

Global Food Security Science White Paper
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The future success of US agriculture is tied to economic growth in the developing world. These countries play a vital role in expanding feed and food export markets; generating beneficial knowledge, information and technologies for adapting to and mitigating climate change; improving natural resource management; helping protect U.S. food and non-food crops, agricultural animals and ecosystems from the threat of exotic pests and diseases, as well as emerging and re-emerging domestic diseases and pests; and improving the quality and safety of domestic and imported food products. Extending US knowledge and expertise to enhance agricultural development in the developing world contributes not only to their food security but also directly benefits the U.S. economy and improves domestic knowledge on a range of topics. In fact, by linking all relevant disciplines of the U.S. university system domestically and internationally on food security issues, students will become more competent, knowledgeable, and better prepared for managing the global aspects of the future world of agriculture in which they will work.

As of May 2012, the world's population is estimated to be over 7 billion and is expected to increase to over 9 billion by 2050 (U.S. Census Bureau, 2012). Currently, nearly one billion people globally are estimated to be food insecure, with 44 percent residing in Sub-Saharan Africa (Shapouri et al., 2010). In addition, many suffer from micronutrient deficiency, such as iron and Vitamin A deficiencies, which contributes to their overall health burden. Projections predict that food security will remain a major challenge over the next several decades. Changes in the demand for food and agricultural products (associated with economic growth and the rise in middle class consumers in developing countries) will create additional challenges for global agricultural markets. Even with investments in agricultural productivity, domestic production and distribution in many developing countries may not be able to fully meet the increased demands of population and income growth. Urbanization, which produces both higher income levels and greater demand for a diversity of foods, is expected to further propel demand for higher valued foods, and increased demand for animal products such as meat and dairy will in turn increase the demand for feed grains (Regmi, 2001). Limited natural resources, uncertainty associated with climate change, and per capita food losses up to 115 kg/yr (FAO, 2011) add another complicating dimension to the challenges of providing sufficient food to meet future global demand.

Poor institutional, research, and scientific training capacities hinder the ability of developing countries to detect and prevent transmission of pests and diseases that threaten agriculture and ecologies within and beyond their borders. Institutional capacities refer to the policies, organizations, processes, and networks that exist in a country, and they need strengthening to better detect, study, and when necessary, combat pathogens, insects, and weeds around the world. This strengthening would not only prevent domestic losses by helping protect U.S. crops and livestock from foreign threats, but it would also introduce new approaches, methods, tactics, and solutions from overseas.

Globalization particularly exacerbates the risks related to two related issues: food security and food safety. Today, global supply chains are complex, and some foods are manufactured from commodities imported from several other countries. Modernization of the food processing and handling sector in developing countries is thus vital not only to better link it to global markets and keep its consumers safe, but also to protect U.S. consumers from health risks

associated with imported food or food produced using imported ingredients. Benefits to the United States go beyond food safety, however. Stable and adequate food supplies and distribution systems in the United States and other countries along with increased economic growth in poor countries not only improve food security but can also remove a major cause for political instability, making the world a safer place for all.

The USDA science strategy on global food security addresses four of the six challenge areas outlined in the OMB/OSTP Memo on “Science and Technology Priorities for the FY2012 Budget.” These include promoting sustainable economic growth, defeating dangerous diseases, adapting to and mitigating climate change, and sustainably managing resources for food production.

Current State of the Science

The 2008 food price crisis, which affected families in the United States and around the world, prompted several assessments and evaluations of the current state of food and agricultural science and the world’s ability to feed itself. These reports were published by the World Bank (2008), National Research Council of the National Academies (2008), International Food Policy Research Institute (Spielman & Pandya-Lorch, 2009), FAO’s High Level Expert Forum (2009) and several other small and large institutions including recommendations by the Chicago Council on Global Affairs to renew American leadership in the fight against global hunger and poverty (2009). These studies, featuring many similarities, collectively make the case that:

