FOOD SECURITY IN AFRICA: THE IMPACT OF AGRICULTURAL DEVELOPMENT

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FOOD SECURITY IN AFRICA: THE IMPACT OF AGRICULTURAL DEVELOPMENT

WEDNESDAY, JULY 18, 2007

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON AFRICA AND GLOBAL HEALTH,
COMMITTEE ON FOREIGN AFFAIRS,
Washington, DC.

The subcommittee met, pursuant to notice, at 11:10 a.m. in room 2172, Rayburn House Office Building, Donald M. Payne, (chairman of the subcommittee) presiding.

Mr. PAYNE. Good morning. I would like to apologize for the interruption. There are a number of mark-ups that are going on, Judiciary, the Farm Bill, the Education and Labor Bill, and so many of the members had to leave, but we are reconvening now. This hearing today is the second in a series of hearings regarding food security. Food security is one of the most serious situations that we have in the world, and it is something that we certainly need to deal with.

More than a decade has passed since the World Food Summit in Rome at which nations pledged to work together to cut the number of undernourished people in half by the year 2015. Unfortunately, we are not on target to achieve that goal in sub-Saharan Africa. According to the Food and Agricultural Organization, in sub-Saharan Africa the number of hungry people has increased from 169 million to 206 million from the period of 1990 to 2006. Things are certainly going in the wrong direction.

We need to know why so little progress has been made. Senator Russ Feingold and I have requested that the Government Accountability Office do a review of U.S. efforts on global food security. I hope the report will provide us with some much needed answers. At a hearing in May the subcommittee examined options to enhance the effectiveness of our international food aid programs.

Witnesses emphasized two main points. First, food aid in and of itself is not sufficient to promote food security. Second, the United States Government must invest more research and resources in long-term agricultural development programs in order to achieve results. Witnesses pointed out that the majority of our food aid resources are being diverted away from long-term development programs and used for emergency food assistance.

Food aid is an important part of our aid program, and we have got to do more, and we have got to do it more effectively and more efficiently. However, it is not the only means that we have to address hunger. Today's hearing will specifically focus on the potential impact of another tool, agricultural development, on food secu-

rity in Africa, which is home to nearly 25 percent of the developing world's undernourished people.

There are serious obstacles to agricultural development in Africa. At a hearing I convened in May the issue of lack of water for farming in the region was raised. Water scarcity remains a major problem in the Sahel in the Horn of Africa and will be more and more a concern in other areas of the continent. In June I held a hearing about climate change in the region. Countries in Africa will be hit hard by climate change as illustrated by a National Public Radio Program which aired on Monday.

As a matter of fact, many say that Africa will be the worst hit as it relates to climate change, so the continent that needs the most will be devastated the most. According to the NPR story, Cape Verde had to build a desalination plant to maintain agricultural production because seasonal rain has been insufficient, and it has been insufficient for many, many years.

Few African countries can afford to engage in such costly endeavors. Conflict and poverty pose additional challenges to agricultural development. However, the potential economic benefits are such that we must not let these challenges impede our efforts in this very important area. Resources from the agricultural sector have fueled industrialization and economic growth in virtually every developed country in the world.

Africa should be no different. In fact, studies have shown that if crop yields are increased by 10 percent the percentage of people living on less than $1 a day is reduced anywhere from 6 to 10 percent. In Africa this means that as many as 12–15 million Africans could see their lives change dramatically by increased agricultural production. The Green Revolution in India increased the income of small farmers by 90 percent and that of landless laborers by 125 percent.

Imagine the impact that such a revolution might have in Africa where, according to the Organization for Economic Cooperation in Development, nearly 70 percent of the workforce in Africa is engaged in some type of farming. In light of the potential impact of agricultural development on peoples' lives, donors and international financial institutions must once again focus on agriculture as a means of wide scale development.

