607.0	9.7	20
Guinea	2011	5.6	2.1	0.21	265.0	7.0	3
Guinea-Bissau	2011	0.2	0.1	0.02	9.0	2.0	0
Kenya	2011	260.7	100.7	0.91	1,150.9	8.5	25
Lesotho	2011	2.5	1.4	0.75	41.1	11.3	46
Liberia	2011	6.7	3.5	0.51	45.1	4.8	20
Madagascar	2011	12.5	4.2	0.16	193.1	2.6	27
Malawi	2011	32.6	15.9	1.03	162.3	3.2	19
Mali	2011	51.1	22.7	0.61	307.0	9.8	22
Mauritania	2011	11.7	4.8	0.88	62.9	8.3	14
Mauritius	2011	31.2	17.3	4.86	150.7	320.6	39
Mozambique	2011	22.8	12.6	0.34	313.6	3.5	31
Namibia	2011	60.4	38.8	3.79	89.4	33.2	38
Nigeria	2011	550.1	264.4	0.27	2,687.6	21.9	29
Rwanda	2011	32.2	14.0	0.67	180.4	4.0	24

Notes: na = not available; a = data for 2006. Table only includes countries where ASTI has conducted survey rounds since 2002. Data in italics are provisional estimates based on secondary data or macro-level survey rounds (for details see www.asti.cgiar.org/globaloverview). Agricultural research includes government, higher-education, and nonprofit agencies but excludes the private for-profit sector. Purchasing power parities (PPPs) measure the relative purchasing power of currencies across countries by eliminating national differences in pricing levels for a wide range of goods and services. PPPs are relatively stable over time, whereas exchange rates fluctuate considerably. Measuring researchers in full-time equivalents (FTEs) takes into account the proportion of time researchers spend on research activities. For example, four university professors who spend 25 percent of their time on research would individually represent 0.25 FTEs and collectively be counted as 1 FTE.

Low and middle income countries by region	Latest year available	Agricultural research spending		Agricultural research spending as a share of AgGDP (%)	Agricultural researchers (FTEs)	Agricultural researchers (FTEs) per 100,000 people economically engaged in agriculture	Female share of total agricultural researchers (%)
		2011 PPP dollars (million)	2011 US dollars (million)				
Senegal	2011	32.2	16.1	0.82	112.2	2.9	19
Sierra Leone	2011	9.2	3.3	0.21	81.7	6.1	14
South Africa	2011	294.6	193.7	2.16	746.3	64.7	45
Sudan	2011	64.0	29.4	0.18	939.1	13.0	40
Swaziland	2011	6.2	3.3	1.43	27.1	19.8	28
Tanzania	2011	97.6	32.4	0.54	814.8	4.7	25
Togo	2011	10.7	4.9	0.42	114.7	8.8	8
Uganda	2011	122.4	40.4	1.15	353.9	3.1	21
Zambia	2011	19.5	9.5	0.42	233.1	7.1	21
Zimbabwe	2011	20.3	10.2	0.84	176.7	5.6	33
Asia-Pacific							
Bangladesh	2012	249.9	78.0	0.40	2,121.0	6.6	12
Cambodia	2010	22.4	7.4	0.18	284.4	5.7	20
China	2008	5,475.7	2,970.7	0.50	43,200.0	8.6	na
India	2009	3,375.4	1,092.8	0.40	11,216.5	4.2	na
Indonesia	2009	770.4	316.8	0.28	na	na	na
Malaysia	2010	702.6	335.1	1.18	1,609.4	99.8	45
Nepal	2009	37.1	12.4	0.23	388.7	3.3	10
Pakistan	2009	297.1	83.8	0.18	3,531.5	14.7	10
Sri Lanka	2009	61.8	21.6	0.34	618.8	15.4	35
Vietnam	2010	136.0	44.5	0.17	3,744.2	12.6	na
Latin America and Caribbean							
Argentina	2008	490.7	318.2	1.07	3,930.5	278.2	41a
Belize	2006	2.7	1.5	0.90	16.7	59.6	31
Brazil	2008	1,748.6	1,537.7	1.36	4,633.2	39.9	34a
Chile	2008	130.3	93.8	1.24	674.6	69.6	30a
Colombia	2008	182.5	114.7	0.56	956.6	26.9	32a
Costa Rica	2006	36.2	24.8	0.90	282.9	86.5	27
Dominican Republic	2012	20.4	10.4	0.30	199.6	45.1	24
El Salvador	2006	6.6	0.4	0.15	76.9	12.4	15
Guatemala	2012	15.6	7.3	0.14	141.8	6.6	20
Honduras	2012	8.0	4.2	0.17	87.6	13.2	14
Mexico	2008	655.2	404.7	1.12	4,066.8	50.2	22a
Nicaragua	2012	17.4	6.9	0.40	131.5	38.1	30
Panama	2012	15.5	8.5	0.74	133.0	51.9	18

continued

Table 1 continued

Low and middle income countries by region	Latest year available	Agricultural research spending		Agricultural research spending as a share of AgGDP (%)	Agricultural researchers (FTEs)	Agricultural researchers (FTEs) per 100,000 people economically engaged in agriculture	Female share of total agricultural researchers (%)
		2011 PPP dollars (million)	2011 US dollars (million)				
Paraguay	2006	13.3	7.1	0.20	128.3	16.3	32
Uruguay	2006	80.5	63.7	1.70	400.4	210.8	43
Central and West Asia and North Africa							
Algeria	2012	91.6	38.3	0.21	593.4	17.6	51
Jordan	2012	36.2	15.0	1.84	272.3	89.6	18
Lebanon	2012	38.2	21.3	0.95	209.2	747.1	48
Morocco	2012	147.3	66.9	0.49	556.3	19.0	23
Oman	2012	110.0	54.8	6.51	243.6	63.6	31
Tunisia	2012	63.0	26.5	0.64	541.6	66.1	33
Turkey	2012	537.3	316.6	0.51	3,009.4	38.5	32
Yemen	2012	38.7	13.7	0.56	526.7	23.8	7

Statistics of Public Expenditure for Economic Development (SPEED)

The Statistics of Public Expenditure for Economic Development (SPEED) database is a resource of the International Food Policy Research Institute (IFPRI) that contains information on agricultural and other sectoral public expenditures in 112 developing countries and 34 developed countries from 1980 to 2012 (see Table 2). IFPRI researchers have compiled data from multiple sources, including the International Monetary Fund, World Bank, United Nations, and national governments, and conducted extensive data checks and adjustments to ensure consistent spending measurements over time that are free of exchange-rate fluctuations and currency denomination changes.

Differences from the data in the *2013 Global Food Policy Report* may arise from revisions of the public expenditure series as well as from other variables such as population, deflator, exchange rate, and total and agricultural gross domestic product (GDP). Additionally, this year we switched to the United Nations Statistical database to obtain more complete time-series of the GDP deflator. At the same time, the World Bank has revised the series on purchasing power parity conversion factor, which has led to substantial changes in the figures for a few countries (for example, Ghana).

Global per capita agricultural spending rose at a rate of 0.33 percent per year between 1980 and 2012. Public spending in agriculture declined considerably between 1980 and 2000, and much of the observed growth took place in the last 12 years (2000–2012). Agriculture on average accounted for about 2–3 percent of total government expenditure globally.

However, developing and developed regions have exhibited different trends. For developed countries, despite their

large volume of investments, agriculture represents only a marginal portion of the economy. Per capita expenditure declined continuously in 1980–2012, and averaged around \$102 per person in the 2000s. In the past decade, the share of agriculture in the total government budget also dropped to about 1 percent, but the ratio of agricultural expenditure to agricultural GDP remained high at above 20 percent. In developing countries, on the other hand, although agriculture accounts for a larger share of total expenditures, per capita spending was considerably lower and was only a fraction of the level in developed countries. Additionally, the level of per capita public expenditure in agriculture by developing countries dropped consistently until the early 1990s yet experienced an impressive recovery afterward, particularly since 2000. As a result, the ratio of agricultural expenditure to agricultural GDP also increased in recent years given the renewed attention that has been paid to the agricultural sector.

Policymakers, researchers, and other stakeholders can use this robust database for many purposes. The data allow users to examine both historical trends and the allocation of government resources across sectors as well as to make comparisons with other countries within a region or at a similar level of development. Because it covers many countries for a long time period, the SPEED dataset provides many analytical possibilities. Analysts can not only examine the policy priorities of national governments as expressed in the allocation of public expenditures but also extend the analysis of government spending to include the tracking of development goals and the efficiency and cost-effectiveness of public spending both within and across regions.

