Facing the Future: Critical Challenges to Food and Agriculture

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AGree

AGree seeks to drive positive change in the food and agriculture system by connecting and challenging leaders from diverse communities to catalyze action and elevate food and agriculture policy as a national priority. Through its work, AGree will support policy innovation that addresses four critical challenges in a comprehensive and integrated way to overcome the barriers that have traditionally inhibited transformative change. AGree anticipates constructive roles for the private sector and civil society as well as for policymakers.

Background on This Document

The four papers in this series describe the critical challenges AGree believes are facing the food and agriculture system. They articulate important facts, issues, and questions that need to be addressed. Their genesis is in the dialogue over the past year among the AGree Co-Chairs and Advisory and Research Committee members who have considered the best available science and shared their perspectives on the challenges as well as potential opportunities to transform the system. AGree intends for these papers to serve as conversation starters as we more deeply engage groups and individuals with an interest in identifying solutions.

Although all the individuals formally affiliated with AGree may not agree completely with every statement that follows, they are committed to working together to find solutions to the challenges facing food and agriculture.

AGree has identified a comprehensive framework of strategies that, together, address the four challenges. As illustrated in the graphic on page iii, there is no hierarchy among the strategies; all are vital. In 2012, AGree will address a subset of the strategies, focusing our efforts on issues we are best positioned to address. Many of the strategies are being addressed in depth by other initiatives and organizations. Where possible, AGree will seek to amplify the work of others.

Acknowledgments

AGree would like to thank members of the Research Committee, the Advisory Committee, and the Co-Chairs for their work in conceptualizing, drafting, and refining this initial series.
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The world’s population, at 7 billion people today, is expected to reach 9 billion by 2050 and may exceed 10 billion by the end of the century. The vast majority of this growth will occur in developing countries, especially in South Asia and sub-Saharan Africa, regions already too familiar with chronic hunger. Much of the expansion will also occur in urban areas, where most people buy food, not grow it.

Meeting the food needs of billions will not be easy. We must at once work together to enable farmers around the world to produce higher yields—and get those crops to market efficiently—while also tending to a fragile environment and conserving the valuable resources of land and water.

As the world’s largest producer, exporter, and donor of food, the U.S. can and will play a significant role in meeting this challenge, through continued exports, through agribusiness investments, and as a source of technological innovation and financial capital. America’s strategic interest in ensuring that a growing world population has enough to eat is a strong one. The route from hunger and poverty to political turmoil can be a direct one.

Imports from surplus-producing countries like the U.S. will always be critical for those countries that cannot grow enough to meet their own needs (Figure 1). Where countries can increase their own production, this will provide the most reliable boost to both rural incomes and food supply. Most food consumed in the world is grown locally. Therefore, developing countries must grow more food, grow it more efficiently, and significantly reduce post-harvest losses. More smallholder farmers must grow food not only to feed their own families, but to feed others, and in selling to others pull themselves out of poverty.

Historically, the United States has been a leading source of agricultural knowledge and innovation, grain and other agricultural exports, agricultural development assistance, and food aid. Looking at the expected food needs of 9 billion people, we must ask once again: What role will the U.S. play in meeting this future demand? Is the U.S. making the public and private agricultural research investments necessary to be a source of innovation appropriate for the systems and challenges in food-insecure regions?

Will it maintain its commitment to addressing hunger around the world in a period of increasingly tight budgets? How might the U.S. best enable the transfer of knowledge and technology to smallholder farmers, agribusinesses, and emerging food systems? Can the U.S. play a leading role in developing agricultural systems that produce significantly more while leaving a smaller environmental footprint?

With a changing landscape of production, trade, and consumer demand, the role of U.S. agriculture will necessarily evolve. To shape this role most effectively, changes must begin now. Feeding 9 billion people will continue to require U.S. leadership, but in what form?
How Much More Food Will Be Needed?

A key question in preparing for the growing demand is, how much more food will we need to produce? The question is difficult to answer precisely, and estimates are hard to pin down, but we will likely need to increase food production by 50 to 100 percent to support this growing and changing population. Some skepticism is warranted regarding all such estimates, given researchers’ poor track record in estimating demand and supply of the major food crops. Until 2005, nearly all of the widely used models predicted that the real price of major grains and oilseeds would remain constant or fall in the foreseeable future. That didn’t happen. The models missed the mark for at least four reasons:

1) They underestimated the rate of growth in economic development of the world’s most populous countries,
2) They overestimated the rate of yield gain for the world’s most important food crops,
3) They failed to foresee the rapid rise in energy prices and the resulting diversion of food crops for biofuels, and
4) The estimates ultimately depend on policy choices that are themselves influenced by the models.

As a result of these prediction misses and policy failures, developing and developed countries misdirected both research and investments. Analyzing what went wrong in the recent past is an important starting point in assessing how to meet global food demand in the future.

Part of the uncertainty about future needs is forecasting what diets will look like in the future, which will depend on rates of economic growth as well as personal and policy choices. As populations grow, so too grows the middle class, and with this growth comes changing demands for food. A growing middle class will want different, and often more resource-intensive, food, such as more processed foods, meat and other animal products, and fruits and vegetables. Today, about one-third of global cereal production becomes animal feed, which then becomes eggs, dairy products, and meat. The costs of “converting” the feed into meat and dairy products varies, but the bottom line is that the world will face increased pressure on cropland, fossil fuel energy, and water.

Research and Education Are Linchpins of Increased Productivity

To increase productivity and yield, we need advanced research and outreach. Developing new technologies must go hand in hand with education and extension services to share improved production practices and technologies with farmers. To be effective, technologies must be appropriate to place and people, recognizing the unique characteristics of growing regions, cultures, and economic and political conditions. And local production is key. As Figure 2 shows, about 85 percent of food is eaten in the same country in which it is grown. Only a
small proportion of food is traded internationally or provided as food aid.

Estimates are that global average yield growth in the major cereals must accelerate to 1.75 percent per year, even in the face of climate change and weather fluctuations, in order to spare vast tracts of currently uncultivated lands from being put into agricultural production. Putting that much into production could cause serious environmental problems, from habitat and biodiversity loss to greenhouse gas emissions.7

But danger signs are looming. For years, yields had been increasing for the world’s three major cereals (maize, rice, and wheat). But beginning in the mid-1990s, the pace of yield gains began to slow, from about 2.9 percent in 1966 to 1.3 percent in 2006.8 This slowdown of yield growth is compounded in Africa and Asia by lower yields overall. Agricultural yields in Africa and Asia are low by global standards, only one-third those of the highest-income nations.9 Lower yields generally result from technical, policy, and economic factors that constrain access to land, water, nutrients, high-quality genetic material, extension services, storage facilities, transportation infrastructure, finance, and markets.10

In countries where most crops have not yet reached 70 to 80 percent of their biological yield potential (the point at which yield growth rates often begin to decline), public investment in research, education, and extension can result in sizable improvements.11

Helping farmers in developing countries increase yields will be the most important strategy to meet growing demand. Increasing yields is particularly important to farmers in sub-Saharan Africa and South Asia, where the gap between current and potential yields is large. And this must all be done using techniques and technologies that conserve soil, water, and habitat and that avoid negative impacts on public health.

The United States can provide research, education, and technical assistance to help developing countries grow more food. U.S. agriculture can also increase its own productivity and spur technological innovations more broadly by strengthening its domestic research efforts to feed a growing domestic population and export food to those countries unable to grow enough themselves. Investing in R&D is a powerful strategy for economic development. Agricultural research investments consistently generate average annual rates of return across the economy of 30 percent to 75 percent.12 Moreover, given that most of the poor in developing countries live in rural areas and derive significant income from agriculture, growth in agriculture is two to three times as effective in reducing poverty as growth in other sectors, making agricultural investment especially “pro-poor,” development that ensures the poor benefit as well.13

Although investments in research have been on the wane in recent decades, recent signs suggest investment in the development of agriculture in low-income countries has begun to rise.14 In 2009, the U.S. government launched “Feed the Future” to allocate additional resources and better align efforts across government departments and donors. The program (www.feedthefuture.gov) focuses explicitly on nutrition and agricultural development, which are in many, if not most, countries central to pro-poor economic progress. Feed the Future, which acknowledges that agricultural development does not automatically result in nutritional benefits, has made explicit programmatic links that help translate agricultural productivity into food security and nutritional improvement.

It should not be forgotten that although most food is consumed in the country where it is produced, not all countries can grow enough food to support their populations. In countries without fertile soil or that face harsh growing conditions, trade—often in the form of imported food from the United States and other surplus-producing countries—is a lifeline. Therefore, as demand continues to grow, U.S. agricultural productivity must also keep pace. R&D at home is needed as well.
Meeting the Challenge:
On the Ground in Uganda

In eastern Uganda, Katie Saram worked alone, cultivating a small plot of land using traditional methods. Like other Ugandan women, she balanced farming with caring for her children, hauling water, and preparing food. The hectare of land she was able to farm was barely enough to sustain her family.

Despite its harsh conditions, Uganda's agricultural potential is tremendous. The land is fertile, the climate is mild, there is enough rain for two growing seasons, and nearby markets are nowhere near saturated.

Five years ago, Saram heard about a Ugandan NGO—supported by a U.S.-based development NGO—that was helping smallholder farmers form farmer groups, grow better crops, reduce post-harvest waste, and sell their surplus. Saram signed up and was soon learning new techniques, such as proper spacing and weeding of crops, how to cultivate better varieties of vegetables, and how to use simple technologies such as maize cribs and elevated cassava-drying racks to reduce post-harvest losses. She also now grows vitamin A-rich foods in her kitchen garden to improve her children’s health.

Today Saram no longer farms in isolation. As the contact farmer for her group, she—and her farm—serve as a model of good farming, health, and hygiene. Her farm now has a pit latrine, shower, and tippy tap (a simple device for washing hands), which reduce the risk of diarrhea, typhoid, and cholera.

It is these basic, yet needed, adjustments—learned through exchange and education between farmers—that producers around the world will need to make if they are to move from growing barely enough for themselves to growing enough to help feed 9 billion people in the near future.

Adapted from ACDI/VOCA success story, Female Farmers Gain Knowledge, Respect in Uganda, http://www.acdivoca.org/site/ID/ugandaKatieSaram

photo courtesy of ACDI/VOCA
Water Scarcity and Climate Variability Add to the Challenge

Climate change is expected to have a disproportionate impact precisely on those regions where demand growth is expected to be greatest and the capacity to adapt the weakest. Climate change is predicted to affect precipitation rates and patterns, resulting in both more droughts and increased catastrophic flooding in various parts of the world. Sub-Saharan Africa is particularly vulnerable, as 95 percent of its crop production area relies entirely on rainfall. Climate change also is expected to affect temperature, growing season, soil moisture levels, rates of pest invasion, and other critical agricultural production factors. A central objective of agricultural research, extension, and education, as well as rural credit systems, must be to help farmers and producers successfully adapt to changing conditions.

Fluctuating temperatures, variable rainfall, and changing seasonal patterns elevate risk for farmers. Recent innovations in commercially viable index insurance may offer new opportunities to reduce reliance on government-funded risk management mechanisms. Nonetheless, much of the necessary adaptation will come in farming and natural resources management practices as well as in crop and livestock genetic material. Agricultural strategies, such as new seed varieties, technologies, and innovative practices, as well as greater diversity of crops, are needed to increase resilience to variability in weather, pathogen and pest pressures, and market fluctuations.

As crops fail or yield declines because of hotter or colder growing conditions or changing precipitation patterns, a pernicious feedback loop begins when food availability fails to meet demand. Food prices rise as a result. With crops more valuable, the incentive is great to convert carbon-rich rainforests, wetlands, and grasslands to crop and livestock production. This only accelerates greenhouse gas emissions, aggravating climate change and putting further pressure on agriculture. Land use change currently accounts for about one-third of human-caused CO₂ emissions.

Farmers also must have access to water, but in many regions of the world water is scarce. Nearly half a billion people around the world currently suffer from water shortages, and by 2025, it is estimated that two out of every three people will live in water-stressed areas. Climate change may further exacerbate water scarcity by altering rainfall patterns and the availability of water resources. Irrigated agriculture is the dominant user of water, accounting for approximately 70 percent of global water use and 80 percent of water consumption in the United States. Irrigation has helped boost agricultural yields and has been a critical component in increased food production in the past 50 years. However, with increasing water scarcity, agriculture will compete with other sectors seeking water, which may affect producers’ ability to provide food security for a growing population. New technologies may help alleviate the pressures. Modernized storage and water delivery infrastructure, high-efficiency irrigation, water reuse/storage, atmospheric water harvest, and desalination of ocean and brackish water are all possibilities to address water shortages.

Significant investments in research, technology development, education, and extension appropriate to place and people will be needed to assist farmers around the world in producing food under changing climatic conditions and in conditions of water scarcity—and to avoid the need for emergency food aid. However, even with significant progress, we can anticipate that droughts, floods, pests, and other natural disasters that disrupt food supplies, as well as economic variability and military conflict, will necessitate emergency food aid from time to time. The United States is the largest provider of donated food to developing countries. To avoid being counterproductive in the long term, emergency food aid must be provided in a manner that avoids distorting local markets and undermining productivity gains in developing countries.
A Kink in the Chain: Post-Harvest Waste and Poor Market Access

Reducing post-harvest waste is another crucial element in meeting the challenge of feeding 9 billion people. Although there are few reliable estimates of the magnitude of food lost between harvest and consumption, experts believe the volumes are huge: 15 percent to 50 percent worldwide. In the high-income countries, most losses are at retail and post-consumer waste stages. Indeed, developed countries waste as much food as sub-Saharan Africa produces. In addition to this waste, increasing amounts of potential food and animal feed are being diverted to produce biofuels.