I am under no illusion that pouring money solely into the farming sector in Africa is a silver bullet for the region's development. There are other issues in play that should be examined. For example, we must look at the trade distorting effort of agricultural subsidies. The United States Government spent $17 billion in fiscal year 2006 for commodities subsidies. Subsidies have had a significant impact on the ability farmers in Africa have to get a decent price for their crops.

So all the programs in the world aimed at building up the agricultural sector might not make much of a difference if the crops produced cannot be sold. I would also point out that if we spent even 5 percent of that total on agricultural development it would allow us to triple the approximately $350 million we spent on agricultural and environmental programs in sub-Saharan Africa last year.

Let me be clear, I am certainly not suggesting that we completely stop assisting U.S. farmers when they need help. I am suggesting that we look at the issue in a considered way. We should also undertake a review of the programs already in place to see if we are using what we have on hand as effectively as we could. As we take the Farm Bill up I hope that we can look into some of the subsidies, which is going to be very difficult to do. Year in and year out many very, very wealthy people get much of the subsidies.

In Europe in general, the EU countries are dealing with subsidies. And it would be actually cheaper for Japan to buy rice from abroad rather than having the government pay to subsidize the rice industry. The fact that very needed land is used in an ineffective way when housing and other issues are so important to Japan is ironic. So it would almost be a win, win in that example and in many other places.

In January of this year I joined the chairman of the full committee, Tom Lantos, in writing to Director of Foreign Assistance urging the administration not to cut funding for Collaborative Research Support Programs. The CRSP Land Grant College lent expertise related to farm production, and security and nutrition to the U.S. Government and to developing countries. Not only must funding for such programs be maintained, it should be increased, our work, to boost the level of investment we are making in that area.

I realize, however, that no matter how good the CRSP program is it alone is not enough to address the develop needs in the agricultural sector, so I hope that during the course of our hearing today our witnesses will address the following issues. Number one, what are the major implements to agricultural development in sub-Saharan Africa? Is a Green Revolution a good idea for Africa, and if so, is it achievable and is it realistic as a goal?

Finally, what does the United States Government need to do in order to get the most bang for the buck so to speak in terms of making development investments in the agricultural sector in Africa? I thank our witnesses for coming today, and I turn to our ranking member for an opening statement.

[The prepared statement of Mr. Payne follows:]

PREPARED STATEMENT OF THE HONORABLE DONALD M. PAYNE, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW JERSEY, AND CHAIRMAN, SUBCOMMITTEE ON AFRICA AND GLOBAL HEALTH

Our hearing today is the second in a series of hearings regarding food security in Africa. More than a decade has passed since the World Food Summit in Rome at which nations pledged to work together to cut the number of undernourished people in half by the year 2015.

Unfortunately, we are not on target to achieve that goal. According to the Food and Agricultural Organization, in sub-Saharan Africa the number of hungry people increased from 169 million to 206 million in the time period from 1990 to 2003. We need to know why so little progress has been made. Senator Russ Feingold and I have requested that the Government Accountability Office do a review of U.S. efforts on global food security. I hope the report will provide some answers.

At a hearing in May, the subcommittee examined options to enhance the effectiveness of our international food aid programs. Witnesses emphasized two main points. First, food aid in and of itself is not sufficient to promote food security. Second, the United States government must invest more resources in long-term agricultural development programs in order to achieve results. Witnesses pointed out that the majority of our food aid resources are being diverted away from long-term development programs and used for emergency food assistance.

However food aid is only one tool to promote food security. Today's hearing will specifically focus on the potential impact of another tool—agricultural development—on food security in Africa. Though only 13% of the world's population resides in Africa, it is home to nearly 25% of the developing world's undernourished people.

There are serious obstacles to agricultural development in Africa. At a hearing in May the issue of lack of water for agricultural production in the region was raised. It remains a major problem in the Sahel and the Horn of Africa, and will be more and more of a concern in other areas of the continent.

