

Global Hunger

Can the planet feed itself in 2050?

New agricultural technology has enabled global food supplies to outstrip population growth, driving down the number of hungry people around the world from just over 1 billion in 1992 to 842 million today — a 17 percent drop. But food shortages and undernourishment remain huge problems in developing countries. Hunger stems from weather-related disasters such as droughts and floods, as well as from war, poverty, overpopulation, poor farming practices, government corruption, difficulties transporting food to markets, climate change and waste. Hunger is severest in sub-Saharan Africa, where 25 percent of the population is undernourished. Developed countries and humanitarian organizations have become proficient at providing emergency relief and promoting higher-yield, environmentally friendly agricultural practices, but the outlook on global hunger remains murky. Experts expect an expanding global population and growing economic affluence in developing countries to increase the demand for food, even as climate change hampers the planet's ability to feed itself.



American food aid is delivered to a refugee camp in Bossangoa, Central African Republic, on Dec. 19, 2013. Twelve percent of Earth's population doesn't get enough to eat. The problem is severest in sub-Saharan Africa, where one in four goes hungry.

THIS REPORT

INSIDE

THE ISSUES	675
BACKGROUND	681
CHRONOLOGY	683
CURRENT SITUATION	688
AT ISSUE	689
OUTLOOK	690
BIBLIOGRAPHY	694
THE NEXT STEP	695

**CQ Researcher • Aug. 8, 2014 • www.cqresearcher.com
Volume 24, Number 29 • Pages 673-696**

THE ISSUES

- 675 • Are developed countries' agriculture policies making hunger worse?
 • Is climate change making hunger worse?
 • Are genetically modified crops needed to end hunger?

BACKGROUND

- 681 **Early Famines**
 Ancient Egyptian carvings tell tales of mass hunger.
- 682 **Manmade Famine**
 Farm collectivization and war caused millions to starve.
- 682 **Relief Efforts**
 International aid and new technology began targeting hunger.
- 685 **Genetic Engineering**
 Use of corn-based ethanol and genetically modified crops intensified.
- 686 **Unintended Consequences**
 The Green Revolution caused environmental degradation.

CURRENT SITUATION

- 688 **Sustainable Food**
 Recent food aid policies focus on small-scale farming.
- 688 **Feed the Future**
 Obama administration supports small-scale farmers.
- 690 **Reversing Damage**
 Sustainable farming aims to reverse environmental impact.

OUTLOOK

- 690 **Solvable Problem**
 Emerging middle classes may drive up food prices.

SIDEBARS AND GRAPHICS

- 676 **Hunger Concentrated in Sub-Saharan Africa, Southeast Asia**
 More than 35 percent of people in nine countries are undernourished.
- 677 **United States and U.N. Are Largest Food Donors**
 The United States delivered nearly 2.2 million metric tons of food aid to needy countries in 2012.
- 680 **Global Hunger on the Decline**
 Worldwide, hunger has declined 17 percent since 1992.
- 683 **Chronology**
 Key events since 1862.
- 684 **Videographer Farmers Promote Best Practices**
 Locally produced videos have credibility.
- 686 **Freezing Food's Footprint to Save Wildlife**
 "The biggest threat to biodiversity is agricultural sprawl."
- 689 **At Issue:**
 Should hunger programs ban genetically modified food?

FOR FURTHER RESEARCH

- 693 **For More Information**
 Organizations to contact.
- 694 **Bibliography**
 Selected sources used.
- 695 **The Next Step**
 Additional articles.
- 695 **Citing *CQ Researcher***
 Sample bibliography formats.

Aug. 8, 2014
 Volume 24, Number 29

MANAGING EDITOR: Thomas J. Billitteri
 tjb@sagepub.com

ASSISTANT MANAGING EDITORS: Maryann Haggerty, maryann.haggerty@sagepub.com, Kathy Koch, kathy.koch@sagepub.com

SENIOR CONTRIBUTING EDITOR:
 Thomas J. Colin
 tom.colin@sagepub.com

CONTRIBUTING WRITERS: Brian Beary, Marcia Clemmitt, Sarah Glazer, Kenneth Jost, Reed Karaim, Peter Katel, Robert Kiener, Barbara Mantel, Tom Price, Jennifer Weeks

SENIOR PROJECT EDITOR: Olu B. Davis

EDITORIAL ASSISTANT: Ethan McLeod

FACT CHECKERS: Eva P. Dasher, Michelle Harris, Nancie Majkowski

INTERN: Kaya Yurieff



Los Angeles | London | New Delhi
 Singapore | Washington DC

An Imprint of SAGE Publications, Inc.

VICE PRESIDENT AND EDITORIAL DIRECTOR, HIGHER EDUCATION GROUP:

Michele Sordi

EXECUTIVE DIRECTOR, ONLINE LIBRARY AND REFERENCE PUBLISHING:

Todd Baldwin

Copyright © 2014 CQ Press, an Imprint of SAGE Publications, Inc. SAGE reserves all copyright and other rights herein, unless previously specified in writing. No part of this publication may be reproduced electronically or otherwise, without prior written permission. Unauthorized reproduction or transmission of SAGE copyrighted material is a violation of federal law carrying civil fines of up to \$100,000.

CQ Press is a registered trademark of Congressional Quarterly Inc.

CQ Researcher (ISSN 1056-2036) is printed on acid-free paper. Published weekly, except: (March wk. 4) (May wk. 4) (July wk. 1) (Aug. wks. 3, 4) (Nov. wk. 4) and (Dec. wks. 3, 4). Published by SAGE Publications, Inc., 2455 Teller Rd., Thousand Oaks, CA 91320. Annual full-service subscriptions start at \$1,054. For pricing, call 1-800-818-7243. To purchase a *CQ Researcher* report in print or electronic format (PDF), visit www.cqpress.com or call 866-427-7737. Single reports start at \$15. Bulk purchase discounts and electronic-rights licensing are also available. Periodicals postage paid at Thousand Oaks, California, and at additional mailing offices. POSTMASTER: Send address changes to *CQ Researcher*, 2300 N St., N.W., Suite 800, Washington, DC 20037.

Global Hunger

BY TOM PRICE

THE ISSUES

As radical Islamists overran the Iraqi city of Mosul in mid-June, taxi driver Abdel Hady, his wife and their six children began walking north toward the relatively peaceful autonomous region of Kurdistan, sleeping in the homes of generous strangers along the way.

When the Hadys arrived at the Garmava refugee camp three days later, workers were pitching tents and digging latrines to prepare for some of the 300,000 or more Iraqis who had fled combat zones the previous week alone, joining 250,000 Syrians already in Kurdish territory.

More than 2.5 million Syrians have fled that country's bloody civil war to neighboring Kurdistan, Turkey, Jordan and Lebanon, and the Iraqi conflict is expected to produce 1.5 million more refugees, straining local resources and draining the budgets of United Nations (U.N.) relief agencies and humanitarian organizations.¹ Feeding the Syrian refugees alone costs \$38 million to \$40 million a week, dramatically demonstrating how warfare contributes to global hunger.²

But such conflicts represent only a fraction of the food shortages that today leave 842 million people around the world undernourished. That figure is down from just over 1 billion in 1992, due to new agricultural technology that has enabled global food supplies to outstrip population growth. (See *graph*, p. 680.) The number of hungry people worldwide dropped by 26 million — 3 percent — in 2013 alone, according to the U.N. Food and Agriculture Organization (FAO).³ The FAO



AFP/Getty Images/Abdifitah Hashi

A severely malnourished girl convalesces at a hospital in Mogadishu, Somalia, on July 15, 2014. Food is scarce in the country, where civil war has been raging for years. Affluent countries sent some 5 million metric tons of food to the world's hungry in 2012, mostly for emergency relief. The United States donated the most — 44 percent of the total.

defines hunger, or undernourishment, as “not having enough food for an active and healthy life” or not being able to meet “dietary energy requirements.”⁴

Still, 12 percent of the Earth's population does not get enough to eat. Most of the hungry are in the developing world, and 70 percent are small farmers or agricultural laborers who can't grow sufficient food to feed their families or sell to others.⁵ The problem is severest in sub-Saharan Africa, where one in four goes hungry, but that is down from one in three in the early '90s.⁶

Experts worry that over the long term, expanding middle classes in rapidly developing countries such as China and India will raise demand for more expensive foods that overtax the environment, further boosting food prices. And climate change and modern in-

dustrial agricultural practices threaten future agricultural production and the environment in a variety of ways, scientists say.

Currently, hunger kills nearly 3.1 million children under 5 each year — 45 percent of all deaths in that age range. One-sixth of the children in developing countries — 100 million — are underweight.⁷ Hunger also helps to truncate adults' lives. Life expectancy in Africa is 58, for instance, compared with 67 in Southeast Asia, 68 in the Eastern Mediterranean and 79 in the United States.⁸

Paradoxically, the Earth produces more food than its inhabitants need, but the food is unevenly distributed. In the United States and other affluent countries, more people are overweight or obese than hungry — the result of eating too much high-calorie food and getting insufficient exercise.

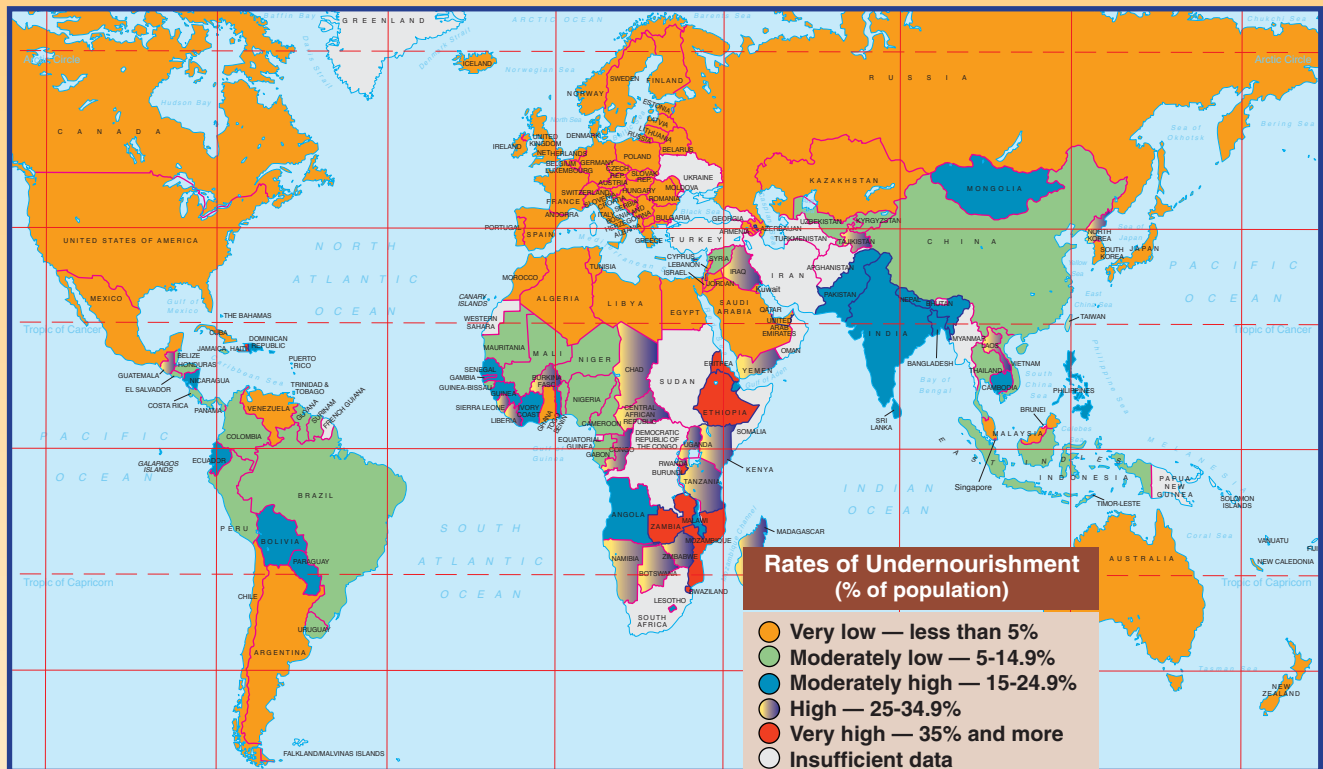
Obesity also is growing in rapidly developing countries such as China, where childhood obesity rose from 1.5 percent of the child population in 1989 to 6.9 percent of boys and 2.8 percent of girls last year.⁹

“One billion people in the world don't have enough food, while one billion people eat too much,” said World Wildlife Fund Senior Vice President Jason Clay.¹⁰

Experts say hunger has a number of causes, including war, poverty, population growth, poor farming practices, government corruption, ineffective food distribution, inclement weather, climate change and waste. “Short-term hunger usually is due to natural disaster or war,” says Christopher Barrett, director of the School of Applied Economics and Management at Cornell University, who researches hunger and

Hunger Concentrated in Sub-Saharan Africa, Southeast Asia

Seven African countries, Timor Leste in Southeast Asia and Haiti in the Caribbean have the world's highest concentrations of hunger, or daily undernourishment.* Twenty-one other countries — including 14 African nations, Iraq, North Korea and Guatemala — have “high” rates of undernourishment, with 25 percent to 35 percent of their population classified as hungry.



* Undernourishment is defined as not having enough calories (energy) to meet minimum physiological needs for an active life. It is a less visible form of hunger than starvation, which the World Food Programme calls acute hunger.

Source: “Hunger Map 2013,” World Food Programme, United Nations, <http://tinyurl.com/plddrmr>

poverty. “Chronic hunger is related to chronic poverty.”

