

Essentials for Science-based Agricultural Development in Africa¹

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The United States Senate Committee on Foreign Relations
March 24, 2009

Introduction

Mr. Chairman and Members of the Committee, I would like to extend my appreciation for the opportunity to appear before you today to submit this testimony on this U.S. Senate hearing of “Alleviating Global Hunger: Challenges and Opportunities for U.S. Leadership”.

With your permission, Mr. Chairman, let me begin with a personal introduction of myself. I am Professor of Plant Genetics and Breeding at Purdue University, but my true credentials to speak on the topic of global hunger arise from the life I lived as a child and the work I have done in the world of international development.

I was born of illiterate parents with little means and raised in a small village with no schools in west-central Ethiopia. An only child, I was nurtured with lots of love, but on a diet less than adequate even for body maintenance, let alone for growth and intellectual development. All nutritional and developmental indicators might have suggested that I was destined not for my current physical stature or the modest professional success I’ve attained, but for failure and perhaps for disaster. And yet by the Grace of God, in what feels like a destiny nothing less than providential, I am invited to sit here today before this distinguished Committee, in this hallowed institution of this great nation, to provide this testimony as a notable scientist with some distinction and repute. This is a very long journey from that village in west-central Ethiopia that I am sorry to report has not changed much since the days of my childhood.

I was rescued by a godsend from the United States of America—the work of other visionary leaders who once sat in similar seats as members of this Committee and envisioned the building of institutions of higher learning in developing countries as a key foundation for global development. Upon completing my elementary education in a township 20 kilometers away from my village, I was selected to attend Jimma Agricultural & Technical School which was established by Oklahoma State University under the old Point Four Program. I then entered Alemaya College of Agriculture, another Oklahoma State University and Point Four establishment in Ethiopia. I graduated in 1973 with a degree in Plant Science, with Great Distinction and at the top of my class. After graduation, I was retained by Alemaya College to serve as a junior faculty member

¹ Testimony presented at the United States Senate Committee on Foreign Relations hearing of “Alleviating Global Hunger: Challenges and Opportunities for U.S. Leadership”.

and was recommended to seek graduate education overseas. A chance meeting in Ethiopia with my mentor, the late Prof. John Axtell, led to my recruitment to Purdue University in 1974, where I joined yet another US government funded project on nutritional quality improvement of sorghum, and completed a PhD program in 1978.

My professional career began exactly 30 years ago this month, when with a newly minted PhD from Purdue University, I joined the International Crop Research Institute for the Semi Arid Tropics (ICRISAT) in India. I was stationed in the Sudan, a country many consider one of the more difficult places in the world to live and work. It was an enjoyable and meaningful experience for me, however. In my five years there, I developed the first commercial sorghum hybrid in Africa and catalyzed the establishment of a private seed industry to support this breakthrough. Drought tolerant and high yielding, the sorghum hybrid Hageen-Dura 1, is now cultivated in Sudan on over one million acres annually. In 1986, Secretary of State George Schultz, in addressing a special meeting of the United Nations in 1986, identified this work as a significant development and cited it as a good illustration of the promise of science-based development in Africa.

For the last 30 years, including 25 years since I joined the faculty of Purdue University, I have conducted an international graduate education and research program in crop improvement at Purdue University funded primarily by the US Agency for International Development. I am, therefore, a product of the international development and technical assistance program. That experience has given me great motivation and inspiration for devoting my life to serving international agriculture. As an educator and scientist, I am now in turn advancing the well-being of poor people through science, especially those I know best, rural Africans.

The Relentless Problems of the Poor in Africa

Mr. Chairman, hunger continues to prevail across Africa and in many developing nations. Hundreds of millions of people are struggling to survive and build a better future for their families—a challenge that seems to get steeper and more difficult each decade. As you gathered from the presentations of the distinguished panel that just testified and the excellent documents prepared by the Chicago Council on Global Affairs, hunger and poverty have been relentless. Rural dwellers, who are the food producers, have been hurt more, but those who fled the rural hardships and became the urban poor have not fared any better.

Several constraints limit agricultural productivity and the use of better management of natural resources in much of the tropics. Growing pressure from increasing population and associated energy and water demands continue to worsen problems of resource limitations. As more recent food price crises have shown, these problems have global ramifications. The inherent biophysical limitations brought about by degraded natural resources are further aggravated by changing weather patterns. The variety of pests and diseases prevalent in the tropics are likely to be even more severe and troublesome with advancing climatic change.