- Without significant improvements in agricultural productivity and development, the imbalances between food supply and demand will exacerbate food insecurity, food scarcity, and food price volatility.
- Improving global food security will require a comprehensive approach through which scientific breakthroughs are adapted and translated into environmentally, socially and economically sustainable practices.
- The strategy to improve global food security needs to focus on: increasing food availability and the dependability of its supply through improved agricultural productivity (including input intensification, production efficiency and technical change); increasing food accessibility by improving the connection between farms and markets; and improving the nutritional quality of diets, while simultaneously addressing food safety issues.
- Improvements in food security can only be achieved when investments to improve agricultural productivity are long-term, and are complemented by efforts to strengthen a country’s ability to carry out agricultural research, extension and education.
- Agricultural research, education, extension and development must recognize the important role women play in agriculture in the developing world, and in ensuring the nutritional well-being of their households, and focus its goals accordingly.

As these reports were being developed and published, the Obama Administration, in consultation with a broad range of stakeholders, launched the Feed the Future Initiative (FTF). The initiative is a whole of government effort to reduce global food insecurity by investing in agriculture to increase productivity and income levels, expand trade, and improve nutritional well-being for vulnerable, food insecure people—particularly women and children. In line with this initiative, USDA has developed a Global Food Security Action Plan which outlines the

related activities of all USDA agencies. Feed the Future also includes a global research agenda, developed collaboratively by USAID and USDA, a portion of which is being jointly implemented by USDA and USAID under the Norman Borlaug Commemorative Research Initiative. This partnership broadly focuses on 1) increasing the productivity of crops and livestock of importance to both the United States and developing countries, 2) research, extension, and education relevant to sustainable production systems in agroecological regions of the developing world, 3) improving diets and human health through improved quality, diversity, and safety of food; and 4) enhancing social science research which assesses the status and contributing factors of food security in vulnerable countries.

Current Research Challenges and Proposed Research Program

In developing countries with largely agrarian populations, a vibrant and sustainable agricultural system is the very basis for broad economic development and stability. Agriculture is often the best route for poverty-reducing growth (World Bank, 2008). Agricultural development hinges on access to affordable, appropriate, and sustainable technologies and practices that can improve food production, natural resource management, harvesting, storage, and distribution, and advance the health and safety of all citizens. Based on recommendations from the National Academies' National Research Council, the Chicago Council and others, current goals of research, development, education, and extension can be summarized as:

- Revitalizing yield growth in crops and livestock of importance to global food security through genetic improvement.
- Prevention of food losses in both developed and developing countries
- Overcoming biotic stressors in crops and livestock, particularly those posing major threats such as wheat rust and tick-borne diseases.
- Minimizing human and environmental health risks from agricultural production.
- Sustainably managing the natural resource base for agricultural production.
- Improving farmer linkages to markets, trade and value chain systems.
- Ensuring that enhancements in global food security result in better nutritional status.
- Ensuring that technology and innovations contribute to mitigating and better adapting to climate change.
- Strengthening local institutions which collect, develop and disseminate timely and reliable agricultural information.
- Strengthening the capacity of key public and private sector institutions to perform policy analysis.

To maximize impact, these research and development activities need to be designed and implemented with local input and participation, so that issues such as the political landscape, market linkages, gender, and the quality of the natural resources are taken into consideration. To ensure sustained local participation, it is necessary to invest in local education, extension, data, research, and ministry-level capacity.

USDA science agencies are uniquely suited to tackle this challenge. They have been addressing food security issues for many years, both as part of their core missions and through technical assistance provided to developing countries with funding from agencies such as USAID, the State Department, and USDA's Foreign Agricultural Service (FAS). To maximize the impact of limited research dollars, USDA science agencies have historically partnered (on

both intramural and extramural research programs) with the private sector, multilateral institutions, U.S. and foreign universities, and other foreign research institutions. While partnering with others to meet global food security goals is essential, USDA's science agencies have a comparative advantage when it comes to the strength of its agricultural research – both biophysical (biological, soils, water, and environment) and social/economic; in expert collection, analysis and dissemination of germplasm, data, and information; expertise in education, education policy, management and program development; and in the ability to lead the world in grappling with issues of agricultural research, extension, education, and economic analysis. Where appropriate and as requested, USDA science agencies share their basic research and knowledge for adaptation, translation and adoption in collaboration with other US agencies or local and multilateral partners in developing countries who have the funding and the mandate for development work (such as USAID, State Department, the UN agencies, the CGIAR institutions, the private sector, universities, and local and international NGO community).

