SMART Investments

in International Agriculture and Rural Development

AIARD
ASSOCIATION FOR INTERNATIONAL AGRICULTURE AND RURAL DEVELOPMENT

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SMART Investments

in International Agriculture and Rural Development

S ecurity and Stability

M arkets and Trade

A daptation and Conservation

R esearch and Innovation

T raining and Education

Recommendations to the New Administration and Congress

July 2017

By

the Association for International Agriculture and Rural Development

AIARD

ASSOCIATION FOR INTERNATIONAL AGRICULTURE AND RURAL DEVELOPMENT

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Cover photos: Cambodian agricultural fields (left/center) by Mark Bell. All other cover photos by Susan Johnson.

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SUSAN JOHNSON/GLOBAL LIVESTOCK CRSP

Eating is an agricultural act.
--Wendell Berry

EXECUTIVE SUMMARY

This report is intended to inform decisions that a new Administration, Congress, and the American public will make as agriculture priorities, the 2018 Farm Bill, and food and nutrition security foreign assistance programs are discussed and debated. The Association for International Agriculture and Rural Development (AIARD) recommends taking urgent action to increase U.S. support for work in international agriculture and rural development, and to maintain the positive momentum in global food and nutrition security progress following the world food crisis in 2007-2008.

In this report, AIARD highlights agricultural development's pivotal role in the quest for global food and nutrition security and recommends areas for urgent investment. Our work is grounded in the 2016 Global Food Security Act (GFSA), which defines food and nutrition security as "access to, and availability, utilization, and stability of, sufficient food to meet caloric and nutritional needs for an active and healthy life." The Act recognizes that it is in the national interest of the United States to promote global food security, resilience, and nutrition, and to "accelerate inclusive, agricultural-led economic growth that reduces global poverty, hunger, and malnutrition."

The report is unique because it is being offered by front line global agricultural development program implementers who are dedicated to developing the local capacity of developing country farmers. It is also distinct because it: makes recommendations for a **package** of SMART investments; recognizes the **interrelatedness** of this set of both domestic and international investments; and highlights how both **U.S. and global partners** will need to work together on needed innovations for greater impact. It calls upon the United States to not only give higher priority to its own public agricultural development investments, but to exercise leadership in leveraging resources from others to meet the critical goal of food and nutrition security – when all individuals have reliable access to sufficient quantities of affordable, nutritious food to lead a healthy life.

AIARD is an association of professionals across the United States and globally who implement programs in international agriculture and rural development. The association's members represent universities, NGOs, international organizations, government and international agencies, and other groups that work around the world in the public and private sectors.

Some feel that the issues surrounding the world food crisis are solved and that food and nutrition security investments are no longer critical. This is far from true — the greatest challenge facing humanity today is the prospect of feeding a world population of 9.7 billion people by 2050, including many Americans, within the context of acute environmental challenges that continue to impact farmers worldwide. By most accounts, this challenge will not be met unless attention to, and funding of, this set of issues increases significantly.

Five SMART U.S. Domestic and Foreign Operations Investments

S — ***Security and stability*** — increase prospects for security and stability by accelerating investments in agriculture, the economic base and primary source of livelihoods in developing country economies;

M — ***Markets and trade*** — keep markets open to expand jobs and market opportunities for U.S. farmers; increase technical assistance to developing countries, our trading partners of the future;

A — ***Adaptation and conservation*** — expand global collaboration and technical assistance to help farmers adapt to the impacts of environmental stress and conserve natural resources for future generations;

R — ***Research and innovation*** — increase research and innovation investments to bring new jobs and increased productivity to both the U.S. and developing countries; expand global research partnerships with groups like CGIAR and others to meet the needs of a world population of nearly 10 billion people by 2050;

T — ***Training and education*** — internationalize the U.S. university curriculum to prepare students for competing in the global marketplace; strengthen developing country higher education institutions, particularly for global food and nutrition security work.

According to the *Global Report on Food Crises 2017*, recent increases in the number of people who are food insecure are linked to difficulties with producing and accessing food due to conflict, record-high food prices in local markets in affected countries, and extreme weather conditions such drought and erratic rainfall. Civil conflict is the driving factor in nine of the 10 worst humanitarian crises, underscoring the strong linkage between peace and food and nutrition security. Today, famine conditions are impacting an estimated 20 million people in South Sudan, Somalia, Yemen, and Nigeria. As well, the global food system faces continuing threats that span country boundaries, such as a strain of wheat stem rust that was recently spreading worldwide and threatening to create a wheat shortage on a scale unseen since the 1950s. Collaborating international institutions must be kept in place to deal with such problems expeditiously, as was the case with the wheat rust issue.

U.S. agriculture is one of the most globally connected sectors, providing our nation with billions of dollars in deficit-reducing exports that return jobs and profits to U.S. farmers and related industries. Less recognized is the fact that American agriculture is made more sustainably productive, varied, and safe through global partnerships. These partnerships are not only critical to assisting developing countries' quest for food and

nutrition security, but also result in important economic, scientific, and social benefits for the United States — including addressing hunger in America. The future agricultural success of the U.S., both at home and abroad, is dependent upon a cadre of agricultural professionals, trained and educated with global skills, who can capitalize on these global connections, help the U.S. remain competitive, and assist other nations with food and nutrition security challenges.

This report recommends five key areas of investment that must be made now by the U.S. government and its many collaborative partners. AIARD calls for renewed U.S. leadership and a package of **SMART** policies and investments in international agriculture that will:

- help keep both U.S. citizens *and* those in the developing world secure and stable;
- grow jobs in both the U.S. and developing countries;
- nurture overseas markets for our food exports, and help developing countries prosper through trade;
- protect and nurture the global natural resource base upon which the future of the food supply depends;
- accelerate global agricultural research and innovation; and
- educate and train the next generation of global leaders in the field.

While funds must be leveraged by working with many partners, the U.S. government needs to lead, set the tone, and accelerate its own investment in these five areas. The public sector must play a leadership role, but other groups need to step forward more aggressively, and in partnership, to address food insecurity. Corporations, cooperatives, foundations, individual philanthropists, universities, other bi-lateral donors, national governments, multilateral institutions, and citizens all have tools and resources that are needed in the fight to end food insecurity. Globally, history has shown that when the U.S. leads, resources can be leveraged from other donors, developing countries can be encouraged to increase their investment targets for agriculture, and the private sector and other non-government stakeholders can see where they might partner and provide needed support.

Dedicating United States resources to global agricultural development is an investment "bargain" that pays back high dividends in the form of a productive U.S. agriculture, job expansion, economic growth, and greater security and stability both here and overseas. Even with very modest resources to work with over the years compared to other fields, the agriculture sector has contributed greatly to the reduction in global hunger. But, progress is uneven across regions and global public investment is at risk due to competing country priorities, particularly pressing refugee issues due to conflict.

AIARD supports recommendations detailed herein that are related to both domestic and foreign assistance policy and funding. Investments highlighted in this report will preserve gains of the last decade in alleviating food and nutrition insecurity and prevent much costlier crisis intervention. Never have the global opportunities and challenges that impact global agriculture's future been greater; never have the stakes been higher.

TOP LEVEL FUNDING RECOMMENDATIONS

Foreign assistance policy and funding

- Dedicate not less than $1 billion annually in FY '17 and '18 to implement the **Global Food Security Strategy;**
- Boost annual funds for **Food for Peace/P.L. 480 Title II** to the level of $1.87 billion for FY2018;
- Ensure an emergency supplemental of $1 billion in 2017 to provide **emergency food assistance** for unprecedented levels of need of nearly 20 million people;
- Provide $1 billion for the **Millennium Challenge Corporation (MCC)** for FY2018;
- Fully fund **Overseas Private Investment Corporation (OPIC)** at $108 million;

Domestic agriculture policy and funding

- Fully fund (authorized at $700 million/year) the **Agriculture and Food Research Initiative (AFRI)** at the United States Department of Agriculture (USDA) and increase funding for international program options;
- Continue the **McGovern-Dole International Food for Education and Child Nutrition Program** at a level of $209 million for FY2018.

INTRODUCTION

In the United States, according to USDA's Economics Research Service, 21.0 million full- and part-time jobs were related to the agricultural and food sectors in 2015—11.1 percent of total U.S. employment. Direct on-farm employment accounted for about 2.6 million of these jobs, or 1.4 percent of U.S. employment. Employment in agriculture- and food-related industries supported another 18.4 million jobs. The sector delivers a consistently high rate of return on public investment; a safe, affordable and varied U.S. food supply; and exports expected to reach $136.0 billion in 2017. Less understood, however, is the complex relationship between success in U.S. agriculture and work in international agricultural development.

For decades, U.S. agricultural professionals have capitalized on a broad network of relationships and project partnerships that have not only helped developing countries with agricultural growth and the development of agricultural expertise, but have also opened new export markets; kept imported food safe for Americans; and brought productivity-enhancing research and innovation back to the U.S. Despite resource constraints, agricultural scientists and educators have worked in partnership across the globe, fostering development, producing dividends of peace and international friendship, and working together toward the goal of an adequate and safe food supply.

Globally, agriculture is the world's single largest employer, providing livelihoods for 40 percent of the population. It is the largest source of income and jobs for poor rural households in the developing world where smallholder women and men operate 500 million small farms worldwide and provide up to 80 percent of the food consumed. Despite the fundamental importance of an adequate, affordable and accessible global food supply, public investment in agricultural research and development in most countries languished for decades. This under-

MARK BELL/CA&ES INTERNATIONAL PROGRAMS OFFICE UC DAVIS

Cambodian farmers loading produce to take to market. Globally, agriculture is the largest source of income and jobs for poor rural households in the developing world. Despite the fundamental importance of an adequate, affordable and accessible global food supply, public investment in agricultural research and development in most countries languished for decades.

investment became painfully evident when world food prices increased dramatically in 2007-2008, creating a food security crisis and causing political and social unrest around the globe.

U.S. leadership to raise resource levels for agricultural development, and for global food and nutrition security programs more broadly, has been instrumental since 2008. The United States has worked with other countries, multi-lateral donors, and the private sector to improve investment targets. In 2016, the U.S. put in place the Global Food Security Act, and an accompanying government strategy, to assure that this set of basic investments would never again slip to a tragically low priority.

Humanity stands at an important juncture in history. While progress has been made in global food and nutrition security, particularly as a result of new investments made worldwide since the food crisis of 2008, the problem is far from solved and new signs of stress are emerging. Investments in local agricultural capacity development need to be a high priority for all countries and existing programs need to be evaluated in terms of their sustainability and adequacy for meeting the challenges ahead. In the following five chapters, AIARD argues that the United States cannot afford to ignore the need for this set of investments and discusses why global partnerships are instrumental for leveraging resources. We cannot afford to risk our security and stability or to cede leadership to other countries in the development of future agricultural scientific networks and markets.

NICHOLAUS MADDEN/UC DAVIS

Women farmers and Afghan extension workers determining soil texture during a soil fertility management workshop in Afghanistan. Investment in developing in-country human capital needs to be a high priority and often produces dividends of peace and international friendship.

CHAPTER 1 — SECURITY AND STABILITY

AU/UN IST/TOBIN JONES

> ***Conflict is inevitable, and it can even be transformative -- but when you do not have the tools to manage it, it spirals out of control and threatens to wash away the investments made in development activities such as improved agriculture, education, health, and transportation. We must get ahead of the crises and build resilience. We must clearly understand and manage the risks and build a more peaceful and thriving world.***
>
> ***-- Dr. Nancy Lindborg***
> ***President, U.S. Institute of Peace***

Problem Statement

Regional and global food insecurity have been identified by the United States intelligence community as key drivers of instability and a threat to U.S. national interests. It is in the national security interest of the United States Government and its citizens to lead a global coalition that invests in development programs and policies that promote security, stability and resilience, thereby contributing to global economic development, food security, and prosperity for all. Accelerating inclusive, agricultural-led economic growth is key to reducing poverty, hunger, and malnutrition and increasing resilience in the most fragile countries.

