

POLICY BRIEFS 2017

AGRICULTURAL RESEARCH

Revitalizing Agricultural Research and Development to Sustain US Competitiveness

Dr. Phil Pardey and Dr. Jason Beddow

HUMAN AND INSTITUTIONAL CAPACITY BUILDING

Enhancing U.S. Efforts to Develop Sustainable Agri-Food Systems in Africa

Dr. Thomas Jayne, the Honorable Chance Kabaghe and Dr. Isaac Minde

AGRICULTURAL TRADE TECHNICAL ASSISTANCE

Leveraging US Technical Assistance for Improved Development Outcomes

Mr. Ammad Bahalim and Dr. Joe Glauber

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The Farm Journal Foundation is a 501(c)(3) organization devoted to informing and engaging U.S. agriculture, policymakers, and the general population on the importance of improving global food security. In 2016, the Foundation launched the Farm Journal Foundation Dialogue, with the desire to convene a public conversation on issues viewed as critical to feeding a growing global population, including discussion of how specific U.S. policies might be improved to better address those issues. Towards that end, the Foundation commissioned policy briefs by renowned experts in the areas of agricultural research, human and institutional capacity building, and agricultural trade technical assistance, which will be released individually during the month of February 2017. These Dialogue documents reflect the views of the authors, and are intended to stimulate interest and debate on these issues as Congress begins to consider the next farm bill and other relevant legislation.

A NOTE FROM THE FARM JOURNAL FOUNDATION

Over the next few years, we have a unique opportunity to further strengthen US agriculture and transform US agricultural development programs overseas to help foster growing markets and build more stable and secure nations. The 2018 Farm Bill reauthorization presents an opening to reposition US agriculture for the 21st century and deploy the tools needed to strengthen inadequate food systems.

Since the Farm Journal Foundation (FJF) started in 2010, it has sought to bring the expertise of US agriculture to the national policy table, providing a platform for diverse stakeholders across the US agricultural system to contribute their knowledge and ideas to feed a growing global population.

With a longstanding relationship with US agriculture and rural America, the FJF invited renowned experts to suggest approaches to enhance the programs and other tools that policymakers will need to generate better outcomes for US investments in agriculture and global food security. A series of three policy papers were commissioned; one on institutional capacity building, one on agricultural trade technical assistance and one on agricultural research. When considered as a whole, we believe that the papers can facilitate a conversation on how US agriculture can maintain its comparative strength while sharing its knowledge and tools with fellow farmers in developing countries to help drive economic growth around the world, and in the process, create new opportunities for US products in the markets of the future.

We hope that this effort will assist policymakers in promoting a national vision and commitment to international agricultural development in US foreign policy, and continued support for US farmers utilizing US Agriculture's best practices and expertise.

The Farm Journal Foundation would like to express its thanks to its donors, our Farm Teams, HungerU students, partners and colleagues across agriculture who reviewed these papers.

Tricia Beal
Chief Executive Officer
Farm Journal Foundation

FARMJOURNALFOUNDATION

The Farm Journal Foundation is a 501(c)3 organization that works with U.S. farmers, ranchers and next generation populations to inform and engage national level policymakers on the important role that the United States can and should play in addressing global food security.

FOREWORD

Today, too few people know where their food comes from and what is required to produce it. Even fewer understand the strong link between hunger, instability and conflict. Widespread hunger and lack of political stability are closely related and key drivers of both conflict and migration – refugees fleeing to Europe and undocumented immigrants entering the United States are but two examples of how people often respond to their inability to feed and protect their families.

As Americans, we have benefitted from decades of low food prices and a safe food supply. Our country's agricultural sector has advanced due to the innovation and dedication of our farmers as well as the US Government's visionary leadership since 1862. Together we have created the most advanced agriculture and food system the world has ever seen; however, many US agricultural institutions are now showing the strains of a mature system. New thinking, resources, and innovation, including improved coordination, will be vital to meet the coming challenges facing our world.

As President of the University of California system, I launched the UC Global Food Initiative in 2014 to focus our UC resources and intellect on one of the critical issues of our time: how to sustainably and nutritiously feed a world population expected to reach at least eight billion by 2025. The governments of China and Brazil are already working hard to bolster their agricultural systems to meet the growing global demand for food; they now spend more than twice the amount the US does on public agricultural research. We need to break out of the 'business as usual' approach and catalyze all relevant players – governments, universities, the private sector, and NGOs – to meet this challenge.

I applaud the Farm Journal Foundation for commissioning this series of reports and taking on the critical issue of how US agriculture can maintain a leadership role in feeding the world. These papers call on the US to both modernize our agricultural system and further link it with national security and development efforts to meet the demands of the future.

As each report demonstrates, no one sector can do it alone; success will require leadership, resources and new models for partnership. Taken together, they kick off a much-needed dialogue on how US Agriculture can maintain its comparative strength, share its extraordinary knowledge, drive economic growth and stability – all while ensuring US competitiveness in tomorrow's agricultural export markets. The issues covered (and the authors) are:

- Agricultural research, written by Dr. Phil Pardey and Dr. Jason Beddow.
- Human and institutional capacity-building, written by Dr. Thomas Jayne, Hon. Chance Kabaghe and Dr. Isaac Minde.
- Agricultural trade technical assistance, written by Mr. Ammad Bahalim and Dr. Joseph Glauber.

We have seen that the nation is ready for new ideas, voices and approaches. The Farm Bill reauthorization in 2018 provides a vehicle for modernizing our approach and improving the efficacy of our US investments both at home and abroad. Let us use these papers, and their recommendations, as a starting point for discussion and to better engage the full breadth of stakeholders within the US agricultural system.

Janet Napolitano
President, University of California

REVITALIZING AGRICULTURAL RESEARCH AND DEVELOPMENT TO SUSTAIN US COMPETITIVENESS



by Philip G. Pardey and Jason M. Beddow

REVITALIZING AGRICULTURAL RESEARCH AND DEVELOPMENT TO SUSTAIN US COMPETITIVENESS

Philip G. Pardey and Jason M. Beddow

SUMMARY

This paper describes the downward trends in US public agricultural research and development (R&D) funding and argues for a doubling of such spending over the next eight to 10 years to ensure that US agriculture maintains its global competitiveness. To address the decline, the US government can reverse current trends in public agricultural R&D spending by creating incentives for increased research funding from state governments and national commodity groups, much as the new Foundation for Food and Agriculture Research is designed to leverage private sector R&D funding. This paper also suggests ways to better coordinate agricultural research activities both between US government agencies and between US and international research institutions, and proposes more precise targeting of USDA funds to those places where agricultural production actually occurs.

INTRODUCTION: WHY SHOULD WE CARE ABOUT AGRICULTURAL RESEARCH?

Innovations generated by agricultural R&D, along with better education to enable best use of the new technologies arising from R&D, have enabled American farmers to produce enough food to feed the people of this country and millions of others around the world, on less land, freeing up resources for other economic and environmental uses. Land devoted to recreational use, such as parks, wildlife preserves, and forests, has increased by over 45 percent in the last 50 years thanks to a 200 million acre reduction in land used for agriculture (Nickerson et al. 2011). Increasing output while using less land requires farmers to use more or better inputs, for example, through adopting improved technologies (such as higher-yielding or improved drought-tolerant crop varieties) and production methods (minimum or no-till cultivation practices). While many US farmers increased the intensity of use of some inputs (e.g., applying more of a particular input, such as fertilizer, per acre), the evidence shows that

in aggregate, US farmers now produce more output using less inputs overall. Agricultural productivity has increased markedly (Alston et al. 2010) with aggregate agricultural output increasing by 268 percent from 1949 to 2007 (Pardey et al. 2014). Clearly, R&D is essential for achieving sustainable improvements in productivity and preserving the environmental conditions affected by agriculture such as air and water quality and water use.

Unfortunately, the rapid productivity growth of the US agricultural sector over the past half-century is unlikely to continue. Indeed, growth in US productivity is slowing, and that trend is likely to persist since the US government spending on agricultural R&D has flat-lined. At the same time, other countries have been ramping up public investments in this area. As a result, the US share of global public agricultural R&D has almost halved over the past five decades (Pardey et al. 2016). Continuing to skimp on spending will have detrimental consequences for US agricultural productivity and international competitiveness for US farmers and ranchers.

Policy Possibilities

While these developments are cause for concern, it is not too late to reverse them. A number of relatively straightforward policy changes would bolster US leadership in agricultural innovation without significant new appropriations from the federal government. In this paper, we propose two sets of policy changes that hold the most promise to reverse the disturbing trends revealed above:

Funding Innovations

- Federal funding: Refocus Farm Bill priorities.
- State funding: Reengage state government support.
- Enhance private support for publicly performed research.

Institutional Innovations

- Improve interagency collaboration in science spending with food and agricultural implications.
- Facilitate greater international engagement in the agricultural sciences.

Clearly, policy changes involve politics. But before turning to a discussion of these policy options, it is worthwhile to step back from the politics and address the fundamental economic rationale for government involvement in agricultural R&D and the reasons for real concern about current US trends.

THE PUBLIC ROLE: WHY SHOULD GOVERNMENT GET INVOLVED?

Despite recent increases in US private sector involvement in agricultural R&D, which now substantially exceed the public commitment, the government must reverse its recent retreat and revitalize its involvement in agricultural research.

In short, the incentive structure for private sector investment is unlikely to generate the appropriate amount and composition of agricultural R&D, thus necessitating some form of collective action, customarily facilitated by governments.

Market failures in agricultural R&D have several dimensions. Notably, those who invest in certain types of agricultural R&D might not be able to fully capture the benefits of that research, including the broad environmental benefits that are intrinsically external to the individual farmer who may pay for or use the results of the research. That is, certain farmers and other firms might benefit from the research even if they do not pay for it directly, and thus there are incentives to "free ride," sharing in benefits without bearing the cost, leading invariably to private sector underinvestment. Furthermore, individual farm operations are almost always too small to carry out robust R&D programs on their own; government investment and collective action among farmers and agribusinesses must usually correct the underinvestment.

Moreover, many of the payoffs from agricultural R&D take decades to materialize, which can undermine private sector incentives to invest given their shorter-term planning horizons. However, even though a long time may pass before the benefits of a specific investment in agricultural R&D are fully realized, the overall producer and consumer returns to these investments are still high (Alston et al. 2010; Hurley et al. 2016). The upshot of these market failures is that substantial and socially valuable R&D investment opportunities will not be supported if the

research is left entirely in the private domain (Pardey and Alston 2010).