Download data: <http://hdl.handle.net/1902.1/19525>

Contact: Samuel Benin (s.benin@cgiar.org) and Yifei Liu (yifei.liu@cgiar.org)

TABLE 2 Agricultural public expenditure for economic development, by country

Region/ country	Agricultural expenditure (billions 2005 constant US dollars)			Agricultural expenditure (billions 2005 PPP dollars)			Per capita agricultural expenditure (2005 constant US dollars)			Per capita agricultural expenditure (2005 PPP dollars)			Ratio of agricultural expenditure to agricultural GDP (%)			Share of agriculture in total expenditure (%)			
	1980	1995	2012	1980	1995	2012	1980	1995	2012	1980	1995	2012	1980	1995	2012	1980	1995	2012	
East Asia and Pacific																			
China	7.157	8.632	103.941	20.518	24.747	297.981	7.106	6.823	73.819	20.373	19.559	211.628	10.933	4.735	22.862	12.203	8.425	9.507	
Fiji ¹	0.032	0.026	0.009	0.060	0.049	0.017	50.328	33.916	10.542	93.787	63.204	19.645	8.170	6.776	2.928	7.237	4.006	0.843	
Indonesia ⁵	1.779	1.631	1.563	8.107	7.434	7.125	12.228	8.404	6.769	55.719	38.295	30.846	9.684	4.803	3.554	10.266	5.891	2.609	
Malaysia	0.747	0.935	4.122	2.148	2.690	11.855	53.992	45.132	140.959	155.297	129.812	405.439	10.204	8.340	20.660	8.751	5.102	8.397	
Mongolia ²		0.010	0.024		0.046	0.108		4.387	8.800		19.888	39.895		1.755	4.838		2.783	2.362	
Myanmar ²	0.108	0.069	0.088	0.416	0.268	0.339	3.122	1.529	1.688	12.073	5.912	6.526	8.024	2.664	1.177	23.566	14.896	6.258	
Papua New Guinea ⁵	0.064	0.046	0.024	0.127	0.092	0.047	19.989	9.834	3.708	39.454	19.411	7.319	7.970	3.255	1.417	8.460	3.965	1.533	
Philippines	0.384	0.772	1.212	1.369	2.753	4.321	8.103	11.092	12.530	28.893	39.552	44.679	3.342	5.930	7.051	6.062	6.902	5.089	
Singapore	0.020	0.028	0.071	0.037	0.052	0.131	8.352	8.037	13.419	15.382	14.803	24.714	5.634	25.513	120.811	0.438	0.239	0.280	
Thailand	0.766	2.474	2.261	2.767	8.938	8.168	16.170	41.948	33.859	58.411	151.534	122.310	7.561	19.491	8.979	9.668	11.301	4.564	
Tonga	0.003	0.001	0.026	0.005	0.001	0.045	32.647	5.378	250.038	56.271	9.270	430.966	6.130	1.230	55.829	9.965	0.798	40.578	
Vanuatu ⁵	0.001	0.002	0.003	0.001	0.003	0.004	9.719	14.863	13.586	11.890	18.183	16.621	2.589	2.709	3.244	2.959	3.135	4.979	
Vietnam		0.464	0.588		2.060	2.610		6.101	6.472		27.094	28.743		6.148	3.413		8.205	5.360	
South Asia																			
Afghanistan ¹			0.105			0.424			3.609			14.565			3.452			4.256	
Bangladesh ³	0.193	0.238	0.856	0.712	0.879	3.161	2.339	1.986	5.728	8.633	7.331	21.145	2.742	2.528	5.915	13.023	4.932	8.919	
Bhutan ³	0.011	0.031	0.043	0.036	0.099	0.139	26.601	60.155	60.698	86.426	195.440	197.204	19.530	23.977	20.363	31.855	19.693	11.183	
India ¹	1.770	3.495	13.413	7.068	13.952	53.545	2.533	3.656	10.984	10.112	14.597	43.848	2.621	3.127	6.170	7.179	5.259	6.508	
Maldives ²	0.002	0.018	0.008	0.004	0.036	0.017	11.640	72.459	25.279	23.765	147.940	51.611	6.993	46.240	12.432	8.844	12.068	1.334	
Nepal	0.059	0.082	0.191	0.274	0.381	0.893	4.085	3.966	6.970	19.040	18.485	32.489	3.931	3.962	5.095	16.394	9.638	8.959	
Pakistan	0.098	0.063	0.901	0.496	0.316	4.543	1.229	0.494	5.030	6.198	2.492	25.360	0.978	0.309	2.566	2.135	0.458	2.905	
Sri Lanka ¹	0.178	0.237	0.412	0.748	0.993	1.726	11.865	12.991	19.677	49.737	54.459	82.488	9.440	8.690	9.446	5.768	5.285	5.468	
Europe and Central Asia																			
Albania		0.056			0.128				16.719			38.261		2.151				3.872	
Azerbaijan		0.086	0.240		0.392	1.091		11.082	25.781			50.392	117.232		6.682	16.392		8.015	2.645
Belarus		0.129	0.698		0.400	2.158		12.701	74.194			39.277	229.442		5.298	17.865		4.231	7.830
Bulgaria		0.017	0.076		0.044	0.201		2.022	10.492			5.312	27.569		0.563	4.101		0.252	0.687
Georgia			0.076			0.219			17.507			50.189			11.280			2.964	
Kazakhstan			0.548			2.023			33.670			124.303			14.942			3.636	
Kyrgyzstan ⁵		0.015	0.016		0.068	0.071		3.325	3.114		14.740	13.807		2.413	2.160		3.536	2.366	
Latvia ²		0.128	0.289		0.239	0.540		51.455	138.195			96.226	258.438		21.421	41.748		5.411	5.165
Lithuania		0.282	0.225		0.526	0.420		77.735	74.393			145.057	138.820		19.868	20.800		8.653	2.282
Moldova		0.012	0.053		0.042	0.188		2.738	15.057			9.710	53.395		1.687	13.070		1.383	4.059
Romania ¹	2.451	1.769	0.411	5.019	3.622	0.842	109.437	77.034	18.859	224.074	157.729	38.614	24.639	12.786	5.455	7.417	7.706	0.990	
Russian Federation		0.216	2.727		0.480	6.055		1.454	19.044			3.229	42.294		0.583	8.443		0.150	1.003

Note: PPP (purchasing power parity) dollars measure the relative purchasing power of currencies across countries by eliminating national differences in pricing levels for a wide range of goods and services. Because of the dramatic differences in countries' agriculture spending, entries have different numbers of decimal places. * 1 = last year of data available is 2011; 2 = last year of data available is 2010; 3 = last year of data available is 2009; 4 = last year of data available is 2008; 5 = last year of data available is 2007.