Complex patterns of political and economic instability and civil wars have created the largest number of refugees, migrants, and internally displaced persons since World War II -- an estimated 65 million people. Food insecurity, conflict, and environmental stress from climate variability are uprooting people who cannot feed themselves and their families and who are no longer willing to live in refugee camps for decades. With the assistance of sophisticated networks of traffickers and modern communication technologies, refugees and migrants have the potential to destabilize countries when they arrive rapidly and in large numbers. Many countries are at risk of devolving into conflict from the stresses caused by this rapid influx of refugees, such as Jordan, Iraq, Lebanon, and Turkey.

> *Lack of adequate food will be a destabilizing factor in countries that are important to U.S. national security but that do not have the financial or technical abilities to solve their internal food security problems. Other countries that are important to U.S. interests will experience food-related social disruptions, but are capable of addressing them without political upheaval.*

The Syria crisis, which began in 2011, triggered one of the greatest modern humanitarian emergencies, with risks to regional and international security. Today, more than half of Syria's population is food insecure and over 8 million people need food assistance; 4.5 million of these people live in areas that are not easily accessible for humanitarian workers.[4] Nearly 5 million people have left the country as refugees and even more are displaced within the country.

Most people have been uprooted because their livelihoods have been destroyed, in some cases due to direct acts of violence. While assisting those who are uprooted, it is also important to support those left behind.

For example, the Food and Agriculture Organization of the United Nations (FAO) is helping farmers by providing them with seeds and by vaccinating livestock. Yet Syrian farmers who can still grow wheat have only been able to produce 60 percent of what they grew before the conflict because of the lack of reliable labor, services, equipment, and modern inputs.

Today 20 countries are facing protracted crises, characterized by acute vulnerability of the population, weak governance and the inability of their governments to respond to threats and to provide protection to their own population. **Almost half a billion people are currently affected by protracted crises;** and **20 percent of all malnourished people** (167 million of a total of 795 million) **live in countries in protracted crisis.** Malnutrition affects children the most in these settings, and conflict has lasting, multi-generational impacts on human development.[1] In protracted crises countries, the proportion of undernourished people is almost three times as high as in other developing countries (39 percent of the population compared with 15 percent in all other developing countries).[2]

Although the causes and effects of these crises are diverse, food insecurity and malnutrition are common features to them all. It will not be possible to address the global hunger problem without also addressing the issues of conflict and governance. These crises have a high price tag: in 2012, they absorbed 78 percent of all OECD member country funds dedicated to humanitarian response.[3]

While there is a tendency to think of food security and conflict mostly in terms of humanitarian aid, responses must integrate comprehensive local capacity development efforts, especially steps to revive the agricultural sector, in order to improve food security and build stronger, more resilient communities.

Background and Challenges

The links that exist between peace, food security, and successful economic development are widely recognized, and multilateral organizations and national governments have recently started a broad and deep dialogue

[1] Food and Agriculture Organization of the United Nations (FAO). Building resilience in protracted crises. Retrieved May 2017 from http://www.fao.org/resilience/areas-of-work/protracted-crisis/en/
[2] Ibid.
[3] Ibid.
[4] Food and Agriculture Organization of the United Nations (FAO) and the World Food Programme (WFP). (2016) Monitoring food security in countries with conflict situations: A joint FAO/WFP update for the United Nations Security Council (July 2016). Retreived from http://www.fao.org/3/a-c0335e.pdf

about these intrinsic relationships to address complex protracted crises and to break the cycle of violence in a comprehensive manner. Indeed, today 93 percent of people living in extreme poverty are in countries that are politically fragile, environmentally vulnerable, or both.[5] And despite efforts to end conflict, post-conflict countries that have not managed to improve the food security of their citizens through investments in the agricultural sector are 40 percent more likely to relapse into conflict within a 10-year time span.

Conflict Worsens Food Insecurity

Food insecurity can be a direct result of conflict and instability. Although it is against International Humanitarian Law, food is too often used as a weapon in conflict situations. Violent attacks on farming communities and the destruction of livestock, fields, infrastructure, and markets directly undermine rural household livelihoods and displace people from their homes. The disruption of food production is particularly strong where guerilla or rebel troops operate in remote rural areas. Farmers abandon the fields that are not located near their homes, turn away from producing to meet a market demand and focus instead on producing just enough for their family's subsistence.[6] This, in turn, contributes to socio-economic stress in semi-urban and urban areas as food shortages threaten food security in those towns and cities.

Food is used to wage and sustain conflict – food is used as a weapon when people are denied food; and it can also be used as a source of political power and legitimacy, when one side uses its ability to provide food and food-sector jobs to bolster political support. Revenues from food production can also be used to finance war operations, thereby fueling and prolonging conflict. This is an aspect of the food-conflict nexus where the engagement of the Department of Defense (DOD) and the Department of State are critical.

In protracted crises, women are more adversely affected than men. Existing disparities related to inequitable access to land and financial services mean that women are usually not equipped to cope with food losses and/or high food prices in times of crisis. At the same time, their burden of caring for family member's increases, thereby reducing their own mobility. In the absence of a male household member – because of conflict and crises – a women's ability to claim family assets for productive use is further restricted, including land and livestock.[7] In conflict situations, mortality due to food insecurity and famine can exceed the number of deaths caused by direct violence. Hence, promoting food security in such countries, while addressing the root causes of the conflict, are both critically important in saving people's lives.

Food Insecurity Destabilizes Communities

There is evidence that high food prices and lack of access to food have contributed to political instability and sparked new civil conflicts, as shown in several countries during the food price crises in 2008. For example, there is a direct correlation between the peaks of the FAO Food Price Index and

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[5] Development Initiatives, UK. (2015) Global humanitarian assistance report. Retrieved from http://www.globalhumanitarianassistance.org/wp-content/uploads/2016/07/GHA-report-2016-full-report.pdf

[6] Kibriya, S., Savio, G., Price, E., & King, J. (2016). The role of conflict in farmers' crop choices in northern Kivu, DRC. *International Food and Agribusiness Management Review,* 19(3), 99-118.

[7] UN Food and Agriculture Organization (FAO). (2015). The state of food insecurity in the world. Retrieved from http://www.fao.org/3/a-i4646e.pdf

The Importance of Investing in Resilience

Today the U.S. government spends about 80 percent of international resources on emergencies and crises, and 20 percent on development activities. This is a reversal from prior decades, when 80 percent was spent on development and 20 percent spent on emergencies. Conflict is eroding the progress made through investments in agriculture and health.

For example, in northern Kenya, United States Agency for International Development (USAID) was spending $500 million per year in 2011-2013 for emergency assistance for crisis and conflict mitigation in the drylands. To address the root causes of these emergencies, the ***Resilience Initiative*** was started in the cross-border dryland areas of northern Kenya, southern Ethiopia, Somalia and eastern Uganda, with USAID working with those governments to strengthen pastoralists and farmers to make pre-crisis prevention a priority. With a $70 million investment in 2013, USAID partnered with the Government of Kenya to help communities in the arid lands achieve sustainable economic growth, improve livestock production as well as natural resource management. The program also prioritizes conflict resolution and conflict management. (*See USAID Website on Kenya and the Horn of Africa for further information)*.

This action is demonstrating the importance of building resilience and supporting livelihoods of people in conflict situations to: (1) prevent future displacement and humanitarian emergencies; and 2) create the necessary conditions for the population to be able to return to their work in agriculture once the conflict ends.

the beginning of protests in North Africa and the Middle East over food prices, leading to socio-political unrest and upheaval. The lack of food, or the inability to acquire food due to poverty, is one of the most immediate threats to national security and to people's lives in periods of protracted crises. Thus, investments to boost agricultural productivity are an investment in food and nutrition security that can yield high returns in terms of peace dividends.

Indeed, there is no peace without food security and no food security without peace. Both are intrinsically intertwined. Interventions to promote food security and peace reinforce each other, leading to mutually beneficial results. Promoting agricultural productivity and food security can help prevent a crisis, mitigate its impact and promote post-crisis recovery and healing. Investing in agricultural productivity not only helps to fight hunger, but also to build peace and sow the seeds for long-term, sustainable development.

At the global level, the strong link between peace, national security and food security is reflected in the 2030 Agenda for Sustainable Development: Sustainable development is critical to ensuring peace and security.

For the first time since its founding over 70 years ago, the United Nations (UN) Security Council held a debate in March 2016 on the role of food security in sustaining peace and

conflict prevention, examining crises as those in South Sudan, Somalia, the Central African Republic, and Syria. The FAO and World Food Program (WFP) now regularly apprise the UN Security Council on the food security situation in conflict-ridden countries.

The U.S. Global Food Security Act 2016 provides a framework for American development cooperation in food and nutrition security and builds on the strong linkage that exists between food security, peace, and development. It recognizes the need, not only to respond to emergency food shortages, but also to address the root causes of hunger and malnutrition, by creating an enabling environment, building resilience, increasing agricultural productivity and incomes, strengthening institutions, and addressing the specific barriers facing women and small-scale producers.

Since the end of World War II, the United States has been the world's leader seeking to prevent complex humanitarian emergencies, hunger and/or famine and responding to such crises when they occur. This leadership has been accomplished through bipartisan cooperation in Congress, support of the Administration and collaboration with countries around the world. U.S. leadership includes bilateral and multilateral efforts to create early warning and rapid responses to natural disasters, famine, and civil conflict; as well as supporting protracted relief and recovery operations in complex humanitarian emergencies.

The United States has worked successfully with allies to create and sustain institutions and to mobilize coalitions of regional and global partners to address famine, conflict and humanitarian emergencies. And on a global scale, such U.S. public and private investments have served to prevent conflict and foster peace-building practices. These public and private investments also serve, over the long term, to maintain global security and stability which encourages economic growth, fosters international commerce, and facilitates interconnected markets and thus, greater prosperity for the United States, its allies and for developing countries themselves.

U.S. public and private investments that strengthen the agricultural production and marketing systems of developing countries contribute to the ability of people to achieve food security, build resilience and to adapt to natural disasters, climate variability, and socio-political turmoil. In fragile states, such investments take on even more importance as the ability of the local governments and public institutions or organizations to provide technical assistance and training to rural communities where most food is produced can be quite limited in scope and scale. **U.S.**

MICHAEL JACOBS/AFGHANISTAN PEACE PROJECT

Conflict resolution training was an integral part of USAID's PEACE project in Afghanistan. Pastoral production systems are particularly vulnerable to conflict and crisis.

public sector investments to build the capacity of local governments and public institutions to be responsive to its citizens and to deliver effective quality services must be maintained. This investment must also leverage additional resources from governments and the private sector in order to sustainably take root and build long-term resilience.

The U.S. public sector must work with international non-governmental organizatons (NGOs) and private sector trade and business associations to strengthen local civil society organizations so that citizens have a voice in their own country's governance and the ability to respond to food crises, climate shocks, and even socio-political turmoil. By working in partnership with local and national governments, multilateral institutions, and the private sector, the U.S. foreign assistance program has helped to foster a secure and stable political environment in many developing nations; one that facilitates and encourages foreign direct investment (FDI) and encourages the growth of a vibrant private sector.

COURTESY OF UC DAVIS CA&ES INTERNATIONAL PROGRAMS OFFICE

Post-conflict countries that have not managed to improve the food security of their citizens through investments in the agricultural sector are 40 percent more likely to relapse into conflict within a 10-year time span. Strengthening investments in agriculture-led economic growth is critical to sustainable peace.

RECOMMENDATIONS FOR ACTION

The following recommended activities/investments will build on the strong linkage that exists between food security, agricultural development, and peace:

Foreign assistance policy and funding

- **AIARD supports the number one recommendation of the Chicago Council on Global Affairs 2017 report Stability in the 21st Century: Global Food Security for Peace and Prosperity to "make global food and nutrition security a pillar of U.S. diplomatic and national security engagement and strengthen the integration and coordination of activities both within the United States and around the world."** While the U.S Global Food Security Strategy mentions food security and conflict, it does not elaborate on it in a substantive way. In general, there needs to be much more in-depth exploration among U.S. interagency groups (especially Department of State, DOD, and USAID) of the interrelationship between food security and conflict in order to better integrate this perspective into the way conflict management and stabilization are analyzed and approached. A white paper/strategy that elaborates on the intent of the Global Food Security Act and strategy would be helpful as a more substantive examination of this issue – U.S. policymakers should consider conflict with a "food lens," in the same way others have similarly sought to introduce a "gender lens."