CHANGING FOOD AND AGRICULTURAL RESEARCH REALITIES

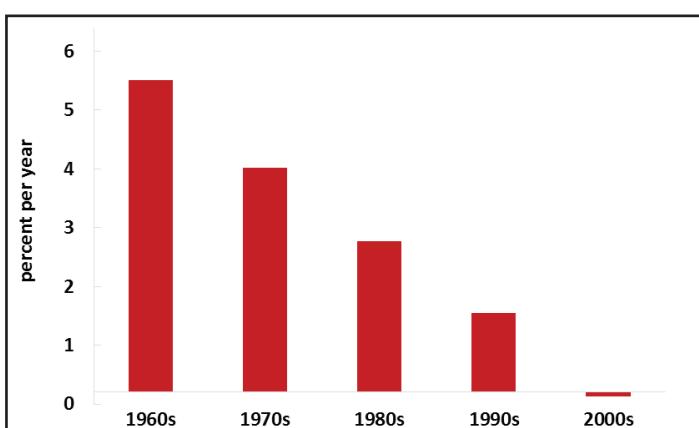
Decisions about the policy approach that best serve society's interests in US food and agriculture must take into account that the domestic and global contours of the R&D investment landscape are now very different than in decades past, a situation that significantly affects US competitiveness.

Public Research Spending Trends

Decades of progressively slowing growth in US public spending (adjusted for inflation) on food and agricultural R&D have given way to cutbacks in real spending in more recent years (fig. 1, panel a). US public on average grew by only 2.4 percent per year from 1960 to 2013. In contrast, public agricultural R&D spending in the rest of the world grew substantially (33 percent) faster at 3.2 percent per year over roughly the same period. As a result, the US share of global public agricultural R&D spending has fallen markedly, from 20 percent in 1960 to 11 percent in 2011.

Notably, key middle-income countries with large agricultural sectors (specifically Brazil, India, and China) collectively overtook the United States in 1998 (Pardey et al. 2016) (fig. 1, panel b). As of 2011, for every dollar the United States invested in public agricultural R&D, those three countries invested \$2.35.

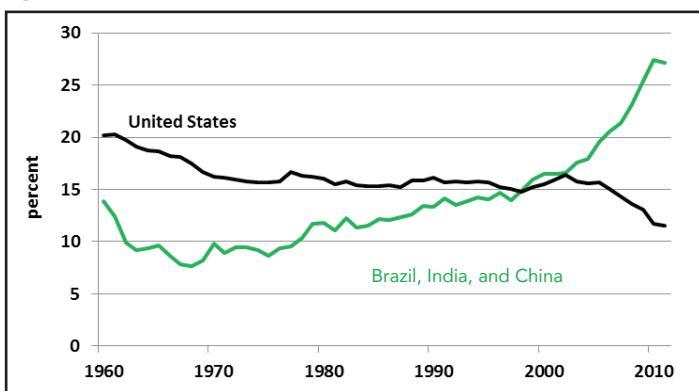
Figure 1: Spending on public food and agricultural R&D Panel a: US public spending growth rates by decade, 1960–2013



Who Performs and Pays for Public Agricultural R&D?

The split of federal-versus state-support for agricultural R&D has changed dramatically over the past seven decades, with equally dramatic but different changes in terms of who actually does the research. Since 1950, the share of state support for research within the state agricultural experiment station (SAES) system has declined from 62 percent in 1950 to just 36 percent in 2013. Federal funding has picked up most of the shortfall and now accounts for 40 percent of the overall SAES funding, almost double its share in 1950. However, over the same period, more of the research has actually been conducted by state agencies.

Panel b: Shifting global public share of food and agricultural R&D, 1960–2011



Source: InSTePP R&D accounts version 3.8.

Note: Panel a annual average period growth rates calculated using the least-squares method and report real (i.e., inflation adjusted) rates of growth. Data are in US dollars deflated to 2009 prices with implicit GDP deflator from BEA (2016). Panel b R&D shares based on spending denominated in purchasing power parity (PPP) units.

In 1950, 39 percent of publicly funded R&D was carried out by federal USDA labs, while 61 percent was done by state-based land-grant universities and other cooperating agencies. By 2013, the USDA labs' share had shrunk by one-third to 27 percent while the states' share had grown to 73 percent. Support to SAES research through grants and contracts from the private sector now also constitutes an important share of total SAES funding, accounting for 23 percent in 2013.

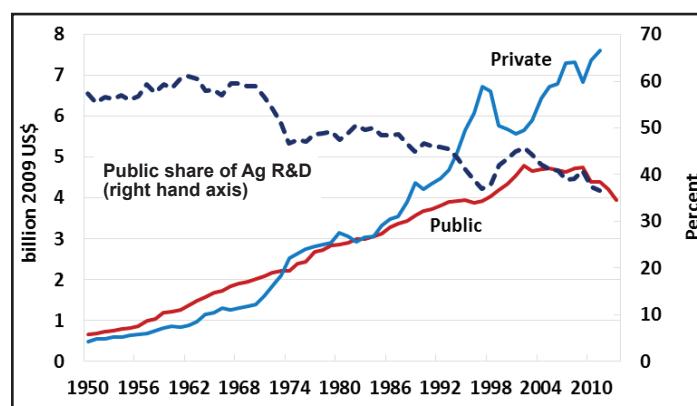
Private Versus Public Research Trends

The private and public shares in total US agricultural R&D have also changed markedly over the past half century (Pardey et al. 2016). In 1950, public agencies spent 34 percent more than private firms on overall food and agricultural R&D. By 2011, that relationship had reversed, with the private sector outspending the public sector by 73 percent (fig. 2).

Part of this growth in the public-private gap reflects a shift in US funding priorities, which has resulted in an initial decline in the growth rate and more recently, an actual decline in public spending levels on the agricultural sciences. These policy actions can in part be ascribed to an expectation that the private sector will fill the void left by these reductions in public spending. This expectation has not been realized, because public institutions tend to undertake more basic and applied types of research for which it is difficult to capture sufficient of the benefits to incentivize the private sector. Instead, the private sector tends to conduct more developmental or nearer-market research that is readily commercialized, but which often relies on breakthroughs achieved by way of the upstream research. The public R&D role must not only continue but expand. The empirical evidence that the economic returns to public R&D remain high provides a clear signal that investments in this area remain insufficient, despite the expanded private commitment to US food and agriculture research in recent decades.

Moreover, the United States is losing ground in terms of its share of global private spending on agricultural R&D. In 1980, private agricultural R&D conducted in the United States accounted for 33 percent of the world total. By 2011, that share had slipped by nearly a quarter. This shift also reflects an increase in domestic spending on private agricultural R&D elsewhere in the world, along with recent decisions by some multinational agribusiness firms headquartered in the United States (and other high-income countries) to shift some of their R&D investments to locations in the agriculturally large and growing middle-income countries.

Figure 2: Spending trends in US public and private agricultural and food R&D



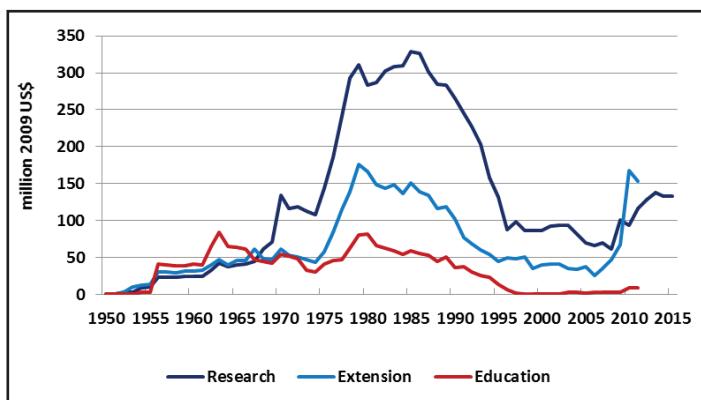
Source: InSTePP R&D accounts version 3.8.

Note: Data in real US dollars are deflated to 2009 prices with implicit GDP deflator from BEA (2016).

US Spending on International R&D Initiatives

For almost half a century, the US government, by way of USAID, has invested in international agricultural research undertaken by a consortium of 15 research centers located throughout the world, organized collectively as the CGIAR. While this research was pivotal to the development of high-yielding wheat and rice varieties that spurred substantial growth in Asian and Latin American agriculture during the 1970s (dubbed "The Green Revolution" by the USAID Administrator at the time), it also yielded sizable benefits for the United States. CGIAR-bred wheat and rice varieties have been widely and successfully planted by US farmers, who by 1996 had reaped more than \$3.7 billion in added value to the US economy, an astonishing return to taxpayers on the \$134 million of US investment in CGIAR wheat and rice research to that point in time (Pardey et al. 1996).

Figure 3: US spending on international food and agricultural R&D, 1950–2015



Source: Authors estimate using data from Alex (2012) for 1950–2010; post-2010 is derived from unpublished USAID data. Note: Data in US dollars are deflated to 2009 prices with implicit GDP deflator from BEA (2016). Research funding includes estimate of support to national and international (e.g., CGIAR) research agencies.

Decades after the Green Revolution, the worldwide benefits of international support for agricultural R&D continue to flow, including to the United States. Rust in wheat is a devastating fungal pathogen that afflicts crops around the globe. US wheat farmers are at risk: almost all US wheat is grown in climatic zones susceptible to the disease (Pardey et al. 2013b). In 1998, a new variant of stem rust first appeared in Uganda. Dubbed Ug99 (1999 being the year the strain was scientifically characterized), this strain has since spread, undermining wheat yields throughout East Africa and beyond. Over the past decade, the work of USDA scientists at the Cereals Disease Lab in St. Paul, Minnesota—in close collaboration with the efforts of SAES and CGIAR scientists and national research partners in Africa and elsewhere in the world—has been pivotal in identifying the changing pathogenicity of Ug99,

paving the way for breeding disease-resistant varieties. USDA scientists continue to play a pivotal role in this research, which is funded through a variety of sources, including USAID's Feed the Future program, similar aid programs of governments elsewhere in the world, and private foundations. The US research program is therefore helping to ameliorate production problems in Africa, while at the same time helping to insure against prospective crop losses here in the United States should history repeat itself and the new rust strains begin cropping up on US farm fields.

The US government has been investing in international research and associated education and extension activities for some time (fig. 3). But that commitment has waxed and waned over the years. It was initiated in the 1960s in response to growing global food security concerns, helping to fuel the Green Revolution, and surged again in the 1970s in response to global food price spikes. Investments in international agricultural R&D peaked in inflation-adjusted terms in the mid-1980s, but subsequently dropped precipitously. Global food price spikes in 2008 led to some recovery in this form of spending, but in real terms US spending on international research still falls far short of the 1986 peak, even though globally, agriculture has to feed 2.4 billion more people than in the mid-1980s, and pressures on crucial agricultural assets such as land and water have intensified. Despite increased US support for CGIAR research in very recent years, the United States, through USAID, accounted for only 16 percent of CGIAR funding in 2014 compared with a peak of almost 30 percent in 1982.