Region/ country	Agricultural expenditure (billions 2005 constant US dollars)			Agricultural expenditure (billions 2005 PPP dollars)			Per capita agricultural expenditure (2005 constant US dollars)			Per capita agricultural expenditure (2005 PPP dollars)			Ratio of agricultural expenditure to agricultural GDP (%)			Share of agriculture in total expenditure (%)		
	1980	1995	2012	1980	1995	2012	1980	1995	2012	1980	1995	2012	1980	1995	2012	1980	1995	2012
Serbia			0.265			0.667			27.786			69.790			10.888			3.251
Ukraine			0.499			1.771			10.966			38.896			6.591			1.867
Middle East and North Africa																		
Algeria ³		0.512	1.719		1.814	6.092		17.463	47.260		61.867	167.431		7.699	16.412		2.418	3.649
Bahrain ⁴	0.011	0.012	0.013	0.024	0.027	0.028	30.582	21.972	11.494	66.111	47.498	24.848	18.578	17.042	24.765	0.635	0.561	0.295
Egypt ⁵	0.619	0.827	0.884	3.641	4.860	5.197	13.786	13.518	11.912	81.028	79.457	70.017	12.776	8.427	6.097	5.143	5.039	3.043
Iran, Islamic Republic of ³	0.949	1.108	0.773	4.078	4.757	3.320	24.412	18.317	10.512	104.852	78.672	45.148	8.779	4.803	3.132	3.360	4.216	1.412
Jordan	0.019	0.110	0.039	0.068	0.391	0.140	8.391	25.445	5.604	29.881	90.614	19.958	8.078	37.730	7.957	0.976	4.461	0.699
Kuwait ³	0.013	0.127	0.150	0.034	0.320	0.377	9.689	79.995	52.459	24.458	201.934	132.425	13.333	58.824	65.000	0.102	0.528	0.449
Lebanon ³		0.024	0.021		0.049	0.042		7.948	4.839		16.266	9.902		1.133	1.439		0.400	0.236
Morocco ⁵	0.484	0.479	0.399	1.188	1.176	0.978	24.459	17.858	13.000	60.024	43.823	31.902	9.964	8.137	4.977	6.804	4.498	2.013
Occupied Pales- tinian Territory ¹			0.017			0.046			4.106			11.239			4.399			0.753
Oman	0.052	0.133	0.101	0.150	0.381	0.290	45.437	61.823	30.588	129.812	176.626	87.390	24.238	20.166	20.186	1.849	1.557	0.496
Syrian Arab Republic ³	0.277	0.473	0.427	0.675	1.150	1.039	30.967	32.962	20.295	75.358	80.214	49.389	11.997	9.025	5.368	5.036	10.237	4.713
Tunisia	0.482	0.406	0.639	1.156	0.974	1.531	76.455	45.249	58.727	183.265	108.464	140.771	34.710	21.172	18.276	15.632	8.325	5.360
Turkey	0.462	0.426	7.352	0.747	0.689	11.892	10.513	7.280	99.352	17.006	11.775	160.705	1.522	1.202	14.839	2.083	0.816	4.486
United Arab Emirates ³	0.055	0.051	0.055	0.116	0.107	0.115	54.064	21.539	7.075	114.177	45.487	14.942	14.006	2.782	2.632	0.833	0.673	0.616
Yemen ⁵		0.031	0.071		0.144	0.327		2.086	3.358		9.603	15.457		1.857	3.495		1.685	1.059
Latin America and Caribbean																		
Argentina ³	0.168	0.144	0.899	0.348	0.298	1.860	5.987	4.133	22.469	12.382	8.549	46.474	2.158	1.840	5.584	0.646	0.577	1.651
Bahamas ²	0.009	0.015	0.014	0.009	0.015	0.014	44.420	54.298	40.273	42.641	52.123	38.660	11.448	7.466	9.347	1.452	1.671	0.973
Barbados	0.025	0.029		0.024	0.027		102.077	108.461		97.010	103.077		12.769	28.289		3.196	2.801	
Belize	0.010	0.008		0.018	0.014		68.630	37.108		122.424	66.195		12.964	6.955			4.606	
Bolivia (Pluri- national State of) ⁵	0.027	0.003	0.030	0.109	0.013	0.121	5.069	0.431	3.124	20.265	1.721	12.490	2.609	0.319	2.885	3.333	0.348	1.363
Brazil		7.225	5.683		16.101	12.665		44.630	28.608		99.455	63.751		20.602	11.228		5.699	2.031
Chile	0.180	0.166	0.585	0.301	0.278	0.982	16.045	11.474	33.517	26.915	19.248	56.224	9.158	4.264	10.654	1.773	1.179	1.649
Colombia ¹	0.128	0.233	0.537	0.312	0.568	1.310	4.749	6.367	11.410	11.582	15.528	27.825	1.403	2.207	4.397	2.001	1.771	0.515
Costa Rica	0.052	0.039	0.406	0.106	0.080	0.831	21.980	11.279	84.397	45.064	23.125	173.037	5.239	2.440	25.924	3.376	2.253	7.763
Dominican Republic ⁵	0.241	0.187	0.131	0.476	0.369	0.259	41.367	23.398	13.655	81.669	46.192	26.957	13.963	10.129	5.498	16.712	8.980	1.858
Ecuador ²			0.193			0.478			12.888			31.874			4.051			1.595
El Salvador	0.100	0.030	0.050	0.202	0.061	0.109	21.496	5.279	7.905	43.386	10.655	17.289	4.030	1.590	2.406	7.266		1.609
Grenada		0.011			0.017			109.683			172.158			31.369			9.652	
Guatemala	0.153	0.052	0.135	0.412	0.141	0.364	21.884	5.249	8.965	58.858	14.118	24.112	6.950	1.818	3.478	7.878	2.724	2.645
Jamaica		0.068	0.084		0.114	0.141		27.794	30.423		46.421	50.812		7.893	13.202		2.334	2.328
Mexico ²	6.598	2.776	4.798	10.090	4.245	7.337	93.788	29.103	40.702	143.414	44.502	62.238	24.416	10.653	15.170	14.565	4.085	2.318
Panama	0.091	0.035	0.095	0.198	0.076	0.205	45.894	12.820	24.952	99.331	27.746	54.005	17.617	5.043	10.198	5.286	1.638	1.327

continued

Table 2 continued

Region/ country	Agricultural expenditure (billions 2005 constant US dollars)			Agricultural expenditure (billions 2005 PPP dollars)			Per capita agricultural expenditure (2005 constant US dollars)			Per capita agricultural expenditure (2005 PPP dollars)			Ratio of agricultural expenditure to agricultural GDP (%)			Share of agriculture in total expenditure (%)		
	1980	1995	2012	1980	1995	2012	1980	1995	2012	1980	1995	2012	1980	1995	2012	1980	1995	2012
Paraguay	0.017			0.061			5.280			19.112			1.560			3.474		
Peru ¹			0.176			0.441			5.953			14.876			2.316			1.228
Saint Vincent and the Grenadines ⁵	0.002	0.003	0.003	0.003	0.005	0.005	17.382	29.840	27.890	28.497	48.920	45.722	9.378	8.738	9.218	3.805	3.465	2.071
Trinidad and Tobago ²	0.138	0.095	0.112	0.255	0.175	0.205	127.547	75.691	83.997	234.706	139.283	154.568	68.724	66.007	126.748	5.096	4.485	1.829
Uruguay ⁵	0.034	0.042	0.062	0.073	0.091	0.135	11.583	13.050	18.675	25.077	28.254	40.432	2.252	3.633	3.809	2.077	1.041	1.507
Venezuela (Bolivarian Republic of) ³			1.552			3.808			54.313			133.209			15.473			2.061
Africa south of the Sahara																		
Angola		0.077	0.240		0.188	0.586		6.365	11.550		15.517	28.157		7.107	4.072		1.745	1.127
Benin		0.039	0.069		0.102	0.183		6.451	6.875		17.077	18.200		4.147	3.731		0.007	5.770
Botswana	0.063	0.140	0.194	0.122	0.269	0.373	63.375	88.235	96.727	121.988	169.839	186.185	29.166	46.662	53.890	9.709	5.961	3.693
Burkina Faso	0.139	0.253	0.199	0.384	0.699	0.551	20.345	25.070	12.116	56.231	69.292	33.487	18.365	27.597	7.895	30.168	41.724	9.393
Burundi		0.012			0.053			2.003			8.591			2.718			4.640	
Cameroon	0.027	0.054		0.063	0.127		3.011	3.878		7.105	9.149		1.188	2.207		2.222	4.162	
Cape Verde ²		0.002	0.018		0.003	0.036		4.227	36.143		8.542	73.043		1.839	15.616			2.830
Central African Republic ²	0.020	0.019	0.007	0.036	0.035	0.013	8.644	5.809	1.592	15.934	10.708	2.935	4.704	3.465	0.886			1.764
Congo		0.005			0.013			1.823			4.707			1.072			0.341	
Côte d'Ivoire	0.119	0.113	0.259	0.305	0.290	0.663	14.384	7.962	13.039	36.858	20.403	33.412	3.605	3.182	4.744	2.496	3.268	5.369
Democratic Republic of the Congo ⁵		0.108	0.045		0.241	0.100		2.567	0.779		5.740	1.741		2.677	1.239		0.182	1.800
Equatorial Guinea ³		0.006	0.054		0.016	0.143		13.249	79.820		35.080	211.352		2.314	20.476			0.801
Ethiopia ¹	0.062	0.119	0.229	0.251	0.482	0.927		2.089	2.562		8.451	10.366	1.970	3.095	2.406	7.020	9.716	3.895
Gambia	0.006			0.021			10.745			33.980			9.251		17.125			
Ghana ⁵	0.058	0.017	0.021	0.262	0.077	0.095	5.413	1.025	0.946	24.236	4.589	4.235	1.763	0.508	0.408	12.206	0.728	0.455
Guinea-Bissau		0.000	0.001		0.000	0.003		0.080	0.610		0.214	1.635		0.031	0.324		0.112	0.742
Kenya	0.142	0.212	0.421	0.457	0.683	1.357	8.704	7.727	9.746	28.064	24.914	31.421	5.352	5.089	6.204	8.285	6.995	6.093
Lesotho ⁴	0.017	0.065	0.031	0.038	0.149	0.070	12.640	37.243	15.618	28.832	84.951	35.624	12.291	54.216	26.465	8.024	12.405	3.153
Liberia	0.023	0.004	0.007	0.059	0.011	0.018	12.328	2.091	1.733	31.188	5.289	4.385	10.623	3.276	0.992	5.018	2.759	1.907
Madagascar ⁴		0.040	0.085		0.180	0.387		2.944	4.278		13.358	19.413		3.482	6.342		6.104	
Malawi ¹	0.042	0.039	0.164	0.126	0.117	0.491	6.752	3.923	10.586	20.250	11.765	31.746	4.397	5.794	12.190	10.151	8.848	15.791
Mali	0.021	0.126	0.103	0.062	0.376	0.306	3.115	14.048	6.928	9.268	41.793	20.611	1.812	10.813	3.782	6.892	15.901	8.484
Mauritius	0.033	0.050	0.052	0.074	0.112	0.117	34.555	44.661	42.337	76.795	99.253	94.090	17.023	13.995	19.658	6.874	5.519	2.552
Mozambique			0.067			0.140			2.674			5.536			2.242			1.702
Namibia ¹		0.090	0.244		0.164	0.445		54.271	109.898		99.003	200.482		16.001	35.993		6.039	6.920
Niger	0.054	0.050	0.104	0.147	0.136	0.283	9.258	5.452	6.068	25.193	14.837	16.511	5.327	6.187	5.549	13.828	12.844	7.385
Nigeria ¹	0.537	0.174	0.454	2.477	0.804	2.093	7.293	1.608	2.765	33.608	7.411	12.744	3.420	1.001	0.898	2.923	3.602	2.460