One of USDA science's signature strengths is its partnership with the land grant universities, and its long tradition of working within the science community to coordinate a wide range of agricultural research, extension and education programs. This U.S. agricultural science model, which facilitates communication flows between landowners, researchers, extension professionals, policymakers, and other stakeholders is often of interest to countries who hope to develop similar systems in order to guide their future research and development investments. Over the years, for example, USDA has offered extension-strengthening programs in several countries (including, most recently, Iraq and Afghanistan) that emphasize stakeholder input, research that includes farmer participation and approaches that are farmer-driven and market-focused. Often dependent on project-based funding, however, these overseas efforts have not always benefitted from a coordinated, systems approach. With a clear focus and adequate resources over a longer time period, and in cooperation with other USG agencies and external partners, USDA science agencies would be able to contribute their unique expertise and coordination to the challenges of food security in target countries for sustainable long-term solutions.

USDA science programs succeed by drawing on the strength of both intramural and extramural programs, and through a close partnership with the U.S. university system. USDA's Cooperative Extension System (CES), linked to the Land Grant University system, provides education and outreach to broad and multiple audiences. The CES, in conjunction with the long-standing and complementary relationship that USDA has with the U.S. higher education system, allows the focus of research, extension, education, and training to be as broad or as targeted as necessary, depending on the needs of specific issues and audiences. Project are made more effective and impactful by bringing capacity building (including new classroom curriculum) and extension (broadly defined) into a given research strategy from its inception. This model is particularly important to countries where weaknesses in institutions or poorly functioning markets can significantly delay the adoption of promising research results or new technologies, especially by the groups most important to the U.S. government's global food security strategy—women farmers or those operating small to medium sized-farms. The same considerations are important for research tied to improved nutritional outcomes for those who often have limited access to health and nutritional information and poor access to improved foods through the social and institutional mechanisms available to them (e.g. poor women and children).

USDA science agencies conduct social science research which includes, but is not limited to economic, human and behavioral studies. Economic research addresses food security issues,

including annual assessments of global food security conditions, analyses of the factors affecting price volatility in global markets, the effects of global price fluctuations on food insecure countries, and changing global consumption patterns and their implications for trade and food security. Research programs also examine institutional and policy factors affecting agricultural productivity both within the United States and globally. USDA science agencies are engaged in collaborative social science research activities with U.S. universities and with UN and CGIAR institutions to examine and refine measures of food security, develop better data to support food security and market analysis, and to analyze household level food security. Other ongoing studies are designed to improve our understanding of the factors affecting the likelihood of adoption of particular interventions and development approaches. These factors can range from cultural preferences, household and local decision making processes to the methodology itself used for technology dissemination - including where the end users of a technology are actively engaged throughout the course of its development.

USDA benefits U.S. agriculture through a range of activities that at the same time often contribute broadly to global food security. First, USDA scientists conduct research on topics relevant to the wellbeing of US agricultural productivity and food security, such as research on crop and livestock production and markets, human nutrition, biotic and abiotic stresses, and climate change adaptation and mitigation, which are also relevant to other countries around the world. Similarly, USDA extension, education, and outreach programs have broader applicability in other countries, both in terms of newer information technologies and communications mechanisms, and as a model for developing countries' education and extension systems. Second, USDA science agencies have the authority to collaborate on research, extension and education initiatives with foreign partners on projects with benefits for both the U.S. and the partner country.

Though USDA's natural and social science agencies consistently work to leverage relevant research and extension programs that have potential benefits around the world, the following strategy focuses on those activities that are directly linked to international food security objectives and programs and reflect the major themes of USG research strategy under Feed the Future. These research themes are increasing agricultural productivity, transforming production systems in targeted agroecological zones in Sub-Saharan Africa and South Asia, and enhancing the safety and nutritional quality of food. The Feed the Future strategy was developed with consideration of the specific needs of the developing countries, as reflected in their own agricultural investment plans. It is also important to note that USDA science contributions toward global food security depend directly on available budget resources, which can potentially constrain its ability to share its vast knowledge, skills and technology with developing countries.