Due to inadequate technology and resources, for instance, Africa’s agricultural productivity is less than half the world average and is rising at half the rate of the continent’s population growth.¹¹

Some anti-hunger activists say affluent nations also add to the world hunger problem. Government subsidies to growers in wealthy nations can depress world commodity prices, they say, reducing the earnings of small-scale farmers in developing nations. Promoting plant-based biofuel also drives up world food prices, making it more expensive for

the poor. Consuming meat- and dairy-rich diets increases the cost of food by diverting food and land to feeding and raising animals. In addition, critics say certain aspects of the donor countries’ aid policies exacerbate hunger, such as a U.S. provision requiring food aid to be shipped on U.S.-flagged vessels, which are often more expensive than other ships.

About a third of the world’s food is wasted, the FAO estimates.¹² “In the undeveloped world, the waste happens before the food gets to people,” said North Dakota farmer Roger Johnson, president of the National Farmers Union.

“The food rots” because of lack of roads and proper storage facilities. In the developed world, he said, waste is due to “the staggering amount of food that’s thrown out after it gets to our plates.”

Food production and distribution are hampered in many countries by prolonged conflict and political instability, such as in Nepal, incomplete land reform, as in Tajikistan, and population growth and extreme poverty in countries like Uganda, according to the FAO.¹³ Erratic rainfall and more frequent droughts have exacerbated hunger in the Sahel, the arid region just south of the Sahara Desert where

20 million people have inconsistent access to food and 5 million children face acute malnutrition, according to the U.S. Agency for International Development (USAID).¹⁴

Countries that are winning the war against hunger have governments that are consistently committed to “long-term rural development and poverty reducing plans,” says the FAO. For instance, in Bangladesh, Ghana and Nicaragua, hunger has been cut in half in the last two decades through economic growth and freer trade, the agency said. Ghana and Nicaragua also have enjoyed political stability and high world prices for their exports.¹⁵

Speaking to a gathering of African diplomats in 2010, Johnnie Carson, then U.S. assistant secretary of State for African affairs, said that “our ability to achieve our shared long-term goals of democracy, stability and prosperity on the continent depends entirely on the integrity and effectiveness of African leadership.”¹⁶

Most food aid responds to emergencies, rather than chronic hunger. Affluent countries sent just over 5 million metric tons of food to the hungry in 2012, 70 percent of which was for emergency relief. The biggest donor, the United States, contributed 2.2 million tons — 44 percent of the total, and more than four times as much as the next-biggest donor, Japan, which gave 407,000 tons.¹⁷ (See graphic, above.)

The United States will spend about \$3.5 billion on international food aid and agricultural development programs this year. The Food for Peace program receives almost \$1.5 billion of that, used primarily to buy U.S. farmers’ commodities, which are shipped abroad as emergency relief. Another \$600 million provides cash for such emergency relief activities as giving food vouchers to individuals and purchasing food near where it is consumed.

The Obama administration’s Feed the Future initiative — which supports development programs led by farmers and

United States and U.N. Are Largest Food Donors

The United States delivered nearly 2.2 million metric tons of food aid in 2012, more than twice the combined amount of the next three largest donors — Japan, Brazil and Canada. The United Nations and European Commission, the largest international government organizations, together provided more than 700,000 metric tons.

Largest Food Donors, Countries, 2012		Largest Food Donors, International Organizations, 2012	
Country	Total Food Aid (in metric tons)	Type of Organization	Total Food Aid (in metric tons)
United States	2,195,285	United Nations	565,796
Japan	406,585	European Commission	137,002
Brazil	334,294	Others	86,192
Canada	293,293	International Government	60,075
China	243,381	Nongovernmental	40,443
Germany	168,486	Private	28,003
Australia	72,817		
Russia	61,606		
United Kingdom	59,876		
Sweden	47,343		

Source: “Table 6, Food Aid Deliveries in 2012 by Donor and Category (Mt — Cereals In Grain Equivalent),” Food Aid Flows 2012 Report Annex Tables, World Food Programme, United Nations, p. 16, <http://tinyurl.com/llklkap>

local, regional and national governments in the developing world — gets about \$1.1 billion. The rest supports child and school feeding activities, increased agricultural productivity and expanded trade in agricultural products.

Almost all of the U.S. emergency relief is distributed by the U.N.’s World Food Programme; non-emergency relief is supplied by nongovernmental organizations. A small amount is distributed directly by the United States, such as when the military responds to natural disasters.¹⁸

Back at the Garmava refugee camp, a Mosul police officer named Taha and his wife Shahla (who declined to give their last names to a reporter) faced a key danger posed by inadequate nutrition: Shahla was about to give birth.¹⁹ “The people who are especially vulnerable to hunger are those in the first 1,000 days — from the beginning of pregnancy to age 2,” says Richard Leach, president and

CEO of the World Food Program USA, an independent nonprofit that supports the U.N.’s World Food Programme through fundraising and advocacy in the United States. If mothers and children don’t receive adequate nutrition then, he says, the children “won’t develop intellectually or physically to the degree that they could have.”

Maternal undernourishment followed by inadequate childhood nutrition causes stunting — abnormally short growth. Stunting affected 160 million children in the developing world — 28 percent — in 2011, down from 45 percent in 1990.²⁰

Children’s health is affected by the quality of the food they eat as well as the quantity. Not consuming enough Vitamin A impairs growth, increases vulnerability to infection and is the leading cause of childhood blindness. Iron deficiency impedes children’s intellectual development and women’s chances of successful pregnancy.²¹

As government officials, relief workers, advocates and scholars debate the best ways to attack hunger, here are some of the questions they are addressing:

Are developed countries' aid policies making hunger worse?

Anti-hunger activists cheered when Congress in 2012 adopted a modest reform to U.S. international food-aid programs by lowering a requirement that 75 percent of food be shipped on U.S.-flagged vessels. By this spring, the cheers had morphed into complaints, as the House moved to repeal the reform.

That legislation — which cleared the House April 1 and awaits Senate consideration — illustrates activists' contention that developed countries' aid policies and lifestyles make hunger worse or lessen the effectiveness of food-aid programs.²²

The critics especially cite U.S. aid policies that rely heavily on purchasing food from American farmers rather than using cash to acquire food near where it will be consumed. Most of the purchased food is given to the hungry, usually through the World Food Programme. But in some cases, commodities may be “monetized” — or sold on the market and the proceeds used for developmental activities. Because of the cost of purchasing commodities in the United States and shipping them overseas, critics say it would be more efficient in both cases to buy food near where it's consumed and to allocate cash to pay for development programs.

Even the 2012 shipping change had fallen far short of activists' desires. It still required that half of U.S. food aid be transported on the more-expensive U.S.-flagged ships, costing \$75 million more per year than if the shipping were open to global competition, according to Cornell's Barrett and Erin C. Lentz, assistant professor of international relations at Bucknell University.²³

Authors of the House legislation repealing the change — Reps. Duncan Hunter, R-Calif., and Elijah Cummings,

D-Md. — said requiring the food to be transported on U.S. ships supports a Merchant Marine that is “essential to sustaining our military.”²⁴ But the Defense and Transportation departments told the House Foreign Affairs Committee that the preference is unnecessary.²⁵

The requirement “forces a huge premium price on ocean shipping and generates windfall profits for a handful of shipping lines, most [of them] foreign owned” despite being U.S.-flagged, says Barrett, who has studied the matter in depth. Even without the shipping markup, locally bought food is often faster and cheaper to deliver, he says.

“For the same [aid] budget,” says agricultural economics professor Michael Carter, “we can save millions more people.” Carter, of the University of California-Davis, directs a research consortium funded by USAID.

But several nonprofits and companies that grow, process and ship the food defend existing commodities programs. In a letter to Congress during last year's debate on reauthorization of a major farm bill, several of them wrote: “Growing, manufacturing, bagging, shipping and transporting nutritious U.S. food creates jobs and economic activity here at home, provides support for our U.S. Merchant Marine, essential to our national defense sealift capability, and sustains a robust domestic constituency for these programs not easily replicated in alternative foreign aid programs.”²⁶

Rep. Jeff Duncan, R-S.C., asked: “How is wiring cash to someone in a developing country a good idea instead of giving them wholesome, nutritious commodities grown by hard-working Americans.”²⁷

As for the criticisms of monetization programs, a 2012 study commissioned by the Alliance for Global Food Security — a coalition of 14 relief and development organizations, some of which engage in monetization — found that properly managed monetization transactions can avoid pitfalls while providing benefits that cash-only support cannot.

Informa Economics — a Memphis-headquartered firm that conducts agriculture-related research — analyzed five monetization programs and found that they were designed not to compete with local production or disrupt commercial trade. Although the sales were made at fair-market value, the study concluded, the programs were able to offer the recipient countries other benefits, such as flexible payment terms. As a result, some recipients were able to make the purchases despite volatile exchange rates and avoid higher shipping costs associated with low-volume sales, the researchers said.²⁸

The key is using “the right tool at the appropriate place,” says Leach, of the World Food Program USA. “There are countries like Sudan that do not have access to food” and need to have it shipped in. “In Syria, it's much better to buy food regionally,” because it's difficult to move commodities through a combat zone.

Shipping U.S. commodities also can make sense when responding to a nearby disaster in the Americas, Barrett says. And when the need is for foods fortified with vitamins and minerals, “you can start to enjoy the efficiency of modern American food processing.”

Aside from advanced nations' aid policies, their agricultural subsidies, bio-fuel mandates and eating habits also can aggravate hunger, critics say.

Farm subsidy programs “tend to reduce worldwide commodity prices, hurting farmers in the developing world,” said Daniel Sumner, an agricultural economics professor at the University of California-Davis and director of the University of California Agricultural Issues Center.²⁹

Supporters of farm subsidies say they help stabilize U.S. agriculture production. Critics should “feel lucky we don't have runs on grocery stores,” said Rep. Tim Walz, D-Minn.³⁰

And donating U.S.-grown commodities — or selling them at below-market prices — can also depress local crop prices, says Robert Rector, a senior research fellow at the Heritage Founda-

tion, a conservative think tank in Washington. “You have to be careful not to undermine domestic production,” Recor says. “Cheap and free food takes away from the [local] market, particularly if you’re doing it consistently.”

Critics say subsidies and mandates promoting biofuels such as corn-based ethanol — designed to reduce greenhouse gas emissions and lower American and European dependence on foreign oil — raise food prices and divert food to fuel production. Action Against Hunger, an international relief and development organization, said the amount of U.S. corn being converted into biofuels could feed 570 million people a year.³¹

Converting food to fuel “poses risks to ecosystems and biodiversity,” said the U.N. Intergovernmental Panel on Climate Change, which previously supported biofuel production.³²

Oxfam, an international relief and advocacy organization, has called for Europe and the United States to end their biofuel mandates and subsidies, which are projected to total between \$9.2 billion and \$11.5 billion in Europe in 2015, says Damon Vis-Dunbar, project and communications manager for the International Institute for Sustainable Development, a Canadian-based research organization with offices in the United States, Europe and China. The United States, which offered \$6.6 billion in subsidies in 2010, cut them to around \$1 billion in 2012.³³

To meet Europe’s biofuel demand, companies are planting land in developing countries that would be better used feeding the poor who live nearby, Oxfam said.³⁴

Biofuels corporate executive Paul Beckwith argued that the ethanol mandate has stimulated important investment that has put the United States ahead of the world in getting “new advanced renewable energy into commercialization.” Beckwith is CEO of Butamax Advanced Biofuels, a joint venture of BP and DuPont that develops biofuel manufacturing technology.³⁵

The affluent world’s appetite also taxes the environment and threatens the developing world’s access to sufficient food, critics say. For instance, raising animals for consumption is far less efficient than using land to grow food plants — and that much-coveted steak is the least efficient of all.

Every 100 calories of grain fed to an animal produces only about 40 new calories of milk, 22 calories of eggs, 12 of chicken, 10 of pork or three of beef, according to Jonathan Foley, who is leaving his position as director of the University of Minnesota’s Institute on the Environment on Aug. 15 to become executive director of the California Academy of Sciences.³⁶ By another reckoning, it takes about a pound of feed to produce a pound of farmed fish, but seven to make a pound of beef.³⁷

Despite the relative efficiency of farmed fish, affluent diners’ desire for wild-caught seafood — along with pollution and global warming — is depleting wild fish populations, which in turn threatens the livelihoods of poor fishermen who compete with sophisticated fleets from developed countries.

The International Programme on the State of the Ocean at Oxford University has declared the planet “at high risk of entering a phase of extinction of marine species unprecedented in human history.”³⁸ For instance, overfishing — both legal and illegal — threatens the scalloped hammerhead shark, used in shark fin soup, a delicacy in many Asian countries.³⁹

Is climate change making hunger worse?

Oxfam has called climate change “the single biggest threat to fighting hunger.”⁴⁰

Scientists have issued dire warnings about the threat global warming poses to humanity’s ability to feed itself in the future, and they cite damage that’s already occurring. The World Food Programme says climate change could wipe out two-thirds of Africa’s arable land by

2025, boost food prices by 50 to 90 percent by 2030 and raise the risk of hunger by 10 to 20 percent by 2050.⁴¹

But when it comes to climate change, agriculture is both a victim and a villain. Farming is a major source of greenhouse gases — including methane, carbon dioxide and nitrous oxide — which scientists say are warming the planet. Agriculture emits more greenhouse gases than all forms of transportation combined. Fuel-burning farm machinery emits carbon dioxide. Cattle release large amounts of methane, fertilizer emits nitrous oxide and soil releases carbon dioxide (CO₂) when cultivated.⁴²

Some say a warming planet and more atmospheric CO₂ will reduce hunger by improving agricultural productivity. “Plants love warmth and sunshine,” says Dennis Avery, a senior fellow at the conservative Heartland and Hudson institutes and director of Hudson’s Center for Global Food Issues. “Both animals and vegetation have a much greater tolerance for temperature changes than the [widely used scientific] models would have us believe.”