In June, I held a hearing about climate change on the continent. Countries in Africa will be hit hard by climate change, as illustrated by a National Public Radio which aired on Monday. According to that story Cape Verde had to build a desalination plant to maintain agricultural production because seasonal rains have become insufficient. Few African countries can afford to engage in such costly endeavors.

Conflict and poverty pose additional challenges to agricultural development; however the potential economic benefits are such that we must pursue such development in a considered way at an appropriate level. Resources from the agricultural sector fueled industrialization and economic growth in virtually every developed country. Evidence suggests that long-term agricultural development programs are one tool that could improve food security in Africa.

Studies have shown, that if crop yields are increased by 10%, the percentage of people living on less than a dollar a day is reduced anywhere from 6 to 10%. In Africa, this means that as many as 12 to 15 million Africans could see their lives change dramatically by increased agricultural production. The Green Revolution in India raised the income of small farmers by 90%, and that of landless laborers by 125%. Imagine the impact that such a revolution might have in Africa, where according to the Organization for Economic Cooperation and Development, nearly 70% of the workforce in Africa is employed in the agriculture sector.

In light of the potential impact of agricultural development on people's lives, donors and the international financial institutions are once again beginning to focus on agricultural as a means of wide-scale development. The theme for the World Bank's World Development Report for 2008 is Agriculture for Development. The report will focus on when, where and how agriculture can be an effective instrument for economic development, especially development that favors the poor.

We must also look at the trade distorting effect of agricultural subsidies. The United States government spent $17 *billion* in fiscal year 2006 for commodity subsidies. I am not suggesting that we completely stop assisting U.S. farmers when they need help. I am suggesting that subsidies have a significant impact on the ability farmers in Africa to get a decent price for their crops.

I would also point out that if we spent even five percent of that amount on agricultural development, it would allow us to almost double the approximately $350 million we spent on agricultural and environmental programs in sub-Saharan Africa last year. In January of this year, I joined the Chairman of the full Committee, Tom Lantos, in writing to the Director of Foreign Assistance urging that the administration not cut funding for Collaborative Research Support Programs.

Through CRSPs, U.S. land grant colleges lend expertise related to food production and security, and nutrition to the U.S. government and developing nations. Not only must funding for such programs be maintained, it should be increased. I will work to boost the level of investment we are making in that area.

But these programs alone are not enough to address the develop needs in the agricultural sector. I hope that our witnesses today will address the following issues: What are the major impediments to agricultural development in sub-Saharan Africa? Is a "green revolution" a good idea for Africa, and if so, is it achievable a realistic goal? And finally, what does the United States government need to do in order to get the most bang for the buck in terms of making development investments in the agriculture sector in Africa?

I thank our witnesses for coming today, and turn to the distinguished ranking member for his opening statement.

Mr. SMITH OF NEW JERSEY. Thank you very much, Mr. Chairman, for calling this important hearing on the impact of Agricultural Development and Food Security in Africa. Living in a country of plenty, as we do, where local grocery stores have aisles of fresh produce, cereal and whole aisles of pet food, one can easily forget that other parts of the world are not similarly blessed and what undernourishment that results from insecurity means in practical terms.

UNICEF estimates that malnutrition is a leading cause of mortality of children under the age of 5 and contributes to the death of about 5 million children each and every year. One to 2 percent of all children under five in the developing world or almost 13 million suffer from severe acute under nutrition. These children are far more susceptible to dying from childhood illnesses including diarrhea and pneumonia.

Of course, under nutrition does not affect only children. Twenty-five percent of all undernourished persons in the world or about 218 million live in sub-Saharan Africa. This constitutes about 30 percent of that region's population. Agricultural production is essential for addressing this crisis on both the local and national levels.

Africa faces numerous challenges in meeting the basic need of food and nutrition for its people. These include the simple lack of food in markets or fields, poor food delivery mechanisms, the inability of many people to buy food or agricultural resources due to poverty, obstacles to food access due to social status, lack of sanitation and clean drinking water and natural and manmade resources. I can attest to at least one aspect of these challenges from my own experiences in Africa.