The following USDA science strategy on global food security identifies natural and social science research that has the potential to dramatically improve food security around the world. It builds off the research challenges that other experts have identified with the goal of developing and sharing the knowledge and skills to promote environmentally, socially, and economically sustainable agricultural systems globally, enhancing global food security and, in doing so, strengthening American agriculture. USDA's comprehensive and integrated approach focuses on these three goals:

- Research, development, education and extension of new varieties and germplasm, practices and systems of interest both domestically and in developing countries, to safely and sustainably increase animal and crop production, and its nutritional value.

- Research, development, and dissemination of new varieties and technologies to mitigate animal/plant diseases and improve productivity, product quality, human health and ecosystems.
- Data development, analysis, and dissemination to improve the understanding of agriculture markets, domestic and trade policies, and other factors that affect nutrition and food systems in developing countries.

Strategy 1: Research, development, education and extension to sustainably increase productivity and nutritional value

The USDA science strategy will focus on 1) improving the management of the natural resource base on which agricultural productivity depends, and 2) sustainably improving the productivity of crops and livestock. Productivity will be improved by increasing the access to and efficient use of agricultural inputs, technology and management methods generated through global research collaborations, sustained through capacity development, and delivered through improved extension services. Programs will focus on reducing pre- and post-harvest losses, adopting higher yielding, drought tolerant, and/or pest/disease resistant seed varieties, appropriate drying and storage facilities, packaging, access to transportation/roads, soil health and access to appropriate sources of irrigation water. This strategy is designed to ensure that the productivity gains are the result of activities that are sustainable in the long-run, both in terms of maintaining the natural resource base as well as in the economic viability of local and regional producers and markets.

Current USDA Science:

Genetic research: USDA has a history of engaging in animal and plant genetics and genomics research to better understand and improve agriculturally relevant species for a variety of characteristics. To assist both USDA scientists as well as others around the globe, in cooperation with Bioversity International and the Global Crop Diversity Trust, USDA scientists have developed a new, cutting-edge version of the Germplasm Resources Information Network (GRIN) database, called [GRIN-Global](#), which can be readily implemented by any genebank—even in small developing nations. [GRIN-Global](#) is an online germplasm resources information network designed to manage and provide access to researchers and breeders worldwide (ARS). In collaboration with partner institutions, USDA is also currently involved in developing heat, drought, and salinity tolerant varieties of selected crops such as sorghum, millet, cocoa, maize, rice, beans, wheat, peanuts, and tomato that are adapted to environmental extremes (ARS, NIFA). Working with CGIAR scientists in the Caribbean and Uganda, USDA has identified resistance genes for bean diseases such as rust, angular leaf spot, common mosaic, and anthracnose and currently maintains races of the pathogens that can be used for screening (ARS). USDA spearheaded the creation of the Global Wheat Rust Initiative and working with CGIAR and other institutions, USDA scientists are sequencing rust pathogen genomes, including that of the highly virulent new strain Ug99, to determine the basis for this new virulence in African stem rust strains (ARS). Other crop genetic research is targeted to the development of crop varieties with reduced risk of mycotoxin contamination (ARS). USDA also has a long-running genetic improvement research program in farm animals in cooperation with livestock and poultry producers and U.S. universities (ARS, NIFA). More recently, USDA and its collaborators have

successfully integrated genomic information into genetic improvement of dairy cattle and are using genomic research tools to identify animals that have reduced susceptibility to diseases (ARS, NIFA). USDA also conducts genetic improvement and other research on aquaculture species in collaboration with U.S. universities (ARS, NIFA). Researchers and breeders can tap the genetically improved farm animal species and more importantly the tools needed for a genetic improvement program to support global food security goals.