The State of Agricultural Education and Research in Africa

Contrary to a widely held view, advances have been made in agricultural education and research in Africa². There have been a number of small success stories, though not well publicized. The United States government led early efforts in the development of many of the newly emerging poor nations in the 1950s when it extended a version of the European Marshall Plan program to the new independent nations. At the time of the flurry of independence of the African nations in the early 1960s, not many Africans had graduate degrees in agriculture and little functional agricultural education and research infrastructure existed. The United States government led early efforts in human capacity building with its Point Four program that set out a vision to lay the institutional foundation for agricultural development efforts in these nations. Our Land-Grant colleges and universities educated a large number of agricultural scientists from these developing countries. A cadre of U.S. citizens with interest in international engagement were also trained and dispatched for service through a variety of organizational arrangements. U.S. universities were mobilized in long-term institutional strengthening programs of the newly emerging developing-country centers of learning in many of these emerging nations. These efforts generated benefits for both the U.S. and the developing nations including those in Africa. The United States saw a growing number of scientists and professionals with knowledge and experience in international agricultural development. The agricultural research “culture” at many national research institutions improved as a result of the efforts of these U.S. scientists and their institutions. Continued assistance from the U.S. and other developed nations helped strengthen the research infrastructure in Africa through the 1980s until support for such long-term human and institutional capacity building declined significantly in the last 20 years.

Within Africa, increased communication and networking among African agricultural research services led to more collaboration and exchange of knowledge and germplasm—key ingredients in technology development and deployment.

Further funding from the U.S. and European governments, other international organizations, and private foundations led to the establishment of the Consultative Group for International Agricultural Research (CGIAR). Increased linkages were developed between these centers and the National Agricultural Research Services (NARS) in Africa, as well as U.S. and European universities. Perhaps most importantly, there emerged a growing recognition of agricultural research as a vehicle of change for national development as a result of these engagements and the resultant interactions among these organizations.

² Holmes, H. 2005. Spurts in Production -Africa’s Limping Green Revolution. In Djurfeldt, G., Holmen, H., Jirstrom, M., and Larson, R. (eds). *The African Food Crisis. Lessons from the Asian Green Revolution*. CA BI, UK and USA.

Unfortunately, the level of support for these long term multi-generational changes has declined over the last two decades, stalling the progress of our early efforts³. A drop in external funding and political neglect of agriculture by national policy makers in developing countries have resulted in an increasing decline in the human capital base. Reduced funding for agriculture and agricultural research has eroded the capability of U.S. institutions to educate and conduct research in vital areas, particularly in the applied sciences including plant and animal breeding, genetics, crop physiology, and plant pathology.

In my view, this general decline in the human capital base and the shrinking opportunities to replenish it through higher education is the most serious threat to the gains we have made in developing countries. Equally concerning is the erosion of U.S. talent in international development, particularly among the university faculty that are well-versed in the sciences, and the lack of opportunities to attract the new generation to careers in science-based development work internationally.

Other challenges to continued growth in agricultural education and research in Africa include:

- Inadequate internal (local) funding for agricultural research and education. In this “Catch 22” situation, research does not receive enough support to produce impact; and because it has not produced impact, national leaders are not persuaded to commit greater support.
- Because of lack of extensive research knowledge and experience, research at some institutions is not carefully targeted to technology development. It is often not easy for professionals who have not been able to benefit from mentoring with experienced researchers to develop a “big-picture” perspective that is essential to catalyze efforts that may sustain change.
- Often, education, research and extension efforts reside in different administrative agencies. Government and non-government organizations do not readily cooperate with each other—and in fact appear to be in competition with each other. In several situations, the desired synergy between internationally funded agricultural research centers and locally funded national research centers has not developed as hoped for, often resulting in unnecessary and undue competition.
- The lack of a firm national strategic framework and agenda. The over-reliance on external funding tends to create research goals and program missions that are reactionary rather than strategic.
- Increased funding for support of rural social services, such as emergency food aid, has also diverted attention from long-term institutional development efforts. Rural

³ Masters, W.A. 2008. Beyond the Food Crisis: Trade, Aid and Innovation in African Agriculture. African Technology Development Forum 5(1): 3-15.

social services save lives and are important, but they do not increase crop yields, lead to productivity gains, or raise earning capacity to reduce poverty. In 2003, for example, U.S. food aid to Ethiopia totaled \$475M, while \$354M was spent in total agriculture development worldwide⁴.