PUTTING POLICIES INTO PRACTICE

A number of US public policies collectively shape the overall incentives to invest in and perform research of relevance for food and agriculture. They include the Farm Bill, annual appropriations for foreign aid budgets, funding for non-USDA federal agencies such as NIH, NSF, and others, and legislation related to the scope and nature of patents and other forms of intellectual property. So what can be done to reshape US public policies in ways that would reposition and re-energize the domestic and international agricultural R&D capacities of the United States? Here we propose some salient US policy changes and focus on a set of potentially consequential funding and institutional innovations.

Fund innovations to double investments in public food and agricultural R&D over time.

All available evidence indicates that the economic returns to US producers and consumers from publicly performed agricultural R&D are exceptionally large: on the order of

20 dollars of social benefit for every dollar spent (Alston et al. 2010). Such high returns strongly signal that the United States under-invests in agricultural research, leaving important research projects unfunded. The necessary boost to agricultural R&D funding should occur gradually, allowing the relevant institutions to ramp up activities in ways that avoid any wasteful spending. Reversing the long-term decline in spending on US public agricultural R&D should be underwritten by federal and state taxpayers as well as private agricultural sector interests, as all three parties stand to reap substantial rewards from the research that private market forces alone are unable to deliver. Below are some suggestions to leverage existing authorities and funding for food and agricultural R&D.

Refocus Farm Bill priorities.

Though an important step, the \$200 million allocated for agricultural research through the new Foundation for Food and Agriculture Research provided in the Agricultural Act of 2014 is not enough to stem the rundown in US public agricultural research capacity that has occurred over recent decades (Pardey et al. 2014). “The additional R&D funding authorized in the 2014 Farm Bill falls far short of doubling public support for the agricultural sciences. It constitutes an average nominal increase of just \$130 million per year, equivalent to an average annual increase of only 3 percent of total US public R&D spending for food and agriculture (as compared to 2009 spending levels).” With the January 2016 budget outlook by the Congressional Budget Office (CBO) pointing to increasing budget deficits and rising national debt over the coming decade (CBO), calls to increase overall federal government spending on Farm Bill programs, even for a crucial area like agricultural research, seem destined to fall on deaf ears. Actually needed, however, is a realignment of congressional priorities on recurring agricultural R&D spending, rather than a net increase in funding for US agricultural programs.

Reengage state government support.

The trends described above show a distinct and broad-based decrease in state government funding for state-performed agricultural R&D, while the share of SAES funding from federal sources has increased. There are several reasons why this is so. Some of the USDA-administered funds made available for SAES research require matching state funding to secure the federal support. However, the share of these matched formula funds in the total USDA funds flowing to the SAESs has

fallen over time; almost 87 percent of total USDA support to the states in 1970 was matched by the states, declining to just 35 percent in 2009. This shrinking share of formula funds was due to two reasons, an increase in competitive grants funding and funding made available to the SAESs by way of USDA contracts for specific research projects, and an increasing share of funding flowing to the SAESs from other federal agencies such as NIH, NSF, and DOE, much of it competitive funding not requiring a match. In 2013 state governments committed just \$0.89 on average for every dollar of federal funding made available for research conducted in the SAESs, compared with \$4.36 of state funding per federal dollar in 1925. There are several ways in which the mix of federal-state support can be rebalanced.

Expand the scope or size of the state matching requirements to secure federal funding for SAES research.

The composition of state and federal funding for SAES research varies considerably among the states. In 2013, 32 state governments contributed less than one dollar for every federal dollar, 12 states contributed between one and two dollars, and only four states provided more than two dollars of funding for each federal dollar directed to the SAESs. Expanding the scope or size of the state matching requirements to secure federal funding for SAES research is one practical way of rebalancing federal and state support for SAES research. It could also serve to better align the locus of where research is performed with where a specific agricultural production activity occurs, with potential for achieving increased efficiencies in the productiveness of R&D given the strong site-specific

attributes that often affect agriculture and its associated environmental impacts. This improved alignment will also expand public support for this type of spending.

Revisit the basis of the “formula funds.”

Politics hinders efforts to reach an allocation of research resources that make economic sense. A state is unlikely to be the most “efficient jurisdiction” for a particular set of R&D services, where efficient jurisdictions are defined according to the largely interstate geographical range of production supported by those research services. Agricultural production is unevenly distributed across the United States, so that striking a more efficient geographical balance of funding would entail shifting existing federal funding from some states to others. A practical way forward is to revisit the basis of the “formula funds,” perhaps

putting more, or even exclusive, weight on the relative value of agricultural production as the basis for cross-state allocation.¹ Combined with more stringent state matching requirements, moves in this direction could strike a more appropriate balance between federal versus state funding, where efficient financing principles would call for financing “local” public goods using “local” taxes.

Re-allocate federal support between states to make more effective use of scarce R&D dollars.

Tackling this spatial resource allocation problem leads to another political challenge: Is 50 (one for each state) the optimal number of experiment stations for the United States? While farmers reap some of the benefits of R&D, consumers are also significant beneficiaries in the form of access to cheaper, safer, and more varied choice of produce. The “beneficiary pays” principle of public finance is based on the notion that all US consumers (and thus federal taxpayers) should underwrite public agricultural R&D, even though all states may not share equally in the distribution of those research dollars. With agricultural production spread unevenly over the geographical (and political) landscapes, the “efficient jurisdiction” concept introduced above suggests the need to improve the alignment between where the majority of US agricultural production is located and the allocation of federal agricultural research dollars, especially in an environment with scarce financial resources available for such work.

Enhance private support for publicly performed research.

If we apply the basic logic of the “beneficiary pays” principle, those who benefit from a program should pay for it. The innovations spurred by agricultural R&D improve food quality, decrease food prices, and protect the environment from the negative externalities associated with agriculture. Since all consumers benefit from agricultural R&D investments, general tax revenues should at least partially fund them.

However, farmers also clearly benefit from innovative agricultural technologies that improve productivity, reduce risk, and decrease production costs. As such, farmers—and agribusiness in general—may appropriately have roles in funding agricultural R&D. US farmers already engage in collective action to fund activities that benefit agricultural producers. In recent years, these collective “check-off” arrangements have garnered annual funding of around one billion dollars. Some of the check-off boards provide funds to support R&D, but the share varies substantially

across various commodity sectors. Most of the remaining funds are used for short-term promotional activities (Alston et al. 2005; Lee et al. 1996).

Legislation that provides incentives for industry to impose a research levy scheme where the funds are focused specifically on R&D and managed outside existing US check-off programs in ways that optimize the innovative “bang for the buck”—perhaps along the lines of the very successful, farmer co-funded Research Development Corporation model launched by the Australian Federal Government in the late 1980s (see Alston et al. 2012)—would be a straightforward way to enable (and induce) producers to collectively co-finance the research that benefits their enterprises.

While farmers reap some of the benefits of R&D, consumers are also significant beneficiaries in the form of access to cheaper, safer, and more varied choice of produce.

To make the program palatable to grower groups (and recognizing that US consumers and taxpayers also gain from agricultural R&D via safer, more abundant and affordable food), the federal government should offer matching funds (up to some predetermined limit), thus splitting the R&D burden between producer research

levies and general tax revenues. Including other industries that benefit from agricultural R&D in the scheme (such as input suppliers and food processors) would allow for even more agricultural R&D and, if implemented wisely, substantially correct the persistent underinvestment in agricultural R&D (Pardey et al. 2013). The federally-matched, research levy scheme introduced by the Australian government decades ago is a successful and now significant source of funding for public research carried out by universities and other government institutions in that country.

INSTITUTIONAL INNOVATIONS

Reversing the long decline in funding for publicly performed US food and agricultural R&D will be a step in the right direction toward maintaining the sustainable productivity performance of US agriculture. Improving the effectiveness by which these funds are mobilized and spent is also possible, requiring adoption of the complementary institutional innovations outlined below.

Improve interagency collaboration in R&D spending with food and agricultural implications.

Both the relevance of R&D in food and agriculture and the economic and societal consequences of innovations in these sectors extend well beyond the domain of the USDA. For example, food and agriculture directly affect nutrition and therefore human health, and so it follows that

coordination of research enabled by such entities as the USDA and the NIH must be improved. In recent years, the NIH has committed around \$1.5 billion dollars annually to nutrition research and training (NIH 2015) compared with approximately \$300 million per year of human health, nutrition, and food safety R&D undertaken by the USDA and the SAESs in 2013. Despite recent interagency deliberations between the USDA and the NIH (and other agencies) (see ICNHR 2016), these two agencies are presently investing just \$3.4 million annually in jointly managed nutrition-related research.

The scale and importance of the social and economic issues involved—notably the increased health costs stemming from obesity and other nutrition-related problems—support the case for a much larger commitment of R&D resources and improved interagency collaboration. Such collaboration would also be helpful in other research topics that cross agency jurisdictions, such as remote sensing technology and climate impacts that involve scientists within both USDA and other agencies such as the Department of Defense (DOD), the National Science Foundation (NSF), and the National Aeronautics and Space Agency (NASA). Improved data capture and sharing tools across agencies could better reveal and leverage cross-agency complementarities in food and agriculture related R&D.

Facilitate greater international engagement in the agricultural sciences.

Addressing global hunger concerns via R&D enabled growth in agriculture around the world has clear US national security and humanitarian rationales. Furthermore, a comparison of public agricultural R&D in the United States and the rest of the world shows that the geography of innovation is shifting offshore, increasing opportunities for scientific and technological spill-ins to the United States. Finally, as the stem rust example above makes clear, the crop and animal disease problems (as well as food safety issues) originating elsewhere can directly and dramatically impact US producers and consumers.

Among the host of policy changes that would likely improve outcomes of US international engagement in food and agricultural R&D, two largely budget-neutral options, one involving USAID and the other the USDA, stand out. Over the past several years, there has been a dramatic shift in the orientation of USAID support to CGIAR research. In 2011, around 64 percent of that support was directed to longer-run R&D activities with especially large social and economic payoffs, and the residual went to a host of (often shorter-term)

economic development activities. Over the subsequent years, CGIAR funding by way of USAID country missions rose much faster than funding from more centralized USAID agencies such as the Bureau for Food Security. As a consequence, by 2015, the R&D-oriented share of funding to the CGIAR (from both mission and more centralized sources) had dropped to around 42 percent of the USAID total, thus significantly shifting the balance of USAID support away from the central “research-for-development” raison d’être of the CGIAR. USAID should refocus its CGIAR funding on long-term R&D activities and resist the temptation to seek shorter-term payoffs.

Lowering bureaucratic barriers for USDA (and SAES) engagement in international R&D would further leverage USDA research expertise. Section 1402 of the National Agricultural Research, Extension, and Teaching Policy Act of 1977 is still the prevailing legislation for agricultural outreach efforts. That legislation makes repeated reference to “United States Agriculture.” Within USDA agencies this wording has the practical consequence of making it difficult for bench scientists to deploy federal government funds in direct support of research done outside (or targeting problems outside) the United States, even if those issues have the potential to affect US producers and consumers. Adding a clause to the law that acknowledges that some US agricultural research must be dealt with at the international level would facilitate more effective deployment of scarce USDA resources.