In the developing world, post-harvest losses occur primarily on the farm, often because poor infrastructure inhibits the farmer's ability to get the harvest or animals to market. Significant losses also occur on farms from pests, disease and poor storage. These losses are also closely linked to food safety concerns related to biochemical contamination – by mycotoxins, for example. In large parts of Africa, how food is stored can expose it to moisture, which contributes to the development of aflatoxins.

Reducing post-harvest waste will require strengthening regional food systems by improving physical transport and communications infrastructure, as well as by making institutional improvements in grades, standards, and contracting arrangements. Reducing administrative barriers to intra-regional and international trade will also help. A further benefit of better market chains and regional food systems is the improved flow of surpluses to areas of need—a major challenge in many countries with high rates of food insecurity. More cost-effective delivery of high-quality, low-priced foods to consumers can help smallholder farmers raise their standard of living as well.

Low population density and lack of good up-to-date market information are some of the impediments to small farmers in both growing and marketing their products. Small farmers, for example, may not have the same access to quality information and prices that buyers do, creating a market disadvantage for them. Various strategies such as improving access to cell-phone technology for timely price information and creating incentives for technology adoption may help develop these regional markets.

Ensuring that supply lines are open, ensuring that farmers have appropriate implements and access to seeds and fertilizer, and providing access to markets are all critical to success. Ultimately, improving infrastructure can help promote both intra-national and international market integration. Unless the necessary infrastructure is in place, even a top producer will fail; and productivity will be a moot point.

International Trade Will Continue to Fill a Need

Even though domestic production is and will remain the workhorse in meeting food demand globally, international trade is vital. Trade helps meet sudden and unexpected food demand and supply imbalances. It provides staples to countries that do not have the natural resource base to produce enough to meet their needs. Trade creates opportunities for economic development through exports of cash crops, drives increases in efficiency and productivity, and provides access for consumers around the world to the full diversity of foods grown globally.
The poor in low-income countries spend a large share of their incomes on food, typically buying the cheapest available staples to make ends meet. When a price shock hits, they have little capacity to substitute among commodities. Even in countries where the majority of the population is rural and in farming, the poor tend to be “net purchasers” of food; that is, they are not currently in a position to benefit from higher prices. Rather, the combination of higher prices and the large share of food in their total budget reduces their purchasing power, driving more families into poverty.\textsuperscript{31}

For more than a century, the cost of basic food commodities had been declining steadily with rising productivity.\textsuperscript{32} But this trend reversed itself recently owing to the convergence of several factors: demand for food crops, rising energy costs, growing global population, changing diets and rising affluence in historically poor countries, and nonfood uses such as fuel.\textsuperscript{33} On top of these higher prices came two severe price shocks in the late 2000s and early 2010s, which hurt low-income consumers in particular.\textsuperscript{34} Global and local trade (imports and exports) play a key role in stabilizing national food supplies, and the United States plays a central role in that process and will likely remain a prime source of agricultural products, food, food aid, and agricultural technologies for the world.\textsuperscript{35}

Looking ahead, as global demand continues to grow and the impacts of climate change on agriculture are felt in many regions, cross-border trade in food will have an important role to play in creating more stable and resilient international food markets. The trading system will have to address politically difficult new issues such as the need for discipline on export restrictions. During the 2007-2008 food price crisis, more than 40 countries around the world rushed to curtail or completely close down exports of food commodities as they struggled with the crisis, further narrowing markets and driving prices still higher.\textsuperscript{36} Food surpluses in some countries were unable to reach hungry people just a border away. In a situation of overall higher prices and increased volatility, a transparent, predictable, and rules-based system governing trade in agriculture will only become more important. Policy will also need to catch up with rapidly unfolding innovations in markets, such as the adoption by major food companies of ever-more-integrated global supply chains.

### Obstacles and Opportunities to Meet the Challenge

The challenge of feeding 9 billion people is not an easy one. Several obstacles remain to be bridged, ranging from political to institutional to scientific. Yet the obstacles, while significant, also point to opportunities to address the issues. In that spirit, we outline below some of the issues and obstacles that have prevented us from moving forward in meeting these challenges, and the opportunities they present for coming together to solve them. The obstacles underscore why this challenge is difficult, but not insolvable.

**Current investments in R&D are misplaced and inadequate.** The institutional capacity for agricultural research and development should be strengthened and priorities shifted. For example, a major priority for R&D efforts should be developing technologies and production systems that enable significant intensification of production while conserving and enhancing soil, water, and habitat. Production systems must be developed and adapted for long-term productivity under the specific ecological and social conditions of those regions with lagging yields, such as sub-Saharan Africa and south Asia. And we need to better understand how climate and ecological conditions are likely to change, the impacts on agriculture, and effective strategies for adaptation. R&D efforts should be targeted within countries as well as regionally and internationally. In addition, more public and private-sector investments are needed to develop and affordably transfer agricultural production and processing technologies. Effective extension programs are critical, and as are strong educational institutions to train agricultural scientists. Key public institutions and private-sector firms in this effort should include life sciences firms, U.S.-based research institutes, universities, and development NGOs. In addition, U.S. policy places a disproportionate emphasis in its foreign
assistance portfolio on food aid; more focus is needed on aid for agricultural development.  

Initial steps in this direction include recent reforms to and expansion of the National Science Foundation, the U.S. Department of Agriculture, and USAID programs for competitively funded research on international agriculture. Their impacts must be monitored going forward. The Obama administration’s Feed the Future initiative is a step in the right direction, but much more remains to be done to leverage necessary private capital and philanthropic dollars. Foreign assistance policies have also grown increasingly decentralized and incoherent, and as a result too often work at cross-purposes. They beg for strategic reconciliation into a coherent whole.

**Policies can impede development.** Policies that impede agricultural development assistance are often shortsighted; agricultural development is vital to the development of poor countries’ economies. When these economies grow, demand for U.S. exports usually increases, including for agricultural products. Yet the Bumpers Amendment, an annual provision in the foreign operations appropriations bill since 1986, sharply limits the U.S. government’s ability to use foreign assistance to support agricultural development in developing countries. Although it was revised in 2011 to exempt the lowest income countries from the restrictions, it remains an obstacle to technology transfer.

The U.S. government can also promote and support environments conducive to private-sector agricultural development, entrepreneurship, and the formation of public-private partnerships. Policies, for example, could target business regulations, governance, rule of law, property rights, farmers’ access to market information, and transportation networks. The United States can further support agricultural productivity in low-income countries through targeted technical assistance, including farmer-to-farmer programs.

**Credit is often limited for small farmers.** Greater productivity will also require adequate and equitable access to credit for producers and others in the agriculture chain. Currently, access to credit is most limited in those very countries where productivity growth is most vital. Foreign, direct investment in those markets can result in both attractive returns for U.S. investors and agricultural productivity gains in the target countries. Of course, the investments must recognize and fairly reward pre-existing (and sometimes informal) property rights in land and water. Capital scarcity is compounded in some cases by insecure land rights and other legal and institutional obstacles that discourage both domestic and foreign investors.

**Scientific evidence on agricultural systems is insufficient.** Without better evidence for the relative merits of various strategies for agricultural intensification, formulating new policies will be challenging. We need to know more about how best to use land and water to accelerate yield growth and improve resilience in the face of climate variability and other stresses on critical natural resources. We must balance this with efforts to reduce agriculture’s environmental impacts.

We also need to know more and share more about what makes agricultural systems resilient and what strategies might be effective in promoting resilience to market fluctuations and to variability in weather and in pathogens and pests. Some evidence suggests that diversity may be an important factor in resilience, but the science remains unsettled as to the optimal scale at which diversification should occur: plot versus farm versus landscape. The science is also unsettled about
how much diversification is required and its effects on land use.

We also need better information on how various technologies, agricultural system designs, and policy options fare across multiple policy objectives (i.e., increasing production and reducing environmental impact). In particular, we must expand our understanding of when and in which context to promote one or another approach, such as reduced or no tillage, precision agriculture, the use of transgenic crop cultivars, and/or agroecological approaches. A recent U.S. National Academy of Sciences report identified numerous examples of innovative, more diverse farming systems that contribute to sustainability goals and show promise for more widespread development. These systems include conservation agriculture, agroforestry, organic farming, integrated (hybrid organic/conventional), alternative livestock production (e.g., grass-fed), and mixed crop/livestock systems.

**Agricultural production is too often at odds with environmental protection.** We need better methods and incentives to conserve and enhance the full range of natural resources on which agricultural production depends. Traditionally, we have focused more often on improving plant cultivars and livestock breeds than on managing natural resources in agriculture. As natural resource scarcity imposes greater constraints on agricultural productivity and risk, more work on integrated approaches will be needed. This will require prioritizing strategies and ensuring that investments in production, conservation, and resilience complement one another.

**Food aid could be more effective.** Food aid was developed initially as a surplus disposal mechanism in support of domestic U.S. farming and shipping communities, with a secondary objective of addressing the needs of poor countries. Yet certain policies that secure benefits to the farming and shipping communities have been widely criticized for their negative impact on the ability of U.S. food aid to satisfy emergency food needs. For example, monetization—in which commodities purchased in the United States are shipped to less developed countries and sold on the market to fund development projects—can distort markets and reduce the food’s value by one-third or more owing to price differentials between countries plus shipping and other transaction costs. Likewise, “tied sales,” that is, the requirement that U.S. food aid be purchased in the United States, also reduces cost-effectiveness. The U.S. Cargo Preference laws that require at least 75 percent of U.S. food aid be shipped on U.S. flag carriers can raise the cost of shipping by as much as 40 to 50 percent, or $150 million a year and result in shipping times that take months.

In addition to cost-effectiveness, food aid policy should deliver more targeted, nutritious foods based on the nutritional needs of the target population. The scientific evidence is clear that sufficient amounts of safe, nutritious food for mothers and infants during pregnancy and the first 1,000 days of a child’s life are critical to prevent wasting, stunting, childhood morbidity, and mortality, as well as to promote healthy growth and development.

The United States is in the process of expanding the range of foods that can be procured for food aid to include foods effective in preventing mortality from wasting in the acute phases of an emergency. This expansion should be further developed, and more should be done to target specialized nutrient-dense foods to young children and pregnant women.
Critical Issues and Questions

No single strategy or sector can meet the impending challenge of feeding 9 billion people by 2050. It will require creative and collaborative efforts among governments, farmers around the world, private companies, universities, and civil society. Meeting this challenge is our collective responsibility. We must work together to ensure that our grandchildren and great-grandchildren do not confront chronic global food crises of the sort that our grandparents so skillfully averted on our behalf.

Following are some of the critical questions that must be addressed for the United States to continue providing leadership in meeting the demand for food of a growing and increasingly wealthy global population:

- What is needed to increase production and reduce loss to feed at least 9 billion people in 2050 with no net increase in land or water use?

- How do we shift U.S. policy and resources to increase production abroad and dramatically reduce the need for U.S. food aid for chronically hungry populations overseas?

- What mix of agricultural systems is needed to meet expected future demand for food? To what extent can more diversified systems help meet the demand?

- Should U.S. foreign agricultural development and emergency food programs continue to include restrictions favored by U.S. producers and transporters at the expense of poor people in developing countries?

- Is the U.S. intellectual property regime inhibiting increased production in developing countries?

- How can the environmental footprint of agriculture be improved?

- How can civil society, government, and the private sector leverage their respective resources and strengths to improve productivity, ensure access to nutritious food, and sustain the environment in developing countries?

- How can we design systems that have the resilience needed to handle variability in weather, shifting climatic zones, and pathogen and pest pressures that agriculture may face in the coming decades?

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1These questions are illustrative of the types of issues AGree will address; they are not exhaustive.
Notes


2 Compounding the population growth effect, between 2005 and 2050 today’s low- and middle-income countries’ economies are expected to grow at an average annual rate of 5.2 percent — versus just 1.6 percent for today’s high-income countries. This will drive up their share of global income from 20 percent to 55 percent. See van der Mensbrugge, Dominique, Israel Osorio Rodarte, Andrew Burns, and John Baffes. (2009). How to Feed the World in 2050: Macroeconomic Environment, Commodity Markets—A Longer Term Outlook, produced for the Expert Meeting on How to Feed the World in 2050. Rome: Food and Agriculture Organization. However, income growth predictions are generally imprecise and contested.


5 Reijnders and Soret find that the average conversion of vegetable to animal protein is 10 to 1. For chicken production, the protein conversion efficiency is about 18 percent, for pork about 9 percent, and for beef about 6 percent See Reijnders, Lucas, and Sam Soret. (2003). Quantification of the Environmental Impact of Different Dietary Protein Sources. American Journal of Clinical Nutrition 78(suppl):664S–85. Smil finds similar rates, from 5 percent for beef to 20 percent for chicken on a protein basis. See Smil, V. (2000). Feeding the world: a challenge for the 21st Century. Cambridge, MA: MIT Press.


9 Tilman et al. (2011).


12 Alston, Babcock, and Pardey (2010). The precise return on investment is difficult to estimate due to attribution problems and temporal lags.