I have traveled along a segment of the Pan-African Highway which is one of Africa's primary transportation routes. The part that I rode on is a narrow, two lane paved road with numerous bicyclists, pedestrians and animals walking along the shoulder. I was told that another segment was a dirt road that was taking far longer than anticipated to be repaved.

One often encounters open air trucks overloaded with bananas or other produce broken down in the middle of the road exposed to the sun and heat. I am told that they remain there for hours or even days at a time. No one can travel this major road after dark as the road is not lit and the danger of hitting one of these disabled vehicles or some other object on the road is too great.

Even if a community is growing bumper crops of high-quality agricultural produce, it would be next to impossible to transport food in a timely manner under these conditions. As we are noting time and again during these subcommittee hearings, Mr. Chairman, inadequate infrastructure is a major obstacle to development in general in Africa and that applies in the case of agricultural development.

African leaders recognized this when they named increased Ag trade capacity and infrastructure as one of the four pillars of the Comprehensive African Ag Development Program of the African Union's New Partnership for Africa's Development. Just 3 weeks ago the subcommittee heard how the Millennium Challenge Corporation is working to address this need. I will be interested to hear from our witnesses about additional measures we are or should take to create the infrastructure necessary to support agricultural business and rural farming populations.

It is unfortunate that some attribute Africa's food crisis, at least in part, to the continent's population growth rate and name the people, especially children themselves, as a cause of the problem of food insecurity. You will recall, Mr. Chairman, that in our recent hearing on the shortage of safe water in Africa, we learned that the

United Nations Development Program had found that the global water crisis is attributable to power, poverty and unequal access to safe drinking water not shortages in quantity resulting from population increases.

I would propose that the same analysis applies with respect to the availability of food and levels of food security. Many researchers on this issue attribute food insecurity not so much to an absolute deficit of food, particularly at the national and international levels, as to the failure of socioeconomic systems, including markets and political processes, to distribute food equitably and efficiently.

Many are of the opinion that better functioning and open market systems are equally or more important to providing adequate food supplies as absolute increases in food production. While we should and must seek to increase the quality and quantity of food supplies we must also address longer term challenges of policy and infrastructure to attain a permanent solution for food security.

People themselves should be considered not a source of the problem but a valuable resource in achieving this goal. I yield back the balance.

Mr. PAYNE. Thank you very much, Mr. Smith. Ms. Watson.

Ms. WATSON. Thank you, Mr. Chairman. I will be very brief in my comments, but I think this is a very timely hearing and right now the Agriculture Committee is working on reauthorizing farm subsidy programs. We need to acknowledge the impact of what we do here in Congress on farmers around the world. Any country that has lifted its people out of poverty in the last Century has started by feeding itself. If a country cannot make its agricultural sector work it is going to be hard press to make its economy work.

Too often agricultural markets in developing countries are distorted by the farm subsidies we have in the industrialized world. Mr. Chairman, both you and Mr. Smith have been vocal on this issue in the past and I look forward to working with both of you and all the members of this committee when the Farm Bill comes to the House floor to see what we can do to blunt the worst impacts of our domestic foreign policies on Africa countries and farmers.

We hope that in some way that there will be much good that will come out of those bills so countries that we are concerned about in rural Africa can benefit. Thank you so much, Mr. Chairman.

Mr. PAYNE. Thank you very much. Dr. Boozman.

Mr. BOOZMAN. I will pass.

Mr. PAYNE. Okay. Ms. Woolsey.

Ms. WOOLSEY. No, Mr. Chairman.

Mr. PAYNE. Thank you. We will move to our first witness. Our administration witness today is Mr. Michael Hess, the Assistant Administrator of the Bureau for Democracy, Conflict and Humanitarian Assistance at the U.S. Agency for International Development. Mr. Hess joined USAID in 2005. Prior to that, Mr. Hess served in the U.S. Army for 30 years attaining the rank of Colonel. He was deployed to carry out humanitarian operations in Turkey, Iraq, Bosnia and Kosovo.