Manage modes of allocating public agricultural R&D resources.

The President’s budget (OMB 2016, p. 305) has proposed an increase in federal funding to agricultural research (from \$2.7 billion in 2016 to \$2.9 billion in 2017), which if supported by Congress is an initial yet incomplete step toward redressing the chronic underinvestment problem. How and to what areas these funds are allocated matters as much as the amount. In its score for the 2014 farm bill, the Congressional Budget Office indicated that 74 percent of the additional agricultural research (Title VII) mandatory funds for research

were earmarked for organic and specialty crops R&D. Such earmarks affect the dispersal of these funds to the extent that the perceptions of scientific opportunity by USDA and SAES researchers and the technical judgment of NIFA (National Institute of Food and Agricultural) R&D funding managers are curtailed relative to the influence of political operators. It also limits the opportunity for a fully effective operation of the scientific marketplace via NIFA’s flagship competitive grants program (Agriculture and Food

Research Institute), wherein scientific ideas are solicited, peer reviewed, and, for the lucky one in 10 proposals submitted, funded. One useful and potentially game-changing policy innovation in the 2014 Farm Bill was the creation of the Foundation for Food and Agriculture Research, to which Congress awarded \$200 million of startup funds, which can only be dispensed if a one-to-one match of non-federal funds can be obtained. This funding model, or variants thereof, should not only be maintained but expanded in the upcoming farm bill.

The lack of a well-informed and articulated strategic vision, combined with bureaucratic inefficiencies (including those arising from overly prescribed, idiosyncratic, and inconsistent calls for research funding applications), raises the transactions costs incurred by competitive funding processes and mutes the operation of the scientific marketplace. NIFA has suffered from both of these problems (NRC 2014), but has implemented steps to address these issues and streamline the whole process (NIFA 2015). NIFA's streamlining efforts should continue, along with the development of a strategic vision for US public sector spending on agricultural R&D.

While the upside of competitive funding processes is that they solicit new scientific ideas that have not been envisioned by farmers, politicians, or bureaucrats (Wright 1983), their downside is that they are costly due to the time and resources devoted to preparing and reviewing proposals. Striking the right balance between the associated costs and benefits involved in allocating R&D funds to individuals (via, for example, AFRI) versus institutions (primarily via the formula funds) is difficult. Through competitive grant programs conducted over the past several decades, federal government support to SAES research has shifted substantively from institutions to individuals. Not only has that shift inadvertently and deeply undercut the extent of matching support from state governments to SAES research—as the amount of formula

funding has shrunk relative to competitive funding from the USDA and others—it has also induced a shift away from (longer-term) programmatic research toward (shorter-term) project research. It still takes seven to 10 years of R&D to turn out a new wheat or corn variety, and the lags in deploying and, as necessary, adapting new agricultural technologies as they are adopted over diverse climatic zones are often decades long.

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effectiveness of US agricultural R&D spending. Some efforts in this area are underway, but more could and should be done to improve overall accountability and, in particular, the efficacy of the allocation of public agricultural R&D resources.

THE BOTTOM LINE

The reduced financial support for public agricultural R&D in the United States over the past several decades suggests a creeping policy and political complacency about the long-term implications of this trend. The overall pace of US agricultural productivity growth has been slowing in parallel with the decline in public agricultural R&D spending, while the pressures to address evolving agricultural pest and disease problems with increasingly constrained land and water assets are growing. Maintaining agricultural producer performance, sustainably, will not happen absent adequate funding and improved institutions to allocate and deploy the dollars dedicated to public food and agricultural research. Failing to reverse these R&D funding trends is an unacceptably risky scenario for the United States. ■

ENDNOTES

1. These formula funds are disbursed to the states under various allocation rules that are still in force. The 1935 Bankhead-Jones Act imposed a formula that tied SAES support to each state's share of the nation's rural population; a more complicated formula was used in the Research and Marketing Act of 1946, with part of the funds divided equally among states, part distributed on the basis of rural population, and a third part based on farm population. The 1955 Hatch Act amendment included a similar formula that replaced the original Hatch, Adams, and Purnell Acts; formula funding also found its way into the 1962 McIntire-Stennis Forestry Research Act and the Research Facilities Act of 1963. The periodic Farm Bills reauthorized federal support for the SAESs thereafter.

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ENHANCING UNITED STATES EFFORTS TO DEVELOP SUSTAINABLE AGRI-FOOD SYSTEMS IN AFRICA



by T.S. Jayne, Chance Kabaghe, and Isaac Minde

ENHANCING UNITED STATES EFFORTS TO DEVELOP SUSTAINABLE AGRI-FOOD SYSTEMS IN AFRICA

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SUMMARY

Africa is on the move. The incoming presidential administration and new 115th Congress will have before them an historic opportunity to extend America's global leadership by promoting the economic transformations underway in Africa. Even with rapid urbanization and the arrival of Walmart, Africa's development still greatly depends on the performance of its agri-food systems¹. Farming remains the primary source of employment for 65 percent of the region's population. Poverty rates are declining but remain unacceptably high. Putting more money in the hands of 500 million Africans who rely on farming for their livelihoods will decisively influence the pace of growth in the rest of the economy. Virtually no country in the world has ever transformed its economy from an agrarian economy to a modern one with low poverty rates without sustained agricultural productivity growth.

Why should US citizens care? Investing in Africa's economic growth is in the United States' national interest. US exports of agricultural products to sub-Saharan Africa totaled \$2.6 billion in 2013 and will grow rapidly if Africa continues to develop. By 2050, sub-Saharan Africa will contain 2.1 billion people—22 percent of the world's population compared to 12 percent today. Rapidly rising population and incomes in Africa will increase the demand for a safe, affordable, and sustainable global food supply. US farmers and agribusiness can help themselves by helping Africa to meet its rapidly growing food needs, by investing in the region's agri-food systems, and by supporting a sustainable and efficient global food system.

But agricultural growth rarely happens spontaneously or solely through private sector initiative, as crucial as private investment is. Private investment responds to incentives. A sustainable approach to developing mutual US-Africa interests will require greater support for the development of African public institutions to nurture the next generation of African educators, farm extension workers, research scientists, entrepreneurs and workers in agri-food systems, and policy makers.

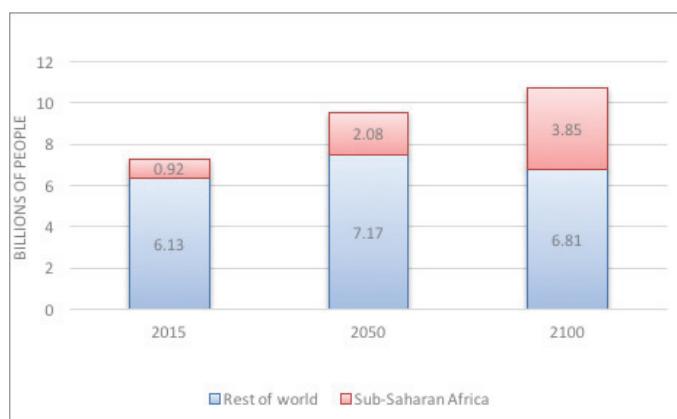
An effective United State (US) approach will also recognize how dramatically the African landscape has changed

in the past few decades with respect to partnerships. Development models premised on 1980s conditions no longer fit 2016 realities. US development-oriented institutions will continue to play a critical role, but their effectiveness will depend on understanding and adapting to how Africans view their role in today's world, in which there is considerably greater local expertise, awareness, and insistence that African organizations control their national development agendas, policies, and programs. These African professionals will collectively shape the enabling environment for local and international private investment in African agri-food systems and hence influence the pace of economic transformation in the region. This policy brief describes this changed landscape and the opportunities being created for developing innovative and effective new partnerships between US and African institutions engaged in African agri-food systems. It will outline a strategic framework to maintain US engagement in this effort, which centers on sustained commitment to capacity strengthening and leadership of African agricultural institutions.

THE CHANGING LANDSCAPE

What would an effective US development strategy toward African agriculture look like? It would be based on a recognition of how dramatically different the landscape is today in much of Africa from several decades ago and how this landscape continues to evolve rapidly. There are at least four major differences. First, the population of sub-Saharan Africa (SSA) is projected to double from 0.95 to 2.1 billion people between 2015 and 2050. SSA's share of the world's population will rise over this period from 12 percent to 22 percent (Figure 1). Rapid population growth is already putting greater pressure on local and global food systems to feed Africa's burgeoning cities, providing unprecedented opportunities for private investment in agri-food systems, especially under favorable agricultural marketing and trade policies (World Bank, 2013). Moreover, as food deficits in Africa continue to grow with its share of the world's population, Africa's agricultural performance will increasingly affect global food supply and demand conditions and hence the long-term trajectory of world food prices (Figure 2).

Figure 1. Population Projections for Sub-Saharan Africa and the Rest of World

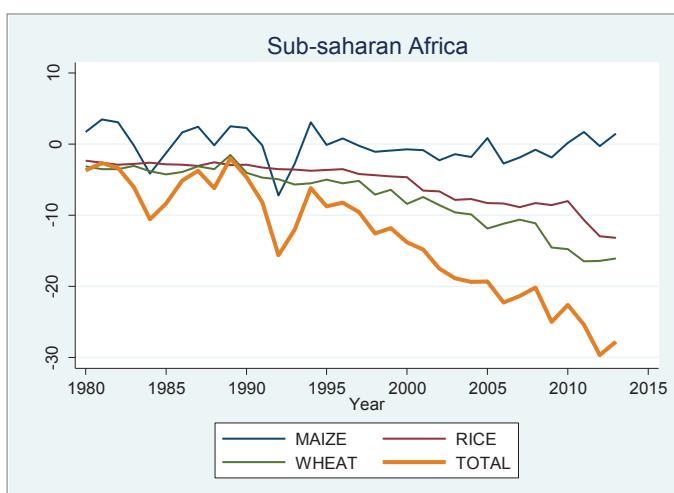


Source: United Nations (2016, mid-year projections, as of the 2014 Revision).

Notes: The estimated population for SSA was 12.3% of the world's population in 2015, and is projected to comprise 21.7% in 2050 and 36.0% in 2100.