Food safety & nutrition: USDA has on-going research on pre- and post-harvest technologies which minimize post-harvest loss and reduce food contamination, particularly by mycotoxins. USDA science agencies conduct research on innovative processing and delivery techniques, and extension education methods designed to minimize food loss and wastage while extending shelf-life and preserving the nutrient quality and safety of foods (ARS, NIFA). USDA will continue to build the capacity of food safety regulatory structures in developing countries (FAS, APHIS). USDA and partner researchers are focusing on nutrient biofortification of plant foods; bioavailability of nutrients; developing varieties of fruits, vegetables (including potatoes, tomatoes, stone fruits, and berries) and grain legumes (pulses and beans) with enhanced nutritional value; and continuing other research and extension to improve productivity along the entire value chain for food products that are essential in providing critical micro-nutrients (ARS, NIFA).

Systems agriculture & natural resource management: Collaborating with other US federal agencies (such as NSF and DOE) USDA is developing science-based decision tools such as earth system models, to improve agricultural decision making (NIFA). USDA is also currently collaborating with NASA and NOAA to develop and improve remote sensing-based tools to predict floods under different climate and land-use scenarios. Other USDA research and extension programs address agricultural water security, soil fertility through manure and nutrient management, water conservation and watershed management, identifying strains of rhizobia for efficient nitrogen fixation in legumes, and developing plants that more efficiently fix and utilize nitrogen (ARS, NIFA). Through the [Sustainable Agricultural Research and Education \(SARE\) grants](#) program, USDA encourages producer-conceived, initiated and endorsed studies to create and refine production and marketing alternatives that will improve the sustainability and diversity of domestic agricultural systems (NIFA).

Extension: Working with the Cooperative Extension System, USDA has helped strengthen extension systems in Central America, sub-Saharan Africa, the Middle East, and the Former Soviet Union. Innovations in delivery tools also include development of eXtension, a web-based outreach tool which can be readily adapted and used to strengthen extension in developing countries (NIFA, FAS).

Norman Borlaug Commemorative Research Initiative: As part of Feed the Future, USDA received funds from USAID to strengthen wheat rust protection and grain legume research, and is actively pursuing this research (ARS, ERS, NIFA).

Primary Goals:

Invest in research, development and extension of new varieties and germplasm, promote practices and systems to safely and sustainably increase animal and crop production and its nutritional value domestically and in developing countries.

Anticipated Outcomes:

- Enhance the capacity of genetic resources and genome databases for target crops, animals, and priority pathogens, and expand the capacity of plant, animal, and microbial collections to manage increased numbers of new experimental stocks (ARS, NIFA).
- Develop and make publicly available crop and agricultural genetic products, production technologies and practices with specific environmental, social, and economic value to improve production efficiencies, product quality, plant and animal health, and animal well-being (ARS, NIFA).
- Develop and share improved feed ingredients, nutritional technologies, reproduction technologies, and animal health products for improved efficiency, productivity and well-being for agricultural animals (ARS, NIFA).
- Develop and share sustainable technologies and practices to enhance the safety and quality of food and other agricultural products through improved pre- and post-harvest management, storage, and distribution (ARS, NIFA).
- Develop and share knowledge, practices, and systems that enhance the management of soil, water and biodiversity to improve resource stewardship and increase economic and social returns (ARS, NIFA, ERS).

Strategy 2: Research, development, and dissemination of new varieties and technologies to mitigate animal/plant diseases and improve productivity, product quality, human health and ecosystems

USDA science strategy seeks to harness global research, extension and education to improve crop varieties and livestock breeds and management strategies for better resistance to pests and diseases, and improved global surveillance and early warning. These efforts can be targeted to address the current threats to food security posed in developing countries by the spread of virulent strains of pathogens that not only threaten food security, but also food safety, local and global ecosystems, livelihoods and human health. In doing so, they also protect and strengthen US agriculture. Below are major examples of ongoing USDA science projects focused on animal and plant health research which are of US and global interest.

Current USDA Science:

Animal diseases: USDA science is involved in research of highly virulent animal diseases which can lead to the slaughter of millions of animals and cause major economic losses (ARS, NIFA). An example of this is the foot-and-mouth disease (FMD), a highly contagious and sometimes fatal viral disease of cloven-hoofed animals. Ongoing USDA research is designed to characterize local isolates of FMD, the development of vector based vaccines, molecular epidemiology, surveillance, and predictive tools for control.