He was recalled to active duty to serve as the Humanitarian Coordinator in the Office of Reconstruction and Humanitarian Assistance during Operation Iraqi Freedom and later served as the Deputy Chief of Staff for the Coalition Provisional Authority. We thank

you for your great service to our country, and we welcome your role here in USAID, your active role as an active U.S. military humanitarian, and we look forward to hearing your testimony.

STATEMENT OF THE HONORABLE MICHAEL E. HESS, ASSISTANT ADMINISTRATOR, BUREAU FOR DEMOCRACY, CONFLICT AND HUMANITARIAN ASSISTANCE, UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

Mr. HESS. Thank you, Chairman Payne, Ranking Member Smith and members of the Subcommittee on Africa and Global Health for the opportunity to be here today to appear before you and to discuss the major role and impact of agricultural development on food security in Africa. I would like to submit, Mr. Chairman, my written testimony for the record and keep my oral remarks short.

Mr. PAYNE. Without objection.

Mr. HESS. I will focus on three topics today, the need for holistic integrated approaches to food security and agricultural development in Africa, the so-called Relief to Development continuum, the importance of CAADP, the new African-led Comprehensive African Agricultural Development Program, and the important role and results of the United States support to the President's Initiative to End Hunger in Africa, IEHA.

Poverty and food insecurity in Africa are among the most significant development challenges in our time. The frequency and magnitude as well as the unpredictability of major food security crises are increasing due to growing chronic vulnerability. Current estimates suggest that over 40 percent of sub-Saharan Africa's population survive on less than $1 a day and cannot meet the minimum daily food requirements.

The problem is especially acute in rural areas where the poor are concentrated. These food insecure populations to a great extent are dependent on agriculture to change their lives and reduce poverty. Agricultural development is vital in this regard. Food security and poverty reduction in Africa cannot be achieved without development of agriculture that enables the majority of Africans now dependent on agriculture for their livelihoods to secure the income, nutrition and economic stability to be productive and responsible members of their communities.

With growing numbers of chronically food insecure in some regions such as eastern Africa and with agricultural development already significantly contributing to poverty reduction in others a broader, holistic approach is needed that is appropriate for each country and integrates relief and development programs to attack underlying causes of food insecurity while achieving economic growth through agriculture.

Most African leaders now recognize the need to achieve agricultural growth and the powerful influence it has on food security and poverty reduction. Their vision for agricultural growth is reflected in the Comprehensive African Agricultural Development Program, CAADP, of the Africa Union's New Partnership for Africa's Development, NEPAD. NEPAD also emphasizes the importance of governance in creating an enabling environment for agricultural growth, and African governments are increasingly focused on improved governance through NEPAD.

CAADP is an African vision and framework designed and led by Africans to ensure that agriculture plays its critical role in supporting transformational development, improving food security, reducing poverty and increasing the effectiveness of development assistance. CAADP is the most ambitious and comprehensive agricultural reform effort ever undertaken in Africa. It addresses importance of governance, policy, market and productivity issues across the entire agricultural sector and across the entire African continent.

By establishing CAADP and pledging their commitment to it African governments are addressing a long-standing barrier to agricultural development in Africa, the lack of African political and financial leadership for agricultural development in Africa. CAADP promotes African accountability and financial and political commitment. It integrates the needs to address food insecurity and economic vulnerability into the mainstream development agenda and provides a framework for Africans to unite to assist famine prone countries tackle the root cases of hunger.

USAID has been a leader in supporting the African agricultural development in general and CAADP in particular. Since 1998 USAID has provided an estimated $1.3 billion of development account funds to support African agricultural development in 25 countries. In addition, USAID has provided over $680 million in P.L. Title II development food aid resources since 1998 for small holder agricultural programs within the most vulnerable populations and the most food insecure countries.