Second, SSA is the only region of the world that is continuing to experience a rapid rise in the number of young people (Figure 3). SSA in 2015 has 18.3% of the world's developing region population below the age of 15. This fraction is projected to rise to 31.3% in 2050, and 42.6% in 2100 (Das Gupta 2016). 62 percent of Africans are below the age of 25. Africans between 15 and 35 now account for 55 percent of the region's labor force. Every year, roughly 11 million young Africans enter the labor force (Filmer and Fox, 2014), and they are considerably better educated than new entrants of previous generations. However, even the most optimistic projections suggest that only 25 percent of these young Africans will find

Figure 2. Net exports of cereals to sub-Saharan Africa, 1980-2013

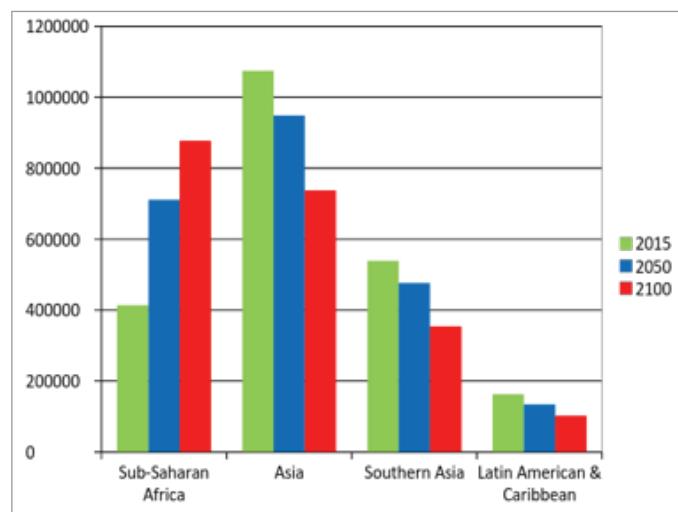


Source: FAOSTAT, accessed January 10, 2017. Negative numbers signify imports.

wage jobs over the next decade. The other 75 percent will depend on farming and informal sector jobs, many of the latter related to agriculture, for their livelihoods (Figure 4). Recent evidence confirms that faster rates of agricultural productivity growth in Africa are associated with rising employment opportunities and labor productivity in the non-farm segments of the economy (Christiaensen et al., 2011; Yeboah and Jayne, 2016 , see Figures 5 and 6). A vibrant agricultural sector will profoundly improve youth employment prospects and political stability.

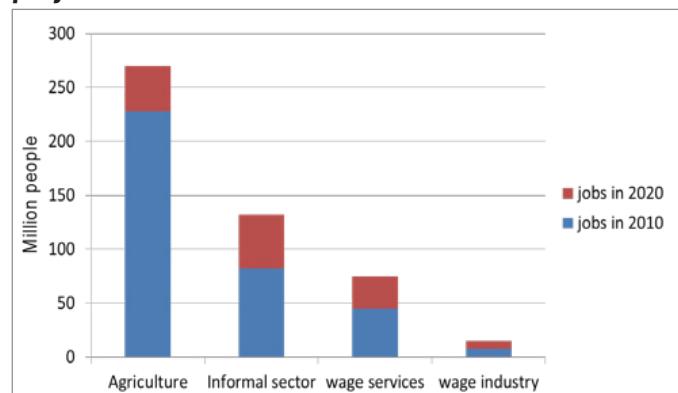
Third, many more Africans today possess professional white-collar job expertise related to agri-food systems, both in the public and private sectors, than 25 years ago. Many were educated internationally, possess valuable technical skills, and can operate effectively in their countries given superior knowledge of local culture and connections with centers of local power. Many are eloquent spokespersons and advocates for African agriculture and are capable of

Figure 3. Projected Population Aged Less Than 15 Years



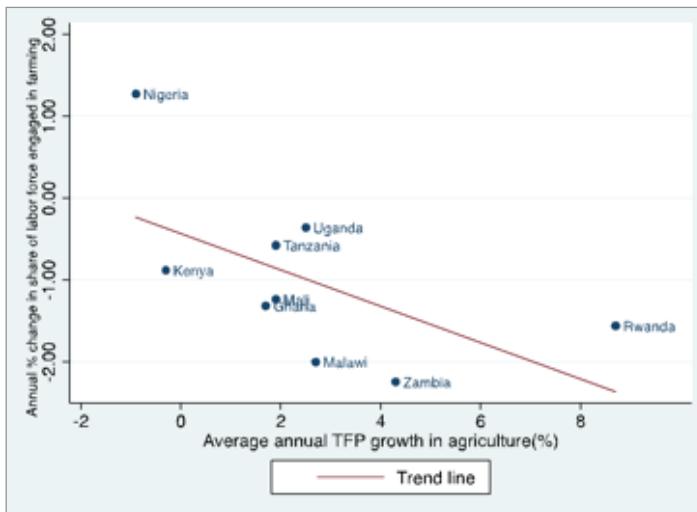
Source: United Nations 2016.

Figure 4. Number of jobs by sector in 2010, with projections for 2020 in sub-Saharan Africa



Source: Filmer and Fox, 2014.

Figure 5. Association between Total Factor Productivity Growth and Change in Share of Labor Force Engaged in Farming in Selected Countries



Source: Yeboah and Jayne 2016. Changes in the share of the labor force engaged in farming are derived primarily from Living Standards Monitoring Surveys (LSMS) described in Yeboah and Jayne (2016). Mean annual agricultural TFP growth rates are from United States Department of Agriculture Total Factor Productivity (USDA TFP) dataset (Fuglie 2015); the time periods for computation of TFP growth rates are lagged two years relative to the dates of the LSMS surveys.

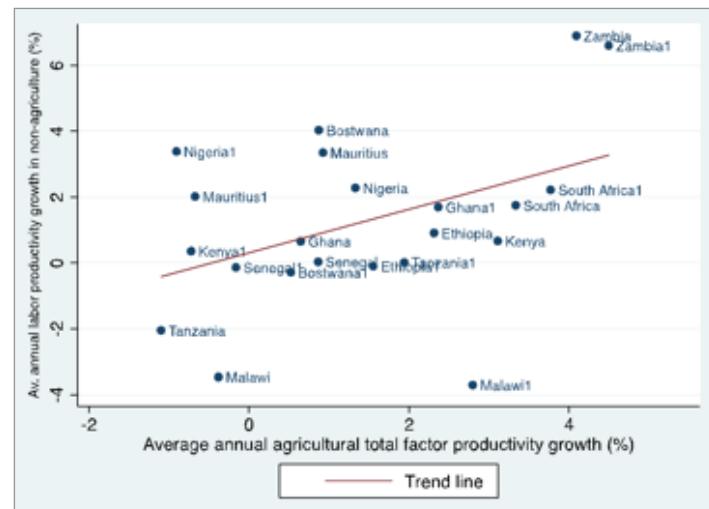
influencing African government investments. An effective US strategy toward African agricultural development will engage African professionals more than in the past.

However, conditions have not changed much in at least one important respect. Despite public agricultural institutions' role in providing public goods², many such institutions in Africa are no more effective in fulfilling their mandates than they were three decades ago—in some cases, less so. National agricultural research and extension systems remain chronically underfunded and, with a few notable exceptions, have had little impact, though there is strong evidence that public expenditures to agricultural research and extension services are effective in promoting agricultural productivity growth and poverty reduction (Economist Intelligence Unit, 2008; Fan et al., 2009). Governments in Asia and Latin America provide much more funding to their agricultural research and extension systems, and these countries are, not surprisingly, reaping major rewards from these investments.

THE VISION

There are strong mutually shared aspirations in the United States and throughout Africa that could be realized through more effective support for African agriculture. US and African governments share core interests in promoting private investment in African food systems in partnership with local firms and in supporting fair agricultural trade and a sustainable global food system. It is increasingly recognized that African agricultural exports in the majority of cases do not compete with US farm interests and are in most instances highly complementary. Rising farm incomes in Africa promote growth multipliers that expand private investment and employment opportunities in African agri-food systems and more broadly in the rest of the economy. Rising incomes in Africa also promote US export interests (Meade et al., 2011; Trostle and Seeley, 2013). Moreover, sustainable agricultural development in Africa promotes political and economic stability in the region. These are the benefits that would emerge from strong partnerships between African governments, the private sector and millions of African farmers and entrepreneurs supported by enlightened US development assistance programs.

Figure 6. Association between Agricultural Total Factor Productivity Growth and Labor Productivity in the Non-agricultural Sector



Source: Yeboah and Jayne 2016. Agricultural total factor productivity growth rates derived from USDA TFP dataset (Fuglie 2015) and computed as mean annual rates over 2001-2005 and 2006-2011 periods; labor productivity growth rates (mean annual rates over 2001-2005 and 2006-2011 period) derived from Groningen Global Development Centre (<http://www.rug.nl/research/ggdc/>) employment data for corresponding periods. NB: two points are shown for each country; the latter period (2006-2011) for each country is denoted with "1" (e.g., Malawi1 represents Malawi 2006-2011). Spearman Correlation coefficient = 0.37, prob > |t| = 0.09.

THE CHALLENGE

How can US agricultural development assistance more effectively help Africa achieve its agricultural development vision? Representatives of agencies such as the United States Agency for International Development (USAID), Millennium Challenge Corporation (MCC), and United States Department of Agriculture (USDA) understand the importance of building the capacity of local institutions in developing countries, those that create and adapt new agricultural technologies (research and development), those that disseminate information about more profitable and sustainable management practices (agronomy, animal sciences, extension services, agribusiness, and economics), and those that provide trusted policy guidance to African leaders (policy institutes). For clarity, the range of local institutions discussed here include African universities, agricultural training colleges and vocational schools, national agricultural research and extension systems, and policy institutes and think tanks. These local institutions can play a critical role in achieving the vision, but they will need new forms of support.

Overcoming perceived threats to objectivity

African policy makers' utilization of policy analysis depends on their confidence in the objectivity of those providing the analysis. External technical assistance has had some successes, but its track record in influencing agricultural policies has been limited. In 2007, the World Bank concluded that technical assistance in support of agricultural policy reform—the vast majority of it undertaken by external analysts—has been among the least effective forms of development assistance in Africa.

Because Africa has a longstanding history of powerful external influence in its political and economic affairs, persisting even after formal colonial ties with European countries were severed, some African leaders understandably distrust outside technical assistance perceived to reflect interests not fully in tune with African priorities. It may be too early to establish that African leaders strongly value the recent creation of autonomous African-led agricultural policy institutes, but such institutes in a handful of countries have proven to be quite effective in influencing policy even within a short time frame. Lack of local African ownership and insufficient local voice in policy analysis may explain why some African governments have distanced themselves from policy prescriptions developed by otherwise well-meaning initiatives such as the Comprehensive African Agricultural Development Programme (CAADP).³

The value of US-funded technical analysis is weakened if the US is perceived to have vested interests in the analytical agenda or conclusions of technical analysis. Analysis intended to guide African government policies on topics such as trade barriers and the setting up of legal frameworks to guide policy toward adoption of genetically modified seeds (GMOs) are often viewed with scepticism. Some African policy makers privately question the objectives of the New Alliance for Food Security and Nutrition, launched in 2012 as a partnership between several African governments, donor country governments, and the private sector. Rightly or wrongly, civil society and the media sometimes portray the initiative as an attempt to expand international private firms' position in local markets and potentially weaken local autonomy over politically sensitive sectors of the economy.