Region/ country	Agricultural expenditure (billions 2005 constant US dollars)			Agricultural expenditure (billions 2005 PPP dollars)			Per capita agricultural expenditure (2005 constant US dollars)			Per capita agricultural expenditure (2005 PPP dollars)			Ratio of agricultural expenditure to agricultural GDP (%)			Share of agriculture in total expenditure (%)		
	1980	1995	2012	1980	1995	2012	1980	1995	2012	1980	1995	2012	1980	1995	2012	1980	1995	2012
Rwanda			0.083			0.269			7.272			23.503			5.630			7.092
Senegal	0.035	0.046	0.256	0.084	0.112	0.621	6.227	5.292	18.633	15.129	12.859	45.271	5.627	4.801	15.683	3.601	4.697	7.972
Seychelles		0.006	0.003		0.009	0.004		80.961	29.257		118.719	42.902		17.501	9.684		1.990	0.654
Sierra Leone ⁵		0.003	0.005		0.009	0.017		0.744	0.969		2.412	3.138		0.417	0.541		1.567	
South Africa		0.254	0.565		0.464	1.030		6.135	10.780		11.189	19.661		4.042	7.972		0.514	0.598
Sudan	0.250	0.004		0.942	0.014		13.057	0.122		49.278	0.461		6.713	0.059		27.330	3.590	
Swaziland	0.027	0.025	0.040	0.065	0.059	0.096	45.428	25.598	32.854	107.840	60.767	77.991	16.478	12.059	24.100	12.977	5.681	4.227
Togo	0.041	0.018	0.047	0.117	0.052	0.133	15.177	4.268	7.060	42.908	12.066	19.962	9.827	2.985	4.103	6.542	5.003	6.416
Uganda	0.008	0.008	0.090	0.022	0.025	0.263	0.598	0.408	2.468	1.754	1.198	7.240	0.794	0.496	2.515	6.713	1.867	3.445
United Republic of Tanzania ³	0.115	0.105	0.416	0.352	0.321	1.270	6.178	3.509	9.543	18.846	10.705	29.111	10.968	3.809	8.683	10.899	8.545	6.704
Zambia ³	0.406	0.034	0.175	0.751	0.062	0.323	71.770	3.798	13.641	132.658	7.020	25.214	56.313	3.688	8.914	22.807	2.804	9.274
Zimbabwe ⁵	0.213	0.256	0.332	0.144	0.173	0.225	29.170	21.917	26.611	19.750	14.839	18.017	13.478	10.265	12.492	7.027	4.177	7.333
High-income European countries																		
Austria	3.834	3.199	1.587	3.478	2.902	1.440	507.852	402.528	188.437	460.708	365.162	170.945	41.862	50.707	30.723	2.513	2.364	0.936
Belgium	0.881			0.788			89.360			79.876			16.530			0.876		
Croatia		0.172	0.675		0.261	1.025		36.790	157.599		55.901	239.467		7.686	26.322		2.501	3.995
Cyprus		0.172	0.658		0.261	0.999		36.790	153.642		55.901	233.454		7.686	25.661		2.501	3.909
Czech Republic	0.134	0.183	0.165	0.146	0.200	0.180	197.335	214.202	147.999	214.978	233.354	161.232	26.606	30.119	38.652	15.064	4.609	1.839
Denmark		2.786	0.792		4.662	1.325		269.747	75.427		451.406	126.223		60.236	22.559		5.408	1.216
Estonia	0.863	0.241	0.426	0.602	0.168	0.298	168.584	46.037	76.506	117.692	32.139	53.411	11.590	3.300	13.876	0.909	0.193	0.284
Finland		0.003	0.008		0.069	0.194		1.922	5.776		48.190	144.800		10.432	20.808		1.471	2.086
France	6.157	6.604	2.209	5.066	5.434	1.818	1292.171	1292.929	409.946	1063.269	1063.892	337.326	61.520	108.312	36.145	10.745	7.893	1.914
Germany		8.226	9.012		7.164	7.849		138.155	137.861		120.318	120.062		14.355	20.052		0.876	0.718
Greece	2.959	14.968	6.961	2.745	13.884	6.457	37.875	183.252	85.106	35.133	169.986	78.945	7.001	48.048	26.111	0.487	1.114	0.504
Hungary	2.906	2.387	0.074	3.273	2.688	0.083	304.390	224.473	6.555	342.791	252.793	7.382	17.656	17.724	1.122	5.297	3.110	0.064
Iceland	5.228	1.580	0.576	8.114	2.452	0.894	488.027	152.953	57.740	757.436	237.390	89.615	33.371	25.255	14.692	7.850	3.637	1.055
Ireland	0.333	0.256	0.192	0.212	0.163	0.122	1474.238	957.061	601.521	937.136	608.380	382.372	33.311	21.286	18.161	12.440	7.223	2.404
Italy	2.640	1.163	1.119	2.101	0.926	0.891	757.254	322.390	244.538	602.755	256.614	194.646	36.111	16.255	47.598	6.965	2.751	1.123
Luxembourg	8.265	7.383	6.554	7.669	6.850	6.081	146.759	129.879	107.933	136.170	120.508	100.146	11.998	14.487	19.512	1.096	0.913	0.741
Malta	0.111	0.142	0.187	0.094	0.120	0.157	307.208	347.674	359.921	259.243	293.391	303.726	47.616	58.935	146.588	2.160	1.526	1.060
Netherlands	2.343	1.430	1.644	2.102	1.283	1.475	166.877	92.486	98.473	149.739	82.988	88.360	17.570	8.384	12.101	1.052	0.517	0.478
Norway	5.143	3.470	1.915	3.725	2.513	1.386	1262.910	796.004	386.548	914.558	576.440	279.925	84.714	49.955	36.986	7.161	2.993	1.342
Poland		2.079	2.445		3.598	4.233		53.861	63.461		93.235	109.853		12.943	17.313		2.684	1.407
Portugal		1.363	0.703		1.602	0.826		135.899	66.602		159.688	78.260		16.377	14.968		2.176	0.738
Slovakia ¹			0.903			1.642			166.249			302.447			38.932			3.753
Slovenia		0.386	0.223		0.507	0.293		193.965	108.493		255.028	142.649		36.341	23.261		3.613	1.110
Spain ¹	5.879	4.734	6.051	6.181	4.977	6.362	158.041	120.194	131.350	166.143	126.355	138.083	14.818	13.348	18.892	3.358	1.353	1.109
Sweden	3.681	1.907	0.760	2.933	1.519	0.606	443.866	216.021	80.442	353.692	172.135	64.099	36.918	23.128	9.970	2.869	1.076	0.356
Switzerland ²	7.404	10.096	9.661	5.290	7.214	6.903	1176.261	1433.972	1247.557	840.424	1024.555	891.364	84.799	155.732	203.199	4.867	9.242	6.814
United Kingdom	6.467	1.607	4.459	5.591	1.389	3.855	114.967	27.695	71.051	99.393	23.944	61.426	26.895	5.406	26.159	1.192	0.218	0.386