Africa's Dismal Record in Technology Transfer

While Africa has made some progress in agricultural education and research, its record in technology transfer has been dismal. African higher education and research infrastructures and institutions have begun to generate a fair degree of progress and momentum, but the technology transfer programs have not fared as well. As a result, products of research, including some that could generate significant impact, fail to reach the farmer and do not produce badly needed change in farm practices and family livelihoods. Reasons for this failure include:

- **Institutional Immaturity:** African institutions today are generally not as strong as Asian institutions were at the advent of the Asian Green Revolution in the 1960s. While progress has been made in some countries, we have a long way to go in the vast number of countries in Africa. Approaches to technology delivery processes have changed too rapidly over the years, although they have varied with funding agencies. Because of these frequent shifts in approach over the last several decades, many interventions have not generated noticeable impact. For example, the U.S. Land Grant approach to agricultural extension has been an effective approach to public-supported technology transfer when given a chance. Extension was part of the early institutional development programs in many countries. At the time, efforts to build closer linkages between agricultural research and extension was not as effective due to the weak human capacity and institutional development programs of African nations in those early days. The Land Grant approach of technology transfer via public extension services was replaced by others including the World Bank's Train & Visit, the Food and Agricultural Organization's (FAO) Farmer Field Schools, as well as a mix of approaches by non-governmental organizations (NGOs), with the latest approaches advocating private sector based agro-dealerships or other approaches that may have a public-private partnership slant to them. None has been sustained long enough to produce a culture of change in rural farm practices.
- **Ill-equipped agents of change.** There are not many African national programs that have been able to build a well-trained cadre of sufficient critical mass with the knowledge of the sciences and understanding of the agriculture of its communities. When well-trained experts from abroad are received, they often do not stay long enough to develop an understanding of both the local agricultural practices as well as the biophysical environments to be effective.

⁴ Eicher, C. 2003. Flashback: Fifty Years of Donor Aid to African Agriculture. Paper presented at the InWEnt, IFPRI, NEPAD, CTA Conference "Success in African Agriculture. 3 December 2003. Pretoria, SA.

- Infrastructure limitations: Almost everywhere in Africa, the infrastructure, facilities, and programs of technology transfer institutions are usually under-funded and underdeveloped compared to the institutions of higher education or research in the same countries. There is no reason to believe that this happens by design, but it is true almost everywhere.
- Unique biophysical problems. That Africa is a large and diverse continent is often not well understood or acknowledged. With nearly 800 million people, more than 1,000 ethnic groups, seven colonial histories, six geographic regions, and a mix of governance styles, a variety of research results and educational formats are needed to reach out to a variety of communities. In poor nations where resources are limited, this presents a formidable challenge.
- Lack of proper incentives for change. Farmers everywhere respond better to economic incentives and benefits, often immediate to their needs. In Africa, where private entrepreneurial plans are not well developed, productivity gains are limited to meeting household needs; they are unable to broadly translate to profitability and to generate a needed demand for new technologies from research.
- The rate of new technology adoption in a country is often directly related to local knowledge, experience, and social realities in the community. We can learn a great lesson from the experience of early adoption of hybrid crops in the United States. Despite the better education and awareness that existed in this country, compared to many of the developing nations of the world, it took over 25 years to move the acceptance of hybrid maize from 0% to 95%. But once the farm communities got used to the new technology, and the experience of hybrid maize was shared and the network of dealerships and private seed sector were well developed, it took only five years to reach a similar level of adoption of hybrid sorghum when that technology first appeared in 1956⁵.

Major Paradigm Shifts in African Agricultural R&D and their Impact

African agricultural research and community development programs have suffered frequent and disrupting changes in approaches and emphasis. There are several reasons for shifts in paradigms to take place in a development practice. Paradigms shift to make what are perceived to be needed adjustments in program approach, or they may be shifted to better position a program for continued research support. Regardless of the reason, paradigm shifts often bring with them loss of momentum, some disillusionment, and result in the never-ending blame game and one-upmanship that is so prevalent in the international development world. These shifts can also result in a perceived lack of local commitment to a project or program. There have been a number of such changes both in the agricultural research arena and in the community development efforts in the developing countries, particularly in Africa⁶.