Overcoming low spending on agricultural R&D by African governments

Of all types of agricultural expenditures, spending on research and development is among the most crucial to growth (Pardey et al., 2006), yet most African agricultural research systems are woefully underfunded. Their weaknesses constrain the pace of agricultural productivity growth in the region (Fuglie and Rada, 2013). Asian farmers benefit from the fact that their governments spend over eight times more annually on agricultural R&D on average than African governments.⁴ Not surprisingly, the pace of agricultural productivity growth in Asia has

eclipsed that of Africa over the last several decades. While advances in ICTs are making it increasingly feasible to provide information to farmers even in the most remote areas, the binding constraint is now an inability to provide farmers with proven "best practices" due to decades of neglect of agricultural research and development, not the inability to communicate with farmers in remote areas. International R&D cannot fully substitute for local R&D because agricultural technologies, especially seed varieties, must be locally adapted, tested, and refined to suit Africa's highly varied agro-ecological conditions. Building African R&D capacity requires sustained investments in people, facilities, lab equipment, budgets for field trials, and other recurrent costs. And because the benefits of most agricultural R&D investments accrue broadly and cannot be captured by firms investing in them, there is a strong role for sustained support for public R&D. Building the capacity of strong African public agricultural R&D and extension systems should be a priority area for US assistance.

Unfortunately, little progress has been made over the past several decades in building African universities and scientific crop and livestock institutes to develop improved technologies appropriate for the wide range of African farming conditions, as the USDA and Land Grant systems did for farmers in the US. Similarly, little progress has been made to rehabilitate weak national agricultural extension systems. US development assistance has typically addressed these weaknesses by providing grants to organizations in the Consultative Group on International Agricultural Research (CGIAR) system, private development-oriented companies, and international universities. The US makes such grants with the intention of developing alternative modes of technology transfer and extension; it projects the view that African public sector organizations are too dysfunctional to generate positive outcomes from direct grants within the short timeframes that grantees are typically given. As a result, R&D projects are often structured to bypass or work around public sector organizations. The setting up of parallel channels to meet 3- to 5-year grant objectives is understandable in some respects, but it leads to a vicious circle in which African public sector agencies are perceived as too weak to contribute productively to grant activities and outcomes, justifying future grants that bypass them again.

Therefore, a key challenge for US development assistance is to find cost-effective ways of building the capacity of local institutions—those providing R&D, extension, education, policy analysis, and dissemination—to support agricultural productivity growth and broader economic transformation in the region. To do so, it is necessary to identify the parts of US assistance that are working well, those that aren't, and what to do about it.

HOW TO STRENGTHEN THE US APPROACH

Sub-Saharan Africa contains some of the fastest growing economies in the world, though performance has been quite variable across the region. Countries investing in their agricultural sectors have obtained more rapid rates of agricultural productivity, greater poverty reduction and more rapid pace of exit of the work force out of farming (Badiane et al., 2016; Yeboah and Jayne, 2016). Economic growth and rapid population growth have combined to push Africa's food imports to record levels in recent years, \$43.6 billion in 2011. That same year, the value of US

agricultural exports to SSA reached a record \$2.9 billion (USDA, 2013). Food imports to SSA are projected to continue to rise rapidly. While the evidence is based on a limited number of countries, studies generally find that agricultural productivity growth in developing countries

tends to raise national incomes and increase the demand for commodities from world markets (e.g., Rada and Regmi, 2010). For these reasons, there are strong mutual US-African business interests in promoting the productivity of African farmers and the broader agri-food systems on which they depend.

The United States has one of the most dynamic and productive agricultural systems in the world. Historians and

economists point to the land-grant university system, the US Cooperative Extension Service, the USDA and its Economic Research Service (ERS), and other public agricultural institutions as major drivers of US agricultural growth (Bonnen, 1989). The United States is capable of providing needed leadership and expertise to support institutional capacity building in Africa. We propose that the main thrust of a new approach be to shift the role of US public institutions from providing the technologies, services, and answers themselves to helping African organizations to do so.

There remain many crucial roles for US institutions to work closely with African organizations, in discovery, foresighting, and frontier research in areas where expensive infrastructure and facilities and/or specialized human capital developed over many decades gives a comparative advantage for some international organizations in some tasks. But the proposed new thrust would build collaboration and capacity building between international and public African organizations more explicitly and effectively by directly involving African organizations early in the design phases of US development frameworks and strategies, programs and projects.

A new model of technical assistance

US assistance should emphasize long-term capacity building support to African universities and national research and extension systems themselves. While it will take decades-long support and innovative program design to meaningfully strengthen R&D and extension systems in African countries, their weaknesses continue to put the region's agricultural sectors further and further behind the rest of the world.

How to develop mutually beneficial partnerships between US development partners and local agricultural organizations

Many capacity building grants to non-governmental organizations (NGOs) and US universities are subject to problems resulting from incomplete alignment of the grantee organization's objectives and the grantor's.⁵ Project support may be designed to build sustainable institutional capacity, but grant recipients may have many additional objectives. Grantees raise revenues through overhead rates on the grant and enhance preeminent capacity in particular thematic areas. Overhead charges may account for as much as 50 percent of the total value of US grants to some grantees, such as international universities, NGOs, and private for-profit companies. University faculty face strong incentives to publish in scholarly journals, which often encourage them to prioritize resources for their own research programs rather than build the capacities of host-country universities and institutes. As a result, capacity building assistance is often less effective than it could be. US development organizations must get more involved in grant management and find new ways to align the interests of grantor and grantee.

International universities play an important 'public goods' role in producing policy-relevant knowledge and new technologies that can be successfully adapted in developing countries and by discovering emerging trends that shape public discussions on important topics in African agriculture. Continuing this type of work is crucial but should be done in a way that brings along local African institutions in the process as equal partners. US assistance can be more effective in promoting long-term collaboration and mutual capacity building between international and African research organizations.

US capacity building programs must consider how to make long-term individual capacity building more cost-effective. The training of scientists with master's and doctoral degrees at major land-grant universities in the United States costs at least \$55,000 per year when relocation costs, living costs, and overheads are counted. The total cost is four times that of producing MSc graduates through the AERC Collaborative Masters in Agricultural Economics and Extension sandwich program at the University of Pretoria, which may serve as a model for experimentation and replication in other fields. This program allows graduate students from developing countries to get classroom training at the University of Pretoria, but conduct field research for their theses in their home countries under

the joint supervision of local and international professors. Where regional demand is sufficient, US universities may also consider providing affordable graduate-level training at overseas campuses in collaboration with one or more African universities.

Stop bypassing local African policy institutes and universities

Few African-led policy institutes or universities have been centerpieces of long-term US capacity building support. Despite some notable successes in recent years whereby US development assistance has built the capacity of local policy research institutes, progress has generally been very limited. The perception that these institutions are weak has effectively sidelined them in policy-oriented grant-making processes. Instead, significant grants intended to assist in developing agricultural policy, monitoring and data generation capacity have been allocated to international organizations that provide important services to local organizations, such as ministries of agriculture, but that devote a small fraction of their budgets to helping African organizations deliver such services themselves.

Current forms of capacity building support to African research institutes may do little to build those entities' long-term development. Prime recipients of US grant funds often attempt to build the capacity of African research institutes by contracting with individuals within them. At any given time, the majority of researchers in a particular institute or university department may be funded through individual consulting contracts on a disparate range of issues as determined by the prime recipients of bilateral and multilateral donors as well as the major

US assistance can be more effective in promoting longterm collaboration and mutual capacity building between international and African research organizations.

international development foundations. This current mode of involvement of African institutes in agricultural policy work may retard their ability to develop their own coherent policy analysis programs and may do little to build long-term capacity of the institutes themselves (Omamo, 2003).

As a response to the global food crisis in 2007–9, the 111th US Congress introduced legislation that would have created a US Global Food Security Program that included the establishment of a Higher Education Collaboration for Technology, Agriculture, Research, and Extension (HECTARE) Program designed to develop and sustain the education, research, and institutional support for a developing country's agricultural science and education sector. The bill was not enacted into law.

Global leaders committed themselves to addressing global

food security v at a [G-8 Summit in L'Aquila Italy in 2009](#). The United States responded by establishing the [Feed the Future](#) program. While comprehensive in a number of areas such as support for women and smallholder farmers, market development, and access to seeds, a strong higher education and human and institutional capacity program is absent. A single HECTARE-type program has been established, and that one, [Innovative Agricultural Research Initiative \(iAGRI\)](#) is funded at the USAID Mission level in Tanzania. Ohio State leads a consortium of six US universities—Michigan State, Virginia Tech, University of Florida, Tuskegee, Iowa State—working to build both human and institutional capacity at Tanzania's Sokoine University. The iAGRI program has been very successful in helping the Tanzanian agricultural sector, and represents an example worth emulating.

Until universities in developing countries are strengthened, they will not be able to partner with American researchers tackling food security issues. With open borders and the ease of travel, plant and animal disease spread quickly around the world. Researchers and scientists must be able to work together to counter these threats.

PROPOSED CHANGES

It is time to consider a new way of doing business at US congressional and executive levels and with non-government actors. First, policy makers must understand the long-term nature of institution strengthening. Focusing on demonstrating achievements over short time horizons encourages partners' programs to obtain quick, unsustainable wins rather than tackle the fundamental problems of weak public sector agricultural institutions. Within their own borders, countries around the world have discovered the importance of public education, agricultural research, farm extension, and data generation and analysis units in contributing to agricultural growth and economic transformation (Bonnen 1998; Eicher and Haggblade, 2013; Fan et al., 2009; Economist Intelligence Unit, 2008).

The task of transforming African agriculture should shift to provide and expect leadership from African experts and organizations, even as both international and local players remain involved. It is not an either/or issue but one of achieving the appropriate balance, with cooperative partnerships at the foundation (Omamo, 2003). Effective US assistance will also recognize that collective action is

required to address many types of challenges, such as climate change, sustainable agricultural intensification, and promoting free and fair trade. Currently, development assistance tends to side-step many collective action problems by creating parallel organizations and systems that can be sustained only as long as donor projects remain funded.

The stakes are high. If the countries of Africa can upgrade their agricultural institutions, they will not only raise living standards and expand employment opportunities but also address social problems borne of youth underemployment and poverty. Leaders need look no further than Syria and other Middle Eastern countries to see how a large population of unemployed and disaffected youth can coalesce into militant groups, potentially leading to widespread violence, mass migration, the creation of fragile states, massive humanitarian expenditures, and US military interventions. Such situations might have been moderated or avoided with earlier well-conceived development support. Many African countries currently enjoy rapid economic growth, but its sustainability is not assured, and many others lag far behind.