- **Initiate a similar policy dialogue within the broader international community about the interconnections between food security and conflict, and what they mean for conflict management.** Specific country cases where the food-conflict nexus is particularly salient (for example Syria, northeastern Nigeria, etc.), could be studied, using the "food lens" to identify areas for policy cooperation. The G7 could be a venue for raising this issue. Among multilateral United Nations (UN) organizations, FAO, WFP, International Fund for Agricultural Development (IFAD) and the UN High Commissioner for Refugees should be included, but also UN peacekeeping authorities and any agency that directly deals with conflict management and peacekeeping.

- **Explore ways to improve international capabilities to anticipate situations where conflicts lead to food insecurity, or food shocks lead to conflict, especially in the context of climate change.** There are initiatives to forecast conflict, emerging food insecurity, and impacts of climate change individually, but these things need to be forecasted in an integrated manner, as interrelated phenomena.

- **Provide at least $1 billion each year for food security programs to develop longer term agricultural economic growth in the most impoverished and insecure countries, in accordance with the intent of the The Global Food Security Act of 2016.**

- **Boost annual funds for Food for Peace/P.L. 480 Title II to the level of $1.87 billion for FY2018 and ensure an emergency supplemental of $1 billion in 2017.** Emergency food assistance is needed to meet unprecedented levels of need and to avoid famine threatening 20 million people.

- **Continue to provide for local and regional procurement of food through a $15 million investment each year.** Local and regional procurement of food can help crises at an early stage and prevent a much greater expenditure later during the cycle of food shortages.

- **Provide USAID, USDA and other frontline U.S. government institutions with the authority for flexible use of funds and an ability to mobilize funds at the country and regional level to invest where it is needed earlier, rather than later.** An example of this early action can be seen in the Complex Crisis Fund (CCF) accounts, established in 2010. CCF was created as a flexible resource to enable the U.S. Government to respond quickly during critical windows of opportunity and/or unforeseen political, social, or economic challenges that threaten a country's stability or help create the conditions necessary for longer-term development. CCF is contingent upon an unanticipated urgent need or a significant triggering event that requires an immediate, robust response. We request no less than $30 million for the CCF in FY2018.

- **Provide an annual $1 billion commitment to the The Millennium Challenge Corporation (MCC) to maintain this successful model of development which would strengthen countries as they build resilience and economic development to avoid conflict.** MCC's unique model of partnership encourages countries to improve their enabling policy environment, thereby attracting additional investments. Many of the MCC country compact portfolios include investments for agriculture, infrastructure, and food security.

- **Provide $32 million annually for the International Fund for Agricultural Development (IFAD).** IFAD is the leading multilateral investor in the livelihoods of rural agricultural producers living in poverty, and plays a critical role in assisting over 2.5 million smallholder farmers in hard to reach areas to strengthen food and nutrition security.

Domestic agricultural policy and funding (including the 2018 Farm Bill)

- **Continue the McGovern-Dole International Food for Education and Child Nutrition Program at a level of $209 million** in FY2018, so that important school feeding and nutrition programs can ensure girls and vulnerable children receive education and nutrition in the most impoverished countries.

CHAPTER 2 — MARKETS, TRADE AND INVESTMENT

COURTESY OF USAID

> *No country has ever lifted itself out of poverty without international trade…. we need to make sure that people in the world's poorest countries have access to markets, to create jobs and encourage growth. But trade needs the right conditions to flourish. Bottlenecks and inefficiencies – whether at border crossings, or in the way the economy is regulated, or even within the private sector – impede progress and prosperity.*
> *-- Organization for Economic Co-operation & Development*

Problem Statement

With 95 percent of the world's consumers living outside of our borders,[8] and with huge demographic shifts and growth projections in developing economies — particularly in Africa — we are faced with enormous opportunity, and many challenges, to ensure that all nations can produce or trade enough to sustain growth and maintain progress toward food security.

The worldwide rise in demand for more protein-rich diets, coupled with consumers' changing tastes in developed and developing economies is re-shaping markets and redefining the dynamic of how countries interact. The rise of an urban-based middle class of consumers across the developing world will continue to influence global trade in goods and services and the competitive balance and imbalance, of global market economies, underlying our interconnectedness and interdependence.

The U.S. has been considered a leader in promoting market-led growth and innovation, especially in agriculture, and it will be important in the coming years not to cede this leadership to competitors. U.S. economic policy should continue to strive for leadership in business growth and innovation while also promoting free and fair trade with the rest of the world. The pace at which economies develop and new markets emerge and mature, now more than ever, requires U.S. public sector global engagement and a shared vision with the U.S. agribusiness community. Opportunities abound for world class U.S. agribusinesses and agricultural research institutions.

[8] U.S. Trade Promotion Coordinating Committee & Export Promotion Cabinet. (2014). National export initiative NEXT: Strategic framework. Retrieved from http://www.trade.gov/neinext/neinext-strategic-framework.pdf

Developing countries are the main source of growth in world agricultural demand and trade. Africa is home to three[9] of the ten fastest growing economies, and the continent will add more than half of the world's population growth to 2050, growing from 1.2 billion in 2015 to 2.5 billion people in 2050.[10] Africa also has the world's largest concentration of un- and underexploited arable land and a young population. Since the U.S. Feed the Future initiative began training thousands of farmers in Tanzania in 2011, U.S. exports to that country alone have increased by 500 percent. The United States has a tremendous opportunity to strengthen ties with the continent in order to support its economic development, maintain U.S. competitive advantage, build future markets for U.S. exporters, and strengthen U.S. agribusiness and research leadership. U.S. leadership is especially important in setting an example for developing nations experiencing political and food insecurity brought about by underinvestment in businesses, human resources, and institutions needed to combat poverty and the spread of out-migration and extremism.

U.S. policymakers should work in partnership with developing nations' leaders to improve the investment climate in developing markets and continue to support capacity building at all levels—institutional, industrial, operational and human. U.S. leadership to promote open and rules-based cross-border trade will help both emerging economies and U.S. businesses that are targeting expansion into these new markets.

Economic growth will not come without the right mix of public and private investment. The gap in investment needed to meet the UN Sustainable Development goals, compared to what is available through the public sector, is estimated to be $2.5 trillion annually.[11] In the increasingly interconnected global market economy, U.S. companies' foreign direct investment and know-how can play a leading role in filling this gap to the mutual benefit of the U.S. and developing nations.

Background and Challenges

In the United States, current benefits of trade include an estimated 38 million jobs, $2.2 trillion in annual sales of goods and services, lower prices and increased choices for consumers, and 5.3 million jobs from foreign-owned companies investing in the U.S. In agriculture, over half of the soy and wheat, three quarters of the cotton, and fifteen percent of corn and livestock are exported from the U.S. (20 cents of every farming dollar earned), generating a $43 billion agricultural trade surplus.[12]

In developing countries, agriculture is the base of many economies and a prime source of employment. More robust promotion of agricultural trade brings a variety of positive impacts, including more and better employment opportunities, development

[9] International Monetary Fund. (2016). World economic outlook. Retrieved from http://www.imf.org/external/pubs/ft/weo/2016/01/index.htm#
[10] United Nations. (2015). World population prospects the 2015 Revision: Key findings and advance tables. Retrieved from https://esa.un.org/unpd/wpp/publications/files/key_findings_wpp_2015.pdf
[11] United Nations Conference on Trade and Development (2014). World investment report. Retrieved from http://unctad.org/en/PublicationsLibrary/wir2014_en.pdf
[12] Abbot, C. (2017). Exports will be increasingly important as bolster of farm income -- Food and Environment Reporting Network (FERN). Retrieved from https://thefern.org/ag_insider/exports-will-increasingly-important-bolster-farm-income/

According to a study by the Business and Sustainable Development Commission, business opportunities around implementing the Sustainable Development Goals (SDGs) related to food production will exceed $2.3 trillion annually by 2030, with two thirds of this growth benefitting developing countries. Investment needed to meet these goals is estimated at $320 billion annually, with the private sector providing most of that. This will result in over 70 million new jobs in developing countries.

Valuing the SDG Prize in Food and Agriculture, Business & Sustainable Development Commission, 2016.

of mutually beneficial supply chains, improved food safety, and ultimately a reduction in malnutrition, hunger, and poverty. Developing countries have entered into regional trade agreements under the umbrella of the World Trade Organization (WTO), such as the Common Market for Eastern and Southern Africa (COMESA).

Although open markets and trade can result in sectoral and industry winners as well as losers, the overall advantages brought to nations by more open markets and trade are well researched and documented. The Heritage Foundation's analysis of the 161 countries covered in the *Index of Economic Freedom*, published annually with *The Wall Street Journal*, indicates that trade liberalization can foster development and raise incomes. As economic growth occurs the poorest people can benefit just as much as, and in some cases more than, the wealthy.

Improving cross-border trade structures and agreements have long been focal points for World Trade Organization (WTO) member countries. At the most recent negotiations held in December 2015 in Nairobi, Kenya, members (including the U.S.) agreed to end agricultural export subsidies,[13] a move that led to China following suit shortly after in April 2016.[14] With previously heavily subsidized imports largely removed, it is expected that developing countries will see a heightened level of competitiveness across the spectrum of agricultural trade.

Regional trade agreements complement large scale trade agreements such as the WTO. Open market agreements such as COMESA and the Economic Community of West African States (ECOWAS) promote regional integration with a focus on harmonizing trade standards, creating economic blocks of 500 million consumers in the case of COMESA, instead of 10 smaller markets with disjointed rules.[15,16]

Creating efficient agricultural trade will necessitate trade regimes that unify rules and regulations that govern sanitary and phytosanitary standards; protect intellectual

[13]World Trade Organization. (2015). Briefing Note: Agriculture Issues. Tenth WFO Ministerial Conference, Nairobi. Retrieved from https://www.wto.org/english/thewto_e/minist_e/mc10_e/briefing_notes_e/brief_agriculture_e.htm
[14]Office of U.S. Trade Representative (2016). 2017 Trade policy agenda and 2016 Annual Report. Retrieved from https://ustr.gov/about-us/policy-offices/press-office/reports-and-publications/2017/2017-trade-policy-agenda-and-2016
[15]Yayo, M., & Asefa, S. (2016). International trade effects of regional economic integration in Africa: The case of Southern African Development Community (SADC) *International Journal of African Development* 2 (3) Spring 2016, 63-85.
[16]Mashayekhi, M., Peters, R., & Vanzetti, D. (2012). Regional integration and employment effects in SADC: Policy priorities for international trade and jobs. Retrieved from https://www.oecd.org/site/tadicite/50288660.pdf

and other property rights; reduce subsidies, tariffs, and taxes; streamline the passage of goods and services across borders; and support infrastructure improvements such as roads and ports. Trade agreements, when properly structured and enforced, harmonize standards for labor, food safety, and environmental practices and create both a level playing field and a basis for faster and more equitable growth.

Communities benefit from investments in capacity building to help them compete under the new trade environment. For example, the WTO Trade Facilitation Agreement (TFA), which came into force in February 2017, provides resources for countries to improve their customs procedures while providing technical assistance to low-income countries to make these improvements. Progress in border procedure improvements are benchmarked by the Organization for Economic Cooperation and Development (OECD) which now monitors the practices of 152 countries. The TFA is expected to improve these further.

An initiative that emerged from the G8 Summit in 2012, the New Alliance for Food Security and Nutrition (NAFSN), has been supported by $6.2 billion in investments across nine OECD countries, and 180 private sector companies, that combined have committed $7.8 billion toward creating more sustainable, private sector-led growth. Recognizing the importance of leveraging private sector investments as a multiplier, private and public funds have also accelerated growth, and led to subsequent initiatives, including the Comprehensive Africa Agriculture Development Programme (CAADP), an unprecedented series of African national government reforms framed to "end hunger and halve poverty in Africa by 2025."[17]

As a nation, the United States values public-private linkages to catalyze growth. The U.S. investment strategy must continue to coordinate, co-create, co-finance, and co-deliver global programs that can benefit developing countries. This approach is consistent with the bi-partisan-supported Global Food Security Act (GFSA) of 2016. Built on the successful food security programs of USAID, the GFSA whole of government strategy will employ multi-sector approaches to promote improved policies, greater local ownership, and investment to drive agricultural development and improve nutrition. Leveraging resources from other G-8 countries and the private sector, the most recent Feed the Future progress report found that the majority of countries receiving such development assistance and investment reported a decline in rural poverty and child stunting, improved production practices and productivity for over 10 million small farmers, boosted nutrition for over 18 million children, and established more than 5,000 public-private partnerships (PPPs) with new private sector investments in agriculture valued at over $600 million.[18]

As part of the whole-of-government approach embraced by the GFSA, the Millennium Challenge Corporation (MCC), U.S. Trade and Development Agency (USTDA), and the Overseas Private Investment Corporation (OPIC) have programs in policy reform and institutional and industrial capacity building.