Describing CO₂ as “like fertilizer for plants,” which breathe it in like animals breathe oxygen, Avery says doubling atmospheric CO₂ concentrations would increase crop yields by about 35 percent.

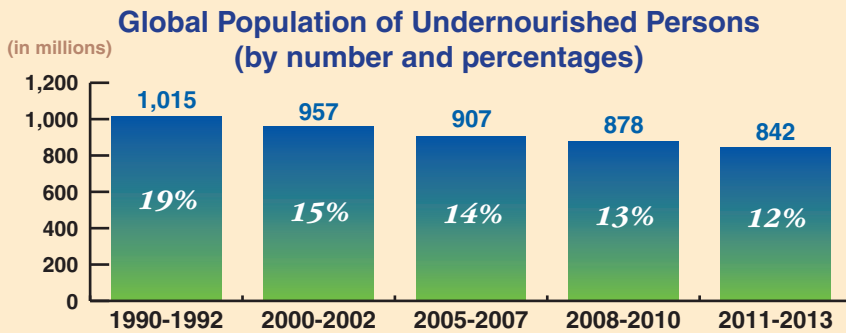
Similarly, Andrei Illarionov, a senior fellow at the libertarian Cato Institute, points out that in warmer places “there is usually more precipitation than in drier areas, the cost of heating and volume of food required to sustain human life [are] lower, while vegetation and [ice-free] navigation periods are longer, and crops’ yields are higher.”⁴³

Arguing that the Earth simply is in the warm period of a routine climate cycle, Avery says the greater threat to food production will occur during the next Ice Age.

Other climate-change skeptics contend that proposed responses to global warming, such as switching to biofuels production, can threaten food supplies.

Global Hunger on the Decline

The number of undernourished people worldwide fell from more than 1 billion in 1992, one-fifth of the global population, to 842 million in 2013, or 12 percent.



Source: "Hunger Portal," U.N. Food and Agriculture Organization, undated, <http://tinyurl.com/yz2bcrb>

Scientists agree that CO₂ by itself could increase plant yields, but most say the damage to food done by greenhouse gases will outweigh the benefits. For instance, two recent studies found that higher CO₂ levels diminish plants' nutritional value and resistance to pests.⁴⁴

More broadly, scientists warn that rising temperatures, more drought, and more violent weather will lead to diminished agricultural yields, particularly in warmer regions where many of the poor live.

This past May was the hottest on record, according to the National Oceanic and Atmospheric Administration (NOAA).⁴⁵ The first decade of this century was the hottest in recorded history, and temperatures are even higher so far this decade, according to the University Corporation for Atmospheric Research, a consortium based in Boulder, Colo., that manages the National Center for Atmospheric Research.⁴⁶

Already, according to the American Association for the Advancement of Science (AAAS), heat waves and extreme storms are becoming worse and more frequent. The Greenland and Antarctic ice sheets are melting more rapidly. The oceans are absorbing growing amounts of carbon dioxide, which makes them

more acidic and degrades coral reefs where millions of marine species live.⁴⁷

Meanwhile deserts are expanding. The growing Sahara Desert has been destroying crops and leaving farmers in West Africa without food.⁴⁸ To escape rising temperatures, plants and animals are migrating toward the poles, up mountainsides and deeper into the sea. Droughts this year devastated crops in Brazil's southeast and in California, which grows nearly half of America's fruits, vegetables and nuts.⁴⁹ Global wheat and corn productivity is declining.⁵⁰

"We're facing the specter of reduced yields in some of the key crops that feed humanity," said Rajendra Pachauri, chairman of the U.N.'s climate change panel. The panel's report warned that altered ocean chemistry could cause fish extinctions, and changes in climate could threaten apple orchards in Washington, cherry orchards in California and coffee crops in Central and South America, often tended by subsistence farmers who depend on their coffee crops for survival.⁵¹

Are genetically modified crops needed to end hunger?

A group of farmers and activists this spring protested at the office of Philippine Agriculture Secretary Proceso Al-

cala, calling on him to block tests of so-called "golden rice," a genetically modified grain designed to combat vitamin A deficiency in the developing world. Last year, about 400 protesters tore down fences surrounding a golden rice test field and ripped the plants from the ground.

"There are not enough studies to ensure the safety of golden rice to humans," Chito Medina, national coordinator of the Filipino activist group known by its acronym MASIPAG, said in explaining the protests. "To plant the genetically engineered rice, or the golden rice, is a real threat to the environment," he said.⁵²

The Philippine protesters represent just one of numerous campaigns worldwide opposing genetically modified organisms (GMOs). Scientists make genetically modified (GM) plants and animals by adding genes that introduce specific traits — such as pest resistance — to the organism. Opponents fear GMO plants could harm humans, animals or the environment. They paint GMOs as part of a plot by Western agribusiness to control farming in the developing world.

So far, their actions have produced mixed results: GMOs are common in the United States, rare in Europe and subject to heated debate in the developing world.

Golden rice was created in 1999 by Ingo Potrykus of the Swiss Federal Institute of Technology and Peter Beyer of the University of Freiburg in Germany. They inserted genes from a daffodil and a bacterium into rice to enable it to generate beta-carotene, which the human body converts into vitamin A. Later, beta-carotene production was boosted by replacing the daffodil gene with one from corn.

The Philippines-based nonprofit International Rice Research Institute, which is developing the rice, said field trials there met beta-carotene goals but produced a lower yield than varieties currently in use. The institute is continuing research focused on yield.⁵³

Proponents say GM foods are safe and essential to ease hunger and meet the demands of a growing world population, particularly as developing countries' become more affluent and demand more and higher-quality food. GM crops, they say, increase yields, survive with less fertilizer and pesticides and can be more nutritious. Scientists are working on drought-tolerant corn, sweet potatoes with high beta-carotene content, bacteria-resistant bananas, cassava varieties that resist viruses and contain added beta-carotene and other nutrients, and corn that requires less fertilizer.

GM plants grow on more than half of U.S. farmland, represent nearly all of America's soybeans and 70 percent of its corn and are common in Canada.⁵⁴ However, European countries effectively ban GMOs, with some exceptions. Some GMO animal feed can be imported, for example, and Spain, Portugal, the Czech Republic, Romania and Slovakia grow some genetically modified crops.⁵⁵

More than half the acreage planted in GM crops last year was in developing countries, 87 percent of that in Brazil, Argentina, India, China and South Africa. Only three other African countries — Sudan, Egypt and Burkina Faso — grow GM crops, partly due to fear among farmers in other African countries that GM crops can't be sold in Europe.⁵⁶

Some countries refuse to accept GMOs as food aid, says Steve Taravella, the World Food Programme's senior spokesman in the United States. And some donor nations prohibit their aid money from being used to purchase GM food, Taravella adds.

Richard Roberts — a Nobel laureate for genetic research and chief scientific officer for a company that makes genetic-research supplies — called opposition to GM crops a "crime against humanity," because the foods are needed to feed the hungry.⁵⁷

Michael Purugganan, a professor of genomics and biology and dean for science at New York University, lament-

ed the "misinformation" circulated by GM opponents. "The genes they inserted to make the vitamin [in golden rice] are not some weird manufactured material but are also found in squash, carrots and melons," he said.⁵⁸

The AAAS has noted that the World Health Organization, the American Medical Association, the U.S. National Academy of Sciences, the British Royal Society and "every other respected organization that has examined the evidence" has concluded that eating GM plants is no riskier than eating plants bred with traditional farming technology.⁵⁹

Opponents, however, contend that there are better ways to feed the hungry. "Most GMOs are not used to solve hunger" but to increase the profitability of industrial farming, says Greenpeace USA researcher Mark Floegel. "We have [other] technologies that subsistence farmers could use to make their lives better."

Paul Johnston and Dave Santillo, scientists in Greenpeace International's Science Unit, argued that history proves the need for caution in using GMOs. Citing the ill effects of "one-time 'wonder chemicals,' such as PCBs and many pesticides," they contended that "new problems continue to emerge from chemicals put into widespread use without the drawbacks having been fully investigated." Thus, they said, "If you are in doubt about the consequences of what you intend to do, then don't do it."⁶⁰

Others take a more nuanced approach. GMO technology can be used "for good or bad," says Walter Willett, chair of Harvard University's Department of Nutrition. GMOs used in the United States probably don't pose health threats, he says, but they also probably don't produce a significantly higher yield. Noting the need to increase global food production, he adds, "I wouldn't take them off the table."

Oxfam is "agnostic about GMOs," says Gawain Kripke, Oxfam America's policy director. Most GM products brought to market so far primarily ben-

efit industrial farming, he notes, but he finds attempts to enrich plants' nutrients "pretty interesting."

Similarly, World Food Program USA's Leach says, "We will accept food from a country if that country would use that food to feed its own population, and we will take that food into any country that will accept it."

Farmers in Burkina Faso in West Africa have found that GM cotton "cuts pesticide and labor costs," the University of California's Carter says. That shows that "small-scale farmers can potentially make good use of at least some of these technologies," he adds.

However, in the United States insects have developed resistance to GM cotton, which initially allowed farmers to use less pesticide. So pesticide use is rising, according to Charles Benbrook, research professor at Washington State University's Center for Sustaining Agriculture and Natural Resources. Similarly, corn engineered to tolerate Monsanto's Roundup herbicide requires increasing amounts of the product to kill weeds that have developed resistance, he said.⁶¹ ■

BACKGROUND

Early Famines

History records serious famine in every part of the world. Egyptian stone carvers chronicled lengthy droughts and famines in the third millennium B.C. They also portrayed the first recorded hunger-relief efforts — by the Egyptian upper class.

In *Famine: A Short History*, Irish economist Cormac Ó Gráda identifies multiple causes of hunger, including too much or too little rain, extreme temperatures, conflict, overpopulation, poverty, ideology and autocratic governments. Often the causes converged, as when conflict coincided with poor harvests, or drought

struck an impoverished community. Famine most frequently hit the poor and seldom occurred in democracies.

The Old Testament book of Nehemiah, likely written in the fifth century B.C., describes overpopulation compelling the poor to sell their children because there was not enough food. The Punic Wars triggered famine in Rome in the first century B.C. Heavy rains and low temperatures brought famine to Europe in the early 14th century A.D. Authoritarian communist government policies turned poor harvests into mass starvation in the Soviet Union and China in the 20th century and continue to do so in North Korea.⁶²

Ó Gráda, an economics professor at University College Dublin, chronicles famines throughout history, including in Turkey (499-501), Bengal (1176), Japan (1229-32), Mexico (1454), Africa (often) and, of course, in Ireland, during the potato famine in the 1840s and '50s, one of the best known.⁶³

Potato blight struck Ireland's potatoes — the primary sustenance of half the population — in 1845. The fungus-like micro-organism, carried to Ireland from Mexico, devastated the crop and led to the deaths of more than 750,000 Irish over the next decade. Two million people fled to England, Canada or the United States.⁶⁴ During the latter part of the century, 50 million people died in famines in India, China, Korea, Brazil, Russia, Ethiopia and Sudan.⁶⁵

Ireland's Great Hunger marked the beginning of the end of peacetime famine in Europe, except for Russia. The last natural famine in Western Europe was in Finland in 1867-68.⁶⁶

Previously, societies had responded to hunger with personal and religious philanthropy. Some governments imposed price controls, distributed food and subsidized migration to places without food shortages. In the 19th and 20th centuries nongovernment relief organizations emerged, as did major advances in agricultural technology.⁶⁷

In the United States, the 1862 Mor-

rill Act funded state colleges and universities focused on agriculture and mechanical arts. The U.S. government also established the Cooperative State Research, Education and Extension Service to disseminate agricultural research findings.⁶⁸ In 1883, the Department of Agriculture began research on boosting agricultural production.⁶⁹ And, in 1905, German chemist Fritz Haber enabled a gigantic leap in agricultural yield by extracting nitrogen from air, which permitted the manufacture of nitrogen-based synthetic fertilizer.⁷⁰

Advances in transportation, storage, medicine and the understanding of nutrition as well as the spread of democracy also helped end peacetime famine in developed countries. In the developing world, hunger was lessened and dealt with more quickly because of the growth of relief organizations, creation of inexpensive nutrient-dense foods that could be stored and transported easily and the expansion of communication technology that enabled news of food emergencies to spread rapidly.

Residents of affluent countries were eating more, including more expensive food. Per capita annual meat consumption in Germany, for instance, rose from less than 44 pounds before 1820 to almost 115 pounds by the early 20th century. In 1800 a typical European consumed 2,000 calories a day, which rose to 3,000 calories by the early 20th century.

In the mid-20th century, nearly 60 percent of the world's population lived in countries with an average daily diet of less than 2,200 calories. By the mid-'80s, only 10 percent did.⁷¹

Manmade Famine

Some of the most notorious 20th-century famines were substantially caused by humans.