continued

Table 2 continued

Region/ country	Agricultural expenditure (billions 2005 constant US dollars)			Agricultural expenditure (billions 2005 PPP dollars)			Per capita agricultural expenditure (2005 constant US dollars)			Per capita agricultural expenditure (2005 PPP dollars)			Ratio of agricultural expenditure to agricultural GDP (%)			Share of agriculture in total expenditure (%)		
	1980	1995	2012	1980	1995	2012	1980	1995	2012	1980	1995	2012	1980	1995	2012	1980	1995	2012
Other high-income countries																		
Australia	1.338	1.771	1	1.262	1.671	1	90.982	97.741	60	85.813	92.187	57	6.986	9.772	7	1.775	1.244	1
Canada ³	2.247	3.407	2	2.244	3.402	2	91.680	116.297	70	91.537	116.117	70	9.988	14.694	13	2.201	1.926	1
Israel ⁵	0.629	0.608	0	0.760	0.734	0	168.008	113.960	32	202.846	137.591	38	24.788	33.537	9	1.970	1.488	0
Japan	15.057	10.551	19	12.810	8.976	16	129.897	84.756	148	110.512	72.107	126	20.845	16.545	34	3.492	1.687	2
New Zealand ⁴	1.144	0.270	1	1.059	0.250	1	363.658	73.389	158	336.478	67.903	146	19.883	5.139	12	5.419	1.072	1
Republic of Korea ¹	1.337	8.030	10	1.735	10.423	13	35.697	179.823	202	46.339	233.433	262	6.582	27.356	39	5.592	11.589	5
United States of America	18.168	11.798	16	18.168	11.798	16	78.931	44.016	49	78.931	44.016	49	12.592	8.434	10	1.485	0.638	1

Global Hunger Index (GHI)

Each year, IFPRI calculates the Global Hunger Index (GHI), which is designed to comprehensively measure and track hunger globally and by country and region. To reflect the multidimensional nature of hunger, the GHI generates one index number from three equally weighted indicators:

1. Percentage of people who are undernourished
2. Percentage of children younger than age five who are underweight
3. Mortality rate of children younger than age five.

According to the 2014 GHI, global hunger has improved since 2005, falling by 21 percent. Despite progress made, the level of hunger in the world is still “serious.” From the 2005 GHI to the 2014 GHI, two countries reduced their scores by 50 percent or more, and scores dropped by between 25.0 and 49.9 percent for 24 countries. In terms of absolute scores, comparing the 2005 GHI and the 2014 GHI, Angola, Burkina Faso, the Central African Republic, Djibouti, Ethiopia, India, Mali, Nepal, Rwanda, and Sierra Leone saw the biggest improvements. Two countries, Burundi and Eritrea, still have “extremely alarming” levels of hunger, and 14 countries have alarming levels of hunger (see specific country scores for the 2014 GHI in Table 3). Because two other likely hunger hotspots—the Democratic Republic of the Congo and Somalia—were lacking reliable data on undernourishment, GHI scores could not be calculated. By highlighting successes and failures in hunger reduction and providing insights into the drivers of hunger, the GHI both points to the geographic areas where policy action is most needed and suggests policy lessons.

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Contacts: Klaus von Grebmer (k.vongrebmer@cgiar.org) and Nilam Prasai (n.prasai@cgiar.org)

**GHI
SEVERITY
SCALE**

≥ 30.0 Extremely alarming
20.0–29.9 Alarming
10.0–19.9 Serious
5.0–9.9 Moderate
< 5.0 Low
- No data

TABLE 3 Global Hunger Index scores (various years), ranked by 2014 country scores

Rank	Country	1990	1995	2000	2005	2014
1	Mauritius	8.3	7.6	6.7	6.0	5.0
1	Thailand	21.3	17.3	10.2	6.7	5.0
3	Albania	9.1	6.3	7.9	6.2	5.3
3	Colombia	10.9	8.2	6.8	7.0	5.3
5	China	13.6	10.7	8.5	6.8	5.4
5	Malaysia	9.4	7.0	6.9	5.7	5.4
7	Peru	16.1	12.4	10.6	10.0	5.7
8	Syrian Arab Republic	7.8	6.1	<5	5.1	5.9
9	Honduras	14.6	13.9	11.2	9.0	6.0
9	Suriname	11.3	10.1	10.9	9.0	6.0
11	Gabon	10.0	8.6	7.8	7.4	6.1
12	El Salvador	10.8	8.8	7.9	6.4	6.2
13	Guyana	14.5	10.9	8.1	7.9	6.5
14	Dominican Republic	15.6	11.5	9.9	9.6	7.0
15	Vietnam	31.4	25.4	17.3	13.1	7.5
16	Ghana	27.2	20.2	16.1	11.3	7.8
17	Ecuador	14.9	11.9	12.0	10.3	7.9
18	Paraguay	9.2	7.4	6.8	6.3	8.8
19	Mongolia	20.3	23.1	18.5	14.1	9.6
19	Nicaragua	24.0	19.7	15.4	11.4	9.6
21	Bolivia	18.6	16.8	14.5	13.9	9.9
22	Indonesia	20.5	17.8	16.1	15.2	10.3
23	Moldova	-	7.9	9.0	7.4	10.8
24	Benin	22.5	20.5	18.0	15.3	11.2
25	Mauritania	23.0	18.7	17.1	14.4	11.9
26	Cameroon	23.3	24.6	21.3	16.6	12.6
27	Iraq	8.6	11.9	12.8	11.6	12.7
28	Mali	27.2	27.2	24.8	20.7	13.0
29	Lesotho	13.1	15.4	14.6	15.0	13.1
29	Philippines	20.1	17.5	17.9	14.7	13.1
31	Botswana	15.6	16.5	18.1	16.8	13.4
32	Gambia, The	18.7	20.4	15.5	15.1	13.6
32	Malawi	31.3	28.8	21.9	18.9	13.6
34	Guinea-Bissau	22.6	20.4	20.5	17.3	13.7
35	Togo	23.6	19.4	20.8	18.0	13.9
36	Guinea	22.0	20.9	22.4	18.0	14.3
37	Senegal	18.9	19.6	19.5	14.3	14.4
38	Nigeria	25.9	23.0	17.9	16.7	14.7
39	Sri Lanka	22.2	20.2	17.6	16.8	15.1
40	Guatemala	15.6	16.0	17.3	17.0	15.6

continued

Table 3 continued

Rank	Country	1990	1995	2000	2005	2014
40	Rwanda	30.6	35.1	30.6	24.1	15.6
42	Côte d'Ivoire	16.4	16.6	17.6	16.5	15.7
43	Cambodia	32.9	30.8	28.1	20.8	16.1
44	Nepal	28.4	26.8	25.2	22.2	16.4
44	North Korea	17.9	22.4	22.8	19.3	16.4
44	Tajikistan	-	21.5	22.3	18.8	16.4
47	Kenya	21.5	21.0	20.2	19.5	16.5
47	Swaziland	9.9	12.3	13.5	11.8	16.5
47	Zimbabwe	19.7	22.5	22.0	21.3	16.5
50	Liberia	24.5	28.9	25.1	20.7	16.8
51	Namibia	21.7	22.0	18.4	16.5	16.9
52	Uganda	21.5	22.7	20.2	18.4	17.0
53	Tanzania	23.5	26.8	26.3	20.8	17.3
54	Angola	40.8	38.9	32.3	24.1	17.4
55	India	31.2	26.9	25.5	24.2	17.8
56	Congo, Rep.	22.6	22.7	18.3	18.3	18.1
57	Bangladesh	36.6	34.4	24.0	19.8	19.1
57	Pakistan	26.7	23.3	22.1	21.0	19.1
59	Djibouti	34.1	29.4	28.5	25.6	19.5
60	Burkina Faso	27.0	22.6	26.3	26.5	19.9
61	Lao PDR	34.5	31.4	29.4	25.0	20.1
62	Mozambique	35.2	32.3	28.2	24.8	20.5
63	Niger	36.4	36.1	31.2	26.4	21.1
64	Central African Republic	30.3	30.3	28.1	28.9	21.5
65	Madagascar	25.3	24.9	27.4	25.2	21.9
66	Sierra Leone	31.2	29.0	29.8	29.1	22.5
67	Haiti	33.6	32.9	25.3	27.9	23.0
68	Zambia	24.7	24.0	26.5	24.7	23.2
69	Yemen, Rep.	30.1	27.8	27.8	28.0	23.4
70	Ethiopia	-	42.6	37.4	30.8	24.4
71	Chad	39.7	35.4	30.0	29.8	24.9
72	Sudan/South Sudan*	30.7	25.9	26.7	24.1	26.0
73	Comoros	23.0	26.7	34.0	30.0	29.5
74	Timor-Leste	-	-	-	25.7	29.8
75	Eritrea	-	41.2	40.0	38.8	33.8
76	Burundi	32.0	36.9	38.7	39.0	35.6

Notes: *GHI scores could only be calculated for former Sudan as one entity, because separate undernourishment estimates for 2011–2013 and earlier were not available for South Sudan, which became independent in 2011, and present-day Sudan.