[17]New Alliance for Food Security and Nutrition. (2017). About. Retrieved from https://new-alliance.org/about
[18]The U.S. Government's Global Hunger & Good Security Initiative. (2016). Feed the future progress report. Retrieved from https://feedthefuture.gov/sites/default/files/resource/files/2016%20Feed%20the%20Future%20Progress%20Report_0.pdf

These programs are focused on improving infrastructure to support agricultural growth, market development, and expansion, and trade facilitation. Leveraging United States Government (USG) funds to spur long-term private sector investments is not new — programs have just become smarter and more catalytic by design. For example, through its efforts to leverage the broad scope and expertise of the American people, business,

Development Corridors: A Systemic Approach to Agricultural Development and Food Security

Katrin Kuhlmann, New Markets Lab

From the transport system of ancient Rome to the historic Silk Road, development tends to happen along corridors. Corridors are natural market structures and trade routes for all products, including food. The ability to move goods and services from areas of production to areas of consumption is critical to increasing income levels and improving livelihoods. Corridors have traditionally been focused on hard infrastructure and industrial development, but their potential as a tool for agricultural development and food security is significant.

While hard infrastructure investment remains the backbone of any corridor, without clustered investments, spatial development analysis, and interventions in the legal and regulatory environment, it is difficult to unlock the full potential of corridors to connect fragmented markets and communities. These challenges are particularly acute in agriculture, which has a long investment horizon and widely dispersed rural base. These elements of corridor development have implications for expanded trade and food security around the world and are increasingly being incorporated into corridors approaches.

In Tanzania, a multi-donor initiative coordinated thorough the World Economic Forum launched the Kilimo Kwanza (Agriculture First) Initiative, which established the Southern Agricultural Growth Corridor (SAGCOT), a pioneering approach in agricultural development designed to support a green revolution in East Africa by promoting "clusters" of profitable agribusinesses that incorporate small-scale farmers. The SAGCOT corridor extends from Dar es Salaam through the southern highlands, with six agricultural investment clusters along the corridor. USAID has been a strong supporter of the SAGCOT Centre and Catalytic Fund through the Feed the Future program. The SAGCOT Centre has emerged as an effective public-private partnership model for improving agricultural productivity, food security and livelihoods. Impacts of the corridor's development include $600 million in new crop development,[1] 250,000 farmers benefitting from training in seed and fertilizer use by Monsanto,[2] and 40 agribusinesses and 500,000 participants in a World Bank Partnership.[3]

[1]Milder, Jeffrey C., Louise E. Buck, Abigail K. Hart, Sara J. Scherr, and Seth A. Shames. (2013). A Framework for Agriculture Green Growth: Greenprint for the Southern Agricultural Growth Corridor of Tanzania.
[2]Monsanto. (2016). Southern Agricultural Growth Corridor of Tanzania (SAGCOT).
[3]World Bank. (2016). New Project to Link Farmers to Agribusiness in Tanzania.

and industry, for every dollar invested in addressing global challenges, USTDA delivered a $74 return per dollar spent. OPIC uses loan and insurance to crowd-in private sector investments that benefit development. OPIC can operate successfully in countries private investors cannot, provide loan terms that the commercial sector will not offer, while supporting projects that demonstrate innovation and new technologies. OPIC's modest budget of $83 million in 2016 resulted in the return to the US Treasury of $366 million in repayments.

These targeted programs deliver a sound return on taxpayer dollars if invested in areas such as improved procurement services; better surface, air, and maritime transport; intermodal linkages that support trade; and information and communication technology to improve information flows. These all lead to more competitive U.S. trade.

RECOMMENDATIONS FOR ACTION

The leadership of the United States in market development and trade is unmatched. Ongoing U.S. investments can be expanded to generate beneficial market and trade outcomes for both domestic and international stakeholders. The U.S. Government and business partners must remain active and committed partners investing significant resources to transform local economies and global markets so that they can deliver benefits to all citizens.

AIARD recommends that the United States take stock in its strategic investments and positions to ensure long-term competitiveness, stimulate technical innovation, promote growth, and maintain its global leadership position in support of dynamic, market-based systems.

Foreign assistance and domestic policy and funding

- **Promote pro-growth and pro-business policy and regulatory frameworks**. The U.S. must continue its support for regional alliances in order to facilitate market entry for U.S. businesses and take advantage of large market opportunities. U.S. leadership and investment can help build economies of scale and the physical, institutional (laws, rules/regulations) and human capacity that will make intra and interregional trade more efficient, transparent, and beneficial to all. The U.S. should continue its support of "doing business" initiatives, including the analyses of policies/regulations to promote investment, supporting agriculture competitiveness, and establishing partnerships to scale programs in new markets, such as in agricultural corridor development. Addressing challenges such as taxation and land tenure is also important. The WTO trade facilitation agreement will help developing countries put in place better procedure at borders, making it easier for U.S. producers to export to those countries, but also for domestic producers to be able to export their products.

- **Support trade and local capacity building overseas**. U.S. farming family livelihoods are directly linked to USG efforts to establish, maintain, and contribute to open and competitive international markets. Ensuring that there is a steady demand for U.S. agricultural products is a national priority since exports play a major role in boosting rural incomes domestically. Emerging markets represent some of the fastest growing opportunities for U.S. exports and agribusiness, and supporting their infrastructure and human capital development through the GFSA should remain a priority. USAID's regional trade hub work in Africa has focused, in part, on helping those countries build credible sanitary and phytosanitary (SPS) standards and regimes. USDA's Foreign Market Development Program and the Emerging Markets Program have included projects where U.S. agricultural producer groups have worked directly with foreign governments to help them develop trade rules that facilitate U.S. agricultural exports, but also create transparent, science-based standards that help producers in those countries. The best example is Vietnam, where U.S. expertise helped Vietnam draft their new food safety and SPS laws.

- **Develop markets, strengthen value chains, and promote innovative technology commercialization**. The bilateral support in Congress for the Global Food Security Act of 2016 is recognition of the positive results of five years of targeted investment in food security, poverty reduction, and improved maternal and child nutrition by USAID. USAID's resulting whole-of-government strategy deserves the full support of the new Administration and Congress so that food security programs can continue to deliver results and expand into new countries. To deliver trade benefits in both the U.S. and overseas, a focus in developing countries will be needed on enhancing market linkages, strengthening promising value chains, achieving compliance with private/company standards, supporting extension services to promote technology commercialization, and reducing post-harvest losses.

- **Grow more public-private partnerships.** Initiatives that promote co-investments and leverage private sector and non-governmental partners, such as the New Alliance for Food Security and Nutrition, the Global Development Alliance, and project-specific programs such as OPIC that engage and leverage private sector investment to fill the development investment gap, must be supported and expanded. Scaling and replicating corridor development projects, such as SAGCOT in Tanzania, help focus investment on the physical and legal/regulatory infrastructure needed for accelerated economic development.

COURTESY OF SAGCOT

SAGCOT strives to foster inclusive, commercially successful agribusiness that will benefit the region's small-scale farmers.

CHAPTER 3 – ADAPTATION AND CONSERVATION

COURTESY OF U.S. DEPARTMENT OF AGRICULTURE

> ***In 2005, Walmart announced a goal to be fully supplied by renewable energy sources, and to work to avoid and reduce greenhouse gas emissions: "We didn't set this goal because anyone forced us to. We set it because we wanted to help address climate change and improve lives, while also strengthening our company and reducing expenses. We thought it would be a win-win: good for society, and good for Walmart".***
>
> ***-- Rob Walton, Walmart Board of Directors***

Problem Statement

Feeding a growing population in ways that do not risk the natural world is one of the most daunting challenges of our time. Dimensions include a mix of scientific, political, and social/cultural concerns that are becoming increasingly complex, with many trade-offs. Extreme weather events, changing climate, drought, floods, soil erosion, nutrient runoffs — the ways in which the environment affects and is affected by agriculture — are boldfaced in our morning headlines and the subject of debates worldwide.

Farmers around the globe are already adjusting their practices to adapt to changing conditions. Further disruptions could adversely impact global food supplies and create new food and nutrition security challenges for all as the world seeks to feed nine billion people by 2050. AIARD supports increased international collaboration on the environmental dimensions of agriculture and food systems development. Environmental issues extend beyond national borders and international collaboration can help produce win-win payoffs. Techniques that are devised to improve resilience of farmers overseas can have highly beneficial applications for farmers in the U.S.

Farmers, if they have the knowledge and tools, are some of the best environmental stewards. They recognize that the future of agriculture and the productivity of their farms is grounded in the health of the natural resource base and available ecosystem services. But, in the face of an array of environmental challenges, farmers both at home and abroad are presently faced with becoming extraordinary adapters. In developing countries, however, farmers may literally be too hungry to adapt — households struggling to feed their families throughout the year are not likely to invest in new practices that include higher costs and risks.

What will be the best ways for farmers of crops, livestock, or fish to adapt and conserve? Will their toolkits be full of newly discovered and/or effective traditional strategies that ensure that their farms remain sustainable for generations to come? Will they have the wherewithal to adopt practices that decrease agriculture's environmental footprint? Around the globe how will the ever-increasing need for food be met in ways that do not unduly contribute to — but instead address and alleviate — environmental concerns?

Our agricultural history, while remarkable in the U.S. and in other countries in terms of productivity, is also of concern. Historically, the U.S. and many other countries of the world have met their growing food needs by converting forestlands to farms, risking loss of biodiversity; overfishing many important regional and global fish stocks; improving farm productivity through game-changing technologies and concentration of operations that have met public resistance; relying on fertilizers and pesticides in ways that spurred the U.S. environmental movement; and expanding cropping seasons and areas through the use of irrigation with saline soils as collateral outcomes.

Sudden or prolonged extreme weather events, such as excessive and/or high and low temperatures or levels of precipitation, can cause life-changing damage to farmer's fields. Whether that damage is to crops or livestock, whether it be in the U.S. or in other countries, it can quickly affect local, regional, and even national food security. While the underlying causes of such events may be debated, there is no question about the destructive outcome of these events.

In the U.S., record droughts have negatively impacted various crops, in particular corn. Floods, hurricanes, typhoons and their many variations have destroyed lives, livelihoods and farms. Another threat that is often rooted in drought, both in the U.S. and internationally, is the increasing frequency of destructive fires in forests, rangeland, plains, and elsewhere. In the U.S. alone, about 7 million acres of federal, tribal, state, and private land as well as more than 2,600 structures are being destroyed by more than 73,000 wildfires annually.[19]

International collaboration to adapt to change, mitigate damage, and enhance resiliency, will be key to meeting future food needs. To build a food secure future will require a variety of re-considered approaches as well as significant investments in reforms and climate-smart agricultural practices. Farming today and in the future — as practiced in America or Africa — will need to integrate incentives for harnessing environmental services with smarter farming practices and technologies that can meet growing food needs while protecting biodiversity and natural ecosystems.[20]

Background and Challenges

While the impacts of environmental stress spread across all sectors and regions, the largest negative consequences are projected in

[19]U.S. Forest Service. (2017) Wildland Fire. Retrieved from https://www.fs.fed.us/managing-land/fire
[20]Food and Agriculture Organization of the United States. (2009). How to feed the world in 2050. Retrieved from http://www.fao.org/fileadmin/templates/wsfs/docs/expert_paper/How_to_Feed_the_World_in_2050.pdf

the health and agricultural sectors, especially in Africa and Asia. Adverse effects are greater among poor communities, particularly in developing countries which are highly dependent on weather-sensitive natural resources. The U.S. Global Food Security Act underlines that negative impacts from natural disasters and environmental degradation are being increasingly found in agriculture which, in turn, affects livelihoods and food security, and, ultimately, economic growth. Crop insurance schemes are becoming more widely implemented to address such risks, but risks continue to increase.