In 1932-33, for instance, an estimated 6 million to 8 million people died — many of starvation — during Russian dictator Josef Stalin's violent push to col-

lectivize agriculture and turn the Soviet Union into an industrial power. Beginning in 1929, small peasant farms were forced into collectives of up to 247,000 acres. Many peasants resisted, and the government cracked down brutally. As farm production fell by 40 percent, the state seized and exported grain to raise funds for industrial equipment, leaving peasants without enough to eat.⁷²

Mao Tse-tung pressed the same disastrous policies on Communist China 25 years later. Between 1958 and 1962, 36 million starved to death.⁷³

In the late 1960s, between 500,000 and 2 million people — many of them children — died of starvation during civil war in Nigeria. Warfare disrupted food supplies, and the Nigerian government blocked relief shipments into the breakaway region of Biafra.⁷⁴

In the early 1980s, several factors converged to create severe famine in Ethiopia. The country was struggling to recover from drought-caused famine in the 1970s when another drought hit. Poor farming techniques worsened the effects, leading to deforestation, soil erosion and expanding deserts. Civil war — between Ethiopia's Marxist dictatorship and rebels in the north — compounded the suffering.

The government tried to keep news of the starvation from the world. But after the BBC televised images of the devastation, relief supplies flowed into the country. The government then blocked shipments to rebel-controlled areas, and diverted food from starving Ethiopians to the army. An estimated 1 million people died in 1984-85.⁷⁵

Relief Efforts

The United States led relief efforts in Ethiopia, just as it had around the world since early in the century, especially after World War II.⁷⁶ The United Nations, created after that war, also facilitated international relief programs.

Continued on p. 684

Chronology

1845-1984 *As technology and anti-hunger organizations fight famine, wars and other human actions become leading causes of hunger.*

1845

Potato blight causes Irish famine that kills 750,000 and sends millions of refugees to England, Canada and United States.

1862

U.S. government begins to support agricultural research and education.

1868

End of Finnish famine marks last in heart of Europe.

1905

German chemist Fritz Haber “fixes” nitrogen from air, enabling manufacture of modern fertilizer.

1929

Soviet Union begins forcing farmers into collectives while pushing industrial development, leading to collapse of agricultural production and 6 to 8 million deaths, many from starvation.

1944

American biologist Norman Borlaug begins research that leads to “Green Revolution” of high-yield farming.

1945

U.N. establishes Food and Agriculture Organization (FAO).

1953

American biochemist James Watson and British biophysicist Francis Crick describe the structure of DNA, enabling eventual creation of genetically modified organisms.

1954

Congress authorizes purchase of sur-

plus commodities for resale at low prices overseas to feed the hungry.

1958

Communist China copies Soviet Union’s collectivism/industrialization efforts; 36 million starve.

1961

U.N. creates World Food Programme to distribute food to the hungry.

1967

Secessionist war in Nigeria’s Biafra state leads to 500,000 to 2 million starvation deaths.

1973

Scientists create first genetically engineered organism; World Bank begins to address hunger.

1984

Drought, poor farming practices and civil war cause famine that kills 1 million Ethiopians.

1994-2014 *New agricultural technologies incite controversy; anti-hunger organizations focus on sustainability.*

1994

Food and Drug Administration approves sale of genetically modified (GM) food.

2000

Genes from genetically engineered StarLink corn, approved only for animal feed, are found in taco shells after farmers sell the corn for human consumption.

2002

GM crops in United States produce 4 billion pounds more food and fiber with less pesticide per acre than conventional plants, raise

farm income by \$1.5 billion.

2006

To help protect wildlife habitat, World Wildlife Fund works with food companies to promote efficient farming practices.

2007

Overuse of Green Revolution techniques in India have made Punjab state’s agriculture “unsustainable and non-profitable,” according to local officials. World Food Programme, with support from the Bill & Melinda Gates and Howard Buffett foundations, begins teaching better agricultural practices to poor farmers and buying their crops for use in relief deliveries.

2009

Obama administration launches Feed the Future program that seeks leadership from developing countries and taps private-sector expertise of nonprofit and profit-making organizations to promote agricultural development.

2011

Study finds high-tech sensors can increase crop yields while reducing fuel consumption and fertilizer and pesticide overuse.

2012

Farmers raise more fish than beef for the first time.

2013

FAO counts 842 million hungry people worldwide — 26 million fewer than in 2012.

2014

Climate-change threat to food production underscored by University Corporation for Atmospheric Research report that this decade is on track to being hottest ever recorded.

Videographer Farmers Promote Best Practices

Locally produced videos have credibility.

The scene — played out thousands of times across rural India — led one journalist to liken poor farmers to the late Indian filmmaker Satyajit Ray.¹

After a crash course in filmmaking, farmers set up tripods and use small, battery-powered, digital cameras to record interviews with fellow farmers about their best agricultural practices. They then edit their work to eight- to 10-minute presentations.

Finally, with a tiny, battery-powered projector and perhaps a sheet stretched between trees, they show the videos to other indigenous farmers at bus stops, temples, schools, street corners or local government offices — anywhere they find farmers with time on their hands and an interest in learning how to grow more food at less cost in environmentally friendly ways. Sometimes government workers attend the meetings and distribute materials needed to implement the suggested practices.²

The program is organized and supported by Digital Green, the brainchild of Indian-American Rikin Gandhi, who got the idea about a decade ago while researching technology for emerging markets at Microsoft Research India.

Traditional government agricultural extension programs, provided via broadcast or print media, don't reach many small-scale farmers, many of whom are illiterate. So Gandhi decided to combine the high technology of making videos with low-tech means of distributing them to far-flung rural communities. The equipment is small enough to fit into a backpack for transport by bicycle or on foot.³

Gandhi figured farmers would be more likely to listen to their peers. So, while the information comes from experts, farmers tell about their own experiences using the new technologies. Having locals produce the videos adds to the films' cred-

ibility, Gandhi said, and enables the films to be shot in the local languages.

"Farmers listen to farmers," says Jason Clay, senior vice president at the World Wildlife Fund, "They listen to their neighbors and to people who speak their language." Worldwide, farmers speak about 6,000 different languages, he says.

When the videos are shot by farmers, Gandhi said, other farmers "instantly connect with it."⁴ "The first questions farmers often ask when they see these videos are, 'What is the name of the farmer in the video?' and 'Which village is he or she from?'" he said.⁵

Farmers adopt the new techniques about 45 percent of the time, compared to a 33 percent rate for traditional agricultural extension programs in India, according to Digital Green. Microsoft Research India also found that the program spent \$3.70 to get a single farmer to adopt a new practice, while traditional approaches cost \$38.⁶

One farmer who adopted a new technique after attending a Digital Green presentation was Chaitan Gadaba, from Putpandi in eastern India, who learned how to grow okra with minimal irrigation. He had been cultivating rice on a portion of his land, and leaving the rest fallow for lack of water. After watching the video, he began planting all of his property.⁷

Similarly, farmers in Karnataka in western India learned to use the azolla fern as cattle fodder to increase milk yields. Originally shot in the Kannada language, the video was later produced in Hindi for farmers in Madhya Pradesh, some 600 miles away, where the practice became popular as well, Gandhi said.⁸

Launched in 2006, Digital Green had reached 20 villages by 2008. By 2009 it had spun off as an independent nonprofit.⁹

Continued from p. 682

The U.N. established the FAO in 1945 and the International Children's Emergency Fund (UNICEF) in 1946. It added the World Food Programme in 1961, the U.N. Development Programme in 1966 and the U.N. Population Fund in 1969.⁷⁷ The World Bank got into the act in 1973, when bank President Robert McNamara set a goal of reducing malnutrition and poverty in the developing world by making loans for agricultural and rural development.⁷⁸

In 1954, the United States institutionalized its relief efforts by creating the Food for Peace program, under which Congress authorized the purchase of surplus commodities from American farm-

ers for resale at low prices overseas. The process was designed to help both U.S. farmers and the hungry abroad. It also provided the basis for a later debate about whether shipping commodities across the ocean was the best way to aid the hungry. Over the years, the program's emphasis shifted from sales, which essentially ceased during the 1990s, to donations.

The postwar era also fostered scientific and technological advances that led to an unprecedented increase in agricultural productivity. In 1944, American biologist Norman Borlaug went to Mexico to work in a Rockefeller Foundation-funded program that launched what became the "Green Revolution"

of high-yield farming.⁷⁹ In 1953, American biochemist James Watson and British biophysicist Francis Crick described the double-helix structure of DNA, which paved the way for mapping the genetic code and creating genetically modified organisms.⁸⁰ Both advances later faced criticisms that they may do more harm than good.

Borlaug, who won the 1970 Nobel Peace Prize, focused on using conventional breeding processes to develop disease-resistant and high-yield wheat varieties.⁸¹ The advances were accompanied by development of chemical fertilizers and pesticides, improved irrigation techniques and increased use of mechanized equipment. Agricultural

Since then, the organization has produced more than 2,800 videos in over 20 languages and shown them to more than 330,000 farmers in 3,000 villages. It operates in eight Indian states and in Ethiopia, Ghana, Mozambique and Tanzania.¹⁰ Gandhi wants to reach 10,000 villages by next year.¹¹ The videos are available at www.digitalgreen.org.

A case study by the OneWorld Foundation India called Digital Green “a viable solution to the major problems afflicting government agricultural extension programs,” which require a “huge number of staff” and “usually restrict their interactions to the richer, more enterprising farmers within a village.”¹²

Gawain Kripke, policy director at Oxfam America, the U.S. affiliate of the international relief and advocacy organization, says Digital Green adopts a key concept in agricultural development: Education should be embraced, directed and delivered by farmers themselves.

“You don’t just arrive with new seeds and say try this,” Kripke explains. “You invite them to ask questions and request support for what they’re trying to do. You can’t come to grow maize if they want to grow mangos.”

— Tom Price

¹ Rajiv Rao, “Aspiring astronaut helps farmers,” *Business Standard* (India), Aug. 9, 2011, <http://tinyurl.com/15cqevt>.

² *Ibid.*; “Case Study: Digital Green,” Governance Knowledge Centre, Department of Administrative Reforms and Public Grievances, Ministry of Personnel, Public Grievances and Pensions, Government of India, June 2011, <http://tinyurl.com/qayfl8p>.

³ David Bornstein, “Where YouTube Meets the Farm,” *The New York Times*, April 3, 2013, <http://tinyurl.com/ozbjohp>.

⁴ M. J. Prabu, “Video clippings educate on methods practised elsewhere,” *The Hindu*, Feb. 17, 2011, <http://tinyurl.com/qchfubr>.



Courtesy Digital Green

Farmers in the central Indian state of Madhya Pradesh, one of the country’s most undeveloped regions, shoot a video on chemical treatment of paddy seeds being grown in a nursery, to be shown to other farmers interested in environmentally friendly, lower-cost farming methods.

⁵ “Tech-based Farming Advice Should Stay People-Centred,” *SciDev.Net* (London), Nov. 20, 2013, <http://tinyurl.com/obp2u4a>.

⁶ Bornstein, *op. cit.*

⁷ “Latest technology helps ryots get good yield,” *The Hindu*, Aug. 4, 2011, <http://is.gd/Tmi1Yq>.

⁸ Geeta Padmanabhan, “When farmers turn filmmakers,” *The Hindu*, Sept. 18, 2013, <http://tinyurl.com/o9uh6so>.

⁹ Rao, *op. cit.*; Priyanka Golikeri, “MIT alumnus chucks space dreams for terra firma,” *DNA India*, March 24, 2011, <http://tinyurl.com/lmmp8hn>; “Ashoka Innovators For The Public: Rikin Gandhi,” Ashoka, <http://tinyurl.com/kxhlwlr>.

¹⁰ “An Innovative Platform for Rural Development,” *Digital Green*, <http://tinyurl.com/pzqv99k>.

¹¹ Padmanabhan, *op. cit.*

¹² “Case Study: Digital Green,” *op. cit.*

productivity soared.

Mexico became self-sufficient in wheat during the 1950s, with yields increasing sixfold between 1950 and 1970.⁸² In India, wheat yields tripled between the mid-’60s and mid-’90s.⁸³

Overall, the Green Revolution has saved up to 1 billion people from starvation, according to former U.S. Agriculture Secretary Dan Glickman and former U.N. World Food Programme Executive Director Catherine Bertini.⁸⁴

Genetic Engineering

It took 41 years for Watson and Crick’s DNA breakthrough to bring

genetically engineered food to market. Scientists created the first genetically engineered organism, a bacterium, in 1973. Calgene — a California-based company that is now a subsidiary of Monsanto — patented the genetically modified FlavrSavr tomato in 1989, but it didn’t get Food and Drug Administration approval for sale until 1994. Two years later, Monsanto introduced Roundup Ready soybeans, which could survive when the fields were sprayed with the company’s Roundup weed killer.

By 2002, U.S. farmers were producing 4 billion pounds more food and fiber per acre with GM crops than with conventional plants, reducing pesticide use by 46 million pounds and raising farm

income by \$1.5 billion, according to the National Center for Food and Agricultural Policy, a Washington-based research and education institution.⁸⁵

Farmers also got an unintentional boost from the 1973 Arab oil embargo. As the embargo pushed up the cost of oil-based fertilizer, pesticides and fuel, governments turned to plant-based ethanol as an alternative fuel. In 1975, Brazil required that ethanol from sugarcane be blended with gasoline. The United States exempted ethanol from gasoline taxes in 1978.⁸⁶

In 2007, the United States required that an increasing amount of ethanol be blended with gasoline — from 9 billion gallons in 2008 to 36 billion by

Freezing Food's Footprint to Save Wildlife

“The biggest threat to biodiversity is agricultural sprawl.”

A few years ago, the World Wildlife Fund (WWF) took a look around the globe and determined that one of the biggest threats to wildlife is habitat loss, and the biggest threat to wildlife habitat is the human appetite.