⁵ Maunder, A. B. 1998. Why Hybrids? In: Axtell et. al. (eds) Proc. West African Hybrid Sorghum and Pearl Millet Workshop. 28 September-2 October, 1998. Niamey, Niger.

⁶ Ejeta, G. 2009. African Green Revolution Needn't be a Mirage. Seminar presented at the Bill and Melinda Gates Foundation. 10 March 2009, Seattle, WA.

Paradigm shifts in research and development have not been the only disruptions in African development. Added to this are changes brought about by structural adjustments that force contraction of government agencies (external influence), and the wave of socialist influence of nationalizing plantations and regional research centers, and replacing research and development enterprises with State farms and communal systems. In many of these cases, generally shifts in research approaches tend to be more jolting than those in community development programs because of the long term nature of agricultural research and the time needed to generate research results. The shifts over the years in paradigms and emphasis have contributed to growth in the “industry of science providers”—a long list of providers with a variety of skills and approaches. There is often no proper division of labor among groups and organizations, which results in unnecessary duplication of effort and competition. All of this, of course, has added to the growing cost of doing business.

The Emergence and Promise of the Bill & Melinda Gates Foundation

The Bill & Melinda Gates Foundation has recently emerged as a leader in helping fight hunger and poverty in sub-Saharan Africa and Southeast Asia. The Foundation is rapidly building its alliances to work with a variety of other institutions including national programs, international centers, and universities. Together with the Rockefeller Foundation, it is a major force behind the creation of the Alliance for a Green Revolution in Africa (AGRA)—a growing partnership working across the African continent to help millions of small-scale farmers and their families lift themselves out of poverty and hunger. BMGF has infused badly needed resources to some sectors, particularly to the International Agricultural Research Centers (IARCs).

It is my perception and that of many Africans that the Bill and Melinda Gates Foundation is viewed as the “Game Changer” or the “Difference Maker” primarily because their involvement comes at a time when total external investments in agricultural education, research, and development from governments of the developed world have fallen. Support of programs such as these has given an elevated sense of hope and vision of leadership to these efforts. However, it is already made clear that even with the great generosity of the Rockefeller, Gates, and Buffet families, more internal and external public resources need to be mobilized to generate the needed impact, for the need around the world is so large and the loss of momentum from early efforts needs greater investment to jump-start and re-energize.

The new agricultural development programs of BMGF are designed to promote capacity building, generate scientific results that offer solutions, disseminate research results aggressively, and catalyze the development and adoption of new agricultural technologies for greater impact in an integrated value-chain approach. Both the vision and the resources from the array of comprehensive BMGF programs have been received with great anticipation and promise.

Essentials for Science-based Agricultural Development in Africa

There is a need to regroup, take lessons from past efforts, and focus on those programs and approaches that generate the needed impact to offer immediate relief and build new momentum in catalyzing science-based development in an accelerated and renewed sense of purpose and energy. Based on my 30 years of development experience and my knowledge of rural life in Africa, I have come to believe that there are three key essentials needed to bring about sustainable change that could generate needed results for generating sustained impact in the agricultural development of developing nations. These three sets of essentials that must be well orchestrated and addressed in concert are 1) Technology; 2) Institutional and human capacity; and 3) Public policy.

1. **Science and Technology:** It is essential that science be affirmed as the primary vehicle of change for economic development. The successes of U.S. agriculture, the Asian Green Revolution, and the few nuggets of change in Africa are evidence that science-based development offers not only a way out of hunger and poverty, but also leads to prosperity. Life altering changes will continue to require scientific innovations that raise productivity and income. Recent advances made in the biological sciences offer exciting opportunities for addressing some of the most intractable agricultural problems prevalent in the tropics.
2. **Institutional & Human Capacity Building:** For appropriate science-based changes to be generated and delivered, institutional and human capacities must be strengthened. I am seriously concerned that the decline in global resource commitments for capacity building threatens to derail all the gains made to date. The acute need for strengthening institutions and building human capacity in developing countries can not be overemphasized. Investments in public institutions that build scientific capacity in research, education and technology transfer need greater reinforcement today more than ever. I may add that the weakest institutions in most developing countries are in the private sector. We must encourage private entrepreneurship and institutions that create incentives for commercialization, support markets, finances, risk management, and infrastructure that facilitates commerce. In building both public and private institutional capacity in developing countries, we must support and advance openness in sharing of experiences with the outside world so that newly trained individuals and their institutions receive the necessary mentoring and seasoning as well as develop a “can-do” spirit.
3. **Policy interventions:** Supportive policies are critical. Empowerment of local institutions and local groups is an indispensable ingredient to making sustainable change. Needed are bold local policies that encourage generation and adoption of new agricultural technologies and support new public and private incentives. Without the needed policy catalyst and sustained resource commitment that should follow, the likelihood of permanent positive change is very small.