While much scientific effort has been dedicated to exploring the impact of weather changes on natural resources and agriculture, research is needed to further understand the consequences of this stress on human activity — on diets and food waste, trade, and on social and economic development. Some advances have been made in the field of food security assessments, e.g. Famine Early Warning System (FEWSNET), but many regions of the world experience challenges in accessing information resources to make everyday decisions and to plan for the long term.

SUSAN JOHNSON/GLOBAL LIVESTOCK CRSP

Unpredictable changes in weather and other shocks make agriculture a risky business. With livestock playing a key role in Ethiopia's economy, pastoralists there are particularly vulnerable to weather extremes.

Some of the most important global natural resource challenges requiring new local adaptation and conservation strategies are the following:

Improving yield stability in the face of temperature variability is a key adaptive strategy worldwide. While in the short-term, researchers predict an increase in production of some crops due to temperature increases (such as wheat, bananas, barley, millets, and potatoes) in the long-term, the effects are more variable over space and time.[21] Wheat yields are estimated to be reduced by 6 percent with each degree increase in temperature. Crop yield models for southern Africa predict that over the next 15 years maize yields could fall by 30 percent due to temperature increases.[22] Crop production will be affected more severely in developed countries due to more intensive production and mono-culture.

Water scarcity and risk in supply chains is one of the most pressing global natural resource issues. Five hundred million people live in areas of water scarcity

[21]Ovalle-Rivera, O., Laderach, P., Bunn, C., Obersteiner, M. & Schroth, G. (2015). Projected shifts in Coffea Arabica suitability among major global producing regions due to climate change. PLOS One, 1-13 doi: 10.1371/journal.pone.0124155

[22]Thornton P.K., & Herrero M. (2015). Adapting to climate change in the mixed crop and livestock farming systems in sub-Saharan Africa. Nature Climate Change, 5, 830–836. doi:10.1038/nclimate2754

and experience water shortages the year around. Water yield gaps in Africa result in farmers reaching just 20-30% percent of their production capacity. Rice farmers in Asian river deltas require higher water demand for rice production, which threatens harvests in dry periods.[23] Both U.S. and global institutions emphasize the need for conservation and promotion of water efficient strategies in agriculture, but more cost-effective investments are needed in water infrastructure, as well as emergency preparation for and response to extreme weather events. Public/private cooperation is imperative. Seven private sector companies in the U.S. have already been recognized as Ceres – World Wildlife Fund (WWF) Agwater Stewards[24] for their commitments to address water risks in their supply chains. These companies include Diageo, General Mills, Haim Celestial, Hormel Foods, Kellogg Company, PepsiCo, and White Wave Foods.

COURTESY OF AQUAFISH INNOVATION LAB

Future growth in agricultural production must be built on a foundation that includes improved stewardship of natural resources and ecosystems.

Forest clear cutting and conversion of permanent grasslands to cropland negatively impact forest ecosystems and livelihoods and have adverse effects on food production systems. The cost of fire suppression in the U.S. alone is predicted to increase to nearly $1.8 billion by 2025.[25] But, successful agroforestry systems around the world show that forests don't necessarily have to compete with agriculture -- forests offer not only mitigation, but also adaptation potential. Value for carbon management can be created through tax incentives, market-based crediting programs, and updated conservation programs that can reward private landowners for their efforts in reducing emissions.

Responsible soil stewardship is key to productivity. Soil degradation occurs in various forms: loss of organic matter, diversity, and nutrients and decreasing ability for water retention, as well as soil erosion. All have negative impacts on agricultural production and the future potential of soil to regenerate. Agricultural systems can also be affected by dust storms caused by field erosion and wildfires caused by droughts. Accumulation of organic matter takes longer than one growing season. Many practices, such as organic agriculture, permaculture and conservation agriculture have a great potential for not only reducing greenhouse gas emissions but also improving soil health and crop yields long-term. Soils need to be as productive as possible if farmers are to produce 60-70 percent more food by 2050.

[23]Preston, N., and H. Clayton, eds. (2003). Rice-shrimp farming in the Mekong Delta: Biophysical and socioeconomic issues. Retrieved from http://aciar.gov.au/files/node/467/tr52e.pdf
[24]Ceres. (2016). Ceres/World Wildlife Fund (WWF) AgWater Challenge. Retrieved from https://www.ceres.org/our-work/water/water-and-agriculture/cereswwf-agwater-challenge
[25]US Forest Service. (2017) Wildland Fire. Retrieved from https://www.fs.fed.us/managing-land/fire

Adoption of sustainable intensification technologies can decrease the number of people at risk of hunger in developing countries. Nitrogen-use efficiency technology would reduce the risk by 12 percent, no-till agriculture – by 8.8 percent, heat-tolerant crops – by 7.8 percent, precision agriculture – by 7.5 percent, integrated soil fertility management – by 4.4 percent, etc. However, USDA reports that adoption rates of some technologies are very low. Additional research evidence is needed to demonstrate management's effectiveness and support farmers' decisions.[26]

Livestock production, while responsible for emissions in the agricultural sector, also has great potential for mitigation and adaptation. This is particularly true for poor communities around the world, often relying on indigenous livestock breeds for their daily source of food, income, and security. *The Second Report on the State of the World's Animal Genetic Resources for Food and Agriculture* highlights the important role of livestock biodiversity for adaptation and as a source of livelihood resilience.[27] At the same time, animal production can be negatively impacted by heat stress, and many world regions may experience drops in the quantity and quality of crop feed with temperature shocks and/or drought. Farmers need assistance making decisions regarding feeds, livestock breeds, grazing and manure management practices, and/or types of weather-indexed insurance.

Land ownership and water rights can be formally recognized to improve resilience of sustainable food systems. According to the Rights + Resources Initiative[28] as much as 65 percent of the world's land area is held under customary systems, yet many governments do not formally recognize these rights to ownership. Such breakdown in governance is a root cause of many conflicts and also negatively impacts progress in adaptation and mitigation activities. They also often lead to additional environmental degradation.

Consumer choices are an increasingly important factor in building resilient food systems. In the U.S., for example, community-supported agriculture occupies approximately 37 million hectares and is being farmed by 12 million growers. Farmers use sustainable management practices and develop relationships with their customers by building trust in their produce. In the U.S., many leading companies across the country such as Coca Cola,[29] Elanco Animal Health, Mars,[30] Dannon, DuPont, General Mills, Kellogg, and Monsanto have given their pledge to investing into efficient strategies protecting natural resources and promoting good agricultural practices in order to compete. The role of private companies is crucial for changing farmers and consumers' attitudes but this process is also driven by today's consumer demanding sustainably grown food.

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[26]Walthall, C.L., J. Hatfield, P. Backlund, L. Lengnick, E. Marshall, et al. (2012). Climate Change and Agriculture in the United States: Effects and Adaptation. USDA Technical Bulletin 1935. Retrieved from https://www.usda.gov/oce/climate_change/effects_2012/CC%20and%20Agriculture%20Report%20(02-04-2013)b.pdf

[27]Food and Agriculture Organization of the United States (FAO). (2015). The second report on the state of the world's animal genetic resources for food and agriculture. Retrieved from http://www.fao.org/3/a-i4787e.pdf

[28]Rights and Resources Initiative. (2015). Who owns the world's land? A global baseline of formally recongnized indigenous and community land rights. Retrieved from www.rightsandresources.org/wp-content/uploads/Global-Baseline_web.pdf

[29]The Coca-Cola Company, (2012, Jan 1). Our water conservation goal. Retrieved from http://www.coca-colacompany.com/stories/our-water-conservation-goal

[30]Mars Incorporated (2016, November 23). Mars continues collaboration with businesses, governments to tackle climate change at COP22. Retrieved from http://www.mars.com/global/press-center/newsroom/mars-tackles-climate-change-COP22

Increasing Resilience through Climate Smart Agriculture

How do we improve agricultural systems' capacity to adapt to environmental stress? Climate smart agriculture (CSA) offers an approach for guiding actions to transform and reorient agricultural systems to more effectively support development and ensure food security. Agriculture outside of the U.S. and Europe is dominated by smallholders. These farmers face growing challenges of land degradation, soil fertility management, and securing sufficient water for crops and livestock in the face of less predictable rainfall seasons, dropping groundwater levels, and greater risks from more frequent extreme weather events. CSA takes an integrated, landscape approach while focusing on three main thematic areas:

(1) sustainably increasing agricultural productivity through the adoption of climate-smart practices for soil, water, crop, and livestock management;
(2) addressing land and water management challenges at a landscape and value chain level;
(3) improving enabling policies, infrastructure, and incentives.

Climate-smart practices for soil, water, crop and livestock management integrate sound water management throughout the land preparation, production and post-harvest management cycle. Many approaches particularly focus on strengthening protections of water sources; improving rainfall capture to reduce erosion and increase groundwater recharge, and apply crop management innovations to enhance soil fertility; boost crop growth and yield; and improve water use efficiency. Landscape and value-chain level actions involve connecting stakeholders across a landscape to consider how land use patterns and production/processing practices either enhance or undermine protection from extreme weather events and long-term sustainable growth.

BOB RABATSKY/FINTRAC

Integrating sound water management practices is fundamental to climate-smart agriculture. Unpredictable rainfall, dropping groundwater levels, and greater risks from more frequent extreme weather events are among the challenges facing farmers today.

Enabling environments play a significant role in reducing vulnerabilities by strengthening stakeholder knowledge through tools such as climate information services, improving farm to market linkages through better infrastructure, and using policies and tools such as index-based insurance and gender and social inclusion to support broader-based economic growth.

The cumulative impacts of our changing climate and its impacts on crops and water resources availability will ultimately depend on each country's development choices, responses to local climate stressors, and changing global market conditions. Adaptive actions in the areas of production, education, and research involve seizing opportunities to avoid economic damages and declines in food quality and quantity, minimize threats posed by climate stress, and in some cases increase profitability.

RECOMMENDATIONS FOR ACTION

The following recommendations related to adaptation and conservation promote global food and nutrition security and resilience around the globe, and are in line with the broad thematic areas associated with promoting climate smart agriculture.

Foreign assistance policy and funding

- **Increase international collaboration on early warning systems.** AIARD recommends increased investments in USAID's programs that are designed to provide early warning of severe environmental conditions. For information systems to be useful, they must: (1) provide salient information in terms of content, scale, lead time and format that citizens can routinely access and use; (2) be widely accessible and understandable, especially for remote communities; (3) be connected to the broader agricultural development and extension efforts; and (4) be accessible and useable by women and marginalized groups.

- **Develop a clearer understanding and a more complete array of safety nets and insurance programs in order to prevent catastrophic losses brought about by extreme weather events.** Data availability remains a significant challenge, requiring more comprehensive data on weather patterns and events. Technical advances in remote sensing and big data offer promise, especially if combined with investments in land-based weather monitoring technology.

- **Invest in actions that contribute to more sustainable landscapes, particularly the protection and management of water resources across these landscapes.** Countries around the world are facing a growing water crisis stemming from increasing demand for water by agriculture, industry, and expanding urban centers; a history of poor water management and water resources protection; and changing hydrologic cycles leading to shorter and more intense rainy seasons combined with longer periods of drought. Addressing these challenges demands greater focus on landscape level approaches that consider the multiple interests of stakeholders, and trade-offs among different uses.

- **Prioritize research, extension and teaching activities in the environmental domain that government, universities, private sector, and foundations can partner to support.** AIARD recommends that USAID and USDA convene an e-Workshop to identify the most promising and/or urgent environmental issues facing current and future agricultural production. AIARD further recommends that, beyond check-listing, the e-Workshop also be charged with identifying highest priorities research, extension and teaching approaches upon which government, academic, private sector and foundations must coalesce their efforts. The e-Workshop should be fully open with participation by all stakeholders encouraged.