The President's Initiative to End Hunger in Africa started in 2003 is playing a leading role in strengthening key African organizations at the continental, regional and country levels to lead and manage implementation of CAADP processes. In 2006 IEHA interventions directly assisted nearly 10 million people, helped 520,000 farmers on 850,000 hectares adopt new technology to increase productivity.

It also helped spur $812 million in international trade and $435 million of integrated intraregional trade and in countries as diverse as Mozambique and Ghana cut by over half the period of food shortages by the chronically food insecure each year. Another specific example is in Zambia. Our USAID project is helping rural cattle and maize farmers use SMS services via cell phones to get critical information on agricultural inputs such as sprays and seeds and to aggregate their purchasing of inputs to obtain price discounts.

Another example of how markets help and market reforms, farmers and agricultural traders across West Africa in 15 ECOWAS countries use cell phone based regional market information networks to find prices by market and by agricultural product. Traders use SMS text messaging via their cell phones to track prices for rice, maize, cattle, tomatoes, onions, millet and other commodities.

Through these improved market chronic activities for farmers they could increase their income for the products they produce. USAID funded rehabilitation of the border post between Kenya and Ghana which shortened the time to clear trucks from 6 days to 6 hours. That produce that you were talking about, Congressman

Smith, that rots on those trucks can now move through those border crossings much faster.

According to a recent study on east Africa it costs more to transport a ton of grain from Mombasa to Kampala than it does from Chicago, Illinois, to Mombasa. USAID supported a new Private Sector Focus Commodities Exchange Program in Ethiopia that is slated to open and increase the markets in Ethiopia. In conclusion, agricultural development can and does play a strategically important role in promoting food security and poverty reduction in Africa.

USAID and the administration play a leading role in globally and locally working with African leaders and the development community to build the necessary coalitions and alliances. Fundamentally, the challenge of food security and agricultural development in Africa must first and foremost be addressed by African leaders. Their vision and aspirations reflected in CAADP are an important stride forward.

It is important that we and others provide credible support for these African-led efforts including the strengthening of regional food markets, trade systems that will play such a large role in securing African economic growth and food security.

Our role is to assist in strengthening the agricultural enabling environment and tackling the fundamental development challenges related to increased productivity and investment while making sure that citizens understand that they and their governments must take responsibility for their future as it is the key to development. Thank you, Mr. Chairman, for the opportunity to appear before this committee on such an important subject. I welcome your questions.

[The prepared statement of Mr. Hess follows:]

PREPARED STATEMENT OF THE HONORABLE MICHAEL E. HESS, ASSISTANT ADMINISTRATOR, BUREAU FOR DEMOCRACY, CONFLICT AND HUMANITARIAN ASSISTANCE, UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

Chairman Payne, Ranking Member, and other members of the House Committee on Foreign Affairs Subcommittee on Africa and Global Health, thank you for the opportunity to appear before you today to discuss the strategic role and impacts of agricultural development on food security in Africa.

THE IMPACT OF AGRICULTURAL DEVELOPMENT ON FOOD SECURITY IN AFRICA

Food security in Africa cannot be achieved without the development of agriculture that enables the majority of Africans, now dependent on agriculture for their livelihoods, to secure the wealth, nutrition and stability to be productive and responsible members of their community.

Poverty and food insecurity in Africa are among the most significant development challenges of our time. From 1990 to 2005, the overall share of the population that is not meeting minimum daily food requirements decreased from about 52% to around 45%. These rates of progress are not sufficient to meet Millennium Development Goals (MDGs). Current estimates suggest that over 40% of sub-Saharan Africa's (SSA) population survive on less than a dollar a day and can not meet the minimum daily food requirements. The problem is especially acute in rural areas, where the poor are concentrated. These food insecure populations, to a great extent, are dependent on agriculture to change their lives and circumstances.