The dream of attaining an African Green Revolution can be achieved⁷. The use of new and improved crop cultivars, new management practices, the education of farm communities to adopt new technologies that generate impact through increased productivity and profitability of incomes is within reach for developing nations. However, these things do not happen without great dedication and incentives, and enabling policy environments that are badly needed.

Dr. Norman Borlaug, universally acknowledged as the “father of Green Revolution” is a hero to me and very many others. I personally admire his single-minded devotion to science and agricultural development and his unending empathy and service for the poor. He has been a great example for scientific leadership and a life so well lived. As I reflect on his accomplishments and leadership, however, in my view the genius of Norm Borlaug was not in his creation of high yield potential and input responsive dwarf wheat varieties, not even in his early grasp of the catalytic effect of technology, but to a great extent in his relentless push to mobilize policy support to encourage the development of the agro-industry complex, to sustain the synergistic effects of technology, education, and markets.

Science-based Development can be Achieved and Sustained in Africa

I have described above the three factors that I consider crucial for sustainable agricultural development in Africa. Science and technology need to be given a chance in Africa. We need to develop a culture of change where, based on learned experience, African farmers form a mind-set of looking to agricultural innovation centers as sources of solutions to their agricultural problems. As farmers and farm communities and key stakeholders begin to assert themselves and earn some economic power, they may lean on government agencies to develop and pursue supportive national policies and policy incentives. With strengthened stakeholders, the rapidly changing paradigm shifts may be slowed and proactive strategies and development agendas may emerge generating badly needed momentum in science-based development.

An effective partnership can be designed between the U.S. government and our institutions of higher learning and research to achieve these interventions. The U.S. Land-Grant Colleges of Agriculture and their partners have a proud legacy of building human capacity and strengthening institutions of education, research, and technology transfer. A good foundation was developed in several developing nations by the early vision and resource commitments of the U.S. government beginning in the 1950s to make it happen. It is an experience that is worth reassessing and replicating at this time.

The U.S. government has supported the International Agricultural Research Centers of the Consultative Group on International Agricultural Research (CGIAR) and the Title XII Collaborative Research Support Programs (CRSPs), both of which work closely with

⁷ Hesser, 2006. The man who fed the world. Nobel Prize Laureate Norman Borlaug and his battle to end world hunger. Durban House Publishing Company, Texas.

developing country institutions in agricultural research and development, helping build human and institutional capacity.

U.S. investments in building human capacity and strengthening institutions in developing countries have been some of the best investments that our government has made toward alleviating hunger, reducing poverty, and safeguarding our natural resources.

It is my assessment that the dividends would be even greater if these educational, research, and development investments were orchestrated with parallel governmental efforts to encourage proper public policies in collaborating nations. Policies that encourage internal investments in agricultural development and further strengthening of local institutions and in local people to raise the level and depth of their national aspirations are badly needed. However, this is the realm of influence for governments and donor agencies; we in the academic and science community are ill-equipped to have much influence beyond ideas to have lasting impact in the field of policy.

The Outlook

Let me state, Mr. Chairman, that I am encouraged by several initiatives that are currently under discussion at the national level:

- The excellent document prepared by the Chicago Council for Global Affairs⁸ articulates the overall need clearly and identifies key institutions worthy of support.
- The back to the basics approach articulated by the Global Food Security Act of 2009⁹ introduced by Senator Casey and Senator Lugar is refreshing and is complemented well by the Chicago Council document.
- The Partnership to Cut Hunger and Poverty continues to promote research-based advocacy for African Agricultural Development as described in its recent “Roadmap” draft document.
- The CGIAR Science Council’s new Mobilizing Science and Linkages initiative, of which I am privileged to be among the leaders, is an effort to better link scientists in international agricultural research centers with scientists in the developed world to create better synergy and complementarities.