Countries with a 2014 GHI score of less than five are not included in the ranking but are shown in Table 4. Countries that have identical 2014 GHI scores are given the same ranking (for example, Mauritius and Thailand both rank first). The following countries could not be included owing to lack of data: Afghanistan, Bahrain, Bhutan, Democratic Republic of Congo, Georgia, Myanmar, Oman, Papua New Guinea, Qatar, and Somalia.

TABLE 4 Countries with 2014 Global Hunger Index scores of less than 5

Country	1990	1995	2000	2005	2014
Algeria	6.6	7.3	5.1	<5	<5
Argentina	<5	<5	<5	<5	<5
Armenia	-	10.5	9.0	<5	<5
Azerbaijan	-	14.8	12.0	5.2	<5
Belarus	-	<5	<5	<5	<5
Bosnia & Herzegovina	-	<5	<5	<5	<5
Brazil	8.8	7.7	6.5	<5	<5
Bulgaria	<5	<5	<5	<5	<5
Chile	<5	<5	<5	<5	<5
Costa Rica	<5	<5	<5	<5	<5
Croatia	-	5.4	<5	<5	<5
Cuba	<5	8.4	<5	<5	<5
Egypt, Arab Rep.	7.0	6.3	5.3	<5	<5
Estonia	-	<5	<5	<5	<5
Fiji	6.2	5.3	<5	<5	<5
Iran, Islamic Rep.	8.5	7.3	5.8	<5	<5
Jamaica	6.1	<5	<5	<5	<5
Jordan	<5	5.5	<5	<5	<5
Kazakhstan	-	<5	7.8	<5	<5
Kuwait	15.6	5.3	<5	<5	<5
Kyrgyz Republic	-	11.2	9.0	5.4	<5
Latvia	-	<5	<5	<5	<5

Country	1990	1995	2000	2005	2014
Lebanon	<5	<5	<5	<5	<5
Libya	<5	<5	<5	<5	<5
Lithuania	-	<5	<5	<5	<5
Macedonia, FYR	-	5.6	<5	<5	<5
Mexico	5.8	5.6	<5	<5	<5
Montenegro	-	-	-	-	<5
Morocco	7.6	7.1	6.1	6.4	<5
Panama	11.6	10.7	11.8	9.5	<5
Romania	<5	<5	<5	<5	<5
Russian Federation	-	<5	<5	<5	<5
Saudi Arabia	6.6	6.5	<5	<5	<5
Serbia	-	-	-	-	<5
Slovak Republic	-	<5	<5	<5	<5
South Africa	7.5	6.4	7.4	7.8	<5
Trinidad & Tobago	6.7	7.6	6.8	6.7	<5
Tunisia	<5	<5	<5	<5	<5
Turkey	<5	5.0	<5	<5	<5
Turkmenistan	-	10.5	9.1	6.9	<5
Ukraine	-	<5	<5	<5	<5
Uruguay	5.0	<5	<5	<5	<5
Uzbekistan	-	7.7	8.9	6.9	<5
Venezuela, RB	7.5	7.3	6.8	5.8	<5

Food Policy Research Capacity Indicators (FPRCI)

How can we strengthen a country's capacity to conduct food policy research that directs evidence-based policy-making in a way that best achieves agricultural development and food security goals?

To do so we must first understand the elements of the country's current capacity to identify needs and gaps. Our starting point has been the following definition of *food policy research capacity*: any socioeconomic or policy-related research in the areas of food, agriculture, or natural resources. From there we have sought to re-form the various dimensions of capacity into measurable indicators.

Our resulting Food Policy Research Capacity Indicators assess food policy research capacity by first quantifying capacity, and second, by qualifying that capacity. Data collection for the set presented here in Table 5 began in 2010, and we continue to expand the dataset each year and refine our data collection methods. This year's report contains a new set of data for China.

The first indicator is a head count of professionals employed at local organizations whose work involves food policy research or analysis. To introduce some uniformity, we also present a modified quantification of the head count: fulltime equivalent analysts/researchers with PhD equivalent. To obtain an indicator of per capita food policy research capacity, this research capacity is then divided by the country's rural population. This helps to

illustrate the impact of local food policy research in a particular country.

As another indicator, the dataset estimates the quality of a country's food policy research capacity by tallying the number of relevant publications in international, peer-reviewed journals over a five year period using searches in two journal databases: EconLit and Web of Science. We view this as a reflection of the local enabling environment for food policy research. This indicator allows us to compare across countries as it ensures that an internationally accepted standard of quality has been met. This indicator in turn enables donors to prioritize capacity building for research across countries.

This dataset will continue to be updated and expanded to include additional countries in order to better facilitate cross-country comparisons, especially between countries with similar agroecological environments or who anticipate facing similar food security-related challenges as a result of climate change. It will also facilitate an understanding of the minimal food policy research capacity threshold for a country and what the returns to scale are. Additionally, it is hoped that such data will aid in informing national policymakers of the importance of investing in local food policy research capacity. Lastly, this data will, in general, provide donors with a framework for prioritizing investments to strengthen food policy research capacity across countries as well as within countries.

Download data: <http://hdl.handle.net/1902.1/20526>

Contact: Suresh Babu (s.babu@cgjar.org) and Paul Dorosh (p.dorosh@cgjar.org)

TABLE 5 Food policy research capacity indicators, 2013

Country	Analysts/researchers (head count) in 2013	Full-time equivalent analysts/researchers with PhD in 2013	International publications produced from 2009 to 2013	Full-time equivalent analysts/researchers with PhD per million rural population in 2013	Publications by full-time equivalent researchers with PhD, 2009–2013
Afghanistan	43	2.975	3	0.131	1.008
Bangladesh	66	22.9	75	0.217	3.275
Benin	38	4.3	38	0.732	8.837
Burundi	39	5.125	3	0.570	0.585
China*	2,000	1,332.53	1326	2.096	1.005
Colombia	85	6.45	54	0.553	8.372
Ethiopia	141	30.4	52	0.397	1.711
Ghana	153	23.3	79	1.903	3.391
Guatemala	45	11.9	7	1.559	0.588
Honduras	33	6.125	5	1.628	0.816
Indonesia	146	42.375	44	0.355	1.038
Kenya	155	31.6	70	0.947	2.215
Laos	9	1.75	8	0.407	4.571
Liberia	34	3.075	0	1.402	0.000
Madagascar	187	11.525	11	0.760	0.954
Malawi	68	18.175	25	1.321	1.376
Mali	60	10.05	12	1.066	1.194
Mozambique	37	3.325	17	0.188	5.113
Nepal	27	3.65	16	0.160	4.384
Niger	29	8.825	6	0.605	0.680
Nigeria	349	77.4	41	0.827	0.530
Peru	54	7.15	22	1.068	3.077
Rwanda	64	5.5	7	0.639	1.273
Senegal	71	9.3	23	1.156	2.473
South Africa	198	50.325	305	2.623	6.061
Swaziland	32	2.85	2	2.900	0.702
Tanzania	91	20.75	30	0.604	1.446
Togo	81	6.825	9	1.641	1.319
Uganda	34	10.925	35	0.344	3.204
Vietnam	175	32.525	24	0.536	0.738
Zambia	29	5.3	18	0.608	3.396
Zimbabwe	42	8.875	22	0.931	2.479

*Country data newly added for this report. The number of researchers in China will be revised continuously based on a detailed survey to be conducted later this year.

Agricultural Total Factor Productivity (TFP)

What do the acronyms TFP and PFP stand for? Total factor productivity (TFP) is the ratio between total output (crop and livestock products) to total production inputs (land, labor, capital, and materials). An increase in TFP implies that more output is being produced from a constant amount of resources used in the production process. Partial factor productivity (PFP) measures, such as labor and land productivity, are often used to measure agricultural-production performance because they are easy to estimate. These measures of productivity normally show higher rates of growth than TFP because growth in land and labor productivity can result not only from increases in TFP but also from a more intensive use of inputs (such as fertilizer, machinery, and the like).

Table 6 presents estimates of TFP and PFP measures for developing countries for three sub-periods between 1991 and 2012 (1991–2000, 2001–2006, and 2007–2012) using data on outputs and inputs from the Food and Agricultural Organizations of the United Nations (FAO). Two major changes with respect to estimates presented in previous numbers of the International Food Policy Research Institute's *Global Food Policy Report* are introduced here. The first change relates to the dataset used, while the second change is methodological.