Tigers no longer live in areas of Malaysia and Sumatra that have been converted to oil palm plantations, for instance. And oil palm cultivation has driven the Sumatran rhino from parts of Malaysia, Sumatra and Borneo.¹

Overall, the fund says, habitat loss is a major hazard for 85 percent of species on the International Union for Conservation of Nature's list of threatened and endangered species. During the 1990s, more than 230 million acres of forests — 2.4 percent of the world's total — were cut down, almost 70 percent for conversion to agriculture.² Between 1960 and 2000, the globe's cultivated land grew by 13 percent.³ And conservationists worry that demand for farmland will soar in the future.

Earth's population — currently 7 billion — is expected to grow to 9 billion or more by the middle of this century, notes Jason Clay, the organization's senior vice president for market transformation. And as economic growth creates larger middle classes in places like China and India, those populations will consume greater amounts of food, especially more animal protein. Thus, by mid-century individuals may require twice as much food as they do now — counting what they consume and the food consumed by the animals they eat, Clay says.

Without greatly improved productivity and more environmentally friendly farming techniques, “the biggest threat to biodiversity becomes agricultural sprawl,” Clay says. “Wildlife need homes, too.”

So the WWF set out to “freeze the footprint of food,” as

Clay puts it, by promoting more efficient agricultural practices: producing more crops on existing cropland, thus halting the conversion of natural habitat to farmland.

The fund's goal is to improve the efficiency of all food producers — from the largest conglomerate to the smallest subsistence farmer — so they use less land, water, fertilizer and pesticides. The organization decided to focus first on companies that produce or trade in 15 commodities whose cultivation poses the biggest threat to wildlife habitat, including soy, sugar, palm oil, beef and farmed salmon.

“We needed to find the business case for change,” Clay says, a case he says can be found in the value of intangible assets such as a company's reputation. “Killing that last population of orangutans can affect your corporate value,” he says. “So companies see this as a huge risk.”

WWF negotiators also argued that producing more food on the same land — or in the same water — was good for the bottom line.

Currently, with support from the Mars food corporation, the WWF also is working with the Beijing Genomic Institute to map the genomes of Africa's most important food crops, such as yams, plantains and cassava. The findings will be released in the public domain, so plant breeders can use the information to improve African crops.

“The goal is to produce better materials” so farmers can “double, triple or quadruple productivity” in areas where hunger is most common, Clay says.

The information can be used to improve plants either through genetic engineering or traditional breeding. Breeders can iden-

2022. Last year, the Environmental Protection Agency, which implements the law, required fuel producers to use 14 billion gallons of corn-based ethanol and 2.75 billion from non-food sources, such as wood or inedible parts of the corn plant.

The United States, Brazil and later European countries were aiming to reduce dependence on foreign oil and cut carbon pollution caused by burning fossil fuels. By 2011, ethanol production was consuming 40 percent of the U.S. corn crop, which rose to 44 percent last year, according to Sen. Dianne Feinstein, D-Calif. Critics began bemoaning the unintended consequences of ethanol use: higher food prices and disappointing environmental benefits.⁸⁷

Unintended Consequences

Genetic engineering and the Green Revolution produced other unintended consequences.

Many people's fears of GM crops were heightened in 2000 when genes from genetically modified StarLink corn — approved only for use in animal feed — were found in taco shells. Some farmers admitted selling the corn for human consumption.⁸⁸ The same year, Roundup-resistant weeds were found in Delaware. Three years later, bollworms resistant to GM cotton were discovered in the South.⁸⁹

The modern agriculture spawned by the Green Revolution — includ-

ing large, industrialized farms that replant the same crops in the same places year after year — has overused chemicals, drained aquifers, depleted soil, threatened wildlife and biodiversity, spewed greenhouse gases and created its own pesticide-resistant crops.

Even small-scale farmers in India have discovered the Green Revolution's downside. Beginning in the 1960s, high-yield seeds, fertilizer, pesticides and irrigation multiplied productivity in Punjab and made the state the breadbasket of a nation that had transformed itself from a land of starvation to a food exporter. Over the decades, however, Punjab's farmers depleted the soil, created pesticide-resistant insects and

tify plants with favorable genetic traits, then use traditional techniques to reproduce them.

The fund also has worked on food-related issues with such industry giants as Wal-Mart, Coca-Cola, General Mills and Kellogg. Now it is focusing on trade associations in order to have a broader, faster impact, Clay says. "Working with companies one by one is not fast enough," he says.

Among other things, the WWF has encouraged industries to have their practices evaluated by independent certification organizations. For example, 15 salmon-farming companies, which represent 70 percent of global production, have committed to having all of their practices meet third-party standards for minimizing environmental damage by 2020, Clay says.

Members of the Consumer Goods Forum — a 400-member international trade association of manufacturers, retailers and service providers whose business lines range from food to beer to laundry supplies — have agreed to stop contributing to deforestation in their production and acquisition of beef, soy, paper and palm-oil products, he says. The fund also is helping palm-oil processors enable their small-scale suppliers to implement environment-friendly practices, he says.

WWF's market transformation program has become "a bit of a model for others, including Oxfam," says Oxfam America Policy Director Gawain Kripke. "We launched a campaign a couple years ago — called Behind the Brands — that's modeled on what WWF has done, but with a slightly different focus."

Oxfam rates how companies treat land, water, climate, women, farmers and workers and then asks its supporters to contact the companies demanding improvement. "We're actually having con-



AFP/Getty Images/Romeo Gacad

Forest habitats for endangered Sumatran tigers have been lost to conversion to massive oil palm plantations in Malaysia and Indonesia, leading environmentalists to call "agricultural sprawl" the biggest threat to the planet's biodiversity.

structive engagement with these companies," Kripke says. "They've done stuff we think is really positive in the last couple of years."

Coca-Cola, for instance, raised its score for how fairly it treats land issues from 1, the lowest, in 2013 to 7, the highest, this year by requiring its sugar suppliers to respect the property rights of small-scale farmers, who often have their land seized by larger organizations, Oxfam reported.⁴

— Tom Price

¹ "Palm oil & biodiversity loss," World Wildlife Fund, <http://tinyurl.com/oc8a9t>.

² "Impact of habitat loss on species," World Wildlife Fund, <http://tinyurl.com/pgv3ota>. For background, see Reed Karaim, "Vanishing Biodiversity," *CQ Researcher*, Nov. 6, 2012, pp. 497-520.

³ Hugh Turrall, "Climate change, water and food security," U.N. Food and Agriculture Organization, 2011, p. 31, <http://tinyurl.com/nlh3q5b>.

⁴ "Race to the top: One year of looking Behind the Brands," Oxfam International, Feb. 26, 2014, <http://tinyurl.com/acxglfh>. For background, see Jina Moore, "Resolving Land Disputes," *CQ Researcher*, Sept. 11, 2011, pp. 421-446.

weeds and polluted the water sources with chemicals. In 2007, the Punjab State Council for Science and Technology reported that "the most stunning example of the Green Revolution in India . . . has become unsustainable and non-profitable."⁹⁰

Pat Mooney, executive director of the ETC Group, an Ottawa-based organization that studies how technologies affect the poor, says the Green Revolution "deserves credit for having produced a lot more wheat and rice and maize. Some people might otherwise not have been fed." But, he adds, "it became a one-size-fits-all model. In the long term it caused a lot of damage and ended up focusing on yields beyond nutrition."

A review of academic literature conducted by Barrett of Cornell and others found that the Green Revolution led to some poor people consuming a calorie-rich but nutrition-poor diet. "From the 1970s to the mid-1990s, the price of staple foods [such as rice and wheat] decreased relative to the price of micronutrient rich foods [such as vegetables] in much of Asia," they wrote. As a result, the poor were eating more grain and fewer vegetables, they said.⁹¹

Barrett also notes other Green Revolution shortcomings. "In initially making water available essentially for free to farmers, it pretty much guarantees they will overuse water," he says. He also notes the overuse of chemicals.

But, he adds, "The Green Revolution had an amazing effect. It increased per capita calorie availability. It drove down food prices. There's no better way to fight hunger than to bring down the price of the food, and the Green Revolution achieved that more than anything before or since."

The Green Revolution was much less successful in Africa, where countries lacked good roads or railways to transport food to market or to distribute high-yield seeds, fertilizers and pesticides. African governments also did not offer farmers the support provided by Asian governments, such as credit, training and subsidies.⁹² And since independence, many African countries have suffered from government

corruption, authoritarianism, anti-free market ideologies and strife, U.S. Assistant Secretary of State for African Affairs Carson lamented in 2010.

“Mismanagement, embezzlement of state revenues and centralized approaches to economic management precipitated economic decline and the deterioration of infrastructure and government services,” Carson said. However, since the 1990s, he said, a growing number of African countries have “liberalized their economies, embraced market reforms and adopted pro-business policies.”⁹³ ■

CURRENT SITUATION

Sustainable Food

The Senate Environment and Public Works Committee is considering a proposal to repeal the mandate that results in nearly half of America’s corn crop being burned as motor fuel. Supporters of the legislation say the mandate diverts food to fuel and drives up food prices.

Cosponsored by liberal California Democrat Feinstein, and conservative Oklahoma Republican Sen. Tom Coburn, the measure would eliminate the requirement that an increasing amount of corn-based ethanol be blended into the nation’s gasoline. However, it would continue a mandate for burning so-called advanced biofuels, which are made from inedible vegetation.

Feinstein said she still supports shifting to low-carbon fuels, but opposes the corn mandate because it raises the cost of food and damages the environment. Coburn called for letting “market forces, rather than political and parochial forces, determine how to diversify fuel supplies.”⁹⁴

The bill fits into a larger movement that emphasizes sustainable food production that uses environmentally friendly agriculture and boosts the resiliency of small-scale farmers in the developing world when they face drought and other challenges, says Leach of World Food Program USA. The efforts include providing drought- and pest-resistant seeds, teaching more effective farming techniques and combining relief with development projects.

The most effective attacks on hunger and its effects, Cornell’s Barrett says, are providing health care for children and women of childbearing age, educating children and investing in boosting poor farmers’ agricultural productivity.

The Obama administration, U.N. agencies and private relief organizations are adopting policies based on the theory that increasing small farmers’ productivity while protecting the environment can lift them out of poverty while reducing hunger and boosting the local economy.

“Half of hungry people globally are small-scale farmers,” Leach says. “We can take them out of hunger by creating economic opportunity.”

For six years the U.N. World Food Programme has been teaching developing-world farmers better techniques, helping to organize them into associations to store and distribute food more efficiently and providing access to credit. The agency then purchases their crops to provide food relief for the hungry.

The goal is to “get them producing the quantity and quality they need to feed themselves, then to sell to the World Food Programme and then to graduate to selling to the marketplace,” Leach explains.

Feed the Future

The Obama administration’s efforts to push a similar approach in U.S. hunger programs have had a “transformative impact on the whole international community,” Leach says.

Similarly, Oxfam’s Kripke describes Obama as “a real leader across the world in pushing agriculture development as a priority.” Unfortunately, he adds, “many other donors haven’t really been following very effectively.”

Called Feed the Future, the U.S. approach assumes that anti-hunger and antipoverty programs are most effective when embraced and led by developing world farmers and their local, regional and national governments. It also seeks to tap expertise of both nonprofit and profit-making private organizations.

The administration, for instance, has asked the Agriculture Department and college agriculture schools to research technologies to enable small farmers to increase productivity. In addition, the New Alliance for Food Security and Nutrition, launched in 2012 by the Group of Eight leading industrial nations,* now includes 10 African countries and more than 160 companies that have pledged to invest more than \$15 billion in African agriculture.

Carter, the UC-Davis researcher, credits the administration for targeting assistance to the specific needs of various farmer groups, such as by conducting research into the most effective and affordable farming techniques for a small geographic area. “It’s one thing to move to the frontier of what’s technologically possible,” he says, “and it’s another to put resources into situations where farmers can exploit what’s available.”

Barrett cites increased funding for agriculture research as key to the program. Overall, according to Barrett, the \$1.1-billion Feed the Future program is “a step in the right direction, but is severely underfunded.”

“We should be spending more for preventative action than for curative treatment,” he says, suggesting that

* The eight were France, Germany, Italy, Japan, the United Kingdom, Canada, Russia and the United States. Russia was expelled after its seized Crimea this year.

Continued on p. 690

At Issue:

Should hunger programs ban genetically modified food?



ÉRIC DARIER, PH.D.
FOOD FOR LIFE CAMPAIGNER, GREENPEACE INTERNATIONAL

WRITTEN FOR *CQ RESEARCHER*, AUGUST 2014

the biotech industry has been exploiting food crises to promote genetically modified (GM) crops, claiming they can solve world hunger. People experiencing hunger should have decent solutions, not be used to promote controversial technologies. Even in emergency situations, desperate people should have the right to choose what they eat.

Greenpeace opposes the deliberate release of GM organisms into the environment. They can multiply and cross-breed and pose a threat of irreversible damage to biodiversity and ecosystems. Furthermore, we don't know if GM crops are safe to eat, especially over the long term. Therefore, with regard to GM foods, it is urgent that we apply the "precautionary principle," which could be summarized as "in case of doubt, leave it out."

Genetic modification makes crops prone to unexpected effects. Evaluating food safety requires looking for such effects, which is extremely difficult, if not impossible, as reflected in the ongoing controversy surrounding the assessment of the safety of GM crops.

U.S. food aid containing GM grains has been used to provide famine relief. Greenpeace is most concerned about the potential uncontrolled environmental spread of GM organisms into the affected countries. Notably, the United States has not joined 167 other countries in ratifying the U.N. Cartagena Protocol on Biosafety, a treaty regulating the movement of GM organisms among nations.