The Challenge of Meeting Future Demand for Food


18 Cassman, Grassini, and van Wart (2010).


25 Gustavsson et al. (2011).

26 Fafchamps, Marcel. (2004.) Market Institutions in Sub-Saharan Africa: Theory and Evidence. Cambridge, MA: MIT Press Book; Barrett, Christopher B. (2008). Smallholder Market Participation: Concepts and Evidence from Eastern and Southern Africa. Food Policy 33(4): 299-317. Food grades and standards describe the attributes that make individual food products safe, useful, and valuable. They can be set by government, the private sector, multilateral organizations, and non-governmental organizations, and compliance can be mandatory or voluntary, depending on the standard. A well-known example is the Codex Alimentarius Commission, a joint FAO-WHO body that has created voluntary, harmonized international food standards, guidelines, and codes of practice for the food trade. In cases where national standards are missing, or conflict exists between the standards of the exporter (or donor) and the importer (or recipient), Codex standards may be adopted. The increasing harmonization of national and international standards and the development of standards for emerging food products can help to reduce food waste by reducing trade barriers and promoting better understanding among trading partners of the food quality and safety requirements desired or demanded by the market.


36 Countries eligible for the World Bank’s International Development Association.
The Challenge of Meeting Future Demand for Food


44 Lenz, Barrett, & Gomez (2012) Recent studies demonstrate that the use of local and regional purchase results in more cost-effective use of food aid funds as well as timelier delivery in emergencies


The Challenge of Conserving and Enhancing Water, Soil, and Habitat

Agriculture is inextricably linked to the environment. Natural resources must be managed, conserved, and protected if producers are to meet the demands of a growing global population over the long term. Farmland with healthy soils and adequate water are the basic inputs that, when enhanced by technology and good management practices, produce affordable food, fiber, and fuel. Although some agricultural activities and practices can degrade environmental quality, a growing body of work suggests that managing agriculture as an ecosystem can achieve both strong agricultural production and a healthy environment.

But agricultural systems will be pushed significantly harder in the coming years. Fifty to 100 percent more food will be needed by 2050 to meet the needs of a population that will top 9 billion. Production will need to be dramatically increased while safeguarding biodiversity, conserving habitat, and reducing the environmental footprint of agriculture.

Obstacles to meeting this challenge are significant, numerous, and varied. In addition to increasing water scarcity and the expected effects of global climate change, constraints include policies that encourage—or fail to discourage—practices that can harm the environment and lack of financial rewards or benefits for conserving natural resources. In some parts of the world, significant financial risk prevents producers from adopting high-yield and/or environmentally protective practices and technologies. Regulation plays a vital role in protecting the environment, but the complexity and diversity of agricultural operations make development of effective regulatory approaches appropriate to all landscapes and farms difficult. Overly broad regulations can be onerous and costly, discourage innovation, and, often, are ineffective. More attention will be needed to development of regulatory approaches that set clear performance standards while providing flexibility to producers in the methods they employ to achieve standards. A lack of coordination and underinvestment in integrative research and innovation also impedes development of the solutions that will be needed to simultaneously increase production and reduce environmental impact.

At the same time, significant progress has been made in improving the environmental performance of agriculture, and there are many opportunities for continued progress. The United States and many other developed countries have steadily increased food production while also improving the efficiency with which inputs are used. Soil erosion has sharply declined in many areas, and toxicity to mammals and persistence in the environment of agricultural pesticides have decreased during the past 50 years. In developing countries with large exploitable yield gaps, greater investment in research and development as well as adaptation of practices and access to technologies that support both greater yields and improved environmental quality are key to ensuring food security,
conservation of natural resources, and sustainable economic development.

Meeting the challenge ahead will require deploying public and private scientific and technology resources alongside management practices, agricultural systems, and innovations that achieve sustained high yields while conserving and enhancing natural resources. Moreover, the development and sale of innovative technologies for environmental protection specific to improving agricultural productivity will provide opportunities for new businesses and good quality jobs in the U.S., which has comparative advantages for global leadership in R&D (both public and private sector) as well as the supporting industries (inputs, farm equipment, information technology). The United States has an opportunity to be a leader in this area.

There also are potential financial rewards for farmers who are able to participate in markets for the environmental services and benefits that they provide through the use of environmentally sound practices and technologies. Usually, regulation or product-specific standards are required to set the parameters of a market in which farmers and ranchers can derive rewards. Where the potential for such markets can be realized, it will not only be possible, but advantageous, for agricultural producers to engage in conservation and environmental protection efforts.

The American public sees farmers as stewards of the land. A 2010 public opinion poll finds that a majority of Americans view agriculture as having a positive impact on the environment. The farmers and ranchers working with AGree and their peers concur with the belief among American producers that resource conservation and environmental stewardship are important priorities that are compatible with high levels of agricultural production. There are people of good will on all sides of these issues who are ready to roll up their sleeves and get to work improving the alignment between agricultural production and environmental quality. Yet, an adversarial approach—whether by environmental advocates, agricultural producer groups, government agencies, or politicians—too often leads to a perception that agriculture and environmental protection cannot coexist.

Though clearly a significant challenge, the goals of increasing global production, improving the environmental performance of agriculture, and maintaining a good financial return can together be achieved through supportive policies; incentives for adopting current technology and practices; the discovery and adoption of new, appropriate technologies, practices, and approaches; and collaboration. The tough question is: How do we achieve all of these goals together?

Current Resource Availability, Environmental Quality, and Agricultural Production

Agriculture is by far the dominant user of water and land to support human activities. The expansion of irrigated areas throughout the world played a major role over the past 50 years in increasing food production. Worldwide, agriculture consumes 70 percent of the surface water withdrawn for use. Irrigated agriculture is practiced on about 20 percent of cultivated land worldwide yet accounts for 40 percent of crop production. In the United States, agriculture accounts for more than 80 percent of water consumed, with the 16 percent of all harvested cropland that is irrigated generating nearly half the value of all crops sold.

In the absence of new sources of water, however, further increases in the use of irrigation pose technological,
The Challenge of Conserving and Enhancing Water, Soil, and Habitat

geographical, and political challenges due to competition for water resources from other economic sectors as well as an increased human population.4

Looming water scarcities present a serious threat. According to the United Nations, almost a half billion people in 29 countries suffered from water shortages in 2008—and the situation is expected to get worse. By 2025, the United Nations estimates that “two out of every three people will live in water-stressed areas.”5 Pressure on water resources can be addressed through policies, institutions, and incentives for improved management of ground and surface water resources as well as by adopting existing technologies or developing new ones, such as modernized storage and water delivery infrastructure, high-efficiency irrigation, water reuse/storage, and desalination of ocean and brackish water—where they are affordable.6

Climate change is expected to affect both temperatures and precipitation rates in various parts of the world. Even though it is a global phenomenon, its likely effects will vary significantly by region. Incidence of drought from changing rainfall patterns could dramatically reduce yields in some regions that rely heavily on rainfed agriculture. An example of such a region is sub-Saharan Africa, where approximately 95 percent of the crop production area relies entirely on rainfall.7 In addition to affecting precipitation rates and patterns, climate change is expected to affect temperature; growing season; soil moisture levels; sea level rise leading to inundation and salinization of coastal areas, deltas, estuaries, and aquifers; rates of pest invasion; and other critical agricultural production factors.

Though some regions of the world may actually benefit from increased temperatures and rainfall, current models suggest the most affected regions will be those with the least adaptive capacity, accentuating already great disparities in agricultural productivity.8 Further, research suggests that adverse consequences of a changing climate will disproportionately affect the world’s poor. “Hardest hit will be small scale farmers and other low income groups in areas prone to drought, flooding, salt water intrusion, or sea surges.”9

In regard to water quality, agriculture is one of a variety of sources of water pollution in the United States and globally. In the United States, the U.S. Geological Survey concluded, based on analyses of stream water samples collected over time, that “increases in nutrient loadings from agricultural and, to a lesser extent, urban sources have resulted in nutrient concentrations in many streams and parts of aquifers that exceed standards for protection of human health and (or) aquatic life, often by large margins.”10 At the same time, research by the USDA demonstrates the effectiveness of conservation practices in improving water quality, as well as reducing soil erosion, and improving conditions for wildlife.11 Such research also suggests the potential for additional improvements in water quality by more widespread adoption of conservation practices (Figure 1).12

**Figure 1**

<table>
<thead>
<tr>
<th>Average Nitrogen Fertilizer Use and Yields for U.S. Corn, 1964-2003</th>
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</thead>
<tbody>
<tr>
<td><strong>lbs/acre</strong></td>
</tr>
<tr>
<td>150</td>
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<tr>
<td>120</td>
</tr>
<tr>
<td>90</td>
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<td>60</td>
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Source: ERS/USDA. Graph reflects most recent complete data available.

While average nitrogen use on corn has leveled off since 1980, average yields have continued to grow. USDA estimates a potential reduction in N use by 18 to 35 pounds per acre on 52 million acres if all corn in the corn belt were grown using conservation best practices (USDA/NRCS Conservation Effects Assessment Project).

Globally, the impact of nutrient loadings on the environment is expected to grow in developing countries unless new tools and practices are adapted and adopted to avoid movement of nutrients from agriculture to surface waters. At present, the proportion of producers who use fertilizers and herbicides in developing countries is lower than in developed
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countries, but current use per acre is often highly inefficient, especially in rain-fed agricultural systems. If yields are to keep pace with population growth in developing countries without harming the environment, targeted and efficient fertilizer use and use of practices that raise soil organic matter and soil fertility are imperative.

Concerns remain that pesticides can also harm environmental quality and pose risks to wildlife and human health via occupational exposure, food, drinking water, and the air. Pesticides used in the United States and other developed countries have become progressively less toxic to mammals and less environmentally persistent over the past 50 years. Also, many agricultural producers have moved toward use of integrated pest management and other information-based techniques that suppress pest populations, thereby reducing the need for pesticides. Pesticides can still be found in surface and groundwater in the United States, sometimes in concentrations that may harm aquatic life or fish-eating wildlife. However, human exposure to high-risk pesticides via drinking water has declined in the last two decades, and regulators remain focused on better understanding and further reducing drinking-water-based risks.

Within the last decade, the United States and other countries have adopted transgenic seed varieties. Transgenic crops now constitute more than 80 percent of soybeans, corn, and cotton grown in the United States. Farmers using this seed may enjoy lower costs and/or higher yields, and such seed has reduced insecticide use on cotton and corn crops. However, recurrent use of genetically altered seeds over large acreages has resulted in the rapid rise of herbicide-resistant weeds. This has both exacerbated crop protection challenges for many growers and led to increased use of other herbicides. An additional challenge is "genetic drift," in which genetically altered materials infiltrate nearby farm fields with nontransgenic crops.

Globally, some older pesticides banned in the United States are still used in developing countries. Developing countries contend they cannot afford, for reasons of cost and/or efficacy, to ban some of these older pesticides. The dilemma of cost/efficacy versus ecological impacts remains a contentious global issue.

Around the world, prime farmland is fiercely contested. At present, crops and livestock use nearly 40 percent of the earth’s terrestrial surface. This includes nearly all land suitable for crop production under available technologies. In the United States, prime farmland is being converted to nonagricultural uses, especially where there is pressure for development. A similar trend is underway in China, and in most developing countries, with a consequent loss of crop production capacity.

In the United States, soil erosion, although still a major issue in some areas, has been reduced substantially through programs in effect since 1985 (Figure 2). The USDA’s quid pro quo arrangement (Conservation Compliance) requires recipients of commodity, farm, or loan payments to achieve a minimum standard for soil erosion reduction on highly erodible cropland. The USDA’s Conservation Reserve Program (CRP) makes payments to farmers who idle environmentally sensitive farmland. The CRP has also enhanced wildlife habitat on arable lands and strengthened rural economies.

The soil and water conservation provisions of the 1985 Farm Bill are recognized by many in both the conservation and agriculture communities as both successful and an excellent investment of public funds.

Figure 2
Soil Erosion on Cropland, Select Years, 1982-2007

Soil erosion originating from U.S. cropland declined by 43 percent between 1982 and 2007, largely as a result of conservation compliance rules and land retirement programs.
Opportunities for Integrating Agricultural Production and Environmental Protection

Given enormous variation in agro-ecological circumstances across the planet, no one farming system or approach will best feed the planet while also protecting the environment. Instead, a wide diversity of crops, livestock, and farming systems is needed. Indeed, coexistence of different farming systems will help promote diversity and resilience, and likely will play a key role in future food and ecosystem security.

Agricultural systems produce both commodities and a range of ecosystem services. Examples include wildlife conservation, biological pest control and pollinator management, and water recharging. Farming also can provide storage capacity for carbon that would otherwise be released into the atmosphere as a greenhouse gas (Figure 3).

Figure 3

<table>
<thead>
<tr>
<th>Estimated Maximum Potential Carbon Sequestration from Improved Cropping/Management Practices</th>
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<tbody>
<tr>
<td>Pasture mgmt</td>
</tr>
<tr>
<td>Improved irrigation</td>
</tr>
<tr>
<td>Improved fertilizer use</td>
</tr>
<tr>
<td>Crop rotations</td>
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<tr>
<td>Conservation tillage</td>
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<tr>
<td>Carbon (MMT)</td>
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</table>

Source: Lewandowski et al., ERA/AEDA

Many agricultural practices have the potential to add carbon back to the soil over time, helping to mitigate climate change.

While there are many “off-the-shelf” technologies that can improve yields without regard to long-term environmental consequences—and many that can reduce environmental impact without regard for increasing yield—there are few that can do both.