Domestic agriculture policy and funding (including 2018 Farm Bill)

- **Strengthen current U.S. conservation programs as authorized in the 2018 Farm Bill through enhanced global partnerships.** While place-based differences in environmental conditions and concerns are clear from country to country, many of the underlying basic biological or sociological factors that influence effective protection, mitigation and conservation know no political boundaries. AIARD encourages strong support for conservation programs and a crosswalk among the suite of Farm Bill and foreign assistance programs that focus on agriculturally important environmental factors. The Farm Bill should authorize and encourage trans-national collaborative research and implementation so that U.S. conservation and related programs are fully strengthened by worldwide insights and know-how.

Overall, **future growth in agricultural production must be built on a foundation** that includes improved stewardship of natural resources and ecosystems — especially in light of the increasing risks posed by shifting rainfall patterns and more frequent and intense extreme weather events. To build this foundation will require significant investment in reforms and climate-smart agricultural practices that integrate incentives for harnessing environmental services with smarter farming practices and the development of technologies that can help meet growing food needs, while protecting biodiversity and natural ecosystems.

BOB MORRIS/UC DAVIS - AAEP

Extension activities, such as the Afghanistan Agricultural Extension Project (AAEP), enables extension workers to deliver effective climate-smart extension services to rural clientele and strengthens government/university partnerships.

SUSAN G. SCHRAM/ICARDA REG. CEREAL RUST RES. CTR.

Problem Statement

The United States food and agriculture sector advances economic development in both rural and urban areas, contributes favorably to the U.S. balance of trade, and has been a leader in providing agricultural technical assistance and humanitarian assistance to developing countries. But the level of research and development (R&D) investment that fuels this important sector is not presently reflective of its importance. AIARD believes that increasing strategic investments in agricultural research and innovation will bring new jobs and increased productivity to the sector in the U.S., increase local agricultural development capacity in developing countries, and forge new and greatly needed global partnerships and research platforms to help meet the food and nutrition needs of a projected world population of 9.7 billion people by 2050.

Worldwide, the food and agriculture sector is facing the looming challenge of producing more food in ways that are environmentally sustainable. The sector is buffeted as never before by forces such as: weather extremes and gradual changes in temperature that affect crop yields and animal health; invasive pests and diseases; consumer demands for more product diversity and improved nutritional qualities; and the need for greater productivity to feed the world's growing population from roughly the same amount of soil and water resources currently being used. World-class interdisciplinary science is vital to meeting future needs for food, fiber, and fuel.

There are two challenges for U.S. leadership at this juncture: 1) through Farm Bill reauthorization and domestic agriculture appropriations, to build transdisciplinary and globally competitive U.S agriculture research and development programs; and 2) through foreign policy and foreign operations appropriations, to re-assert U.S. leadership by fully funding agricultural research and development programs authorized in the 2016 Global Food Security Act, and leveraging additional resources through collaborative global research.

The 'green revolution' of the 1950s–1970s set the bar for a fruitful era of scientific progress. Given the many problems confronting farms and food production now, we need the next revolution to start today. Food is too important to the human race to be a research after-thought; it needs to be a high priority for the nation's entire scientific community.

-- Dr. W. Danforth, Founder of SoAR

Background and Challenges

Access to adequate, affordable, and nutritious food that is produced sustainably is a primary concern for all, making agriculture one of the largest and most significant global industries and an important global employer. The United States has been among the most productive agricultural producers in the world. U.S. agriculture and agriculture-related industries contributed $985 billion to the U.S. gross domestic product (GDP) in 2014. Americans spend less on food, as a proportion of their income, than any other nation in the world. U.S expertise shared through international technical assistance has also made an enormous contribution in developing countries through collaboration on agricultural research, development, and program implementation.

Following the wake-up call of the 2007-2008 world food crisis, policy makers worldwide realized the tragic impact of failing to invest significantly in agricultural development for over two decades. Progress has been made since the crisis. U.S. government's Feed the Future initiative has improved U.S. investment, and provided leadership that has spurred investment and accomplishments in developing and developed countries. Feed the Future has recognized that research is critical to enhancing and sustaining agricultural productivity growth, economic growth, and poverty reduction – all essential elements of sustainable food security. However, in light of current projected budget cuts for the State Department and USAID, food and nutrition security research programs may again be at risk.

YAW ANSAH/BORLAUG LEAP

Following the world food crisis in 2007, many African countries increased their investments in agricultural development. However, investment still falls short of the recommended level of 1 percent agriculture GDP.

Many African countries also increased their investments in agricultural development since the world food crisis, but investment levels in most countries are still well below those required to sustain agricultural R&D needs. In 2011, Africa invested on average just 0.51 percent of agricultural output on agricultural R&D, well below the recommended level of 1 percent of agriculture GDP.[31]

The U.S. Department of Agriculture's research budget has risen less than 1 percent since 2003.[32] USDA's Agriculture and Food Research Initiative (AFRI) is the nation's leading competitive grants program for agricultural sciences. The National Institute of Food and Agriculture (NIFA) awards AFRI research, education, and extension grants to combat childhood obesity, improve rural economies, sustainably increase food production, create new sources of energy, mitigate the impacts of climate variability, address water availability issues, ensure

[31]International Food Policy Research Institute. (2015). Global hunger index: Armed conflict and the challenge of hunger. Retrieved from http://www.ifpri.org/publication/2015-global-hunger-index-armed-conflict-and-challenge-hunger.
[32]Supporters of Agricultural Research Foundation (2016). Cultivating science: Growing the landscape of competitive food and agricultural research. Retrieved from http://supportagresearch.org/wp-content/uploads/2017/03/SoAR-2016-Annual-Report.pdf.

food safety and security, and train the next generation of agricultural workforce. But AFRI has never been funded to its fully authorized level. While the 2014 Farm Bill authorized up to $700 million per year through 2018 for AFRI, Congress appropriated only half of that amount — $350 million — in 2016. Nor has AFRI tapped the benefits of international collaboration to any significant degree.

State budgets for these programs are also lean. Public and land-grant universities continue to struggle with funding cuts for agricultural research and extension programs, which can also jeopardize availability and opportunities for international involvement. The Association for Public and Land-grant Universities has established the Challenge of Change Commission to examine contemporary challenges to global food and nutrition security and to make recommendations on the actions required in university research, education, and global outreach to meet future challenges. They recommend a better alignment of university resources and structure to support transdisciplinary, problem-focused domestic and international research, and a greater role for government and non-government partners in supporting the work of universities in food and nutrition security.

The Global Food Security Act of 2016 calls for several areas of effort that would revitalize agricultural research and upgrade agricultural technology and human capacity development around the world. The Act calls for action to: better harness science, technology, and innovation in all relevant federal agencies; strengthen partnerships between U.S. public and land-grant colleges and universities and institutions in developing countries; leverage resources through private sector partnerships; and expand collaboration between U.S universities and universities in target countries on cutting edge agricultural science and human capital development.

The Time for Public Investment is *Now*. It is an opportune time for a new Administration and Congress to take bold leadership in international agricultural research and development. Public investment must be reinvigorated now to allow adequate time for ideas to be transformed into productivity-enhancing innovations and new jobs. Agricultural R&D investments can require gestation periods of over a decade to realize their full benefit, but over time they pay large dividends in jobs, profit for farmers, a higher quality of life in rural communities, and abundant food supplies at low consumer cost.[33]

U.S. private sector investment in research and development in agriculture has grown since 2000, and now exceeds what is federally funded, but this financing is focused on shorter term, for-profit benefits and does not replace basic research conducted by the public sector. More than 80 percent of federally-funded research is designed to provide the building blocks for long-term production increases to address problems the world will face in the decades ahead. To estimate the likely impacts of public research and development (R&D) funding choices on productivity growth, USDA's Economic Research Service projected future productivity growth with alternative public R&D investment scenarios. Their analysis found that declines in public R&D have more serious effects in the longer term. Due to the

[33] Global Harvest Initiative. (2016). GAP report: Sustainability in an uncertain season. Retrieved from http://www.globalharvestinitiative.org/GAP/2016_GAP_Report.pdf.

lag between research investment and application, even if public R&D investment were to recover substantially, productivity growth would take time to resume.[34]


STEVEN ASERCION/UC DAVIS CAS PROJECT

Pakistani research scholars and farmers visit Lindcove Citrus Research and Extension Center in California. Partnerships have been a proven mechanism of research collaboration, innovation, and training.

Globally, the United States has had a history of leveraging investments by engaging in impactful science and education partnerships with developing countries. These partnerships, based on working together in areas of mutual interest, have built a cadre of scientific allies around the world and brought significant benefits to all parties. However, data show that the U.S is losing its competitive edge and increases in public investments in agricultural research and development are lagging behind other countries. U.S. public agricultural R&D expenditures grew at least 2.6 percent annually in real terms in the years following World War II and this growth continued at a strong pace until leveling off in the early 1980s. In 2000, the rate of growth in investment began to slacken, and it has declined 6 percent since then. To ensure global food security through 2050, the U.S. will need to accelerate its investments in agricultural R&D, and sustain higher funding levels over the next 30 years.[35]

China in particular has dramatically boosted its commitment to agricultural R&D in the past decade. China's agricultural production has skyrocketed, fueled by a tripling of government investment in the agricultural sciences that now outpaces that of the United States.[36] Indeed, a recent scorecard published by the Council on Foreign Relations' *Renewing America* initiative cautions that the U.S. is on course to be overtaken by China as the leading investor in R&D overall by 2020.[37] India's investments in public sector funding have also increased, but expenditures in Western Europe, Brazil, and Asia-Pacific (including Canada) have leveled off.[38]

Faster progress can be made through collaborative global research. As food and agriculture problems become more complex, and challenges more interdisciplinary and global, solutions are requiring a more encompassing global perspective of collaboration. The U.S. can go farther, faster by leveraging investments through strategic global collaboration.

[34] United States Department of Agriculture Economics Research Service. (2015). Agricultural productivity growth in the United States: Measurement, trends, and drivers. Retrieved from https://www.ers.usda.gov/webdocs/publications/45387/53417_err189.pdf?v=42212.
[35] Global Harvest Initiative. (2015). GAP report: Building sustainable breadbaskets. Retrieved from http://www.globalharvestinitiative.org/index.php/gap-report-gap-index/2015-gap-report/.
[36] Supporters of Agricultural Research Foundation (SoAR). (2016). Re-taking the field: The case for a surge in agricultural research. Retrieved from http://supportagresearch.org/wp-content/uploads/2016/04/soar_retaking_the_field-FINAL.pdf.
[37] Council on Foreign Relations. (2016). Keeping the edge: U.S. innovation progress report and scorecard. Retrieved from https://www.cfr.org/report/keeping-edge-us-innovation.
[38] Global Harvest Initiative. (2015). GAP report: Building sustainable breadbaskets. Retrieved from http://www.globalharvestinitiative.org/index.php/gap-report-gap-index/2015-gap-report/.

Behind our access to an abundant food supply in the United States, is a sophisticated system of win/win international agricultural research collaboration that has produced a successful record of global benefits to both the U.S. and other countries. Increasing this investment is a key strategy for assuring a safe, adequate, and accessible world food supply both in the U.S. and overseas. In addition to helping farmers overseas, international research collaboration has: 1) protected Americans from foodborne diseases and assured that safe, high quality food comes across our borders; 2) expanded global markets for U.S. agricultural exports; 3) assured our access to the latest scientific knowledge and information and new varieties; 4) solved environmental problems that span political borders and endanger agriculture's natural resource base; and 5) improved U.S competitiveness by preparing our young people for work in a global economy. Recently, rapid and critical international collaboration among researchers and institutions across the globe halted the spread of UG 99, a lineage of wheat stem rust, preventing a wheat production disaster that threatened food security worldwide.

Several years ago AIARD published a compendium of case studies called *Food: The Whole World's Business*.[39] Case studies in the compendium showed the value of international research and development collaboration, including examples of work on wheat and rice in collaboration with the Consultative Group on International Agricultural Research (now known by its acronym alone – CGIAR). It is well known that these projects launched the "green revolution" overseas as a result of the development of short-stature, disease-resistant wheat and rice varieties. Less well publicized is the fact that these same improved crop varieties produced billions of dollars in economic benefit for U.S. wheat and rice farmers who grow them on a wide scale. The data supporting this report are just now being updated, but even many years ago in 2001, these improved crop varieties (in a U.S. wheat industry worth $8 billion annually and a rice industry worth $1.3 billion) had produced up to $13.7 billion in benefits for U.S. wheat farmers and $1 billion for U.S. rice farmers. U.S. investment in, and partnership with, CGIAR is a key strategy for the future to optimize global food security research impact.