Results confirm the strong performance of developing regions during the 2000s, with peak performance occurring between 2001 and 2006. TFP growth in Africa south of the Sahara and Asia has remained strong between 2007 and 2012, while growth in Latin America and the Middle East and North Africa appears to be slowing down to the levels observed in the 1990s.

DATASET

As in previous versions of the TFP estimates, the output values are the FAO-constructed gross agricultural outputs, each of which is a composite of 190 crop and livestock commodities aggregated using a constant set of global average prices from 2004–2006. Inputs (as used in previous estimates and still used here) are agricultural land, measured in hectares of cropland and permanent pasture; labor, measured by the number of economically active persons in agriculture; and fertilizer, measured by tons of fertilizer nutrients used.¹

One of the changes introduced in the dataset is the use of FAO's new series of capital stock that aggregates quantity of physical assets at 2005 constant prices. Capital used in crop production from this series (land developments and equipment, plantation crops, and machinery and equipment) is now included as an input, replacing the more narrow category of machinery used in previous estimates. Similarly, livestock capital (animal stock, livestock structures, and milking machines) is now used instead of animal stock.

The second difference in the dataset is the increase in the number of inputs to include animal feed, measured as the amount of edible commodities (from FAOSTAT food balance sheets) fed to livestock during the reference period. Quantities of the different types of feed are transformed into metric tons of maize equivalents using information regarding energy content for each commodity. This dataset of outputs and inputs was checked and cleaned using different statistical techniques.

Download data: <http://hdl.handle.net/1902.1/20518>
Contact: Alejandro Nin-Pratt (a.ninpratt@cgiar.org)

TABLE 6 Average annual growth of agricultural output and total factor productivity (TFP) and levels of land and labor productivity, various years

Country/region	Land productivity				Labor productivity				Output growth (%)			TFP growth (%)		
	1990	2000	2005	2012	1990	2000	2005	2012	1991–2000	2001–2006	2007–2012	1991–2000	2001–2006	2007–2012
Africa south of the Sahara	82	109	135	179	600	646	735	853	3.1	4.8	4.3	1.7	2.6	2.4
Angola	15	24	39	56	252	314	437	528	5.0	8.9	6.4	3.9	5.5	4.0
Benin	395	511	532	715	820	1180	1248	1509	6.2	0.7	6.4	1.7	0.7	3.1
Botswana	8	8	9	13	1071	722	798	991	-0.8	1.5	6.5	-1.3	3.4	3.1
Burkina Faso	110	147	206	221	281	288	385	359	3.2	8.2	2.3	0.7	4.2	-0.1
Burundi	487	396	428	449	406	327	304	254	-1.4	2.0	-0.3	-0.8	-0.7	-3.5
Cameroon	238	325	423	577	707	856	1089	1565	3.2	5.6	5.2	1.6	4.2	4.6
Central African Republic	108	152	158	198	522	657	680	783	3.7	1.3	2.9	2.2	0.3	1.7
Chad	17	23	30	36	441	460	531	590	2.9	4.3	3.7	0.6	2.3	2.2
Congo	20	26	32	42	465	546	657	833	2.8	4.3	3.8	1.6	3.8	2.9
Congo, DR	172	150	147	158	473	328	288	278	-1.5	-0.3	1.4	-0.5	-0.6	0.4
Côte d'Ivoire	209	289	281	318	1472	1924	1982	2327	3.7	0.7	1.7	2.4	-0.5	1.7
Ethiopia	82	144	194	250	255	219	269	313	1.8	6.7	5.1	1.4	2.8	2.5
Gabon	39	49	49	60	967	1215	1293	1707	2.3	0.4	3.1	0.6	-0.3	2.9
Gambia	132	227	226	214	221	272	228	214	4.9	0.0	1.4	2.5	-2.9	-1.4
Ghana	160	294	352	451	561	885	995	1128	7.7	4.3	4.8	4.8	1.2	2.3
Guinea	73	111	127	153	433	451	508	547	3.8	3.2	3.1	-0.3	-0.1	1.2
Guinea-Bissau	105	130	150	204	450	542	579	721	3.4	2.9	4.8	0.8	2.2	2.6
Kenya	150	168	233	321	513	418	523	643	1.1	6.4	5.2	0.2	4.7	2.1
Liberia	103	153	160	157	452	557	542	428	4.4	-0.9	1.6	-3.3	-1.5	-0.1
Madagascar	69	65	76	89	626	503	490	478	0.4	3.1	2.6	-0.4	1.3	1.1
Malawi	244	410	324	595	304	495	391	645	6.5	2.8	6.6	2.7	0.1	1.4
Mali	46	47	65	93	755	761	969	1212	2.1	6.3	6.8	-1.0	3.1	2.6
Mauritania	9	10	11	13	779	689	672	675	1.5	2.3	2.7	-0.3	0.0	0.3
Mauritius	2144	2437	2655	2825	3174	3907	4635	5441	0.3	0.4	-0.2	-1.0	0.4	-0.5
Mozambique	24	34	40	65	222	230	246	356	3.5	4.3	7.4	0.8	2.9	5.1
Namibia	10	10	12	11	1689	1528	1839	1524	0.4	2.8	-1.7	-2.4	2.6	0.7
Niger	34	46	56	74	497	547	666	722	4.3	7.4	3.9	1.5	3.9	1.8
Nigeria	235	390	471	714	968	1312	1523	2040	5.2	5.5	5.8	3.3	2.2	3.8
Rwanda	590	742	830	1289	392	382	401	541	1.1	4.3	7.8	2.0	-1.2	2.6
Senegal	101	139	141	154	392	415	373	369	3.1	-2.0	5.6	1.6	-3.3	3.9
Sierra Leone	155	117	189	352	405	316	560	869	-2.8	16.8	6.0	-1.8	7.0	2.9
Somalia	33	33	37	42	782	706	721	734	-0.1	2.3	1.9	0.2	1.8	2.0
South Africa	96	111	118	140	5713	7321	8569	12006	1.6	0.5	3.2	1.4	0.7	3.4

Note: Land productivity is agricultural gross production per hectare of agricultural land; labor productivity is agricultural gross production per economically active person in agriculture. Both types of agricultural gross production are measured in constant 2004-2006 US dollars.