One such approach to designing agro-ecological systems is called ecological or sustainable intensification. Sustainable intensification increases crop production while also improving environmental, social, and economic sustainability by enhancing nutrient flows and managing biodiversity and ecosystem services. Intensification can include a variety of methods to achieve multiple goals, such as increasing yields, reducing water use, protecting ground and surface water quality, avoiding negative impact on wildlife and biodiversity, and decreasing greenhouse gas emissions.

Globally, the regions most amenable to increasing crop yields while still meeting the other sustainable intensification criteria include land with yields currently well below global averages, including sub-Saharan Africa, parts of Latin America and South Asia, and Eastern Europe, where nutrient and water limitations are strongest. Opportunities abound, particularly in the developing world, for technological “leapfrogging” by applying advanced irrigation, improved crop varieties, soil building techniques, targeted nutrient application, pest management practices, communications, energy, and other technologies to transform low-productivity agricultural sectors.

Diversified farming systems, which can be combined with sustainable or ecological intensification, are another approach for integrating agriculture and ecosystem management. Diverse systems compose a modest but growing component of U.S. agriculture and include conservation agriculture, organic farming, integrated (hybrid organic/conventional), alternative livestock production (e.g., grass-fed), and mixed crop/livestock systems. These systems rely on a set of common practices, including diverse crop rotations and soil-building practices. In some cases, diverse farming systems may have lower yields than their conventional counterparts, while in others cases yields may exceed conventional systems. Diverse systems often can better integrate production, environmental, and economic objectives. With more research and extension investment in these systems, crop yields on par with or even exceeding conventional systems may be possible under a greater range of conditions.
In addition to diversification of systems, landscape scale initiatives show promise. Collective efforts among farmers and ranchers can transform entire river basins, watersheds, aquifers, bird flyways, or other geographically dependent catchments. Yet, there are challenges to managing such programs. Landscape-scale areas tend to extend across multiple jurisdictions, and environmental impacts in them frequently result from multiple sectors (for example, both farm runoff and municipal wastewater). Thus, managing efforts to improve the environment requires collaboration. In the United States, the federal government is a partner in a suite of voluntary multi-jurisdictional efforts to achieve critical thresholds or to set inspirational and scalable precedents.

One such landscape-scale effort is the U.S. Fish and Wildlife Service’s (USFWS) Partners for Fish and Wildlife Program. Under this program, USFWS provides technical and financial assistance to private landowners and Tribes who are willing to work with the agency and other partners on a voluntary basis to meet the habitat needs of Federal Trust Species. Since the program was established in 1987, its managers have worked with more than 44,000 ranchers, farmers, and other private landowners as well as 3,000 partnering organizations to successfully restore and enhance more than one million acres of wetlands, 3 million acres of uplands, and 9,000 miles of stream habitat.

Also initiated by the USFWS, Landscape Conservation Cooperatives (LCCs) are public-private partnerships working across political and jurisdictional boundaries to “allow a region’s private, state and federal conservation infrastructure to operate as a system rather than as independent entities” by using an approach that is “holistic, collaborative, adaptive and grounded in science.” All federal agencies involved in conservation-related activities participate in the 22 LCCs that cover the geography of the United States, as do many state agencies, universities, and private-sector partners. Efforts such as these demonstrate the potential for public-private collaboration in both setting and achieving landscape-scale conservation goals. The Nebraska Natural Resource Districts are another example of cross-jurisdictional natural resource management in heavily agricultural landscapes.

**Obstacles to Addressing the Challenge**

Both in the United States and globally, a wide range of factors influence the extent to which both high agricultural production and conservation of soil, water, and habitat are achieved.

**The nature of agriculture.** The most fundamental obstacle to finding global solutions to increased production while protecting the environment is the diverse, dispersed, and site-specific nature of agricultural production itself. Agriculture as a whole is characterized by unique combinations of soil, climate, topography, hydrology, and biological diversity as well as a diversity of crops and production systems. Add to this unpredictable weather and market conditions, and together, these factors require flexible, adaptive, and localized management systems that are not easily covered by one-size-fits-all policies. This interest in more flexible policies is one driver for growing interest in performance-based standards, as opposed to practice-based incentives or regulations.

**Current investments in R&D are misplaced and inadequate.** Another obstacle is the lack of coordination in setting research priorities and carrying out research, as well as declines in public investments in agricultural research in the United States since 2002. Productivity-enhancing R&D and conservation R&D need to be integrated. A systems approach to research on environmentally compatible agriculture is essential, including on-farm and applied research that producers can use to help adapt management practices to real-world circumstances. In addition, cuts to extension services and applied agricultural sciences departments threaten the adaptation and widespread adoption of improved management practices and technologies. Research investments that produce publicly available information, tools, and technologies that are available for use in extension and directly by farmers are critical.
Institutionalizing an integrated approach to research, development, education, and extension will likely require new organizational structures, innovative approaches to education, and changes in professional incentives. Currently, there is no mechanism in place that Land Grant University and CGIAR systems, other national and private universities, major research funders, and private research entities can use to coordinate research efforts in order to avoid redundant research, heighten synergies, and minimize gaps in R&D efforts.

Climate change, water scarcity, invasive pest and disease pressures, and food insecurity are global problems. Technologies that better integrate environmental and production goals are needed by every country in the world. Countries that pioneer R&D efforts in this area are likely to enjoy the benefits of creating new industries, jobs, and export markets. Given the nature of the challenges facing the food and agriculture system and the 8-15 year lag time between initiating research and commercial availability of new technologies, it is imperative to shift and align research priorities now.

**Cost of conservation.** Few farmers can adopt conservation systems and provide ecosystem services at a loss. Keeping biologically sensitive or highly erodible lands out of production can reduce short-term revenue and profit, and adopting conservation systems and technologies can be expensive. For example, the costs of installing grassed waterways and buffer strips to keep sediment and nutrients out of rivers and lakes are not recouped in commodity prices. Although markets for ecosystems services that reward resource protection for the public good are developing, they are few and generally small.

Farmers frequently also depend on financing through the existing banking system, and securing credit for projects that do not bolster the producer’s bottom line is difficult. Not surprisingly, conservation is practiced to a higher degree by well-off farmers and ranchers than by smaller producers with fewer financial resources. Farmers and ranchers, especially those with smallholdings or precarious finances, tend to be highly risk averse when it comes to yields. Uncertainty and the perception of yield risk from the adoption of conservation practices is a barrier everywhere, from Ethiopia to the United States.

**Suitability and complexity of some environmental regulations.** Strategies that have been successful in dramatically improving air quality and reducing toxic emissions from specific sources, such as regulation of pollution from factories or car emissions limits, are not easily applicable to agriculture given its dispersed nature. In addition, states vary considerably in their approaches to, for example, addressing water quality impacts from nonpoint source pollution from agriculture. This compounds problems with compliance and leads to highly uneven results in improving environmental quality.

Many regulatory programs are complex and in some cases overlap, making compliance difficult and burdensome. Often the only interaction farmers and ranchers have with the U.S. EPA involves enforcement. Agencies could likely improve compliance rates and environmental outcomes by simplifying regulations and focusing less on enforcement and more on supporting operators’ efforts to understand and comply with them. Regulation succeeds best when it establishes clear and enforceable standards while providing flexibility to the
private sector regarding which technologies and practices to employ to achieve standards, such as has been the case with dramatic reductions in the sulfur dioxide emissions that cause acid rain. Successful performance-based regulation requires widely applicable metrics and measurement tools, which in many cases have yet to be developed.

**Multiple and sometimes conflicting policies and objectives.** Public policies sometimes have unintended consequences or create conflicting incentives. For example, subsidizing input costs, which may be critical to increasing production and closing yield gaps in some developing countries, can lead to overuse. And countries that subsidize agricultural production or artificially increase commodity prices create incentives for producers to produce more than a free market would support and overuse yield-enhancing inputs. This can lead to increased production on environmentally sensitive, marginal lands. In the United States, policies and programs also sometimes function at cross-purposes. For example, the Renewable Fuel Standard and ethanol tax credit have created strong incentives for farmers to plant fence post to fence post, while at the same time the Conservation Reserve Program encourages farmers to set aside highly erodible acreage for conservation. Conflict also arises in the implementation of the multiple statutes that govern agriculture and the environment.

In some cases, enhancements in one area take away from enhancements in others. For example, flood irrigation uses more water than some other forms of irrigation, but it can enhance habitat for certain species of birds or other water-loving creatures. Clearing land around fields may address food safety concerns that result from intermingling of animal excrement with crops, but it removes wildlife habitat.

Agencies often lack the flexibility required to effectively balance competing policy objectives. The requirements of statutes can limit the ability of government agencies to try new approaches to solving problems. Moreover, policies often are not designed to achieve landscape-scale environmental outcomes. For example, many current USDA conservation programs limit the ability of the agency to focus limited resources on the most serious issues and fail to include mechanisms to evaluate their effectiveness or to anticipate change.

**Lack of knowledge about and resistance to new techniques.** Lack of information, scientific knowledge, and extension services are barriers to adopting conservation practices. Social learning, whether it occurs at a village festival or during coffee shop chats, is vital to promoting the adoption of new technologies or techniques. Custom and culture also play a role. Producers may be discouraged from adopting new technologies or practices by time-honored practices. People are often more comfortable doing things as “they have always been done,” including methods for growing crops and managing land or allocating government resources and operating programs. In addition, technologies developed and used in the United States do not always transfer well to developing countries, particularly when farming occurs on small plots and institutions and infrastructure to support the technology are not in place.

Adoption has lagged of the many profitable and effective conservation practices and systems that have been developed. The link between discovery of new conservation practices and systems and their adoption is complex and far from automatic. A better understanding is needed of what stands in the way of wider adoption of existing, proven conservation practices.
Adversarial politics and practices. There are, in fact, many examples of farm and environmental groups that work well together and devise effective compromises. Unfortunately, however, tension and poor relationships among government agencies, business interests, and environmental advocates persist and needlessly hinder advances in agricultural production, resource conservation, and environmental quality. The views of many have hardened, reducing their willingness to try new approaches. In some cases, parties resort to lawsuits, leading to significant expense and gridlock.

Opportunities for Innovation in Conservation Policy and Practice

Well-designed policy can drive innovation, increasing the effectiveness and lowering the costs of technologies and practice systems that improve both productivity and environmental performance of agriculture. One opportunity, for example, is to develop better performance-based standards and incentives to achieve the environmental outcomes specified by law. Rewarding achievement of specific environmental performance standards accomplishes more than using incentives to adopt best management practices. Measuring and monitoring the environmental performance of agricultural systems requires accurate metrics, however, both that quantify local and national and global level impacts. Such metrics must be able to support and inform decision-making. Investment is needed to develop a set of widely applicable metrics and the measurement tools.

“Regulatory incentives” provide another opportunity to improve environmental performance. Expedited review of permit applications, compliance assurance, or priority for regulatory relief could encourage producers to institute conservation practices that achieve more than the minimum standards established by regulations. An example of such incentives is the NRCS’s Sage Grouse Initiative. In exchange for making certain changes now, farmers and ranchers will be exempt from future conservation actions if the Sage Grouse is later listed as threatened or endangered under the Endangered Species Act. Since its launch in 2010, it has become a conservation success story of the western United States.

Regulation can create the incentive for private markets for ecosystem services that benefit farmers and ranchers. Indeed, without government policies that set up the need for, and the operation of, private markets, markets for agriculture environmental services will exist under only limited conditions. Generally speaking, a regulated or multi-jurisdictionally agreed upon maximum level of sediment, nutrients, effluent, greenhouse gases, or other measurable pollutants is needed to define the boundaries within which agricultural participants can produce, accumulate, trade, or sell credits that prevent maximum levels from being exceeded.

When an environmental service market policy is appropriately specified and designed to include agricultural sector participation, farmers and ranchers can benefit from the sale of environmental services from existing or modified agricultural practices. Ideally, this is accomplished without an unwieldy administrative burden. Such programs are most successful when farmers receive positive messaging, incentives, and trust in their expertise.

There are specific cases in which the public sector has purchased ecosystem services directly from farmers. The City of New York pays farmers who operate on land upstream of their drinking water source to adopt practices that reduce run-off. This option proved to be
less expensive for the city than upgrading its water treatment facility. Similarly, in the Florida Ranchlands for Environmental Services Project, state water districts pay ranchers to retain water on their property and/or reduce phosphorus levels rather than spend resources on expensive infrastructure projects. These are examples of projects that are succeeding in part because they are crafted to address very specific circumstances.

Private-sector initiatives also can drive increased alignment between agricultural and food production and environmental quality. Increasingly, food companies, from Stonyfield (food producer), to Walmart (food retailer), to McDonalds, are responding to customer demands by requiring that the farmers and ranchers that supply them adhere to specific production practices. Some producer groups also are creating tools and programs to assist their members in improving environmental performance. For example, the Iowa Soybean Association’s Ag Technology and Environmental Stewardship Foundation helps farmers assess and improve environmental impact associated with nutrient management. The Dairy Farmers of America are driving improvements in greenhouse gas intensity through a carbon footprint tool and recognizing leadership through their annual U.S. Dairy Sustainability Awards. Private-sector efforts are also underway to develop comprehensive sustainability standards that can be applied to individual operations and products.