Millions of people around the world suffer from food shortages, high food prices and hunger, due to several factors: industrial farming, bad harvests, inadequate access to food due to poverty and inequality, rising oil prices, changing consumption patterns, commodities speculation and the rush to produce unsustainable biofuels.

Instead, ecological farming enables and encourages communities to produce enough food to feed themselves while fostering sustainable farming and healthy food.

There are many ecological alternatives to GM crops. The U.N. agriculture assessment known as IAASTD recommended policies that would lead to scaling up ecological agriculture. More recently, the report of the U.N. special rapporteur on the right to food urged governments to "move away from business as usual" and to tackle the systemic failure of the current food system.

Let people choose which ecological agriculture solutions best allow them to feed themselves while protecting nature. GM crops are part of the problem, not the solution.



DENNIS T. AVERY
ENVIRONMENTAL ECONOMIST AND SENIOR FELLOW, HEARTLAND INSTITUTE; CO-AUTHOR, UNSTOPPABLE: GLOBAL WARMING EVERY 1,500 YEARS

WRITTEN FOR *CQ RESEARCHER*, AUGUST 2014

gM crops produce more food during good years and have the potential to resist drought and disease more effectively than traditional crops. They are ideal for famines and emergencies.

Pessimists say we can't yet trust GM foods, but they've turned up no valid dangers. In fact, the European Commission in 2010 said GM is slightly safer than conventional crops because of the targeted research conducted on them.

Aside from hunger emergencies, GM is also critically important to meeting the enormous food challenge of the next 40 years. The world must roughly double its food output, quickly, in order to feed a larger, more affluent population. (After 2050, world population will begin a slow, steady decline as increasingly literate women live in cities where it is expensive to raise a child.)

Ideally, we will be able to double food output without plowing under wildlife habitat equal to the land area of South America — just to produce low-yield crops. The world's prime farmland is already under cultivation, so farmers must redouble per-acre yields on existing fields. More nitrogen fertilizer and herbicides can be used in Africa, but most of the world's farmland is already using today's high-tech inputs. That leaves a major food-supply gap that only higher-yield new technology — such as biotechnology — can fill.

The last time the world faced such a problem, during the Little Ice Age (1300-1850 AD), it was also solved with technology. Governments ordered farmers to rotate crops and livestock on the same land to maintain soil nitrogen. Better sailing ships brought Europe crops such as corn and potatoes from the New World and cold-tolerant turnips from China as a feed crop. Drought-tolerant New World corn was planted across China. Food production surged, averting famine — except in France, where people claimed potatoes were poisonous. Famine then brought on the French Revolution.

A California biotech researcher believes he has found a one-gene solution to a massive Third World food problem. The soil in about half of the world's tropical cropland is naturally saturated with toxic aluminum. Traditional crop plants struggle to survive in the toxic soils, but the researcher has devised a way to genetically modify plants to thrive on the same soils. However, the scientist is being discouraged due to public GM mistrust in wealthy, aid-donor countries.

Continued from p. 688

“\$10 billion is in the neighborhood of what’s needed.”

Cornell’s Barrett is also optimistic about a trend in which relief agencies acquire food from local and regional sources rather than shipping commodities from donor countries. In the United States, the 2014 farm bill took modest steps in that direction by increasing the amount of aid that can be provided in cash instead of commodities or that can be used to purchase food near where it’s consumed.

Corporations also are pitching in. Wal-Mart, for instance, helps farmers in Mexico and Central America follow more sustainable practices and improve their post-harvest food handling, where much waste occurs. The Keurig Green Mountain coffee company helps coffee growers in Mexico, Central America and Africa diversify their crops to combat seasonal hunger.⁹⁵

Corporate involvement is doubly important, according to Clay of the World Wildlife Fund, because “when companies like Wal-Mart or McDonald’s make commitments to sustainability, their supply chains follow suit.”

Reversing Damage

Private organizations also are moving to overcome environmental damage caused by modern agriculture, which affects the Earth’s future ability to feed itself.

Some advocates are looking to the sea as a source of food, because water covers 70 percent of the globe but provides less than 2 percent of the planet’s food. They face significant obstacles, however. Many ocean areas have been overfished, and fish farms pose significant pollution challenges.⁹⁶

Farmers raised more fish than beef for the first time in 2012, harvesting more than 70 million tons of seafood — 14 times what they produced in 1980. But, just as agriculture has de-

stroyed wildlife habitat, depleted soil and polluted fresh water supplies on land, aquaculture has destroyed mangroves to create shrimp farms and released fertilizers, pesticides, antibiotics and fish waste into oceans.⁹⁷

To avoid aquaculture’s downsides, some farmers are raising fish in tanks on land; others are adopting environmentally friendly practices at sea.

In landlocked western Virginia, for instance, Blue Ridge Aquaculture has devised a land-based fish farming method that produces 12,000 pounds of antibiotic- and hormone-free tilapia each day. Company president Bill Martin describes his indoor fish farming process as having “as close to zero impact on the oceans as we can get.”

Others are working to minimize the impact of their ocean-based fish farms. Off the coast of Panama, for instance, Open Blue raises hundreds of thousands of cobia in cages 60 feet below the Caribbean. Ocean currents flush the pens to provide the fish with clean water and to dilute waste. The farm does not use antibiotics, and researchers have not found waste outside the farm.

To the north, off Canada’s British Columbia coast, University of Victoria researchers are raising sablefish (also called black cod) while keeping the Pacific Ocean clean. Down-current from the fish pens, baskets of shellfish eat the fish excretions. Sugar kelp grow next to the baskets and consume almost all of the remaining nitrates and phosphorus. Eighty feet below, sea cucumbers ingest the waste that falls to the sea floor.⁹⁸

Farmers who grow crops and livestock on land are deploying “precision-agriculture” technology to increase yields while decreasing environmental damage. Global Positioning System devices attached to farm equipment detect precise locations where water, fertilizer or pesticides are needed. Other machines drag sensors over and through soil to measure treatment needs.

Precise measurements enabled New Zealand farmer Hugh Wigley to cut his

lime use by 40 percent, for instance. Wigley, who also supplies precision equipment to other farmers, says one client discovered he didn’t need to spread any lime on land where he had been using about two tons per acre.⁹⁹

A 2011 Agriculture Department study found that precision agriculture has enabled farmers to reduce the damage caused by runoff of fertilizers and pesticides, reduced fuel consumption and increased crop yields.¹⁰⁰ ■

OUTLOOK

Solvable Problem

While food production has been growing more quickly than consumption, experts worry that expanding middle classes in countries such as China and India will boost demand for more expensive foods that put a greater strain on the environment than cheaper foods. That could drive already-rising food prices higher, making it harder for the poorest of the poor to purchase enough to eat.

Fulfilling demand for meat — especially beef — will divert food to animal feed and put added pressure on the environment. In addition, climate change could disrupt the growth of crops and livestock. But technological advances promise to enable farmers to increase yields while protecting the environment. And many experts are optimistic that hunger not caused by conflict or natural disaster can be eliminated.

“Hunger is a solvable problem,” Leach of World Food Program USA says. “We are smarter now in terms of understanding the causes of hunger and in having creative strategies to address hunger. And there’s greater understanding by the private sector about how to enhance their businesses and at the same time have positive social impact.”

Big remaining challenges include addressing climate change and creating “better mechanisms to prevent conflict,” Leach adds.

Cornell’s Barrett also expects the private sector to contribute to reducing hunger. Rising food prices are drawing more private investment into production, he says. And reducing agriculture’s threat to the environment goes hand in hand with reducing farmers’ costs, he says.

“As you develop products that are greener and lower-cost, farmers adopt them pretty quickly,” Barrett explains. “They’re doing a better job of dosing inorganic fertilizers precisely so we reduce inorganic runoff to waterways. People are figuring out better ways to control pests with natural predators and natural secretions from plants. And we’re doing a much better job developing efficient machinery.”

Unfortunately, these improvements are not occurring fast enough to meet expected future demand, he adds. Kripke, of Oxfam, agrees. As to whether poor farmers will benefit from increasing food demand, Kripke says, “It’s possible. It’s not inevitable.”

Clay, of the World Wildlife Fund, worries that rising food prices — which may be good for farmers — will “leave people with less money in a real bad way.” But he’s hopeful today’s young adults will tackle hunger because “they care a lot about [how their food is] produced and knowing that it’s produced sustainably.”

Mooney, of the ETC Group, contends that affluent eaters must change their habits, and relief organizations must teach the poor how to grow their own food and eat more healthily. “We’ve got to adapt our consumer habits to our planet and to our health needs, which means we need to reduce our meat and dairy consumption,” he says.

Developed nations waste food because “you go to the grocery once a week and buy all sorts of stuff, and it spoils in the back of the refrigerator,”

Mooney says. Shoppers should visit the store more frequently and buy less on each trip, he says.

Large-scale farms will continue to produce a substantial amount of the world’s food, Mooney says. But “that doesn’t mean it has to be highly chemical farming.” Small-scale farmers probably will adapt to climate change more easily than large agricultural corporations, if researchers focus on small-scale agriculture’s needs, he says.

Avery of the Heartland and Hudson institutes predicts that large-scale, high-tech agriculture will not be replaced. “We need more food and more high-value food, and we have to think about tripling the yield of crops and livestock on the good land that we currently farm, because there’s no more good land,” he says.

Without continued technological advances — including with GMOs and chemicals — “we will have more famine, and there will be loss of wildlife habitat on a massive scale” as more land is allocated to farming, Avery says. ■

Notes

¹ Abigail Hauslohner, “U.N. agency raises disaster designation in Iraq as refugees flood into Kurdistan,” *The Washington Post*, June 18, 2014, <http://tinyurl.com/k7deo5v>; Mac McClelland, “How to Build a Perfect Refugee Camp,” *The New York Times*, Feb. 13, 2014, pp. MM-24, <http://tinyurl.com/ljncv3v>.

² Olivia Ward, “Canadian aid timely for starving children,” *The Toronto Star*, May 30, 2014, p. A10, <http://tinyurl.com/nrmc86w>.

³ “The State of Food Insecurity in the World: The multiple dimensions of food security,” Food and Agriculture Organization of the United Nations, 2013, <http://tinyurl.com/njqzjzp>.

⁴ *Ibid.*

⁵ “The State of Food Insecurity in the World 2013,” Food and Agriculture Organization of the United Nations (executive summary), 2013, <http://tinyurl.com/nq8npru>; “Wake up before it is too late: Make agriculture truly sustainable now for food security in a changing climate,” U.N. Conference on Trade and Development, September 2013, <http://tinyurl.com/kly4c3r>.

⁶ “The State of Food Insecurity in the World

2013,” *op. cit.*

⁷ “Hunger Statistics,” World Food Programme, <http://tinyurl.com/lhix45>.

⁸ “World Health Statistics 2014 Part III: Global Health Indicators,” World Health Organization, <http://tinyurl.com/q5fgmxx>.

⁹ Chris Otter, “Feast and Famine: The Global Food Crisis,” *Origins: Current Events in Historical Perspective*, Ohio State University, Vol. 3, Issue 6, March 2010, <http://tinyurl.com/l988h56>. Also see “Table: Age-standardised regional and national estimates of the prevalence of overweight and obesity combined and obesity alone for girls, boys, men, and women for 2013, for 188 countries and 21 GBD regions” in “Global, regional, and national prevalence of overweight and obesity in children and adults during 1980-2013,” *The Lancet*, May 29, 2014, <http://tinyurl.com/k8sllkbu>.

¹⁰ Jason Clay, “Freezing the Footprint of Food,” World Wildlife Fund, Oct. 23, 2012, <http://tinyurl.com/kohxm3k>.

¹¹ Andrew C. Revkin, “It’s Time for Africa’s Green Revolution, Focused on Corn,” *The New York Times* (blog), April 10, 2014, <http://tinyurl.com/kdn4kqx>.

¹² Brian Jones, “Wasting food can eat away the future,” *Canberra Times*, April 5, 2014, p. B9, <http://tinyurl.com/oyezt6e>.

¹³ “The State of Food Insecurity in the World 2013,” *op. cit.*; Mark Koba, “A hungry world: lots of food, in too few places,” CNBC, July 22, 2013, <http://tinyurl.com/n8trpyp>.

¹⁴ Chris Thomas, “Improving nutrition, building resilience for families, societies,” USAID, May 22, 2014, <http://tinyurl.com/kfqwn9d>.

¹⁵ “The State of Food Insecurity in the World 2013,” *op. cit.*

¹⁶ Johnnie Carson, “Africa: Remarks at the African Diplomatic Corp’s Celebration of Africa Day,” U.S. State Department Documents and Publications, May 25, 2010, <http://tinyurl.com/39o78ar>.

¹⁷ “Food Aid Flows 2012 Report,” World Food Programme, United Nations, December 2013, <http://tinyurl.com/jwcl2tn>.

¹⁸ Statistics from interview with Alan Jury, senior adviser to World Food Program USA.

¹⁹ Hauslohner, *op. cit.*

²⁰ Miguel I. Gómez, *et al.*, “Post-green revolution food systems and the triple burden of malnutrition,” *Food Policy*, October 2013, Vol. 42, pp. 129-138, <http://tinyurl.com/ozugl6n>.

²¹ *Ibid.*

²² “H.R. 4005 — Coast Guard and Maritime Transportation Act of 2014,” Library of Congress, <http://tinyurl.com/ozso9el>.

²³ Christopher B. Barrett and Erin C. Lentz, "Highway Robbery on the High Seas," *The Hill*, May 29, 2014, <http://tinyurl.com/19t7gp7>.

²⁴ Elijah E. Cummings and Duncan D. Hunter, "Food aid supports sea-lift abilities," *The Washington Post*, May 17, 2013, p. A16, <http://tinyurl.com/1s4c9jd>.