continued

Table 6 continued

Country/region	Land productivity				Labor productivity				Output growth (%)			TFP growth (%)		
	1990	2000	2005	2012	1990	2000	2005	2012	1991–2000	2001–2006	2007–2012	1991–2000	2001–2006	2007–2012
Sudan	31	54	79	84	750	1140	1617	1565	6.3	8.3	0.1	3.7	6.0	–2.0
Swaziland	220	204	236	256	1958	1686	2052	2293	–0.9	2.1	1.8	–3.6	1.7	1.0
Tanzania	116	129	175	235	374	324	412	498	1.1	7.3	4.8	0.0	2.2	2.8
Togo	151	176	211	244	529	578	573	702	2.9	1.9	4.5	1.0	1.3	3.5
Uganda	322	395	425	438	578	586	587	534	2.5	2.1	1.8	–0.3	0.1	–0.4
Zambia	36	39	49	75	338	327	390	521	1.6	4.9	7.0	0.4	3.6	4.7
Zimbabwe	121	138	91	99	550	636	464	515	2.8	–4.7	0.8	1.7	–3.5	0.5
Latin America and Caribbean	223	296	349	412	3639	4875	5932	7536	3.2	3.8	2.5	1.9	2.8	1.8
Argentina	192	252	281	268	16822	22171	26889	28806	2.8	3.2	0.4	2.0	2.0	1.0
Bahamas	1656	1776	2056	2312	3974	4618	5345	7139	1.5	3.0	4.4	0.0	2.6	2.9
Barbados	2847	2778	3232	3195	6011	7144	10343	12368	–0.8	–0.8	–0.2	0.1	2.3	0.0
Belize	725	1043	1140	1085	5076	6215	6188	5420	5.5	3.0	–1.3	1.7	3.4	–3.2
Bolivia	48	65	78	99	1417	1541	1642	1793	3.6	4.2	3.1	0.8	1.4	1.5
Brazil	252	341	421	528	4338	6689	9193	13874	3.9	4.8	3.5	2.2	3.6	2.4
Chile	279	411	472	540	4757	6457	7680	8906	3.4	4.1	1.3	2.2	3.0	1.6
Colombia	216	256	302	320	2917	3202	3605	4030	1.6	2.7	0.8	0.6	2.4	–0.7
Costa Rica	713	1248	1399	1610	5352	7044	7680	9614	3.4	3.3	1.5	3.1	3.3	–0.2
Dominican Republic	629	753	894	1211	2584	3464	4351	6765	1.7	4.0	3.6	0.8	2.9	3.2
Ecuador	479	732	824	999	3366	4879	4996	6001	4.6	1.4	2.2	3.5	0.0	1.0
El Salvador	602	680	671	790	1296	1542	1677	2122	1.8	1.5	1.5	0.8	0.9	2.5
Guatemala	470	637	726	1027	1352	1906	1754	2119	3.5	3.9	4.0	1.5	0.8	1.3
Guyana	105	186	185	222	3138	5789	5861	7711	5.8	0.2	2.4	5.9	0.5	1.2
Haiti	582	568	593	579	520	482	463	446	0.3	0.3	0.9	–1.4	–0.6	–0.4
Honduras	355	442	587	702	1753	1766	2725	3449	1.0	5.8	3.7	0.2	2.6	3.2
Jamaica	1031	1118	1120	1271	1785	2158	2285	2707	0.9	0.6	0.3	0.5	0.5	2.1
Mexico	219	279	319	370	2696	3415	3945	4976	2.7	2.7	1.6	1.9	2.3	1.5
Nicaragua	162	203	242	320	1671	2653	3461	4778	4.7	3.5	4.4	1.7	2.6	5.0
Panama	383	373	381	429	3293	3221	3327	3988	0.2	1.2	1.5	–1.6	0.3	0.1
Paraguay	156	143	186	260	4646	4067	4779	6442	0.8	5.5	5.4	–1.0	3.2	3.3
Peru	156	279	321	449	1228	1769	1931	2583	5.7	3.9	4.5	3.0	1.9	3.2
Suriname	1343	1072	1343	1545	4074	3145	3055	3907	–2.2	1.8	3.6	–2.2	4.6	2.1
Trinidad and Tobago	1743	2189	2738	2708	2685	2933	3018	3219	0.9	0.5	–0.6	2.2	1.7	–0.3
Uruguay	147	191	234	305	11840	14498	18090	23763	2.7	4.0	3.2	1.2	2.5	0.9
Venezuela	196	265	274	318	4931	7004	7590	9650	2.9	1.7	1.2	2.3	1.3	–0.1

Country/region	Land productivity				Labor productivity				Output growth (%)			TFP growth (%)		
	1990	2000	2005	2012	1990	2000	2005	2012	1991–2000	2001–2006	2007–2012	1991–2000	2001–2006	2007–2012
Asia	491	707	837	1058	632	909	1053	1388	4.0	3.3	3.4	2.2	2.1	2.3
Afghanistan	54	67	83	96	738	565	592	569	2.0	2.4	3.7	0.4	1.1	0.9
Bangladesh	1073	1631	1895	2006	362	483	540	573	3.2	2.9	0.1	2.0	1.4	-1.6
Bhutan	229	195	268	326	627	611	635	501	-0.1	8.3	0.0	0.1	5.4	1.3
Cambodia	275	397	495	778	390	471	582	866	4.5	7.3	7.4	1.6	3.6	6.2
China	458	729	859	1100	596	1062	1325	2038	5.1	3.2	3.5	3.1	2.5	3.1
India	720	922	1034	1346	620	701	729	878	2.6	2.6	3.5	1.1	1.5	2.0
Indonesia	669	836	971	1163	703	788	970	1298	2.4	5.2	3.7	0.9	3.3	1.1
Korea, DPR	1532	1287	1517	1450	1066	986	1220	1233	-1.6	2.8	-0.8	1.3	1.9	-0.2
Laos	428	632	692	876	478	622	665	863	5.0	3.6	7.0	2.2	-0.2	0.7
Malaysia	1042	1252	1601	1930	3893	5341	7214	9744	2.8	5.0	2.3	1.3	3.3	1.9
Mongolia	7	7	6	8	3812	3973	2785	4035	0.1	-6.2	5.3	3.2	-5.5	1.3
Myanmar	596	975	1361	1700	429	616	854	1133	5.4	8.5	3.9	3.1	5.1	0.4
Nepal	703	916	1055	1392	439	446	434	464	2.9	2.7	4.5	1.6	1.2	2.7
Pakistan	808	1098	1251	1522	1393	1582	1564	1573	3.5	2.5	2.6	1.5	0.4	1.4
Philippines	1149	1400	1629	1801	1180	1262	1432	1621	2.0	3.2	2.5	0.5	2.1	1.6
Sri Lanka	900	992	993	1116	588	645	653	729	1.0	1.4	2.6	0.8	0.9	2.1
Thailand	829	1268	1375	1598	833	1252	1336	1803	3.6	1.8	3.4	2.9	0.3	1.8
Vietnam	1588	2132	2389	2831	471	721	862	1029	5.8	5.0	3.7	1.0	0.7	1.8
Middle East and North Africa	206	232	281	329	2360	2991	3450	4053	2.6	3.4	2.0	1.5	2.5	1.3
Algeria	74	94	131	188	1492	1386	1795	2423	2.9	6.8	5.7	1.9	4.7	3.7
Bahrain	2424	2855	2257	4334	4849	8755	6546	8513	3.1	-0.6	6.1	2.5	-1.2	4.9
Egypt	4179	5234	5635	6474	1704	2717	3019	3621	4.5	3.6	1.9	2.1	2.2	0.9
Iran	217	303	527	554	2653	3303	3991	4124	3.6	4.7	1.4	2.2	4.3	-0.3
Iraq	297	263	310	374	4384	4077	6072	7126	-2.3	5.2	0.3	-0.7	3.9	-1.4
Israel	3504	4122	5199	5679	31214	38248	47767	60535	1.4	2.3	1.8	0.8	2.5	1.4
Jordan	554	741	943	1250	5647	6710	8304	11233	3.2	4.1	3.6	1.5	3.0	3.0
Kuwait	643	971	1159	1973	10072	13068	14492	21158	4.7	4.3	8.4	1.1	1.6	6.3
Lebanon	1762	2082	1861	2028	15447	25804	32848	49850	1.5	-0.1	0.6	0.6	0.0	0.3
Libya	53	66	70	78	6453	9927	12715	18888	2.2	0.9	2.0	2.4	0.4	1.2
Morocco	167	170	224	298	1551	1547	2098	3065	0.3	7.2	2.1	-0.6	7.2	1.3
Oman	167	284	214	213	706	1040	1340	1147	5.4	0.9	2.7	3.0	-2.8	2.8
Qatar	448	708	629	846	3902	11682	7996	6608	5.5	-1.2	4.3	2.5	-0.6	-1.3
Saudi Arabia	20	16	19	21	2501	4128	5389	7698	1.2	3.8	1.0	-0.8	2.7	3.4
Syria	272	408	505	444	3850	5007	5533	4553	4.3	4.7	-3.0	2.1	1.4	-4.7
Tunisia	282	303	353	391	3736	3823	4443	4878	1.7	3.9	1.5	-0.1	2.6	1.0
Turkey	677	785	822	1078	2592	3478	3918	5196	1.7	1.4	2.8	1.4	1.6	3.7
Yemen	33	48	57	82	574	598	621	812	3.8	4.3	4.9	1.5	1.1	2.1

NOTES

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CHAPTER 3

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CHAPTER 9

Africa

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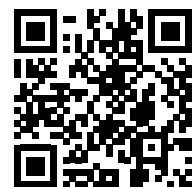
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- ▶ What is the role of improved sanitation in shaping key nutrition outcomes, especially for children?
- ▶ How can we support smallholder farmers in "moving up" in agriculture or "moving out" of the sector altogether?
- ▶ What social protection measures help shield vulnerable people effectively and efficiently against an increasing number of shocks?
- ▶ How can we best build and regulate the capacity of actors along the food chain to tackle food safety and health risks?
- ▶ How should we address food and nutrition security of people living in conflict zones?
- ▶ What policies can support the sustainable development of the aquaculture sector as the global demand for fish skyrockets?
- ▶ What have been the major developments in regions and countries where poor and hungry people reside?

The *2014–2015 Global Food Policy Report* also presents data for several key food policy indicators, including country-level data on hunger, agricultural research spending, and capacity for food policy research. In addition to illustrative figures, tables, and a timeline of food policy events during the past year, the report also presents the results of a global opinion poll on the current state of food policy.

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2033 K Street, NW, Washington, DC 20006-1002 USA

T. +1-202-862-5600 | F. +1-202-467-4439 | ifpri@cgiar.org

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