**Looking Forward**

Sustained and intensive public- and private-sector attention, investment, and collaboration will be needed—both in the United States and globally—to integrate improved environmental protection and resource conservation with increased agricultural production at the scope and scale required to meet the critical challenges ahead. Key questions¹ include:

- How do we redirect research priorities and mobilize resources to achieve game-changing breakthroughs needed in both agricultural productivity and environmental performance around the world?

- How can U.S. agriculture, conservation, and environmental protection policies, programs, research, and agencies avoid working at cross-purposes?

- What policy changes will achieve environmental quality, spur innovation, and provide regulatory certainty for U.S. producers?

- If public funds for traditional cost-share program solutions diminish, what is the alternative to ensure meaningful progress is made?

- To what extent can producers everywhere be rewarded for the ecosystem services they provide?

- How do we ensure that actions necessary to meet the very real and serious challenges of the not-too-distant future are not postponed?

- What can be done to reduce adversarial politics and promote the collaboration needed to protect the environment and ensure the vitality of U.S. agriculture?

¹These questions are illustrative of the types of issues AGree will address; they are not exhaustive.
Notes

13 In China, up to half of the nitrogen applied to crops is lost by volatilization and another 5-10 percent by leaching. This contrasts with the situation in Africa, where use rates of fertilizers are very low and limit agricultural production there. See FAO (2002).
14 A class of moderately persistent pesticides has been linked in a recent study to bee colony collapse disorder. Whitehorn, Penelope R., Stephanie O’Connor, Felix L. Wackers, and Dave Goulson. (2012). Neonicotinoid Pesticide Reduces Bumble Bee Colony Growth and Queen Production. Science 335 (6076): 351-352.
18 This includes seed in which the genes of a biological insecticide, Bacillus thuringiensis (Bt) have been inserted in corn and cotton, as well as corn, soybean and cotton seed with engineered properties that convey herbicide resistance so that the weed killer glyphosate (Round-Up) doesn’t also kill the crop. See National Research Council. (2010). Impact of Genetically Engineered Crops on Farm Sustainability in the United States. Washington, D.C.: National Academies Press.
19 At least eight weed species have evolved resistance to glyphosate in fields using glyphosate-resistant crops, and the number is growing. See National Research Council (2010).
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28 The degree to which these services can be provided depends on management practices. Some have suggested that for this approach to be successful on a global scale, dramatic changes in agricultural consumption patterns, such as reducing meat consumption in human diets and reducing bioenergy crops on our most productive farmlands, would be required. See Foley, J.A., et al. (2011). Solutions for a cultivated planet. Nature 478:337-342.


37 The National Research Council, in reviewing the U.S. Land Grant University system identified a need to (1) develop and expand research programs and academic curricula to reflect a contemporary view of the agri-food systems, (2) remove historic barriers to encourage interdisciplinary research, teaching, and extension collaborations, and (3) engage a wide variety of stakeholders to assess their needs and develop priorities, targeted programs, and effective information delivery modes. See National Research Council. (1997). Colleges of Agriculture at the Land Grant Universities: Public Service and Public Policy. Proceedings of the National Academy of Sciences 94 (5): 1610-1611. A subsequent series of studies by the Kellogg Foundation came to similar conclusions. In particular, the third report in the series “Returning to Our Roots: The Engaged Institution” (1999) emphasized the importance of community engagement, outlining seven characteristics of an engaged institution – responsiveness, respect for partners, academic neutrality, accessibility, integration, coordination, and resource partnerships. Moreover, the report noted that lack of stable funding for engagement was a critical problem. See Kellogg Commission on the Future of State and Land-Grant Universities. (1999). Returning to Our Roots: The Engaged Institution. Washington, D.C.: National Association of State Universities and Land-Grant Colleges.

38 The Consultative Group for International Agricultural Research (CGIAR) system, which has been highly effective in developing technology, raising productivity and alleviating poverty in developing countries, was evaluated by the World Bank. The Bank urged the CGIAR system to more clearly and systematically prioritize its research goals, and to strategically target its resources to achieve priorities. See World Bank (2003).

39 Certainly there are great examples of public-private, cross-institutional and transnational partnerships in agricultural and natural resource research. See Ridgway, Richard L. and Charles Valentine Riley Memorial Foundation. (2011). Agriculture, Food, Nutrition and Natural Resources R&D Round Table: Research Partnerships Yield Greater Societal Returns. Washington, D.C.: Charles Valentine Riley Memorial Foundation. Available at http://www.farmfoundation.org/news/articlefiles/1733-Proceedings_web.pdf. Yet, there is no policy or institution whose responsibility it is to coordinate on global and cross-sectoral scales. There are institutions for the coordination of health efforts (World Health Organization), for development of voluntary international standards for business performance (International Organization for Standardization, ISO agreements), and various conventions for the inter-institutional and international coordination of priorities, but no such institution exists to target, focus and optimize multiple research efforts.


In one case, long-time foes, the Humane Society and the United Egg Producers developed a legislative proposal to regulate chicken cage size. These groups' compromise, which did not meet either group's original demands, is reported to have been prompted by a personal meeting between two top executives who recognized that the costs of continuing to fight against each other’s position was greater than the losses each side would incur from a compromise. See Neuman, William. (7 July, 2011). Egg Producers and Humane Society Urging Federal Standard on Hen Cages. *New York Times*, p. B6.


The Challenge of Improving Nutrition and Public Health

A healthy diet is the most effective form of preventive health care. Obesity and related health issues from overeating reduce individuals’ quality of life and cost the United States billions in unnecessary health care costs. On the other side of the spectrum, food insecurity—and its driver, poverty—rob children of healthy development, and impede working age and elderly Americans’ ability to enjoy productive lives, with potentially long-term, and costly, impacts.1

Given these enormous costs, it makes sense to invest more in improved diets. Yet we face a conundrum: How do we ensure that everyone can make healthy dietary choices (through both equal access to healthy food and straightforward information about the consequences of their food choices) while maintaining the American ideals of free choice, free markets, and free speech?

We must navigate this conundrum to identify effective policies and actions that will ensure universal availability of and access to sufficient nutritious food and enable consumers to make healthy food choices. And to implement them, we must determine the appropriate roles of private-sector actors along the supply chain, the medical community and health care systems, multiple public agencies and institutions (including agriculture, health, education, commerce, and foreign assistance), and a range of civil society organizations.

While there are many questions about how to change the choices individuals make about food, the barriers to better policy are largely institutional and political. The decision-making apparatus for U.S. food policy does not function well to address systemic, long-term, multifaceted, complex challenges, such as improving nutrition across the population. This has been true for so long that it’s hard to even perceive what we could accomplish with shared purpose, constructive dialogue, and reasonable compromise. The key ingredients of healthy food choices may have largely disappeared from the shelves of the U.S. food policy marketplace, but like kitchen gardeners rediscovering old food ways, we can grow them anew.

This paper outlines the scope of the problem in the United States and examines policies and practices that can improve nutrition and public health domestically. AGree’s interest in better food and agriculture policy also includes helping to improve nutrition and public health in developing countries, but we address those challenges separately.2 This paper discusses the evidence for the following questions: What public policies, private-sector actions, and collaborative activities have been proposed to help Americans make healthy food choices? What are the appropriate roles of government, the private sector, and civil society in helping to ensure availability of and access to sufficient amounts of nutritious and safe food? What are their roles in promoting nutrition for good health?

Food Insecurity, Obesity, and Rising Health Care Costs

In 2010, 14.5 percent of U.S. households—nearly 49 million Americans—were food insecure, meaning they were not assured adequate food at all times during the year. Because of rising poverty during the economic crisis, U.S. food insecurity was greater from 2008 to
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2010 than at any time since measurement began in the mid-1990s.

Meanwhile, Americans suffer an epidemic of obesity and nutrition-related chronic disease. The Centers for Disease Control and Prevention estimate about one-third of U.S. adults and 17 percent (or 12.5 million) of children and adolescents aged 2–19 are obese (Figure 1). Between 1970 and 2003, average caloric intake in the United States increased to 2,757 calories, 20 percent higher than the World Health Organization recommends.

Figure 1

Four of the ten leading causes of death in the United States—heart disease, cancer, stroke, and diabetes—are related to diet and obesity. The percentage of adults with diabetes, for example, has grown from 8.5 percent to 12 percent since 1999, and one in three children today is expected to become diabetic. In 2008, the direct and indirect costs to the U.S. health care system and to the U.S. economy from overweight and obesity totaled approximately $147 billion. In 2007, the costs associated just with Type II diabetes—to which overweight/obesity and lack of exercise significantly contribute—were $159.5 billion, including medical costs of $105.7 billion and indirect costs of $53.8 billion.

The burden of increasing health care costs is a major contributor to current U.S. fiscal challenges. States are estimated to spend as much as $75 billion a year on obesity-related medical costs, and this number could rise substantially if there is a shift in health care responsibility from the federal to state governments. If current trends continue, obesity and diabetes will account for one-fifth of U.S. health care expenses by 2020.

Several changes to our lifestyles and personal choices have contributed to the increase in obesity. More two-worker households pressed for time means that convenience often trumps healthier home cooking; ready-to-eat foods are often higher-calorie options. Our jobs are more sedentary, and our diets consist of more processed, low-cost, high-calorie foods. Some have argued that farm subsidies, particularly for corn, have contributed to the growth in consumption of high-fat animal products, high-fructose corn syrup, and processed foods, although the evidence of such a link is scant. Marketing and media, which more often promote high-calorie snack food and fast food than fruits and vegetables, also play a role, as do changing norms around portion sizes and when and where to eat.

Strategies to Improve Nutrition and Public Health

Strategies to improve American diets, lower health care costs, and improve health abound. The critical question is: Which of these strategies will work, and of these, which reflects an acceptable balance between freedom of choice and speech and government action to promote the public interest? Should farm programs and policies encourage more fruit and vegetable production? Should marketing be restricted? Labeling increased? Should the U.S. government impose taxes on certain foods and beverages? Should government nutrition programs prescribe healthier purchases and healthier school meals? Should regional food efforts be supported to encourage awareness of and access to healthy foods? How should the government handle food safety and food related risks? And what can and should the private
sector do to move both food companies and consumers to make choices that improve nutrition and health? These questions and the following sections are intended to highlight—rather than in any way endorse—potential approaches that seem to have traction among various constituencies.

**Increase Consumption of Fruits and Vegetables**

An important step in improving diets is to eat more fruits and vegetables. This is among the most glaring gaps between the American diet and the *U.S. Dietary Guidelines*. The Guidelines recommend that Americans consume more fruits, vegetables, whole grains, fat-free and low-fat dairy products, and seafood, and fewer foods with sodium (salt), saturated fats, trans fats, cholesterol, added sugars, and refined grains. The Guidelines currently serve as a foundation for nutrition interventions and education to improve health. They also influence food labeling and advertising rules, standards, and guidelines for the federal nutrition assistance programs.\(^ {14}\) While it is difficult to precisely estimate the dietary changes needed to align U.S. food consumption patterns with the Dietary Guidelines because of the numerous combinations of foods that can yield healthy diets, we know in which direction diets need to shift.

This gap in Americans’ consumption of the recommended amounts of fruit and vegetables exists for a variety of reasons, and ultimately influences both supply and demand for fruits and vegetables. While people do exercise personal choice in health decisions, including food choices, social influence plays a big role.\(^ {15}\) Marketing, cultural norms, family norms, education, and in the case of children, parents’ decisions all influence diet choices.

In addition to those social influences are issues of affordability and access. Not everyone has easy access to healthy food choices given what they can afford, where they live, or, if they are dependents, who provides their food. Fruits and vegetables are more expensive on a calorie basis than energy-dense refined grains and fats.\(^ {16}\)

There is also evidence that overall healthier diets cost more.\(^ {17}\) Low-income households may be optimizing their food budgets to get the most satiating diet at the lowest cost.

Finally, institutional purchases, such as within the federal food security programs, influence supply and demand of healthy food. The National School Lunch Program and the School Breakfast Program serve about one-third of U.S. school children.\(^ {18}\) The school meals are prepared and sold by not-for-profit School Food Authorities at the school district level, and they must balance a “trilemma” of (a) ensuring nutrition quality, (b) restraining program costs, and (c) encouraging student participation.\(^ {19}\) All of these decisions affect what is served, and ultimately what farmers grow to sell to the programs. To maintain participation levels, for example, many programs serve quick-service, restaurant-style menus. To maintain revenue levels, they also serve comparatively less healthful, but appealing foods through a la carte lines and vending machines. The USDA’s School Nutrition Dietary Assessment study found that most meals served provide sufficient amounts of food energy, protein, and other nutrients, but also that most meals failed to meet recommendations for avoiding too much of other nutrients (such as saturated fat) and ingredients (such as sodium).

New rules seek to strengthen nutrition standards while maintaining the economic feasibility of school meal program operations. Reauthorization legislation in 2010 for the Child Nutrition and Special Supplemental Food...
Program for Women, Infants, and Children (WIC) for the first time directed USDA to establish nutrition standards that apply to all foods sold in schools. The law requires competitive food sales to raise sufficient revenue to cover their costs so they are not cross-subsidized by the federal meals programs.