Fundamentally, the impact of agricultural development on the poverty and food security of individuals and on the transformation of African national economies comes from agriculture's ability to:

a. Put money in the pockets of millions of individuals and create jobs in rural and urban areas;

b. Directly improve the health and well being of society, especially children in formative stages, by ensuring the availability of high quality food and safe food systems;
c. Promote good economic governance among large segments of society; and
d. Improve the care and stewardship of natural resources that directly affects conflict, especially among the poor.

The power of agriculture to influence food security and poverty reduction in Africa is clearly reflected in the experiences of Ghana and Uganda. From 1992 to 2005 poverty in Ghana dropped from 50% to 30% of the population, and hunger dropped from 39% to under 20% of the population, a reduction of 5.3% annually since 1992. Driving this change is sustained improvements in the performance of agriculture, reflected by growth in agriculture total factor productivity (TFP) which grew by 2.5 % per annum between 1990 and 2003.

In Uganda, the share of population living in poverty decreased from 56% in 1992 to 31% in 2005. At the same time agriculture productivity grew at 3 % per annum. Further, rural incomes grew five times faster than urban incomes from 2000 to 2005 providing some early signals that the rural economy is taking off. This take off is laying the foundation for overall growth and economic transformation—which is critical to tackle the root causes of food insecurity and poverty.

At a continent level, agriculture has historically performed poorly. Recent trends show improvement, although the results are mixed and are not yet sufficient to meet either the MDG targets or the targets of African leaders to reduce poverty and hunger, and improve food security. Africa-wide, per capita agricultural production has declined, with the fastest rates of decline in Eastern and Southern Africa. West Africa per capita production trends indicate that it is the only region in Africa that has improved. Further, Africa's share of global agricultural exports has experienced a constant decline since the 1960s, and currently account for 2.1% of global agricultural exports.

But, there are signs that the region's agricultural performance is on the verge of a takeoff. Since 1997, Sub-Saharan Africa's share of the world's traditional agricultural exports has grown slightly from approximately 7% to 11%. Beginning in 2000, agricultural growth rates have improved in many countries, and, as recently as 2005, Sub-Saharan Africa's agricultural GDP grew by 6%. In general, household incomes are on the rise.

BARRIERS TO AGRICULTURAL DEVELOPMENT IN AFRICA

African leaders recognize the need to get agriculture moving and the powerful influence it does and must have on food security. Their vision for agriculture is reflected in the Comprehensive African Agricultural Development Program (CAADP) of the African Union's New Partnership for Africa's Development (AU/NEPAD).

CAADP is an African vision and framework designed and led by Africans to ensure that agriculture plays its critical role in supporting transformational development, improving food security and increasing the effectiveness of development assistance. CAADP is the most ambitious and comprehensive agricultural reform effort ever undertaken in Africa. It addresses policy and capacity issues across the entire agricultural sector and across the entire African continent.

By establishing CAADP and reinforcing their commitment to it, African governments are addressing a long standing barrier to agricultural development in Africa—lack of African political and financial leadership for agricultural development in Africa.

CAADP offers multiple opportunities for progress on the Monterrey and Paris Declarations. It promotes African mutual accountability and financial and political commitment. African governments committed to provide 10% of their national annual budgets to support agriculture by 2008. It provides a framework that facilitates prioritization of where and what to invest in to achieve the targeted 6% agricultural growth rate under CAADP. It integrates the need to address chronic food insecurity and economic vulnerability into the mainstream development agenda and provides a framework for Africans to unite to assist famine-prone countries tackle the root causes of hunger. It also reflects a commitment of African leaders to put in place a policy framework to support agricultural development.