USDA science is also currently involved in collaborative research projects aimed at controlling vector borne diseases such as the Rift Valley Fever (RVF). RVF, which primarily affects animals (cattle, sheep, camels and goats) but also has the capacity to infect humans, is a significant threat for livestock production in East Africa. Since 2000, RVF cases were confirmed in Saudi Arabia and Yemen, raising concerns that it could extend to other parts of Asia and Europe (ARS, NIFA).

Working with USDA APHIS and in collaboration with UN agencies, USDA science agencies are contributing to the development of [global early warning systems for major animal diseases](#) (including zoonoses). Current USDA science expertise and knowledge also provide some potential for future international collaborations on neglected tropical diseases and other areas intersecting agriculture and human health (ARS, NIFA).

Plant diseases: USDA science is identifying highly virulent plant pathogens that threaten the grain supply and cause major economic losses (ARS, NIFA). An example is the Ug99 wheat stem rust strain that can severely harm wheat and barley yields. USDA research is identifying and characterizing Ug99 mutations, developing rapid detection methods, and developing predictive tools for management (ARS, NIFA).

Food safety: USDA science supports the development of a vaccine to control *Salmonella* and *Escherichia coli* in chickens to improve human food safety and to develop strategies for controlling *Salmonella* and *E. coli* O157:H7 in feedlot cattle (ARS, NIFA). USDA also supports reduction in salmonella prevalence and Hazard Analysis and Critical Control Points (HACCP) training in Mexico (FAS, FSIS). HACCP is a systematic approach to food safety that first identifies hazards along a supply chain from production to consumption that could cause the finished product to be unsafe, and then designs ways to reduce these risks to a safe level.

USDA science supports the Partnership for Aflatoxin Control in Africa (PACA) and is providing its expertise on biocontrol and resistance breeding of crops to combat aflatoxin contamination of food (ARS, FAS, NIFA). Aflatoxins are highly toxic and carcinogenic with significant adverse effects upon human health, animal health, income generation and trade.

Norman Borlaug Commemorative Research Initiative: Livestock diseases and mycotoxins are priority research areas under FTF and USDA has received additional funding for research under the Norman Borlaug Commemorative Research Initiative (ARS).

Primary Goals:

Invest in research, development and dissemination of new varieties and technologies to mitigate animal/plant diseases and increase productivity, sustainability and product quality.

Anticipated Outcomes:

- Develop and share effective, affordable, and environmentally sound integrated control strategies to reduce losses caused by diseases, pests, and weeds, including early detection,

identification, monitoring and implementation of biologically-based and area-wide strategies to manage key native and invasive species and postharvest pests (ARS, NIFA).

- Partner with other federal departments (State, Defense, Homeland Security, Health and Human Services) to develop strategies to transfer technologies and capacity to diagnose and control vector-borne and zoonotic diseases that impact livestock and human health (ARS, NIFA).
- Explore partnering with the National Institutes of Health (NIH) and Food and Drug Administration (FDA) to develop and share alternatives to antibiotics including pre- and probiotics, biotherapeutics, and immune modulators to enhance animal health and production under field conditions (ARS, NIFA).
- Expand research and extension capacity for current and emerging vector-borne and trans-boundary diseases that will both help control disease in the countries of origin as well as provide valuable information on control strategies in the event of the entry into the United States (ARS, NIFA).
- Develop and share strategies to substantially reduce foodborne pathogens in pre- and postharvest environments in animal/crop production and processing systems – particularly aflatoxin (NIFA, ARS).

Strategy 3: Data development, analysis and dissemination to improve the understanding of agricultural markets, policies and other factors which impact food systems

USDA science in this area will focus on improving the understanding of agricultural markets, changing consumer demand for agricultural outputs, and the impact of policies and other factors on agriculture, with the goal of improving business and policy environments to foster efficiency and productivity growth in agricultural value chains.

Current USDA Science:

Capacity building: USDA science has successfully developed a system for providing statistical information to farmers, producers, processors, veterinarians and policymakers, and conducting research on market needs and opportunities for small farmers. This system uses an integrated approach to improving statistical information for basic crop and livestock production organizing market information and analysis, and improving food security assessments (ERS, NASS).