²⁵ "Senator Coons introduces bill to reform and modernize America's food aid program," Office of Sen. Christopher Coons, June 3, 2014, <http://tinyurl.com/lab8wf9>.

²⁶ Letter to Sens. Debbie Stabenow and Thad Cochran, wheatworld.org, March 21, 2013, <http://tinyurl.com/nwav3dq>.

²⁷ Steve Baragona, "Congress Debates Limiting US Farmers' Role in Food Aid," Voice of America News, June 18, 2013, <http://tinyurl.com/oswob8b>.

²⁸ "The Value of Food Aid Monetization: Benefits, Risks and Best Practices," *Informa Economics*, November 2012.

²⁹ Daniel A. Sumner, "Picking on the Poor, How US Agricultural Policy Hurts the Developing World," AmericanBoondoggle.com, <http://tinyurl.com/ko62jfk>.

³⁰ Tim Krohn, "Farm bill up against misperceptions, lawmakers say," *The [Mankato, Minnesota] Free Press*, Feb. 19, 2014, <http://tinyurl.com/m5p9nyl>.

³¹ *Ibid.*

³² James Phelan, "U.S. Food Aid: To Ship Food or Send Cash — the Obama Administration Weighs In," Action Against Hunger, April 9, 2013, <http://tinyurl.com/mw3wpxo>.

³³ Dennis T. Avery, "Column: Biofuels have fallen out of fashion," *Orange County Register*, May 8, 2014, <http://tinyurl.com/q5c2kgp>.

³⁴ "Direct federal financial interventions and subsidies in energy in fiscal year 2010," U.S. Energy Information Administration, Aug. 1, 2011, <http://tinyurl.com/nvm97sz>; Robert Pear, "After

Three Decades, Tax Credit for Ethanol Expires," *The New York Times*, Jan. 1, 2012, <http://tinyurl.com/a3ve67x>.

³⁵ Timothy Spence, "Europe Worsening Hunger Worldwide," Inter Press Service, May 31, 2011, <http://tinyurl.com/plzmtup>. For background see Jina Moore, "Resolving Land Disputes," *CQ Researcher*, Sept. 6, 2011, pp. 421-446.

³⁶ "National Journal Holds a Policy Summit on Biofuels Mandate," *Political Transcript Wire*, Oct. 9 2013, <http://tinyurl.com/nctkqo4>.

³⁷ Jonathan Foley, "A Five-Step Plan to Feed the World," *National Geographic*, undated, <http://tinyurl.com/13b2jaw>.

³⁸ Joel K. Bourne, Jr., "How to Farm a Better Fish," *National Geographic*, June 2014, <http://tinyurl.com/15hbosw>. For background, see Daniel McGlynn, "Whale Hunting," *CQ Researcher*, June 29, 2012, pp. 573-596.

³⁹ Richard Black, "World's oceans in 'shocking' decline," BBC News, June 20, 2011, <http://tinyurl.com/oqtyo9p>. Also see Reid Wilson, "Fisheries at Risk as Oceans Acidify," *The Washington Post*, July 31, 2014, p. A3, <http://tinyurl.com/pqwtvk7>.

⁴⁰ "The IUCN Red List of Threatened Species: *Sphyrna lewini*," International Union for Conservation of Nature, <http://tinyurl.com/qexdyos>.

⁴¹ "4 steps food companies can take to help stop climate change," Oxfam, May, 20, 2014, <http://tinyurl.com/ow3ffim>.

⁴² "7 Facts About Climate Change And Hunger," World Food Programme, United Nations, Dec. 4, 2011, <http://tinyurl.com/7zw9c4u>.

⁴³ Foley, *op. cit.*

⁴⁴ Andrei Illarionov, "A Few Notes on Climate Change," The Cato Institute, Dec. 11, 2009, <http://tinyurl.com/ourmqpg>.

⁴⁵ Eli Kintisch, "High CO2 Makes Crops Less Nutritious," *National Geographic*, May 7, 2014, <http://tinyurl.com/p3ud8fc>.

⁴⁶ Terrell Johnson and Jon Erdman, "World's Hottest May Is Now May 2014: NOAA," The Weather Channel, June 23, 2014, <http://tinyurl.com/kcnjgpn>.

⁴⁷ "How Much Has the Global Temperature Risen in the Last 100 Years?" The University Corporation for Atmospheric Research, <http://tinyurl.com/a8gygt3>.

⁴⁸ Fiona Harvey, "Rate of ocean acidification due to carbon emissions is at highest for 300m years," *The Guardian*, Oct. 2, 2013, <http://tinyurl.com/o55anz3>.

⁴⁹ Coral Davenport, "Climate Change Deemed Growing Security Threat by Military Researchers," *The New York Times*, May 13, 2014, <http://tinyurl.com/q9jnvak>.

⁵⁰ Winnie Byanyima, "World 'woefully unprepared' for climate impacts on food," Oxfam International, March 25, 2014, <http://tinyurl.com/oxwbatz>.

⁵¹ Justin Gillis, "Panel's Warning on Climate Risk: Worst Is Yet to Come," *The New York Times*, March 31, 2014, <http://tinyurl.com/mstxs6b>.

⁵² Alex Renton, "How climate change will wipe out coffee crops — and farmers," *The (London) Observer*, March 29, 2014, <http://tinyurl.com/pdgl6wb>. Also see The Associated Press, "Cost of change," *The Denver Post*, April 1, 2014, p. A-14.

⁵³ Rio N. Araja, "Golden rice entry blocked," *Manila Standard Today*, May 1, 2014, <http://tinyurl.com/pvblyoh>; Amy Harmon, "Golden Rice: Lifesaver?" *The New York Times*, Aug. 24, 2013, p. SR1, <http://tinyurl.com/nvanmkm>.

⁵⁴ "What is the status of the Golden Rice project coordinated by IRRI?" International Rice Research Institute, March 2014, <http://tinyurl.com/la6moer>.

⁵⁵ Richard Roberts, "GMOs are a key tool to addressing global hunger," *The Boston Globe*, May 23, 2014, <http://tinyurl.com/q5gespx>. See also Reed Karaim, "Farm Subsidies," *CQ Global Researcher*, May 1, 2012, pp. 205-228.

⁵⁶ Marjorie Olster, "Key points in the genetically modified food debate," The Associated Press, Aug. 2, 2013, <http://tinyurl.com/mkuwj2b>; "Beyond Promises: Top 10 Facts about Biotech/GM Crops in 2013," International Service for the Acquisition of Agri-biotech Applications, <http://tinyurl.com/mjopzge>. For background, see Jason McLure, "Genetically Modified Food," *CQ Researcher*, Aug. 31, 2012, pp. 717-740.

⁵⁷ Sharon Schmickle, "Hungry African nation at center of a food debate," *The Washington Post*, Oct. 8, 2013, p. A10, <http://tinyurl.com/k2wvmkfl>; "Beyond Promises: Top 10 Facts about Biotech/GM Crops in 2013," *op. cit.*

About the Author



Tom Price is a Washington-based freelance journalist and a contributing writer for *CQ Researcher*. Previously, he was a correspondent in the Cox Newspapers Washington Bureau and chief politics writer for the *Dayton Daily News* and *The (Dayton) Journal Herald*. He is author or coauthor of five books including, with former U.S. Rep. Tony Hall (D-Ohio), *Changing The Face of Hunger: One Man's Story of How Liberals, Conservatives, Democrats, Republicans and People of Faith Are Joining Forces to Help the Hungry, the Poor and the Oppressed*.

⁵⁷ Roberts, *op. cit.*

⁵⁸ Harmon, *op. cit.*

⁵⁹ Ginger Pinholster, "AAAS Board of Directors: Legally Mandating GM Food Labels Could 'Mislead and Falsely Alarm Consumers,'" American Association for the Advancement of Science, Oct. 25, 2012, <http://tinyurl.com/no6eyt9>.

⁶⁰ Paul Johnston and David Santillo, "Precaution is simply common sense," Greenpeace International, May 24, 2012, <http://tinyurl.com/pgj29pa>.

⁶¹ Carey Gillam, "Pesticide use ramping up as GMO crop technology backfires: study," Reuters, Oct 1, 2012, <http://tinyurl.com/9etfaj5>.

⁶² Cormac Ó Gráda, *Famine: A Short History* (2009), <http://tinyurl.com/6slof8r>. Also see Joohee Cho, "North Korean Prison Camp Atrocities Detailed in UN Report," ABC News, Feb. 17, 2014, <http://tinyurl.com/o23wb4w>.

⁶³ Ó Gráda, *op. cit.*

⁶⁴ "The Irish Potato Famine," *Digital History*, University of Houston, <http://tinyurl.com/jwvnh96>.

⁶⁵ Otter, *op. cit.*

⁶⁶ Ó Gráda, *op. cit.*

⁶⁷ Robert Denning, "Review: Famine: A Short History," *Origins: Current Events in Historical Perspective*, Ohio State University, October 2009, <http://tinyurl.com/pv26cvv>.

⁶⁸ For background, see Tom Price, "Science in America," *CQ Researcher*, Jan. 11, 2008, pp. 25-48.

⁶⁹ See Jennifer Weeks, "Farm Policy," *CQ Researcher*, Aug. 10, 2012, pp. 693-716.

⁷⁰ "Fritz Haber," Chemical Heritage Foundation, undated, <http://tinyurl.com/m6b7w4w>.

⁷¹ Otter, *op. cit.*

⁷² "Ukraine: The famine of 1932-33," *Encyclopaedia Britannica*, <http://tinyurl.com/k4eu moo>; David P. Lilly, "The Russian Famine of 1932-1933," The Center for Volga German Studies, Concordia University, <http://tinyurl.com/k6maf8>.

⁷³ Yang Jisheng, "China's Great Shame," *The New York Times*, Nov. 13, 2012, <http://tinyurl.com/n7m3d8rb>; Anne Applebaum, "When China Starved," *The Washington Post*, Aug. 12, 2008, <http://tinyurl.com/l63626u>.

⁷⁴ "The Biafran War," Inventory of Conflict and Environment, American University, <http://tinyurl.com/n5c235o>.

⁷⁵ Tony Hall with Tom Price, *Changing the Face of Hunger* (2006); "Ethiopian Famine 25th Anniversary — Questions and Answers," ONE, Oct. 23, 2009, <http://tinyurl.com/m6akc5v>.

⁷⁶ Denning, *op. cit.*

⁷⁷ See Tom Price, "Assessing the United Nations," *CQ Global Researcher*, March 20, 2012, pp. 129-152.

⁷⁸ See Mary H. Cooper, "World Hunger," *CQ*

FOR MORE INFORMATION

Center for Global Food Issues, P.O. Box 202, Churchville, VA, 24421; 540-337-6354; www.cgfi.org. Project of the conservative Hudson Institute think tank that promotes free trade in agricultural products and contends that agricultural productivity is key to environmental conservation.

ETC Group, 180 Metcalfe St., Suite 206, Ottawa, ON K2P 1P5, Canada; 613-241-2267; www.etcgroup.org. Research and advocacy group that studies how new technologies, especially in agriculture, affect the poor.

Food and Agriculture Organization, Viale delle Terme di Caracalla, 00153 Rome, Italy; 39-06-57051; www.fao.org/home/en. U.N.'s chief agency for food and agriculture issues; compiles statistics and publishes reports on hunger.

Oxfam International, Second Floor, 228-240 Banbury Road, Oxford OX2 7BY, United Kingdom; 44-1865-339-100; www.oxfam.org. U.S. affiliate: **Oxfam America**, 226 Causeway St., Fifth Floor, Boston, MA 02114-2206; 800-776-9326; www.oxfamamerica.org. Global relief, development and advocacy organization.

World Food Programme, Via Cesare Giulio Viola 68, Parco dei Medici, 00148 Rome, Italy; 39-06-65131; www.wfp.org. U.N. agency that is the world's largest anti-hunger organization, distributing 58 percent of the world's food aid in 2012.

World Food Program USA, 1725 I St., N.W., Suite 510, Washington, DC 20006; 202-627-3737; www.wfpusa.org. An independent nonprofit organization that supports the U.N.'s World Food Programme.

World Wildlife Fund, 1250 24th St., N.W., Washington, DC 20037; 202-293-4800; www.worldwildlife.org. Wildlife conservation organization that sees agricultural expansion as a threat to wildlife habitat.

Researcher, Oct. 25, 1991, pp. 801-824. Also see Marcia Clemmitt, "Global Food Crisis," *CQ Researcher*, June 27, 2008, pp. 553-576.

⁷⁹ Tina Rosenberg, "A Green Revolution, This Time for Africa," *The New York Times*, April 9, 2014, <http://tinyurl.com/kc6v4zf>.

⁸⁰ For background, see Jason McLure, "Genetically Modified Food," *CQ Researcher*, Aug. 31, 2012, pp. 717-740.

⁸¹ "Our History," International Maize and Wheat Improvement Center, <http://tinyurl.com/q79dynr>.

⁸² *Ibid.*

⁸³ Rosenberg, *op. cit.*

⁸⁴ Dan Glickman and Catherine Bertini, "Saving A Billion People from Starvation," *The Huffington Post*, Sept. 18, 2009, <http://tinyurl.com/nkdjx8n>.

⁸⁵ McLure, *op. cit.*

⁸⁶ For background, see Sarah Glazer, "Rising Food Prices" *CQ Global Researcher*, Oct. 18, 2011, pp. 499-524.