I am further encouraged by new organizations that have come into international agricultural development with great interest and resource commitment. I recently spent a

⁸ Renewing American Leadership in the Fight Against Global Hunger and Poverty. The Chicago Initiative on Global Agricultural Development. Report issued by and independent leader group (Catherine Bertini and Dan Glickman, Co-Chairs).

⁹ Introduced to the U.S. Senate, as the Global Food Security Act of 2009 by Robert Casey (Pennsylvania) and Senator Richard Lugar (Indiana), this bill seeks to assign greater priority to alleviating hunger and poverty.

year in Nairobi, Kenya assisting the Rockefeller and Gates Foundations to design a new joint initiative called the Alliance for Green Revolution in Africa (AGRA).

This is also an opportune time from the point of view of developing countries. For the first time in my life and my career, I am beginning to see a more focused sense of purpose and commitment among African leaders, particularly in more deliberate, visionary investments in higher education, agriculture, development institutions, and infrastructure.

However, the current propitious momentum will be lost without effective global leadership for international development.

I, therefore, applaud the vision and leadership of the Senate Committee on Foreign Relations in considering the Global Food Security Act of 2009 and today's discussion around the Chicago Initiative on the Global Agricultural Development. Your work is essential to reinvigorating the position of the US government in support of science-based development in developing countries.

With your permission, Mr. Chairman, let me end my comments with these light words about the need and power of policy intervention:

I liken agricultural development programs with diet and weight loss programs. Some weight loss programs are gimmicks, some are real. Most have something in them that works. Some produce results right away while others need time to be effective.

Regardless of which weight loss program is chosen, however, the only way sustainable, life-transforming change can be achieved is if the person commits to them and uses the newly learned discipline to stay the course and continue to eat right, exercise, and clear the mind.

The same principle is true of introducing new agricultural technologies to developing countries. We can produce some positive results with most R&D programs, where infusions of money and effort demonstrate the value of our interventions. But only if we encourage, engage and empower local people, local institutions, and local governments—and remain vigilant until the change is ingrained—can we bring about that truly transformative change that we all aspire to achieve!

Thank you for the opportunity to share these thoughts with you.

About the Witness

Gebisa Ejeta is a native of Ethiopia, where he received his early education including a BSc in Plant Science from Alemaya College of Agriculture, established in Ethiopia by Oklahoma State University under the old Point Four program. He later studied Plant Genetics and Breeding at Purdue University completing a PhD in 1978. Gebisa started his professional career as a Principal Plant Breeder at the International Crop Research Institute for the Semi Arid Tropics (ICRISAT) in 1979. He returned to Purdue University as a member of its faculty in 1984 to teach and conduct research in international agriculture. He currently holds a position of *Distinguished Professor* of Plant Breeding & Genetics and International Agriculture. At Purdue, Professor Ejeta has led an interdisciplinary research program on sorghum advancing the knowledge base of the genetics and physiology of the major biotic and abiotic stresses afflicting the crop including drought, plant diseases, and the parasitic weed *Striga*. Gebisa is responsible for the development and spread of the first commercial sorghum hybrid in sub-Saharan Africa. He has also developed, released, and facilitated the adoption and spread in several countries of a number of sorghum varieties and hybrids. He has studied and promoted biodiversity and advanced the effective exchange and use of crop germplasm resources globally. Gebisa has also worked on the improvement of nutritional quality of cereals and made significant contributions to our theoretical understanding of factors influencing in vitro protein digestibility of cereals.

Professor Ejeta has made significant contributions in international development through crop improvement research, through his efforts of building human capacity and strengthening institutions, as well as in advisory capacity on research program management. Professor Ejeta has served on review panels and advisory boards of major agricultural research and development organizations including the International Agricultural Research Centers (IARCs), the Rockefeller Foundation, the Food and Agricultural Organization (FAO) of the United Nations, and a number of national and regional organizations in Africa. Recently, he spent a sabbatical year in Nairobi, Kenya assisting the Rockefeller and Gates Foundations launch their new joint initiative, the Alliance for Green Revolution in Africa. He is currently a member of the Science Council of the Consultative Group for International Agricultural Research (CGIAR).