If all Americans were to follow the Dietary Guidelines’ recommendations on fruits and vegetables, imports and domestic production would need to increase considerably to meet new demand. If the increased supply were to come exclusively from domestic sources, U.S. producers would have to more than double their fruit acreage and increase vegetable acreage by nearly one and a half times—still only a small fraction (less than 10 percent) of total American cropland. Yet the current U.S. planting flexibility restriction bars growers who participate in federal crop programs from planting fruits and vegetables on land for which they receive direct payments. Groups representing fruit and vegetable producers have insisted on this provision in successive farm bills, asserting that removing it would give program producers an unfair advantage; they would be able to plant specialty crops while still receiving the cross-subsidy that the direct payment represented. This will be largely moot if the direct payment program is eliminated in the next farm bill. Policies aside, there are a number of production barriers such as capital costs for new equipment, access to manual labor, and access to markets that may also impede increased supply.

**Improve Marketing and Advertising Targeted to Children**

Another set of questions focuses on whether public policy should try to affect food advertising, and much of the attention is focused on advertising to children. Those who support such policies point to the Institute of Medicine’s report, *Food Marketing to Children and Youth: Threat or Opportunity?* The report summarized evidence from 123 studies of the effect of advertising on children’s food choices and health outcomes and concluded, “Food and beverage marketing practices geared to children and youth are out of balance with healthful diets and contribute to an environment that puts their health at risk.” The report also cites the Federal Trade Commission finding in 2006 that children ages 2–11 watched 25,600 advertisements in a one-year period, of which 5,500 were for food and beverages. The most frequent ads were for restaurants and fast food, cereals (of which 84 percent of ads were for sweetened cereal), and desserts and other sweets. Children saw on average 1,400 ads for fast food and restaurants, but only 16 ads for vegetables and legumes, and not one ad for fresh fruit. The American Psychological Association argues that children under age 8 cannot understand an advertiser’s persuasive intent. Claims that would be recognized by most adults as deceptive may be unclear to children.

There are two primary methods to rein in advertising that targets children: industry self-regulation and stronger government regulation. In recent years, attention has focused on a series of voluntary industry initiatives by the Council of Better Business Bureaus and other private-sector associations. Many argue that to make a difference in the actual marketing environment that children face, these voluntary initiatives need stronger voluntary principles and accountability. “If industry fails to demonstrate a good faith commitment to this issue and take positive steps,” Deborah Platt Majoras, Federal Trade Commission chair in the George W. Bush administration, warned in 2005, “others may step in and act in its stead.”

**Impose Taxes on Less Healthful Foods and Improve Food Labeling**

Another strategy often discussed to influence choice and demand is taxing less healthy foods. Health policy advocates tend to support such taxes because they have the biggest favorable impact on food choice. For example, the director of the Centers for Disease Control and Prevention, Thomas Frieden, has argued for a 10 percent sales tax on sugar-sweetened beverages. USDA Economic Research Service researchers have estimated that a 1 percent increase in the price of caloric sweetened beverages would lead to a 1.26 percent decrease in the quantity consumed.
More research is needed to understand the impact of taxes on food and beverage consumption. The federal government could carry out pilot projects and then support well-designed research to estimate the impact, such as how taxes might affect average intake reductions. Research could also estimate other social and economic effects that are relevant to policy decision-making, such as the degree of consumer dissatisfaction and the regressivity of the resulting tax burden and health benefits.

Whether and how to label food more precisely is also a question. Some argue that the government should play a more substantial role in regulating claims about nutrition and health qualities that consumers cannot themselves verify. The U.S. government ensures that consumers have access to quality information on nutritional content and health-related qualities, both positive and negative, through requirements for consistent and accurate labeling of calories, saturated fats, cholesterol, and sodium, among other nutrients. A report by USDA’s Economic Research Services on mandatory food labeling suggests that consumers who use food labels are more likely to eat more fiber and iron than those not reading labels. A separate study found even greater impact of food labeling on consumer choices. Furthermore, the federal government recently implemented a new requirement that many large chain restaurants must now post calorie levels for standard menu items. More research is needed, however, to better understand the impact of specific strategies to provide nutrition information on healthy food choices and overall dietary quality.

**Improve Nutrition in Food Assistance Programs**

The federal government devotes approximately $70 billion annually to food and nutrition assistance programs for vulnerable families, and proposals are on the table to improve the nutritional effectiveness of these programs.

In 2010, fully one in five Americans participated in one or more of the major nutrition programs. The Supplemental Nutrition Assistance Program (SNAP) is by far the largest. One-half of all children will participate in SNAP at some point during their childhood, including 90 percent of African American children. Evidence is growing that SNAP improves food security among families. For example, a 2010 study commissioned by USDA’s Economic Research Services finds that SNAP participation reduces by more than 30 percent the likelihood of being food insecure. Another nutrition program, WIC, provides nutrition counseling, services, and a package of particular high-nutrient foods and infant formula to about 9.2 million pregnant and post-partum women, infants, and young children each month.

Proposals to improve the nutritional quality in SNAP have included restricting the class of foods eligible for purchase (for example, by making sugar-sweetened beverages ineligible). Others have proposed an extra subsidy for more favored categories of foods, such as municipal “bonus bucks” programs for farmers’ markets or the Healthy Incentive Pilot subsidy for fruit and vegetable purchases. The WIC food package was revised in the late 2000s to improve nutrition content and more strongly promote breastfeeding rather than infant formula.

The effects on behavior of such policy changes could be complex. For example, restricting SNAP benefits might cause inconvenience, stigma, or lower “take-up” of benefits by eligible people. Likewise, further changing
the WIC package might cause additional risk or difficulties for formula-fed infants.

Three other federal nutrition programs are the National School Lunch Program, the School Breakfast Program, and the Child and Adult Care Food Program, which serves meals in centers and home day care settings. Using these programs to improve nutrition among students could improve health but would likely raise costs, as noted above.

**Expand Local and Regional Food Systems**

In recent years, a broad-based national effort has emerged to encourage Americans to “buy local” and help support local farmers with direct-to-market sources of revenue. Americans purchased $4.8 billion in locally produced foods in 2008, about one-fifth through direct market channels such as farmers’ markets and roadside stands. As of October 2011, there were nearly 7,300 farmers markets in the United States, an 18 percent annual growth rate since USDA began tracking these outlets in 1994.

One federal program that is supporting regional food networks is the 2009 “Know Your Farmer, Know Your Food” initiative. It promotes and supports local and regional foods through several programs. The Know Your Farmer initiative also helps spark demand by issuing coupons for direct-to-consumer fruit and vegetable purchases for seniors and for mothers and children enrolled in WIC. The initiative also supports farm-to-school tactical teams to assist school food administrators in purchasing more locally and regionally grown food.

Although an emerging market segment, locally grown foods still represent a very small proportion of total food sales and the national-level health impacts are difficult to measure. Although specific links between improved health and local and regional food systems have not been established, the growth and attention show promise in engaging the public in more conscious food choices. Farmers’ markets, farm-to-school programs, direct-to-consumer marketing of foods, and Community Supported Agriculture arrangements have helped families learn more about the foods they eat, become exposed to new foods, and engage in community activities. Furthermore, increased enthusiasm around local and regional foods has made many consumers better informed about where their food comes from.

**Ensure Health and Safety of the Food Supply**

Heightened concern and demand in the United States and globally for a healthy, safe, and affordable food supply has driven research and adoption of new technologies and practices that have reduced exposure both to potentially harmful agricultural and food inputs as well as food-borne pathogens. These include improvements in contamination detection methods through improved institutional capacity and reduced diagnostic costs. However, concerns remain that there is insufficient scientific understanding about the comprehensive, synergistic, and cumulative effects to human health and the environment from exposure to inputs used in agricultural production and food manufacturing, such as pesticides, chemicals, fertilizers, transgenic seeds, antibiotics, and hormones. There are particular concerns about the exposure of women of childbearing age, pregnant women, and children, with some studies indicating that current exposure levels are harmful to child development and health.

understanding and sound methods and metrics for risk assessment. Widely embraced by diverse groups, the report recommends harnessing scientific advances to make toxicity testing quicker, less expensive, and more directly relevant to human exposures. More effort is needed to advance these and other strategies recommended for improving understanding.

Improvements in food safety will also be needed to further reduce the adverse health effects from biological contaminants. Each year, food-borne illness affects more than 48 million Americans. The Food Safety Modernization Act represented a sweeping reform of food safety laws, providing the Food and Drug Administration (FDA) new enforcement authority to achieve higher rates of compliance with prevention- and risk-based food safety standards and to better respond to and contain problems when they do occur. The act also provides the FDA with important new tools to hold imported foods to the same standards as domestic foods and directs FDA to build an integrated national food safety system in partnership with state and local authorities.

Critical Choices

All these strategies, and others, hold potential for improving American diets and public health. Clearly, given the country’s growing girth and persistent food insecurity, current programs and policies are not as effective as they could be. As the costs of obesity-related diseases continue to rise and the toll on individual health mounts, the call for a public health response grows louder. The health care costs, some argue, are reason enough for government intervention. To nudge the nation toward better diets (and better health), both the public and private sectors must continue to grapple with the above strategies and issues.

A major question in any discussion will be what is the appropriate role of government, the private sector, and others in civil society in helping to ensure the availability of and access to sufficient amounts of nutritious and safe food? What are their respective roles in promoting good nutrition for good health? Market-driven forces play an important role in the efficiency and effectiveness of global, domestic, regional, and local food markets. Billions of consumers today in countries around the world have access to a wide variety of affordable foods because of market forces. Efforts to improve nutrition and promote health must recognize and leverage the fundamental nature of personal freedoms and free-market principles while attending to the public health costs of the foods we eat.

Following are some of the critical questions1 with which stakeholders and policymakers must wrestle in developing strategies and actions to address the challenge of improving nutrition and public health in the United States:

- Should marketing of foods be restricted and labeling made more visible in order to encourage healthier food choices?
- Should foods that are high in sugar, fat, and salt be taxed?
- Should government restrict or incentivize the choices of nutrition program recipients to encourage healthier food choices?
- Should private-sector interests be excluded from the process of setting nutritional criteria in the school lunch and breakfast programs?
- Should public policy do more to promote regional food production and consumption?
- Does current research, oversight and regulation of biological contaminants, transgenics, and chemicals used in agriculture adequately protect the public and the environment?

1 These questions are illustrative of the types of issues AGree will address; they are not exhaustive.
Notes


2 These issues are discussed in AGree’s The Challenge of Meeting Future Demand for Food paper and will be further explored in the context of AGree’s work to support vulnerable populations’ access to nutritious food, both in the United States and overseas.


14 U.S. Department of Agriculture & Department of Health and Human Services (2010).


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31 To be eligible, households income must fall under 185 percent of the federal poverty threshold or be participating in one of several other safety net programs. In addition, there must be evidence of nutritional risk, broadly defined, at a cost of $6.8 billion in fiscal year.


34 Eligible children are from families with incomes below 130 percent of the federal poverty threshold, although all federal school meals are subsidized to some extent. In fiscal year 2010, the NSLP served 31.6 million lunches daily, on average, and the smaller and newer SBP served 11.6 million breakfasts. The cost for both was $13.3 billion.


38 Martinez, et al. (2010).


Neil and Brandon Moseley couldn’t on the surface be more different. Brandon is quiet and introspective; Neil is an extrovert. Neil loves to mingle with the crowds at farmers’ markets answering questions about his pesticide-free tomatoes. Brandon loves nothing more than getting on a tractor, alone, with only a field of corn in his sight lines. Neil came to farming in a round-about manner; Brandon knew in high school that he wanted to farm. What the two brothers do share, however, is a love for the job. They also share something else: a story that points to the future of U.S. farming.

Brandon is a conventional farmer, farming with a partner 2,000 acres of soybeans, corn, wheat, and seed corn in central Indiana, about a half hour’s drive from Lafayette. His brother Neil, three years older, is a different sort of farmer, farming 22 acres of all those vegetables your grandmother grew—tomatoes, green beans, squash, zucchini, the list goes on—all without the use of chemical fertilizers and pesticides, and right next door to his brother and other larger, neighboring farms. Small versus big, conventional versus organic (albeit not certified): It is this mix that can help to sustain U.S. agriculture by drawing a diverse group of farmers, young and old, new and experienced, who will push for new innovations and ensure a diverse landscape of 21st-century farming.

But it wasn’t an easy road, and it seldom is on today’s family farms. Brandon, Neil, and five other siblings grew up on a farm their parents, Jim and Kathy, had purchased with a 100 percent FHA loan in the 1970s. Although Jim was himself a fourth-generation farmer, there was no family farm waiting for him after he graduated from college. His grandparents, like many farm families, had not left a clear will, and the estate was complicated. As a result the land did not transfer seamlessly to his own father. That left Jim and Kathy with no other option but to rent a farm when they graduated from college and try to make a go of it.

Through sheer will and hard work, they made a success of it. So successful, in fact, that people accused Jim of “industrial farming” because they raised 60,000 pigs and 3,000 acres of grain, something that still irks him to this day. “It was still a family farm that started with nothing,” he said. And a business, he pointed out, that spurred new businesses. “Through the years, I developed people as managers and partners as a way to give them an opportunity to build experience and equity. They could leave our operation and start their own business because they had acquired those two important ingredients. In addition, we have three of our kids today involved in farming and we’re not directly linked to the business of any one of the three. They’re on their own.”

Neil and Brandon are two of those children, although for Neil, the path into farming was a little more circuitous. After college he worked for a number of years but then thought about starting a restaurant business. Knowing the failure rate of that profession, his father suggested he consider producing locally grown, all-natural produce for restaurants instead.
So while his brother Brandon bides his time waiting for the spring thaw to get into the fields, Neil is in his greenhouse in January coaxing tomato seedlings to life so he can beat the “normal” tomato selling season and eke out a better profit.