USDA science agencies have experience collecting and disseminating agricultural data and statistics, and in providing information on new technologies, building human capacity through participatory extension and education approaches, as well as participating in innovative public-private partnerships in support of more reliably functioning markets (ERS, NASS, NIFA).

Food security analyses: USDA science is currently undertaking research on the performance of domestic and international markets and their impact on food security, assessing the food security status of developing countries, and examining trends and factors impacting agricultural productivity growth (ERS).

As part of its core research program, USDA science conducts an annual global food security assessment covering more than 70 food insecure developing and transition economies. The model used to conduct this assessment is also used to evaluate underlying factors affecting food

security, and to evaluate alternative responses to key food aid problems. In 2011 USDA revised the model to examine all four dimensions of food security (availability, access, utilization, stability) and will seek to continue increasing its analysis of nutritional aspects of food security (ERS).

USDA's National Agricultural Library (NAL) has begun leading a cross-government initiative to develop a framework for organizing and providing access to data on environmental, economic, and social aspects of agricultural and forestry products throughout their life-cycle, looking at the entire supply chain. These data and analyses are important for both domestic and international supply chains, among other uses. (See the REE sustainable agricultural systems white paper for further discussion of this work.) (ARS, NIFA, ERS, NASS)

Norman Borlaug Commemorative Research Initiative: USDA has received some additional funding under the Norman Borlaug Commemorative Research Initiative to strengthen and broaden coverage of its annual Food Security Assessment report, particularly the nutrition component (ERS).

Work done with additional funds: With external funding, USDA science agencies have conducted assessments of food systems, employment and regional trade linkages in South Africa and Mozambique. These agencies have also conducted assessments of the scope and quality of statistical and information systems in key Feed the Future countries. In select countries, USDA science agencies are planning to provide capacity building in statistics, market information and food security monitoring (ERS, NASS).

USDA science is currently providing technical assistance and training in several developing and transition countries to support the preparation and conduct of agricultural censuses, improve or develop ongoing agricultural statistics programs, and improve the capacity of local staff to carry out these functions. The assistance programs are implemented using a long term approach designed to provide a sustainable system that can operate long after the program is complete. Current externally funded activities include work in Armenia, Georgia, Haiti, Mongolia, Moldova, Nigeria, and Serbia as well as training programs in the U.S. under the USDA's Cochran and Borlaug Fellowship Programs, which are administered by the Foreign Agricultural Service. (ERS, NASS, FAS)

In cooperation with the Farm Foundation and with financial support from Global Harvest Initiative, USDA science is building a Global Agricultural Productivity Network. The purpose of this network is to promote economic research and information sharing on productivity issues confronting agriculture. The research interests of the network span methodological issues on productivity measurement, data needs and resources, examining the influence of policy and other factors which influence the rate and direction of productivity growth, and understanding the consequences of productivity change for agricultural and rural development, economic welfare, food security, income distribution, poverty, natural resource conservation, and other issues (ERS).

Primary Goals:

Invest in data development, analysis, and dissemination to improve the understanding of agriculture markets, domestic and trade policies, and other factors which impact food systems in developing countries.

Anticipated Outcomes:

- Provide technical assistance to improve agricultural statistics systems in developing and transitioning countries (ERS, NASS).
- Analyze the performance of domestic, international, and regional markets and policies for their impacts on global food security (ERS).
- Develop estimates of international agricultural productivity growth to improve understanding of patterns of growth and analyze how different factors—including government policies—influence productivity trends (ERS).
- Produce annual Food Security Assessments covering 70 food insecure countries that analyze the current food security landscape, estimates food security developments over the next decade, and analyzes the effect of alternative economic and policy alternatives on global food security (ERS).
- Examine changes in food aid distribution to better understand the determinants of allocation decision of donors (ERS).

In summary, USDA science programs in the area of global food security are focused on safely and sustainably increasing productivity and nutritional value of agricultural outputs; contributing to agricultural productivity growth while simultaneously safeguarding human and environmental health; and the development, analysis and dissemination of data to improve the understanding of agricultural markets, policies and other factors which impact food and agricultural systems.

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