⁸⁷ Charles Kenny, "Congress Wakes Up to the Bad News About Biofuels," *Bloomberg Businessweek*, Jan. 6, 2014, <http://tinyurl.com/pfmg6e8>; "Feinstein, Coburn Introduce Bipartisan Bill to Eliminate Corn Ethanol," Office of Sen. Dianne Feinstein, Dec. 12, 2013, <http://tinyurl.com/pal8nyz>.

⁸⁸ Andrew Pollack, "Altered Corn Surfaced Earlier," *The New York Times*, Sept. 4, 2001,

<http://tinyurl.com/qg5nu24>.

⁸⁹ McLure, *op. cit.*

⁹⁰ Kenneth Weiss, "In India, agriculture's Green Revolution dries up," *Los Angeles Times*, July 22, 2012, <http://tinyurl.com/luofrj2>.

⁹¹ Miguel I. Gómez, *et al.*, *op. cit.*

⁹² Revkin, *op. cit.*

⁹³ Carson, *op. cit.*

⁹⁴ Office of Sen. Dianne Feinstein, *op. cit.*

⁹⁵ Andrew C. Revkin, "A Coffee Seller Seeks to Cut Hunger Among Coffee Growers," *The New York Times*, Oct. 9, 2012, <http://tinyurl.com/m8o4enb>; "Food Security," Keurig Green Mountain, <http://tinyurl.com/k5ln3r7>.

⁹⁶ Alan Ward, "Weighing Earth's Water from Space," National Aeronautics and Space Administration, Dec. 23, 2003, <http://tinyurl.com/qxjjoqa>.

⁹⁷ Bourne, *op. cit.*

⁹⁸ *Ibid.*

⁹⁹ Tim Cronshaw, "Soil mapping technology a big step forward," *The (Christchurch, New Zealand) Press*, July 4, 2014, p. 15.

¹⁰⁰ David Schimmelpennig and Robert Ebel, "On the Doorstep of the Information Age: Recent Adoption of Precision Agriculture," U.S. Dept. of Agriculture Economic Research Service, August 2011, <http://tinyurl.com/m8qan98>.

Bibliography

Selected Sources

Books

Buffett, Howard G., *40 Chances: Finding Hope in a Hungry World*, Simon & Schuster, 2013.

A philanthropist and son of billionaire investor Warren Buffett analyzes how the well-fed world should fight hunger and poverty.

Falcon, Walter, and Rosamond Naylor, eds., *Frontiers in Food Policy: Perspectives in Sub-Saharan Africa*, Stanford Center on Food Security and the Environment, 2014.

Experts at an agricultural development symposium address various aspects of hunger and rural poverty in the hungriest region on Earth.

Gratton, Lynda, *The Key: How Corporations Succeed by Solving the World's Toughest Problems*, McGraw-Hill, 2014.

A professor of management practice at London Business School argues that global problems such as hunger cannot be solved without help from major corporations and their executives.

Ó Gráda, Cormac, *Famine: A Short History*, Princeton University Press, 2009.

An economics professor at University College, Dublin, traces the history of hunger from ancient Egypt onward.

Thurow, Roger, *The Last Hunger Season: A Year in an African Farm Community on the Brink of Change*, Public Affairs, 2012.

A senior fellow for global agriculture and food policy at the Chicago Council on Global Affairs tells the stories of four small-scale farmers in western Kenya and concludes that relief and development organizations are headed in the right direction.

Articles

Barrett, Christopher B., and Erin C. Lentz, "Highway Robbery on the High Seas," *The Hill*, May 29, 2014, <http://tinyurl.com/19t7gp7>.

The director of Cornell University's School of Applied Economics and Management (Barrett) and an assistant professor of international relations at Bucknell University lament that hungry people go unfed because Congress requires at least half of U.S. food aid to be shipped in U.S.-flagged vessels. The American vessels tend to be more expensive, so less food can be purchased when they are used.

Bourne, Joel K., Jr., "How to Farm a Better Fish," *National Geographic*, undated, <http://tinyurl.com/15hbosw>.

A former senior editor for *National Geographic* explores environmentally friendly approaches to fish farming.

Otter, Chris, "Feast and Famine: The Global Food Crisis," *Origins: Current Events in Historical Perspective*, March 2010, <http://tinyurl.com/1988h56>.

An assistant professor of history at Ohio State University provides a historical perspective on the modern paradox of global hunger and widespread obesity.

Rosenberg, Tina, "When Food Isn't the Answer to Hunger," *The New York Times*, April 24, 2013, <http://tinyurl.com/n7b7ndm>.

Monetary aid can better solve hunger than food aid under certain circumstances.

Reports and Studies

"Case Study: Digital Green," Governance Knowledge Centre, Department of Administrative Reforms and Public Grievances, Ministry of Personnel, Public Grievances and Pensions, Government of India, June 2011, <http://tinyurl.com/qayfl8p>.

A case study prepared for the Indian government evaluates Digital Green, a nonprofit that uses information technology to educate poor farmers about agricultural practices.

"The State of Food Insecurity in the World 2013," U.N. Food and Agriculture Organization, Sept. 1, 2013, <http://tinyurl.com/mbt7g5g>.

An annual U.N. report says the world is approaching the U.N.'s 2015 hunger-reduction target, but achieving it would require "considerable and immediate additional efforts."

"Wake up before it is too late: Make agriculture truly sustainable now for food security in a changing climate," U.N. Conference on Trade and Development, September 2013, <http://tinyurl.com/kly4c3r>.

A U.N. agency report says farmers should grow a larger variety of crops and reduce fertilizer use, while food-aid organizations should support small-scale farmers and consumption of locally grown food.

"What is the status of the Golden Rice project coordinated by IRRI?" International Rice Research Institute, March 2014, <http://tinyurl.com/1a6moer>.

A nonprofit explains the challenges of developing "golden rice," a genetically modified grain designed to combat blindness and other ailments due to Vitamin-A deficiency.

Schimmelpfennig, David, and Robert Ebel, "On the Doorstep of the Information Age: Recent Adoption of Precision Agriculture," Economic Research Service, U.S. Department of Agriculture, August 2011, <http://tinyurl.com/m8qan98>.

Government economists evaluate farmers' use of technology such as optical sensors and GPS systems to more accurately fertilize, protect and water their crops.

The Next Step:

Additional Articles from Current Periodicals

Cash vs. Commodities

Katz, Jonathan M., "Food fight: Coast Guard bill could limit aid to hungry," *Al Jazeera America*, June 25, 2014, <http://tinyurl.com/m7jrqa3>.

A freelance reporter contends that the U.S. food aid system is wasteful and recommends that the United States send cash or buy food locally during humanitarian crises.

Nixon, Ron, "Typhoon Revives Debate on U.S. Food Aid Methods," *The New York Times*, Nov. 21, 2013, <http://tinyurl.com/nzuc7uz>.

Typhoon Haiyan in the Philippines reignited a debate on U.S. food-aid policy: Aid workers and antipoverty groups say current laws delay recovery efforts. The Obama administration wants more flexibility to buy less expensive food closer to disaster areas and agriculture and shipping industries say changing aid methods would hurt U.S. farmers and kill jobs.

Pecquet, Julian, "Obama administration hails Farm Bill's food aid reforms," *The Hill*, Feb. 4, 2014, <http://tinyurl.com/m7qmon6>.

The U.S. Agency for International Development hailed Senate passage of the farm bill for its "meaningful food aid reforms," which include \$80 million a year for local food purchases during international emergencies, limits on sales of U.S. commodities in countries receiving aid and increases in cash-based assistance to countries in need.

Climate Change

"Global warming worsens food, hunger problems, UN panel says," *The Associated Press*, March 31, 2014, <http://tinyurl.com/q7d3326>.

A warmer world will push food prices higher and reduce food production, making it harder and more expensive to feed the world, according to a United Nations scientific panel.

Gordon, Larry, "UC system aiming to reduce world hunger, improve food research," *Los Angeles Times*, July 1, 2014, <http://tinyurl.com/pg3no9e>.

The University of California system will expand research to help reduce world hunger and help farmers cope with the effects of climate change on food production.

Food Distribution

Gottfredson, Mark, and Gerry Mattios, "Removing The Trade Obstacles That Promote Hunger," *Forbes*, July 14, 2014, <http://tinyurl.com/l9hw7g4>.

Food distribution problems along the agriculture supply chain, such as spoilage and spillage, contribute to world hunger, according to two partners at a global business consulting firm.

Moestafa, Berni, and Agus Suhana, "Indonesia Trade Minister Says Better Food Distribution a Focus," *Bloomberg*, Feb. 12, 2014, <http://tinyurl.com/nnseepb>.

Indonesia's new trade minister said natural disasters, such as floods and volcanic eruptions, challenge the steady supply of staple goods and that his priority will be to improve food distribution.

Genetically Modified Crops

Esipisu, Isaiah, "Malnutrition a threat with use of climate-resilient crops, scientists say," *Thomas Reuters Foundation*, July 1, 2014, <http://tinyurl.com/nhyg7g2>.

Genetically modified (GM) crops designed to meet growing demand for food in developing nations and to be resilient to climate change may inadvertently worsen malnutrition, according to scientists.

Roberts, Richard, "GMOs are a key tool to addressing global hunger," *The Boston Globe*, May 23, 2014, <http://tinyurl.com/q5gespx>.

The chief scientific officer of New England Biolabs says genetic modification of crops is key to addressing world hunger because it improves agricultural yields and greatly enhances the nutritional value of plants.

Shoo, Elizabeth, "Can genetically modified crops end hunger in Africa?" *Deutsche Welle (Germany)*, Jan. 24, 2014, <http://tinyurl.com/n9r8njf>.

The African Union seeks to eradicate hunger on the continent by 2025, but there is controversy over whether genetically modified crops can help countries reach that goal.

CITING CQ RESEARCHER

Sample formats for citing these reports in a bibliography include the ones listed below. Preferred styles and formats vary, so please check with your instructor or professor.

MLA STYLE

Jost, Kenneth. "Remembering 9/11." *CQ Researcher* 2 Sept. 2011: 701-732.

APA STYLE

Jost, K. (2011, September 2). Remembering 9/11. *CQ Researcher*, 9, 701-732.

CHICAGO STYLE

Jost, Kenneth. "Remembering 9/11." *CQ Researcher*, September 2, 2011, 701-732.

In-depth Reports on Issues in the News

Are you writing a paper?

Need backup for a debate?

Want to become an expert on an issue?

For 90 years, students have turned to *CQ Researcher* for in-depth reporting on issues in the news. Reports on a full range of political and social issues are now available. Following is a selection of recent reports:

Civil Liberties

Abortion Debates, 3/14
Voting Controversies, 2/14
Whistleblowers, 1/14
Religious Repression, 11/13
Solitary Confinement, 9/12

Crime/Law

Racial Profiling, 11/13
Domestic Violence, 11/13
Border Security, 9/13
Gun Control, 3/13
Improving Cybersecurity, 2/13

Education

Paying College Athletes, 7/14
Dropout Rate, 6/14
School Discipline, 5/14
Home Schooling, 3/14
Homeless Students, 4/13

Environment/Society

Future of Cars, 7/14
Search for Life on New Planets, 6/14
Digital Journalism, 5/14
Future of TV, 4/14
Media Violence, 2/14

Health/Safety

Understanding Autism, 7/14
Regulating Toxic Chemicals, 7/14
Treating Addiction, 5/14
Synthetic Biology, 4/14

Politics/Economy

Assessing the Threat From al Qaeda, 6/14
Regulating Lobbying, 6/14
U.S. Global Engagement, 5/14
Wealth and Inequality, 4/14
China Today, 4/14
Youth Unemployment, 3/14

Upcoming Reports

Transnational Crime, 8/29/14

Race and Education, 9/5/14

Youth Suicide, 9/12/14

ACCESS

CQ Researcher is available in print and online. For access, visit your library or www.cqresearcher.com.

STAY CURRENT

For notice of upcoming *CQ Researcher* reports or to learn more about *CQ Researcher* products, subscribe to the free email newsletters, *CQ Researcher Alert!* and *CQ Researcher News*: <http://cqpress.com/newsletters>.

PURCHASE

To purchase a *CQ Researcher* report in print or electronic format (PDF), visit www.cqpress.com or call 866-427-7737. Single reports start at \$15. Bulk purchase discounts and electronic-rights licensing are also available.

SUBSCRIBE

Annual full-service *CQ Researcher* subscriptions—including 44 reports a year, monthly index updates, and a bound volume—start at \$1,054. Add \$25 for domestic postage.

CQ Researcher Online offers a backfile from 1991 and a number of tools to simplify research. For pricing information, call 800-818-7243 or 805-499-9774 or email librarysales@sagepub.com.

CQ RESEARCHER PLUS ARCHIVE

GET ONLINE ACCESS TO VITAL
ISSUES FROM 1923 TO THE PRESENT



CQ Researcher Plus Archive delivers fast, online access to every *CQ Researcher* report from 1991 to the present, PLUS lets you explore the complete archive of *Editorial Research Reports**

from 1923-1990. Search and browse more than 3,800 in-depth reports.

Loaded with handy online features, *CQ Researcher Plus Archive* provides the trustworthy reporting and the advanced online functionality today's researchers demand. The "Issue Tracker" feature provides quick links to past and present reports on the specific topics you need.

For a free trial, visit:

<http://library.cqpress.com/static.php?page=freetrial>

For pricing information, call 800-818-7243 or 805-499-9774 or e-mail librarysales@sagepub.com

**Editorial Research Reports*, the predecessor to *CQ Researcher*, provides the same expert, nonpartisan reporting on the vital issues that have shaped our society.

CQ Press • 2300 N Street, NW, Suite 800 • Washington, DC 20037