Congressional Action

The US Congress may consider an approach that more effectively encourages relevant US agencies to recognize the long-term nature of capacity building work in key agricultural institutions in developing countries, and give them the authority to provide appropriate funding and oversight framework for such efforts.

- Capitalize on USDA's extensive knowledge and technical expertise to enhance understanding in developing nations on regional technical regulations, trade facilitation, and overcoming barriers to market.
- Foster knowledge transfer and capacity training for post-farm gate processing, production, and transport.
- Expand the Innovative Agricultural Research Initiative (iAGRI) program model to a multi-country pilot to scale up teaching, research, and extension programs that address organizational development challenges by providing management training and matching local organizations with sister organizations in the US.
- Update the Bayh-Dole Act to provide incentives to academic institutions that develop patentable innovations out of federally funded research to license technology to entities or individuals in developing

countries for lower fees, and potentially with a longer patent protection period if a certain share of licensing goes to developing countries. The African Agricultural Technology Foundation may be used as a model.

- Amend the Bayh-Dole Act to cover patent rights for innovations developed through joint federal/non-federal research projects, such as will be promulgated under FFAR.
- Create mechanisms to help land-grant faculty members with agricultural experiment station appointments through funding from the Hatch Act to identify and recruit scientists from universities in developing countries to work jointly on research projects.
- The Farmer-to-Farmer program, established in the 1985 Farm Bill, enables American farmers, extension specialists, and others in the US agricultural community to provide short-term, on-the-ground technical assistance to counterparts in developing countries. Congress could give USAID the flexibility to offer extension personnel and other agricultural specialists longer term assignments to work with counterpart institutions in Africa. This approach might allow USDA to apply its domestic extension experience internationally to strengthen counterpart African public sector extension systems.
- Under the current Peace Corps program, create a one-to two-year agricultural specialization program for US students and faculty in partnership with 4-H or Future Farmers of America (FFA) that focuses on strengthening the capacity of African agricultural extension systems. 4-H already operates in 50 countries around the world; the basic structure is already present in many places.
- As some development agencies such as the Gates Foundation do, mandate lower overheads on grants to international development partners.

With the Global Food Security Act enacted, USAID now has more explicit authority to operate international agricultural development and research programs. Within that framework, USAID can more closely monitor how activities aimed at fostering agricultural institutions are funded and managed, with particular attention to the following:

1. Move to longer-term institutional capacity support, based on the recognition that time frames for progress on institutional capacity building may realistically require sustained commitments of a decade or more. Periodic reviews can be conducted to assess whether sufficient progress is being made to warrant continuation.

2. For grants where the lead grantee is an international partner, consider putting greater oversight and direction on the activities of US partners—universities, NGOs, and private development firms—so that their activities directly target capacity building objectives within the grant. In many cases, this will require more intensive official review of grant budgets to ensure that sufficient grant funds are flowing to recipient organizations and that the effort expended by US university staff is devoted to directly supporting particular objectives of the grant.

3. Where appropriate, require that substantial shares of total project funds be subcontracted to local African partners (perhaps with a minimum threshold) with oversight of how such funds are allocated.
4. Where appropriate, engage in direct long-term contracts with African universities and institutes, with international partners as sub-recipients with clearly specified roles and budgets in service to the long-term building of local institutional capacities.
5. Recognize that institution building involves much more than research capability. Local African organizations can benefit from capacity building in many respects, including (i) the preparation of well-designed proposals capable of achieving important objectives in a realistic manner; (ii) the ability to spend on funds granted over specified time periods, including the administrative capacity to issue sub-agreements and payouts to sub-partners; (iii) delivering on the terms of reference in a timely manner and at a satisfactory level of proficiency; and (iv) the ability to prepare and pass financial audits. US development partners can build the capacity of African organizations to satisfy these criteria, and progress is indeed being made.
6. Consider greater use of performance contracts with specific capacity building deliverables based on project proposals and work plans prepared jointly by African and international partners, and endorsed by high-level management within all parties.
7. Encourage grant recipients to set up advisory boards comprised of representatives from a range of African stakeholder organizations in the recipient country's agricultural sector to periodically advise and guide the activities of US grantees.
8. Encourage international lead grantees to involve African partners through institutional contracts rather than through individual consultancies.
9. Support African universities' efforts to undertake land-grant university activities that have been, and in some cases continue to be, very effective for rural communities in the United States. US agricultural

- development assistance may encourage partnerships with local and international land-grant universities, engaging with local and international NGOs to co-create effective ways of serving the interests of local communities.
10. Regarding US assistance to the CAADP process and other US initiatives designed to provide policy guidance to African governments, support long-term partnerships between African universities and policy institutes and US development partners to simultaneously build capacity and support African policy institutes' efforts to liaise directly with African governments.
- education and training systems are currently producing. Developing the skills and jobs to move the continent towards a productive twenty-first century agriculture will require transforming the content and approach of African agricultural education, research, extension, and policy analysis institutions. And, now that ICTs are increasingly able to overcome problems of remoteness, the transformative power of ICTs is increasingly dependent on our ability to generate appropriate information for dissemination through ICTs. This means a serious commitment to overcome decades of neglect in supporting localized, context-specific adaptive public agricultural research and extension programs.

CONCLUSIONS

Agricultural productivity growth is at the heart of Africa's economic transformation, and investing in Africa's economic growth is in the United States' national interest. Over the past 15 years, African governments that have effectively promoted farm productivity growth have enjoyed faster rates of poverty reduction, higher rates of labor productivity in the non-farm segments of the economy, and a more rapid exit of the labor force out of farming. Because the economies of most African countries still depend largely on the performance of agriculture, public investments in agricultural productivity growth will be an important component of an effective youth employment strategy. Young people between 15 and 34 years of age account for roughly 60 percent of Africa's labor force. Often considered more of a burden than a benefit, Africa's youthful workforce could open up a wide range of economic opportunities in farming, in the downstream stages of agri-food systems and in the broader non-farm economy, with the right mix of policies and public investments toward agriculture.

African agri-food systems of the future will require upgraded and profoundly expanded skill sets relative to what local

The time has arrived for the United States to invest directly in long-term capacity building of African universities, agricultural training colleges, vocational schools, national crop science research organizations, extension systems, and policy analysis institutes. International private companies, universities, and NGOs have important but increasingly redefined roles that put African institutions in the lead. African governments should show greater financial commitment to building the capacity of public agricultural organizations, and innovative cost-sharing arrangements among foundations, international development agencies, and African governments might provide scope for leveraging greater mutual commitment to the development of African agri-food systems.

The United States can help the stronger African universities and research institutes to carry out many of the land-grant activities that US universities undertake at home, providing know-how and extension support to farmers and local agribusiness firms, and training the next generation of young Africans to contribute to their nations' development. Once enacted, the proposals made here will take time to generate their full impact. This is why there is no time to waste in getting started. ■

END NOTES

1. We use the term “agri-food system” rather than “agricultural sector” to emphasize the importance of agricultural input and commodity trade, agro-processing, retailing, preparation of foods away from home, as well as farming, in providing employment and generating economic growth and transformation in countries in their early stages of development (Johnston and Mellor, 1961; Allen et al., 2016).
2. Public goods include those that would be under-provisioned if left to the market; a partial list relevant here would include investments in generating new technologies in areas where they could not necessarily be paid for by the users themselves; technologies such as open pollinating varieties in which private companies might not recoup the costs of generating them; investments in educational systems, policy analysis and policy institutes, and agricultural extension systems, which may produce high returns to society but not to any particular firm investing in them.
3. African governments have for the most part sought to exclude policy issues from the CAADP process, instead focusing on the level and composition of public expenditures to the agricultural sector.
4. Twenty-eight Asian governments spent 7.52 billion USD in support of public agricultural R&D in 2000 compared to 1.46 billion USD by the 44 sub-Saharan African governments for which data was available (Parday et al., 2006), an eight-fold difference per country between Asia and Africa.
5. These problems, also referred to as “principal-agent problems,” tend to make it costly for grantors to adequately oversee the activities of the grantee.

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LEVERAGING US TECHNICAL ASSISTANCE FOR IMPROVED DEVELOPMENT OUTCOMES



by Ammad Bahalim and Joe Glauber

LEVERAGING US TECHNICAL ASSISTANCE FOR IMPROVED DEVELOPMENT OUTCOMES

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SUMMARY

This paper describes the obstacles that farmers in developing countries face in accessing international markets for their products, and how greater US investment in providing trade technical assistance to those countries can help instill confidence by potential participants in the international trading system. It notes that for developing country exporters of agricultural products, it is lack of capacity to deal with sanitary and phytosanitary (SPS) standards, not hefty import tariffs, which presents the greatest problem in accessing markets in the United States and other developed countries. The paper recommends an increased US focus on providing experienced personnel and the appropriate equipment to address SPS issues in developing countries and improved coordination between USG agencies involved in these activities. Improved coordination with other donor countries on SPS matters is also encouraged.

INTRODUCTION

The poorest and hungriest people in the world are often farmers. Countries that have substantially reduced poverty and hunger have included agricultural trade in development strategies, but with the WTO's Doha Round of talks stalled and regional agreements being pursued by many nations, multi-lateral negotiators have settled for less ambitious outcomes, such as the Trade Facilitation Agreement rather than insist on the significant reductions in farm tariffs and domestic support that were outlined in the Round's original agenda¹. So far, the Round has failed to deliver on the promise of agricultural trade policy reform.

In the absence of a global deal, an incoming US administration could leverage the nation's technical expertise to help poor farmers in developing countries gain access to world markets. In the last few years, key bills on trade capacity building and global food security have passed, and the US government made commitments to help developing countries under the Trade Facilitation Agreement. With a new Administration and a new farm bill expected in 2018, the time is ripe for an ambitious US vision.

THE VISION

- Help poor farmers export goods to foreign markets through improved technical assistance to meet sanitary and phytosanitary (SPS) standards. The bottleneck that higher value exports from developing countries face, such as fruits, vegetables, and processed agricultural products often results from inability to meet such standards. Greater ability to comply with standards will boost trade flows and incentivize investment in agricultural value chains.
- Build confidence in the trading system. Among rich countries, the United States has one of the lowest agricultural tariff profiles, but developing country exports often have trouble at borders in meeting SPS requirements, a situation some consider to be disguised protectionism. Lowering these barriers, in collaboration with other developed countries, will build confidence among countries reluctant to negotiate a more ambitious multilateral trade agenda.

Trade liberalization focused only on reduction in tariffs is insufficient to boost trade, as a range of non-tariff measures do not allow developing countries to fully benefit from a functioning open market.² The United States can shape the future trade agenda as "Aid for Trade" and unilateral preference schemes did in the late 1990s and early 2000s—targeted, technical, and bilateral solutions in the absence of global consensus.³

THE CHALLENGE

How do the poorest of developing country farmers realize the potential of trade? Smallholder producers, especially in Africa, rarely have access to rich markets. They face many problems, including:

- Not all agricultural products are exempt from tariffs under preference arrangements such as the African Growth and Opportunity Act (AGOA).