Neither one is actually making much of a profit in these early years. Brandon must balance the huge capital investment that farming requires today and calculate how many acres to farm based on labor rates per acre to support his family. For most grain farming, that’s about $40/acre. Neil, meanwhile, must figure out how many “loss leader” crops he can carry, and how to work the local politics to break into the very competitive local farmers’ markets. Neil brings in about $32,000 net while raising three kids. Brandon clears about $40,000 with two kids. That’s tough when their friends from college are making two or three times that in the cities.

Their father says they’re willing to make those sacrifices because of that intrinsic, “hard-to-put-your finger-on-it” value of farming. They do it because they find a generational continuity in it, a security in working with family. They also have the farm-life optimism that next year’s crop will give them a better return. And they do it in the end because “they don’t want their kids and their grandkids to be disconnected from this life.”

Last spring, shortly after Neil had put his new tomatoes in, his neighbor took to the field to spray his crops with 2,4-D, an herbicide that will annihilate tomatoes. Neil and his dad tried frantically to wave him down, but he didn’t see them. And the wind was blowing right onto Neil’s field. That event highlighted the differences between the two styles of agricultural production and the inherent risks posed. It means there has to be respect and cooperation, and the two brothers have figured out how to do that.

The current debate about the present structure of agriculture in the policy arena and the media attention around it has illustrated the tension that Brandon and Neil should feel. Based on what many claim, they would by necessity be at each other’s throats—one holding the mantle of the virtuous “small and natural,” and the other doing “big ag.” But for these two, that story doesn’t resemble the truth. They are not at odds over their differences in farming styles. Both, in fact, are the future of farming.

“We need both,” says Jim. “It’s not even a matter of two ends of the spectrum. There’s variation along the spectrum. We need all these styles of farming in order to feed the population. It really is that simple.”

This paper explores the future viability of farms and ranches, the pull and tug of government support of agriculture, the pull and tug of big versus small. It also explores the growing reliance on hired farmworkers and immigrant labor, and the important role rural communities play in supporting generations of farmers and ranchers. Whether they are starting out on their own or taking over a family business, attracting young people like Neil and Brandon into farming occupations requires attention not only to the financials of farming but to important quality-of-life issues as well. Good schools, shopping, and exposure to new ideas and innovations can be as important as the expected returns from the farm business.

**Ensuring Farm Viability and Opportunities for Future Farmers**

The future of any food system and economy depends on the viability and sustainability of its farm businesses and workforce. In the United States alone, the food and
agriculture industry is valued at nearly $1.8 trillion and constitutes 8.64 percent of the total U.S. employment. Much of the increase in the productivity and competitiveness of the U.S. farm and food sectors over the last half-century is the result of the entrepreneurship, hard work, and resilience of millions of family-run farms, farm laborers, and managers and employees. American agriculture is extremely diverse—farms differ by size, use of hired workers, types of commodities raised, and production practices. This diversity is a strength, but it also poses serious challenges to public policymakers seeking ways to sustain or improve farm viability.

Almost 90 percent of U.S. farms are small and medium-sized family operations (defined as those with gross farm sales of less than $250,000 per year). While they operate about half of the total U.S. farmland, they generate just 15 percent of total farm sales. On average, farm households on these operations receive virtually no (and often negative) net farm income and rely almost completely on off-farm income. Clearly, opportunities for off-farm work, with benefits, in rural communities have become vital to the well-being of these farm households. Most small and medium-sized U.S. farms are also land rich but cash poor, with average net worth of over $500,000. The low business income and high asset values of many farms and ranches make them difficult to transfer or sell to future generations of farmers.

By contrast, the remaining 280,000 large family and nonfamily operations with gross sales over $250,000 per year collectively produce most of the food, fiber, and fuel in U.S. agriculture, and their operators report average household income from farming alone of over $100,000 per year. Owners of large farms and ranches carry significantly more debt than smaller operations, but they also report higher asset values and net worth. Although they often have family members who still work off-farm (usually for the health benefits), they are much more likely to depend on agriculture for the majority of their family income (Figure 1).

Within the ranks of medium and large commercial farms, the level of capital, sources of income, and use of hired labor differ dramatically by the type of commodities farmed. Those who grow oilseeds or grains, on the one hand, use little hired labor and generate 25 percent of U.S. farm sales, yet receive more than 50 percent of federal government payments. On the other hand, those who raise specialty crops rely heavily on hired labor and compose 17 percent of U.S. farm sales, yet receive only 2 percent of government payments. Among livestock farmers, most chicken and pork is raised on moderate-sized farms employing family labor. They use large confinement facilities and rely on contracts with processors to sell their products. These farms receive almost no direct assistance from farm programs.

Meanwhile, the dairy sector, which includes successful family operations that are both moderate and large-scale, sells its products to a highly regulated market and receives federal income and price support for dairy products. Beef production is split between hundreds of thousands of relatively moderate-sized family-run cow-calf operations with little hired help and a small number of very large cattle feedlots that have significant hired workforces and finish beef just prior to slaughter. The
unique challenges and opportunities these different groups face are important to address in developing new approaches to farm and food policy.

Because it is such a competitive sector, farms tend to be price-takers (buying from and selling to much more consolidated industries). As a result, short-term returns on individual farms often depend on national and global market conditions and/or changes in federal farm programs and tax policies, neither of which farmers can control. It is important not to equate scale with profitability—there are many examples of small or mid-sized farms in the U.S. with competitive costs of production (and also large-scale farms that are not making money).

In addition, a farm operation’s viability involves more than simple calculations of economic profitability. Farm business decision-making often involves maximizing multiple objectives, only some of which are traditional business goals. The family character of U.S. agriculture can be a double-edged sword, however. Research consistently shows that farmers are often willing to accept below-market returns to their labor, management, and capital assets, which collectively depresses their net returns and can lead to overproduction. On the other side, however, their strong attachment to land and community and reliance on unpaid family labor have increased their resilience by allowing them to absorb market fluctuations and compete against larger nonfamily operations with more fixed cash expenses.³

The rate of new business formation in U.S. agriculture has declined in recent decades. And the percentage of farms that were operated by new entrants (people who started farming in the previous five years) declined from 22 percent in the 1980s, to 17 percent in the 1990s, to 12-14 percent in the 2000s.⁴ Over the same period, the rate of farm exits actually declined, as older farmers and ranchers remained in business longer (perhaps because of the lack of new entrants). As a result, the average age of principal farm operators in 2007 was 57, up from age 50 in 1978, and the proportion of farmers under age 35 has declined from 16 percent to 5 percent. Currently, nearly one-third of U.S. farmers are over age 65, and they manage almost 30 percent of U.S. land in farming.⁵

Interestingly, farming operations with sales over $500,000 have notably younger principal farm operators (only 17 percent are over 65), and are much more likely to be multigenerational businesses with more than two farm operators.

Stories of farm children being unwilling or unable to take over a family operation are widespread. Completely new entrants face many additional barriers. One major threat to farm entry (and the future growth of many farming operations) is the rising cost of land and equipment associated with modern agriculture. Rising land values and economies of scale make it increasingly difficult for young farmers to assemble sufficient capital to purchase (or take over) a viable large commercial farming operation. It’s highly unlikely that Brandon or Neil Moseley, for example, would have been able to get started without the backing of their father’s already-successful venture. A lack of adequate estate planning and high estate taxes also make it difficult to transfer large and complex commercial farming businesses across generations. Many observers note that a large fraction of U.S. farmland will likely change hands over the next two decades, with great uncertainty about who will be able to afford to acquire these assets.

Another factor influencing the decision to farm is the pressures introduced from the growing reliance on exports and the broader globalization of food markets. U.S. farmers must as a result increasingly compete with low-cost producers in other countries. Changes in the use of technology and labor can help many farms survive, but not all changes improve the quality of life for farmers and workers, and the economic benefits often accrue to a small group of early farm innovators, downstream processors, and consumers (in terms of lower real food prices).⁶

Farm incomes on small and mid-sized farms and ranches are often too small and volatile to sustain a family without a second or third job. In aggregate, farm income composed less than 10 percent of total U.S. farm household income in 2009. As a result of this off-farm
income, when viewed through the lens of households, most farm families appear to be relatively well off.\(^7\) Compared to typical nonfarm households, U.S. farm households report higher median household income, have lower poverty rates, and are more likely to have health insurance.\(^8\)

However, when viewed as businesses, relatively few U.S. farms are thriving, and most farm households earn relatively little of their family household income from their farming. Among the 2.2 million farms\(^9\) counted in the 2007 Census of Agriculture, only 1 million reported positive net cash income from farming, and most of those had net gains of well under $25,000 per year. In addition, USDA data show that while farm household income may be higher than average, it is also more variable than nonfarm household income.\(^10\) The income is highly volatile owing to sudden price swings and unpredictable weather and other risks.

A growing suite of federal and state programs is specifically designed to promote entry into farming. These include federal direct farm loans and loan guarantees targeted at beginning farmers, “farm-link” programs to connect retiring farmers with new farmers, farm transition services to help reduce the legal and financial complexities of transferring a farm operation across generations, and farmer training programs designed to help young people without farm backgrounds learn the basics of farming. In addition to these state and federal government programs, several nongovernmental organizations have developed programs as well. These additional support programs receive relatively modest annual funding from the federal government and are too new for their effectiveness to be determined.

Although many assume that future farmers will materialize through traditional transfers of farm assets and knowledge across generations, there is growing interest in nontraditional models of farm entry and farm transition. Examples include transferring ownership to unrelated farm managers and farmworkers, recognizing and supporting the growing numbers of small-scale immigrant farms that often thrive in urbanizing areas, and supporting new entrants (often with nonfarm backgrounds) who are using emerging local food markets as the basis for starting new farm operations.

Particularly in situations in which farm youth are unable or unwilling to continue the family business, nontraditional transitions can help to ensure the future viability of farm businesses. As a whole, whether these alternative models can be significant enough to affect the larger U.S. farm-sector output remains to be seen.

As the story of Brandon and Neil Moseley reveals, ultimately, the decision to farm is influenced by more than simple balance sheet calculations. Intrinsic factors such as an affinity for a rural lifestyle, the appeal of being one’s own boss, and a desire to involve children in farming are major motivations for farming. Yet policies to promote farm viability rarely address these noneconomic issues. It should probably not be surprising, therefore, that only a weak relationship exists between farm program spending and the rates of farm entry and survival across time.

**Rethinking Farm Policy**

To ensure a sufficient food supply and rural economic well-being, a central thrust of most U.S. farm programs since the 1930s has been to improve the level and stability of economic returns for farmers. Most federal spending on farm programs focuses on three aims: (1) marketing loan assistance and counter-cyclical payment programs that guarantee certain levels of market prices
or revenues in the face of market volatility, (2) a direct
payment program that provides farmers with annual
subsidy payments regardless of output or market prices,
and (3) crop insurance and disaster payment programs.
Total annual spending on these programs has averaged
$6-15 billion in recent years.

The diversity of farm operations described earlier makes
designing effective and fair policies challenging. Only 30
percent of all U.S. farms receive commodity program
payments, and many important commodity producers—
particularly specialty crop and livestock farms—are
largely excluded from the most significant federal
programs. There is no strong evidence that these farm
programs consistently stabilize farm income or increase
long-run net income for the farmers who qualify. Part of
the problem is that farmers respond to the financial
incentives associated with government programs in
ways that might mitigate some of the short-run
benefits. For example, increased returns
associated with some farm programs can lead to
farmers and investors bidding up the price of
farmland. Program benefits have also been
linked to inflated farmland rental rates.

Deliberations about the 2012 farm bill are focused
on alternative ways to use funding from the direct
payments program to expand risk management
tools for farmers. The debate in Washington
largely assumes that government-supported risk
management is necessary for the farm sector to
thrive. A deeper examination, however, about the
extent to which the private sector could
independently provide risk management tools is
needed. The private sector already independently
provides farmers with tools to manage their price
risk. For example, corn farmers can lock in high
corn prices on the futures market. But growth of
subsidies for both crop insurance premiums and
administrative costs has largely crowded out private-
sector involvement in developing new yield or revenue
protection programs. Some question whether
agriculture would be adversely affected by greater or
total reliance on the private sector for risk management
tools.

Studies show that many U.S. farm programs reinforce a
larger process of structural change toward larger
farms. The perceived structural impacts of farm
policies have led to the development of policies to set
some limits on the amount of total federal program
payments that a single farm operator can receive. The
argument in favor of payment limitations is that the
largest operations typically have more sufficient farm
income to survive in a competitive private market
without government help.

Current payment limitation policies appear to have had
little dramatic effect on the distribution of farm program
subsidies. Because many federal benefits are linked to
farm output, a relatively small number of large farming
operations continue to receive a very large share of total
farm program payments (Figure 2).