Global collaboration on data is also key. Research both drives and is positively impacted by the generation, sharing, and use of "big data" globally to improve breeding, weather prediction, water management, crop/livestock resilience, etc. The Global Open Data for Agriculture and Nutrition initiative (GODAN) supports global efforts to make data relevant to agriculture and nutrition available, accessible, and usable for unrestricted use worldwide. Launched just over two years ago, GODAN is a rapidly growing initiative, currently with nearly 300 partners from non-governmental, international and private sector organizations and national governments. The initiative focuses on building high-level policy and institutional support for open data, both in the public and private sectors.

[39] Hertford, R. & Schram, S., eds. (2001). Food: The whole world's business: Investing in international agriculture and food systems development for the mutual benefit of the United States and developing countries. Association for International Agriculture and Rural Development (AIARD). Retrieved from http://www.aiard.org/uploads/1/6/9/4/16941550/foodthewholeworldsbusiness.pdf.

RECOMMENDATIONS FOR ACTION

Foreign assistance policy and funding

- **Fully fund programs authorized in the Global Food Security Act of 2016 related to agricultural research and development and leverage resources through multidisciplinary collaborative global research.** This recommendation includes the following four sub-recommendations:

1) Expand global agricultural R&D by providing $60 mil. annually for USAID's Feed the Future Innovation Labs for Collaborative Research, a cost-effective mechanism and investment for collaborative international research, development, and training.

Feed the Future Innovation Labs are a partnership between U.S. universities, developing country institutions, and the USAID. They address issues of hunger and poverty through collaborative science, technology development, and training. Innovation Labs bring benefit to developing country food and agriculture systems, but also bring impressive benefits (productivity increases, disease resistance, improved crop varieties, global research networks, etc.) back to United States agriculture. There are presently 24 Feed the Future Innovation Labs across the United States that involve over 60 universities across the country, and many developing country institutions.

2) Fully fund and program (through USAID) the $35 million partnership program between U.S. public and land-grant universities and developing country institutions to conduct research and train the next generation of scientists.

Building the human and institutional capacity of developing country universities through partnerships with U.S. public and land-grant universities has been at the heart of global agricultural development for decades. Over the years such partnerships have been a proven mechanism of research collaboration, innovation, and training, and have provided U.S. scientists with a base of collegial support and friendship all over the world. But this type of collaborative work has suffered from a serious decline in funding. AIARD recommends full funding and USAID programming of the $35 million Partnership program called for in the Foreign Operations Appropriations Bill of 2016**:** "*not less than $225,000,000 shall be made available for assistance for higher education, including not less than $35,000,000 for new partnerships between higher education institutions in the United States and developing countries*."

3) Continue the U.S. contribution and support the World Bank contribution to CGIAR; examine how U.S. public and land-grant universities and the U.S private sector could partner more effectively with CGIAR Collaborative Research Programs (CRPs) for mutual impact.

CGIAR is a global research partnership dedicated to reducing poverty, enhancing food and nutrition security, and improving natural resources and ecosystem services. Fifteen CGIAR centers carry out research, in close collaboration with global partners. U.S. academic institutions, development organizations and the private sector partner with CGIAR for R&D benefits in multiple countries. Estimate of the benefits of CGIAR research are USD$2 in benefits for every U.S.$1 invested. CGIAR research platforms help foster partnerships between U.S. public research universities and international centers and others that make it possible to do the collaborative research needed to meet the food needs of an expanding population living in a variety of agro-ecological zones.

Core funding of $50 million for CGIAR was provided by the World Bank for decades, leveraging millions of dollars in contributions from many international donors. In 2015 the Bank threatened to phase out its support. Following strong opposition by the U.S. and many other countries, $30 million was restored, annually, for three years. Continuing U.S. leadership is needed to encourage the World Bank to sustain its $30 million contribution to CGIAR in support of global agricultural research that will deliver new technologies, production practices and policies to alleviate hunger, child stunting and extreme poverty. USAID should continue to provide sustained support of rigorously prioritized CGIAR research toward these same goals through $50 million in research funding. Combined with USAID mission buy-in investments of some $100 million annually, this will ensure delivery and uptake of technologies and policies by millions of smallholder farm families, increase collaborative research capacity of host country partners, and optimize impacts from USAID's investment in food security-related CGIAR research.

4) Support the GODAN initiative, which encourages collaboration and cooperation among existing agriculture and open data activities.

Continued investment is needed in the generation, sharing, analysis and use of big data to solve long-standing issues related to sustainable global food and nutrition security. Institutional policies restricting openness of data can constrain agricultural and nutritional research and innovation. A shared global research agenda could help increase the availability, quality, sharing and interoperability of data.

Domestic policy and funding (including 2018 Farm Bill)

- **Through Farm Bill and domestic agriculture appropriations assure full funding for USDA's AFRI program at the level of $700 million; and increase focus on transdisciplinary domestic R&D and on projects that strengthen American agriculture by encouraging international collaboration with scientists working on issues of mutual interest across the globe. This may require re-prioritization of existing Farm Bill programs.**

Programs authorized in the Farm Bill are designed to help provide the science needed for addressing food insecurity at home, as well as overseas. Through the 2014 Farm Bill, Congress re-authorized the The International Science and Education (ISE) program to make competitive grants to colleges and universities in order to strengthen campus-based agricultural teaching, research and extension programs, promote United States economic competitiveness, and enhance international market development (ISE had originally been authorized in Section 229 of the 1998 Farm Bill).

Unfortunately, the 2014 Farm Bill Authorization did not lead to appropriations, thus, the ISE program only received funding from 2004-2011. It was successfully implemented for these seven years by USDA's National Institute of Food and Agriculture. The ISE program budget level had grown to a modest $3 million over that time period. When USDA eliminated the ISE program they pledged to compensate by "internationalizing" AFRI. This has not been accomplished to any significant extent. Only 2.6 percent of all programs across all National Institute for Agriculture (NIFA) programs, including AFRI, have an international component. Adding resources to AFRI for research and development programs benefiting the U.S., but also with an international collaboration component, would help carry out the internationalization intent. Alternatively, the upcoming Farm Bill could re-authorize the ISE program at a higher level, and tweak the program to expand international collaboration on issues of keen interest to the U.S.

- **In order to strengthen future extramural extension, research and teaching programs funded by USDA, AIARD recommends that NIFA assess the success of its current efforts to foster international partnerships that strengthen American agriculture.**

AIARD is not alone in issuing this wakeup call for investing in America's agricultural research and development enterprise. AIARD joins many organizations (which in turn represent thousands of citizens) in its requests, including, but not limited to: the Agriculture and Food Research Initiative (AFRI) Coalition; AGree; the Association of Public and Land-grant Universities; the Chicago Council on Global Affairs; the Global Harvest Initiative (GHI); and the SoAR Foundation. What is unique about this report is AIARD's focus on the opportunities within the domestic USDA research enterprise and USAID's international agricultural research programs, and the importance of these investments as a package. The time has come to consider how both domestic and global programs can be strengthened in ways that maintain America's own food secure future, but also provide hope to those around the world who are less fortunate and hungry.

CHAPTER 5 – TRAINING AND EDUCATING THE NEXT GENERATION

COURTESY OF IAGRI, OHIO STATE UNIVERSITY

Problem Statement

The challenge of feeding a projected world population of 9.7 billion people by 2050 requires a new generation of talented and highly educated agricultural development professionals working not only in their own countries, but collaborating globally on subjects of mutual interest and issues of mutual survival. AIARD calls upon all stakeholders in agricultural higher education to step forward on both domestic and foreign assistance fronts to help address this challenge.

In the United States, whether university students are preparing to work domestically or for a career overseas, much greater internationalization of their curriculum is required. U.S. employers today are looking for language skills, cross-cultural competency, and knowledge of global agricultural markets to provide the skills to expand their businesses into emerging markets. As well, students need to be introduced to the possibilities of global scientific collaboration that can: accelerate scientific advances and produce two-way technology flows; create joint ventures; and expand the capacity to respond quickly to global food crises. Since public university budgets are already strapped, resources for such programs are likely to be needed from international or federal public funds and the private sector. Foundations and university alumni should also contribute as new sources of support.

University education is more than the next level in the learning process; it is a critical component of human development worldwide. It provides not only the high-level skills necessary for every labor market but also the training essential for teachers, doctors, nurses, civil servants, engineers, humanists, entrepreneurs, scientists, social scientists, and a myriad of other personnel. It is these trained individuals who develop the capacity and analytical skills that drive local economies, support civil society, teach children, lead effective governments, and make important decisions which affect entire societies.

-- Educational Pathways International

In developing countries, the challenge is one of building local capacity and strengthening educational institutions. Strengthening is needed so that institutions can: 1) offer quality curricula, including programs relevant to global food security work; 2) become sustainable enough institutionally in the longer term to develop the human capital required to solve country and region-specific problems; and 3) train and graduate students equipped to find jobs in the agriculture sector. While many advances can be made through partnerships with developed countries, countries and regions need relevant educational institutions that educate their own scientists, policymakers, entrepreneurs, extension service personnel, and food systems workers. If the goal of foreign assistance is to foster locally owned, locally led, and locally sustained development in agriculture and other sectors, developing countries need investment in their educational institutions at *all* levels.

The greatest challenge is in sub-Saharan Africa where 1 of the 2+ billion people to be added to the planet by 2050 will reside. The youth bubble presently represents 18.3 percent of the world's developing region population below the age of 15 and sixty-two percent of Africans are below the age of 25. If these young people are left untrained with few options for a successful livelihood, there is a risk that some may emerge as radicalized extremists. Education — especially in agriculture, the sector upon which so many developing countries depend for socio-economic advancement — is one of the most powerful antidotes to radicalization of the young.

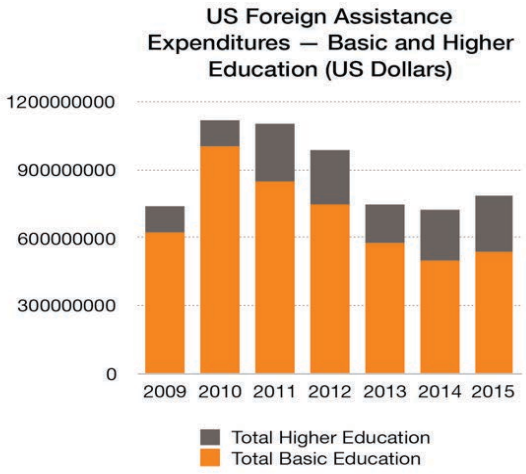
Jayne, Kabaghe, and Minde highlight the importance of developing the capacity of local institutions in sub-Saharan Africa to provide livelihoods for young people — African universities, agricultural training colleges and vocational schools, national agricultural research and extension systems, and policy institutes and think tanks. These local institutions will need new sources of support to play a critical role not only in appropriate solutions for Africa, but in achieving the vision of greater global collaboration, particularly with the U.S. Where it is challenging for each country to develop a top flight university, regional institutions that are cooperatively supported by several national governments and donors should be more aggressively supported.[40]

The Greatest Need is for Investment in Higher Education. The 2015 UN Sustainable Development Goals (SDGs) highlight the importance of equitable quality education at all levels – early childhood, primary, secondary, tertiary, technical and vocational training.[41] All areas of educational investment are important, but the greatest need is for investment in higher education. This area has been a low priority for the United States' foreign assistance support for years.