- Farmers are often unaware of export potential or requirements.
- Farmers lack the mechanisms to aggregate their production.
- Farmers do not have access to appropriate domestic infrastructure in terms of human and institutional capacity and even laboratory equipment to test for product quality.

Furthermore, smallholders face a host of problems, including low productivity and limited access to finance, which keep many of them poor. Some US development programs and initiatives address the issue, among them Trade Africa and Feed the Future led by the US Agency for International Development (USAID), the Food for Progress program run by USDA's Foreign Agricultural Service (FAS), and related activities in as many as 19 other agencies. In the 2015 reauthorization of the AGOA, Congress required the executive branch to coordinate, report, and expand how it provides technical assistance to farmers to improve use of the preferences program. Targets underlying the new UN Sustainable Development Goals commit member countries to providing technical aid to poor farmers.

In a typical year, less than one percent of US agricultural imports come from sub-Saharan Africa.

WHAT'S WORKING

Government agencies and regulations have kept the American food supply safe and pest-free while allowing access to food from around the world, notably tropical produce. The United States is one of the world's largest agricultural importers and exporters, and its single most important aid provider. Agricultural goods of tremendous volume and value are subject to inspection at American ports. USDA's Animal and Plant Health Inspection Service (APHIS), FAS, and the Food and Drug Administration (FDA) deliver safe, reliable agricultural and food products. The technical expertise of these US personnel sets an international standard.

New legislation is also helping. The Food Safety Modernization Act (FSMA), signed into law in 2011, is the greatest overhaul of food safety rules since 1938. It expands the FDA's mandate to build domestic capacity to prevent spread of food borne illness and streamlines the import process. USAID and others have improved access to the American market. The Trade Africa initiative, launched in 2013, has helped total East African Community exports to the United States climb 24 percent between 2013 and 2014. These elements could be combined to generate returns greater than the sum of their parts.

PROPOSED CHANGES FOR CONSIDERATION

As the world's largest economy, the United States must do more to help developing countries' agricultural goods cross borders. In a typical year, less than one percent of US agricultural imports come from sub-Saharan Africa.

Standards compliance is the single greatest barrier to the US market for poorer farmers.⁴ At APHIS, just one of the agencies responsible, procedural delays can be significant, especially if the product is politically sensitive due to domestic producer concerns or if the foreign government is slow to respond to US requests for additional information. Ten years passed before Mexico's Hass avocados were allowed into the United States year-round. The average length for the approval process is three years.⁵ Only well-resourced producers can bear the risks associated with the slow approval process.

Expediting the process is only part of a complex series of barriers—at both ends of the supply chain. Aid alone is not the entire solution.⁶ We recommend these actions:

1. Prioritize technical assistance: Give potential exporters access to expertise, equipment, and funds in order to comply with SPS requirements.

- a. Request funding from Congress for additional FDA, APHIS, and USAID technical assistance staff. The 2015 AGOA re-authorization calls for 10 additional staff to work on technical assistance, and the FSMA regulations will substantially increase the SPS burden by adding consideration of food safety on top of and pest and disease risks to the regulatory infrastructure. Provisioning this public good for American consumers will require additional staff in-country and at headquarters. Some have called for establishing an FDA office in Africa in addition to those currently operating in China, India, and Latin America.
- b. In order to streamline bureaucracy, implement evidence-based best practices, such as an Export Helpdesk, or a "one-stop-shop" for tariffs, SPS, and other requirements to enter the United States.⁷ A single, well-publicized entity will help exporters understand US market regulations; currently, they must navigate the approval process for both pest control and food safety across several agencies.
- c. Create formal mechanisms of collaboration—through memorandums of understanding and other means—with potential exporting countries and regional blocs to improve staff capacity.

- 2. Improve coordination within the US government:** Align goals and collaborate on implementation of capacity-building programs in developing countries. The US is the world's largest provider of trade-related assistance valued at \$2.3 billion in 2014 alone. Given that any trade facilitation with developing countries will likely be in agriculture, a common goal for US agencies should be the support of value addition and processing in agriculture. They can do this through the following actions:

- a. Revitalize the Office of Trade Capacity Building at the Office of the United States Trade Representative (USTR) to coordinate government-wide implementation of technical assistance and trade capacity building programs. At least 21 government agencies have agricultural trade and development interests with current and potential US export partners. Experts have long recommended coordinating the actions of government agencies.⁸ Multiple and conflicting requests from within the executive branch can lead to suboptimal development outcomes. The USTR has served this function under previous administrations, and participants in the interagency process appreciated its leadership.

- b. Take stock of the agriculture-related technical assistance provided through US trade capacity building programs. A review of published agency budgets and aid statistics suggests that over the last decade between \$200 million and \$1 billion per year have been provided for technical assistance, some of it on agriculture. The range of estimates results primarily from different definitions of technical assistance applied by the various agencies in their reporting. An external assessment should be performed to understand how programs interact and how they could be improved to align executive priorities with a trade capacity building bill currently in discussion in Congress. Recommendations could include broadening the funding and mandate of USDA to explicitly provide technical assistance, and for USTR to coordinate various agencies.

- c. Develop a government-wide strategy to support developing US implementation of the WTO's Trade Facilitation Agreement. This agreement will reduce administrative complexity at borders, but some developing countries are skeptical. Demonstrating

its benefits and explaining how countries receive assistance under its implementation may allay concerns. High-value tropical exports, such as fruits, vegetables, and flowers are highly perishable. A reduction in red tape will support both expanded South-South trade and trade with richer countries.

- 3. Coordinate with donors and beneficiary governments: Help beneficiary countries draft national technical assistance strategies and support donor alignment on common objectives.**

Donor and national efforts could be better aligned with continental and regional priorities to concentrate efforts targeting specific and shared objectives, especially around the Malabo Declaration on Accelerated Agricultural Growth and Transformation for Shared Prosperity and Improved Livelihoods, adopted by African heads of state in 2015, which called for tripling intra-African agricultural trade.⁹ A host of donors operate in this space but not all of them are coordinated or integrated. In-country and global collaboration would be helpful.

At least 21 government agencies have agricultural trade and development interests with current and potential US export partners. Experts have long recommended coordinating the actions of government agencies.

a. Create a pilot program to work with select countries on identifying products with export potential to the US and a reasonable SPS risk mitigation profile. Not all farm goods produced by small farmers are likely to be competitive in foreign markets nor will they regularly be SPS compliant. USAID and USDA could work with interested countries or regional blocs to identify the appropriate products with smallholder impact, note technical assistance needs, and pilot SPS compliance strategies.

- b. Align donors in-country and globally. Most technical assistance is provided as bilateral aid, and international mechanisms exist as a backstop. As a leading donor, the United States could use its representation at several bodies at the WTO, (the Committee on Trade and Development, the Standards and Trade Development Facility, the Enhanced Integrated Framework), to ensure that donors align globally on supporting developing country compliance with SPS measures. In-country implementation could be coordinated in locations where the pilot strategies are established, with donors' contributions appropriate to their strengths.

- c. Engage in an SPS dialogue with leading importers. The United States could work with other agricultural importers such as Japan or the EU to simplify standards compliance by coordinating

and streamlining procedures. Mega-regional trade agreements, such as the Trans-Atlantic Trade and Investment Partnership negotiations currently underway between the United States and European Union, should include recommendations for generating common standards that benefit the poorest developing countries.¹⁰

CONCLUSION

The United States can put market-led solutions within reach of small farmers by leveraging its technical expertise, and the nation has every reason to connect the poorest countries with global markets. Notably, most developing countries' relative comparative advantage is in producing tropical goods, not a strong suit of American agriculture.¹¹ Poorer economies are currently net importers of farm goods and likely to be increasingly dependent on global markets; encouraged to grow through export-led agriculture, they could become a destination for future US exports thanks to the effects of higher incomes. Finally, US regulators have an obligation to ensure compliance with domestic standards, an unequivocal public good and national security concern. ■

ENDNOTES

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REVITALIZING AGRICULTURAL RESEARCH AND DEVELOPMENT TO SUSTAIN US COMPETITIVENESS

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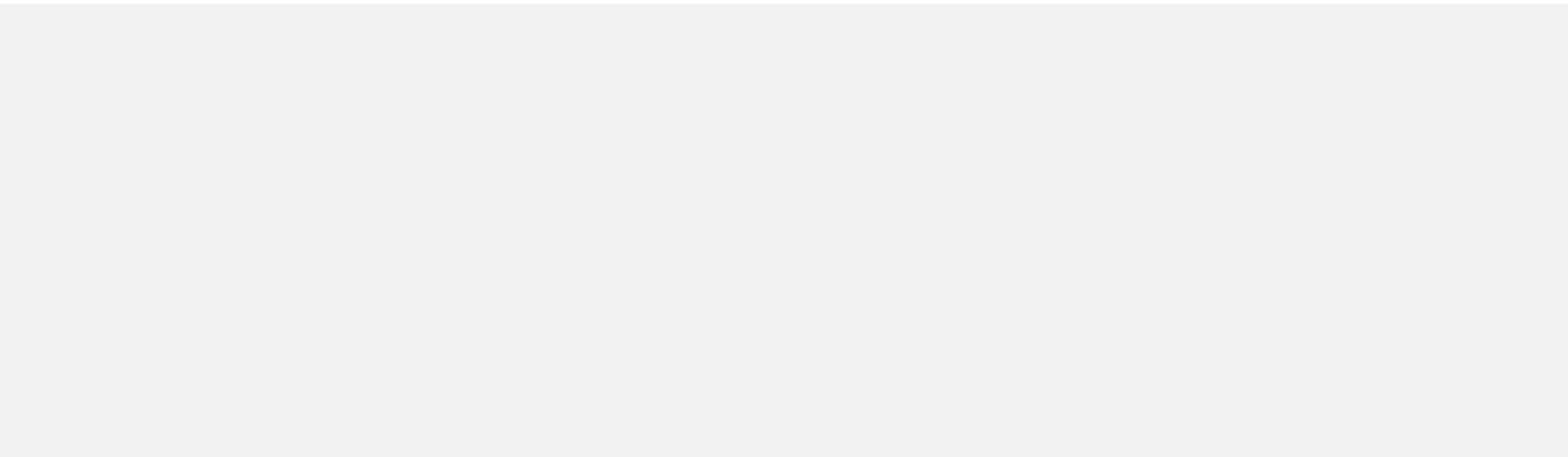
ENHANCING U.S. EFFORTS TO DEVELOP SUSTAINABLE AGRI-FOOD SYSTEMS IN AFRICA

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LEVERAGING US TECHNICAL ASSISTANCE FOR IMPROVED DEVELOPMENT OUTCOMES

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