Figure 2

Encouraging a Skilled and Stable
Workforce

As farm sizes have grown, the number of hired
farmworkers has grown. On larger farms, hired help
makes up more than one-third of the farm labor force.
Workers for labor-intensive crops such as fruits and
vegetables and workers for confinement livestock operations are in particularly high demand. There are currently well over one million seasonal or year-round farm employees, many of whom are immigrants.\textsuperscript{15} Farmworkers experience working conditions that can vary widely based on geography, crop, and employer. Hired farmworkers have long been a mainstay of U.S. farming systems in the West and Southeast, although the share of foreign-born workers in this group has varied over time.\textsuperscript{16} More recently, the livestock industry and other operations in the Midwest and Northeast, regions that traditionally relied on family or local sources of labor, have begun using immigrant farmworkers as well.\textsuperscript{17}

Changes in immigration policy in the mid-1960s curtailed legal immigration to the United States for temporary farm work, although the use of foreign-born workers appears to have continued unabated. As a result, growing numbers of immigrant farmworkers do not have legal work status. Among seasonal agricultural workers, for example, the estimated share of undocumented workers rose from 7 percent in the early 1990s to over 50 percent in 2005-2006.\textsuperscript{18}

Hired farmworkers have traditionally had among the lowest pay with the poorest working conditions of any sector in the U.S. economy. In 2010, average earnings were about $9 an hour. Studies indicate that farmworkers’ median weekly earnings are only 60 percent of that of workers in comparable private-sector jobs outside agriculture, such as construction and retail. Their underemployment and unemployment rates are much higher than the national averages as well. Farmworker households also have twice the poverty rate of nonfarm households, a situation that partly reflects the fact that many workers send a significant share of their wages back to their home countries.\textsuperscript{19} Housing conditions (particularly for migrant workers) are often poor, and workers can experience exposure to pesticides, inadequate sanitary conditions, long working hours, and obstacles to obtaining health care. Although many states and individual farmers have worked to improve the pay and working conditions of hired employees, many states have lenient standards and many farmers have been reluctant to improve wages and working conditions because it could reduce their competitiveness.

Despite farm laborers’ growing ranks, growers have sometimes lost crops because not enough workers were unavailable. The H-2A guest worker program only certifies about 75,000 to 100,000 temporary foreign workers per year and is considered cumbersome and expensive by many growers. The perceived vulnerability of farmers to changes in immigration policy has led some farm industry leaders to press for reform and expansion of immigration programs (like the H-2A program). These programs are designed specifically to provide more efficient and reliable supplies of legal foreign agricultural workers.\textsuperscript{20}

Efforts to expand the use of legal foreign labor are premised on the idea that there are too few American workers willing to do the work and meet demand. A series of studies and commissions, however, finds little empirical evidence of a systematic national farm labor shortage, though the debate over the issue continues.\textsuperscript{21} However, there is evidence that recent state initiatives to proactively enforce federal immigration laws have created labor shortages and raised anxiety among farmers and ranchers. In some places and at critical labor bottleneck times, spot shortages of workers have led to the bidding up of farmworker wages.\textsuperscript{22}

Efforts to address the immigration dimension of farm labor have proven challenging given the polarized political environment around immigration. Immigration
issues are highly charged at the state level, in Congress, and in the 2012 presidential election campaigns. Bipartisan efforts in Congress to address agricultural labor issues through changes in both immigration policy and domestic agricultural labor policy have been complicated by larger congressional debates and disagreements on the best approaches to overarching immigration reform.

Farm labor is not the only form of agricultural work, however. In fact, more people today work in the agricultural input and food processing sectors than in farming or ranching. In the United States alone, the food and agriculture industry constitutes 8.64 percent of the total U.S. employment, and this figure is projected to increase over time. A recent USDA study predicted more than 50,000 new job openings in food and agriculture between 2010 and 2015, only 15 percent of which are in growing and raising commodities. (Figure 3 shows the breadth of the agriculture industry.) Interestingly, the majority of workers in food processing and marketing live and work in metropolitan areas. Many food processing jobs, like farmworker jobs, offer low wages (estimated at $12 an hour in 2010) and rely increasingly on the same immigrant labor pool. At the same time, jobs in food science, agribusiness, agricultural engineering, and biotechnology are high-skilled occupations that provide above-average wages and benefits. Employers in these fields report growing difficulty finding sufficient qualified workers.

Efforts to improve the skills, supply, and working conditions of the farm and food labor force will require careful balancing of the goals of improving social justice, individual opportunity, community well-being, and the competitiveness of farm and food businesses.

**Farmers Need Strong Communities**

Attracting young people into farming occupations, whether to start out on their own or to take over a family business, requires attention to important quality-of-life issues in the communities where they reside. A vibrant social scene, good schools, shopping, and other public services and infrastructure can be as important as the expected returns from the farm business. Communities with diversified economies, strong institutions, and amenities will be more attractive than communities that do not offer these and other basic requirements for people to have a good quality of life.

Farming has long been seen as a positive contributor to rural community well-being, partly because farmers are often seen as embodying traditional American social and political values. Long-time residents in many farm towns have particularly strong attachments to their communities, neighbors, and lifestyles. Growing specialization and consolidation of farm production on fewer and larger operations has raised concern about the potential erosion of the traditional connections between family farming, thriving rural communities, and the beauty of the

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This does not include an additional 16.8 million workers in food wholesale and retail businesses.
land and its natural resources. Since the early 1970s, preferences for a more rural way of life have prompted many urbanites to move to less densely populated areas, particularly in areas with attractive natural amenities. “Amenity-based” migration and retirement destinations were among the fastest growing and economically vibrant areas in the United States during the 1990s and 2000s.27

Yet not all small rural towns are bucolic ideals. Growing consolidation of farm production on fewer and larger operations has meant gains in efficiency, but it also has raised concern about the erosion of services and quality of life in some rural communities. A substantial body of research suggests that growth in farm size and the rise of more “industrial-style” farming practices are linked to a wide range of community-scale outcomes.28 Most studies agree that farm consolidation has contributed to population loss in farm-dependent towns in the Great Plains, which has undermined rural communities’ social and economic vitality in those regions. Larger farms, technological change, and increased contracting have also been associated with less money “staying in town.” The larger farmers may no longer purchase supplies locally, for example.29 Finally, it appears that growing dependence on a hired farm labor workforce is associated with higher levels of poverty and economic inequality in rural communities.30 This trend has also placed increased demands on local schools and social services.

Much federal rural policy has focused on improving conditions for farmers, under the assumption that agriculture is a critical driver of rural social and economic conditions and therefore efforts to improve the status of farm households should benefit their rural communities more broadly. While this made sense at a time when a sizable share of Americans lived and worked on farms, fewer than 5 percent of residents in nonmetropolitan counties now work in the farm sector.31 More generally, the importance of agriculture in local rural economies varies widely, and a relatively small number of rural residents now live in places that can be considered “farm-dependent.”32 Perhaps, then, it is not surprising that federal farm programs have little if any impact on rural community well-being in most places.33

Although many federal programs have focused on supporting agriculture as a way to support rural communities, other rural development programs have targeted rural community development more directly. Most federal rural development spending has been in the form of grants or loans to support infrastructure, housing, and rural businesses.34 Although less than $40 million in rural development spending is mandated in the federal farm bill, discretionary allocations from Congress have increased federal outlays to over $2.5 billion a year (mostly in housing programs). These numbers nearly doubled in 2009 and 2010 as federal economic stimulus packages temporarily but dramatically increased funding, particularly for broadband internet and rural housing assistance programs.

Strong rural communities are important elements of any viable farming and food system. While some rural communities are struggling, many others are thriving—particularly those that have been able to diversify their economies to include growing nonagricultural sectors. The strongest communities are those that have
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diversified and stable economies, provide adequate services (including schools, health care, and shopping), and have few pressing social or environmental problems that could drain public resources and reduce quality of life. They also capitalize on shifting population and economic trends as migrants from urban or other areas bring new social capital, ideas, and insights to the fold. Ironically, because so many U.S. farmers now depend on nonfarm income for their household survival, efforts to bolster broad rural community vitality have become particularly important to the viability and survival of farms. Therefore, the question going forward will be, which programs and policies are most effective in improving community well-being? And how can farmers be rewarded for sustaining or increasing social, cultural, and environmental benefits to local communities?

Rural development practitioners have identified several “best practices” for building strong rural communities—although many of these have yet to be adopted by policymakers. For example, there is growing evidence that regional approaches that enable cooperation and collaboration across many communities are more effective in generating aggregate economic development than efforts to improve conditions in individual towns. Similarly, experts believe programs that build local capacity and opportunities for self-development generate longer-term and more sustainable benefits for rural communities. Examples include training local residents in entrepreneurship and business management, leadership development, community planning, asset mapping, and projects designed to build social capital. Another best practice is strategies that retain a larger fraction of profits and wealth in the local rural community. This can involve efforts to expand local ownership and control of new business ventures and incentives to encourage reinvestment of profits in rural areas. Finally, because the economic base and development challenges of nonmetropolitan areas vary widely, a flexible approach that adapts development strategies to the unique circumstances of diverse rural communities is most likely to succeed.

One development approach that merges support for agriculture and broader community well-being is reflected in efforts to build strong local and regional food systems. Institutional support for farmers’ markets and local food processing and distribution capacity provide significant proven opportunities for growth in local employment and income. Moreover, local food markets provide opportunities for social networking and can generate measurable improvements in residents’ quality of life. Although food and agricultural policies have direct and indirect impacts on rural communities, maximizing rural community benefits from agriculture would require a looking at federal agricultural policies through a different lens and designing them differently. For example, policies and programs to improve the status of farmworkers would likely have direct benefits by increasing economic multipliers associated with farm employment and reducing demands on rural social services. Significantly increasing recreational hunting and fishing opportunities in agricultural areas would require policies that reward farmers who enhance land and water habitats, while reducing incentives that generate negative impacts. And maximizing the economic and social benefits resulting from strengthened local and regional food systems would require investments and policies that provide the necessary infrastructure and financing.

Looking Forward

The history of much agricultural policy in the United States has been a struggle to find ways to improve economic returns and stability in farming without stimulating overproduction or encouraging resource exploitation. Despite a dramatic decline in the number of farmers and growing consolidation of production in the hands of the largest farms, the U.S. farm sector remains one of the most highly competitive industries in the country, with millions of privately held businesses acting largely independently to produce and market their products.

American agriculture and the communities that support it are diverse and changing, and this diversity makes the development of simple policy solutions difficult. But
there are clear opportunities to meet the challenge of strengthening the farms, workers, and communities involved in food and agriculture. Ensuring the future viability of farming and ranching will require innovative efforts to overcome the barriers for new entrants, from the cost of land and availability of credit to providing legal and financial advice to facilitate transfers of complex businesses across generations. It also means creating an efficient and effective set of risk management tools that can meet the sector’s very diverse products, geographies, and circumstances. The new interest in local, regional, and organic food also offers new opportunities for young entrepreneurs to enter the sector.

Current labor policies do not meet the needs of farmers and ranchers or the needs of their workers. The politics of immigration policy impede progress toward a workable guest worker program, and the pressures of international competition continue to put downward pressure on wages and better living conditions. The shared desire of producers and farm and food labor advocates for a legal, stable workforce may offer an opportunity for the food and agriculture community to take leadership on the issue, in spite of the national political debates.

Finally, it is clear that farmers, ranchers, and workers need communities that offer a good quality of life. Investments in basic infrastructure are necessary, even as the nation looks to tighten spending—water, sewer, roads, bridges, and broadband investments are critical to supporting the businesses and the families producing food and fiber, and to attracting and retaining new entrants and next-generation farmers and ranchers. Rural development policy has long taken a back seat in both state legislatures and the federal government, and finding a way to build political support will be hard but necessary. The growing interest in where food comes from and how it is produced may offer an opportunity to build new alliances for rural community vitality, and the expanding cultural and natural amenity tourism efforts in rural regions may reinforce those alliances.

A set of fundamental questions must be answered, however, if food and agricultural policy is to address the principal issues facing it today, including:

- Would agriculture be adversely impacted by greater or total reliance on the private sector for risk management tools? Would the viability of the farms that produce most of the volume and value of U.S. agricultural commodities be affected?
- Is policy intervention needed to ensure that commercial farms in the U.S. can transition successfully to the next generation of farm operators?
- What reforms in U.S. immigration and labor policies would most improve the stability, security, and well-being of the hired farm and food system workforce in the U.S.?
- How can we improve the compensation and working conditions of U.S. farm laborers while maintaining the global competitiveness of U.S. producers?
- How can improvements in rural community nonfarm economic opportunities be used to help support the viability of commercial farming operations?

These questions are illustrative of the types of issues AGree will address; they are not exhaustive.
Notes

5 U.S. Department of Agriculture National Agricultural Statistics Service, various censuses of agriculture. These figures are for the “principal operator” of U.S. farms and do not capture the fact that many farming operations now have multiple operators, some of whom represent younger generations who will eventually assume control of the farm.
8 Jones, C.A., T.S. Parker, M. Ahearn, A.K. Mishra, and J.N. Varyiam. (2009). Health Status and Health Care Access of Farm and Rural Populations. EIB-57. Washington, DC: Economic Research Service, U.S. Department of Agriculture. It is worth noting that access to quality health care services is lower in less densely populated areas, farm households tend to spend more out of pocket to obtain insurance and health care, and farming is one of the most dangerous occupations.
9 The official USDA definition of a farm is “any operation that sells at least $1,000 of agricultural commodities or that would have sold that amount of produce under normal circumstances.”
15 Some evidence suggests that peak employment in critical seasons might exceed 2 million farmworkers (ibid).
23 Bureau of Economic Analysis (2010).
24 U.S. Department of Agriculture Economic Research Service. (2005). *Farm and Farm-Related Employment*. Available at: www.ers.usda.gov/Data/FarmAndRelatedEmployment/. This does not include an additional 16.8 million workers in food wholesale and retail businesses. The most recent year for which complete U.S. data is available is 2002.
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