The total foreign assistance budget of the United States (approximately $33 billion) accounts for less than one percent of the total U.S. Budget. Within that total,

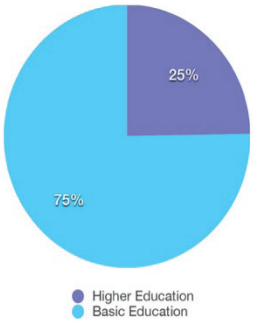
[40] Jayne, T.S., Kabaghe, C. and Minde, I. (2017). Enhancing United States Efforts to Develop Sustainable Agri-food systems in Africa. Washington DC: Farm Journal Foundation.
[41] United Nations Division for Sustainable Development. (2015). Transforming our world: The 2030 agenda for sustainable development (A/RES/70/1). Retrieved from https://sustainabledevelopment.un.org/post2015/transformingourworld/publication.

higher education development assistance presently accounts for $249.6 million — just .74 percent of the total $33 billion. Basic education expenditures, on the other hand, account for $534.3 million, significantly over twice the amount spent on higher education. As shown in the following, expenditures for higher education have been disproportionally small, compared to U.S expenditures for basic education since 2009. The bar chart (based on Congressional Budget Justification figures) shows comparative expenditures by year. The pie chart shows that, from 2009-2015, only 25 percent of total foreign assistance was spent on higher education, while 75 percent went to basic education.[42]



Foreign Assistance Higher & Basic Education (2009-2015)

CATEGORY	$6,424,310,000 TOTAL SPENT ON EDUCATION
Higher Education	1,589,481,000
Basic Education	4,834,829,000



Prospects for meeting the sustainable development goals in education are presently not bright. An analysis of overall higher education participation rates overall in 35 countries in South Asia and sub-Saharan Africa by University of Cambridge researchers Ilia and Rose detected "extremely low" rates for people under 25 in almost all of them: below 10 percent in 31 of the countries, and below 5 percent in 20. Drawing on U.S.-funded Demographic and Health Surveys conducted between 2007 and 2014, the study found that enrollment was generally lowest in sub-Saharan Africa.[44]

Further, average attendance rates mask vast differences in participation between the poorest and richest youth. There are five countries where the number of poor young people going to university is "not statistically different from zero": Burkina Faso, Liberia, Malawi, São Tomé and Príncipe, and Tanzania. More than 5 percent of the poorest half of young people went to university in only four of the 35 countries — Comoros, Bangladesh, Nepal and Pakistan — and, even in these nations, richer citizens were three to five times more likely to enroll. In 24 of the 30 countries where at least some of the poorest

[42] Alvis, S. L. (2016). Investing in human and institutional capital through building higher education: An analysis of United States assistance to higher education in developing countries from 2013-2015 and the relationship with U.S. universities. College Station, Texas: Texas A&M University.
[43] Ilie, S., & Rose, P. (2016). Is equal access to higher education in South Asia and sub-Saharan Africa achievable by 2030? Higher Education, 72(4), 435–455. Retrieved from https://link.springer.com/article/10.1007/s10734-016-0039-3

are enrolled, poor young women were the least likely to enter a university.

Contrary to prevailing thought, the poorer the region the greater the return on investment from higher education. In fact, the poorest world region, sub-Saharan Africa, shows the highest rates of return from investments in higher education at 21.9 percent. This rate of return is nearly double that for primary and secondary education in the region, and nearly double the return on higher education for high income economies at 11 percent.[44] Additional studies show not only increased earnings by the individual as income, but improvement in health, greater education level attainment of children, stronger civic institutions, and democratic values.[45]

Background and Challenges

Historically, the United States government has invested in developing countries through foreign assistance investment in long-term degree training and the building and transformation of institutions of higher education. Institution building was typically in the form of university partnerships and student training, often focused on agricultural sciences. [46]

Initially focused on transfer of knowledge, as promoted by Truman's Point Four program, twenty-six partnerships were supported in the 1950s, including one between India and U.S. land-grant universities in Illinois, Kansas, Missouri, Ohio, Pennsylvania, and Tennessee.[47] Focus shifted in the 1960s to in-country institution building and U.S. based short and long-term training of students.[48]

Following the establishment of USAID by President John F. Kennedy in the Foreign Assistance Act of 1961,[49] Congress allocated $10 million in 1966 for research and educational institutions to strengthen economic and social development programs in developing countries. This however, was a short-lived investment, as contracts to universities from USAID dropped by 50 percent in the 1970s.[50]

Despite this reduction of investment in building higher education in developing countries, U.S. universities remained engaged in partnerships with developing country institutions of higher education, in part through Title XII, a 1975 act of Congress that specifies collaboration on activities related to food and agriculture. Title XII established the Board for International Food and Agriculture Development (BIFAD)

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[44] World Bank (2013). World Development Report 2013. Retrieved from http://siteresources.worldbank.org/EXTN-WDR2013/Resources/8258024-1320950747192/8260293-1322665883147/WDR_2013_Report.pdf
[45] McMahon, W. (2009). Higher learning, greater good: The private and social benefits of higher education. Baltimore, Maryland: Johns Hopkins University Press.
[46] United States Congress, Office of Technology Assessment. (1991). New opportunities for U.S. universities in development assistance (OTA-BP-F-71). Retrieved from http://ota.fas.org/reports/9131.pdf
[47] Read, H. (1974). Partners with India: Building agricultural universities. Urbana-Champaign: University of Illinois, at Urbana-Champaign.
[48] United States Congress, Office of Technology Assessment. (1991). New opportunities for U.S. universities in development assistance (OTA-BP-F-71). Retrieved from Federation of American Scientists website: http://ota.fas.org/reports/9131.pdf
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and the Collaborative Research Support Program (CRSP). BIFAD is an advisory body which serves as an intermediary between universities and USAID. The Collaborative Research Support Program (CRSP) has evolved into the current Feed the Future Innovation Labs for Collaborative Research.

But overall, investment in higher education by the U.S. and other countries experienced a serious decline over the past 30 years. Following a series of studies which showed that returns to education were highest at the primary level education;[51, 52, 53, 54, 55] lending organizations and development agencies withdrew or diminished investment in higher education. Policy recommendations which followed these reports encouraged governments to reallocate investments from higher education to primary education.[56]

Return on Higher Education Investment is High. More recent research has called for a new look at educational investment strategies. It has shown that returns on investment in education are highest when investment is made at the higher education level.[57, 58] This is not to say that investment in primary and secondary education is unimportant, but that investment should be made across all levels of education in order to create a workforce that is able to be innovative and meet the needs of industry.

The analysis also countered a number of widespread misperceptions: that U.S. government-funded long-term training benefits the children of the elite, that participants do not return home, that scarce training funds would be better spent on more trainees in-country, and that brain-drain is worsened. The report notes that *roughly 90 percent of the participants returned home* and it was uncommon for a participant to be unemployed. Brain drain was contained — not worsened — by the major contributions participants made in their home-country institutions and sectors that multiplied opportunities, improved the learning environment, and raised hopes for young, upcoming professionals. The report also highlighted that the *cost per impact* derived from USAID's investment may be lower for participants trained at U.S. universities than for those trained in-country when compared accurately.

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U.S. Universities Have the Capacity and Legislative Authority to do More in Global Higher Education. U.S. higher education institutions have unique capacities, years of experience, and a mission drive to support USAID's human and institutional capacity development programs, and they should be more adequately funded. Formerly the United States annually funded as many as 15,000 students to study in our country for a year or more. USAID now funds only a small fraction of that number.

While we argue strongly for investments in higher education institutions in developing countries, there is a special niche for training students in the United States. International students who study at U.S. institutions of higher education often go back to their home countries and take on leadership roles in their civil society, the private sector, and government. These students are exposed to U.S. values and norms, including democracy and, in the years after their stay in the United States, often look to the U.S. as a partner and a source of expertise. In this way, U.S. higher education is a strategic asset for global development and U.S. relations abroad, both diplomatic and economic.

If the U.S. does not fund these activities, our competitors will fill the gap and reap the benefits. In Africa, for example, China is eclipsing U.S. efforts in training and education and building a contact base for the future. **Chinese President Xi Jinping has announced 10 major plans to boost cooperation with countries across Africa in the next three years, including 40,000 training opportunities in China and 30,000 government scholarships. In total, China will provide USD$60 billion in funding support across the continent.** China would also establish regional vocational education

COURTESY OF BORLAUG LEAP

Borlaug LEAP Fellow Zennah Kosgey inspects wheat fields in Kenya. U.S. higher education is a strategic asset for global development and training the next generation of developing country scientists.

centers and capacity building colleges for Africa and train 200,000 African technicians. Further 200 African scholars will be invited to visit China, 500 young Africans will be given opportunities to study in China each year, and 1,000 media professionals from Africa will be trained. China will be establishing the types of long-term scientific and educational partnerships and friendships that have been a feature of U.S. foreign assistance for years and that have brought back productivity enhancing innovations and trade opportunities to our country.

U.S. legislative authorization to enhance investment in global higher education is in place. The Global Food Security Act of 2016 states that it is in the national interest of the United States to "continue to strengthen partnerships between United States-based universities, including land-grant colleges, and universities and institutions in target countries and communities that build agricultural capacity." The Act sites agricultural research and academic institutions, including land-grant universities and extension services, as key stakeholders engaged in efforts to advance global food security programs and objectives.

RECOMMENDATIONS FOR ACTION

Foreign assistance policy and funding

The funding for research requested in chapter four — for Feed the Future Innovation Labs and the land-grant university partnership fund — will not only develop research capacity, but will also develop country-based human capital, provide mechanisms for longer term international educational collaboration and exchange, and help educate and train the next generation of developing country leaders. In addition, AIARD recommends:

- **Elevate the level of U.S. foreign assistance funding for higher education to a level equal to the amount invested in basic education.** This will enable agriculturally-centered recipient countries to build local capacity and move from problem sources to problem solvers.

- **Adjust priorities in foundations, the private sector, and recipient countries so that additional developing country agricultural experts and leaders can benefit from higher education**. It should not be the USG's responsibility alone to build higher education in assisted countries. Higher education agricultural programs should be assisted by a number of entities in ways that encourage merit-based access and problem-solving relevance.

- **AIARD calls upon the U.S. higher education community to work more closely together in developing a cogent strategy for U.S. foreign assistance investments in agricultural higher education**. This includes land-grant and non-land-grant universities, community colleges, and others. All institutions with programs in agriculture, food and nutrition, natural resource management, human science etc. have tools that are needed in the quest for global food security.

Domestic policy and funding (including the 2018 Farm Bill)

- **Promote the internationalization of U.S. campus-based programs in agriculture.** In the 2014 Farm Bill (as noted in chapter four) Congress recognized that it is in the self-interest of the United States to internationalize campus-based agricultural teaching, research, and extension programs. The bill re-authorized the International Science and Education (ISE) competitive grants program to make competitive grants to this end. Congressional intent needs to be revisited regarding this program as part of Farm Bill re-authorization, or another means must be developed to meet its objectives, as USDA has not provided funding for the ISE program since 2011.

CONCLUSION

The SMART investments highlighted in this report are presented at a time of unprecedented opportunity and need, but also unprecedented concern. Rarely in the long history of food insecurity have there been coincidental policy openings as there are now; decisions will soon be made that will shape the future of our country's approach to agricultural development and food assistance overseas and here at home. At such a juncture, when the Farm Bill, the Global Food Security Strategy, and overall foreign assistance policy and appropriations will be re-examined by the President and Congress, this report calls for renewed steps forward, not back. As America's leadership abroad and well-being and security at home are highly valued, we must pledge to wisely and whole-heartedly invest in the fundamentals of food and nutrition security. Previous generations laid the foundation. We owe it to ourselves and to those who follow us to accelerate our response.

Five SMART U.S. Domestic and Foreign Operations Investments

S — ***Security and stability*** — increase prospects for security and stability by accelerating investments in agriculture, the economic base and primary source of livelihoods in developing country economies;

M — ***Markets and trade*** — keep markets open to expand jobs and market opportunities for U.S. farmers; increase technical assistance to developing countries, our trading partners of the future;

A — ***Adaptation and conservation*** — expand global collaboration and technical assistance to help farmers adapt to the impacts of environmental stress and conserve natural resources for future generations;

R — ***Research and innovation*** — increase research and innovation investments to bring new jobs and increased productivity to both the U.S. and developing countries; expand global research partnerships with groups like CGIAR and others to meet the needs of a world population of nearly 10 billion people by 2050;

T — ***Training and education*** — internationalize the U.S. university curriculum to prepare students for competing in the global marketplace; strengthen developing country higher education institutions, particularly for global food and nutrition security work.

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