The G–8 has committed to support CAADP during the Gleneagles, St. Petersburg, and most recently at the Hieligendamm meeting, where the communiqué on Growth and Responsibility in Africa noted that *"To improve food security and sustainable use of natural resources, the G8 will support AU/NEPAD's Comprehensive Africa Agricultural Development Programme (CAADP) and promote policy reforms and investments in sustainable agriculture leading to higher productivity, better market ac-*

cess and reduced vulnerabilities in order to support the population in rural areas". Under the leadership of the United States Agency for International Development (USAID), the Initiative to End Hunger in Africa (IEHA) framework is the vehicle through which the U.S. government meets its G–8 commitments to support implementation of CAADP.

CAADP has four pillars. Of particular strategic importance is pillar three which focuses on food security, hunger and emergency assistance to address the needs of the most vulnerable. CAADP integrates this concern for the vulnerable and food security into the core of the agricultural development agenda. The other three pillars promote: sustainable management of land and water resources (pillar one); increasing agricultural trade capacities and infrastructure for agriculture (pillar two); and increasing the use of productivity enhancing technology (pillar four).

The major challenge that the implementation of CAADP faces is increasing the scale and scope of policy reform, capacity building and investment to levels sufficient to achieve the accelerated agricultural growth targets. In 2000, barely 3% of national budgets were allocated to agriculture, and no country in Africa was providing 10% of their budget to support agriculture. In 2003, the average share of national budgets going to agriculture increased to just over 5%.

Key barriers and challenges to increasing the performance and contribution of agriculture in Africa to the reduction of poverty, hunger and food insecurity that CAADP and IEHA need to address include the following:

- Increasing agricultural productivity and growth in the use of agricultural inputs.
- Strengthening policy and institutions to support agriculture.
- Expanding regional economic cooperation to grow market opportunities and access.
- Strengthening the capacity of private sector based agricultural market and trade systems—to link producers and manufacturers to markets and finance.
- Expanding private sector foreign and domestic investment.
- Building the infrastructure to serve agriculture businesses and populations.
- Strengthening the capacity to deal with vulnerabilities to political instability as well as environmental and economic shocks.

Recognizing that countries face different barriers and challenges to develop their agriculture, action plans and investments need to be adapted to local needs. The AU and NEPAD have established a process, coordinated by lead regional economic communities in Africa, to provide evidence-based planning to guide the adaptation and adjustment of the CAADP framework to meet the country specific needs in pursuit of the common objectives of CAADP. This commitment to regional economic integration and coordination, along with evidence-based planning is a major step forward by African leaders in creating the conditions to improve competitiveness and facilitating broad based economic growth.

Securing the engagement, alignment and commitment of the international development community in assisting Africans to put in place the capacity and investments to enable an efficient, coherent African-led agenda for agricultural development also remains a challenge and barrier to success. Progress is being made, but much remains to be done to fully secure the alignment of International Finance Institutions and foundations along with traditional bilateral donors.

AGENCY FOR INTERNATIONAL DEVELOPMENT AGRICULTURAL DEVELOPMENT ACTIVITIES IN AFRICA

Since 1998, USAID has provided an estimated $1.35 billion in DA, not including Food for Peace development food aid, to support African agricultural development. Over the past ten years USAID has provided development assistance for African agriculture in 15 to 25 countries each year. In 2007, development assistance to support agriculture is being provided to 20 countries in Africa. USAID also provides support for regional (multi-country) agricultural development programs in East, West and Southern Africa to increase competitiveness and expand economic opportunities including reducing regional trade barriers for inputs and food grains. The Agency also supports global networks and advanced research systems that focus on agriculture in Africa, such as the Consultative Group for International Agricultural Research and the U.S. universities involved through Title XII Programs such as the Collaborative Research Support Program, directly supported from the Washington headquarters. And, through the Food for Peace development programs, managed from Washington, we provide support for African agricultural development in an estimated 16 countries.

The new U.S. Framework for Foreign Assistance recognizes the strategic importance of agriculture in economic development, especially among developing countries. It provides a framework to focus our efforts on agricultural enabling environment and agricultural productivity challenges that can demonstrably contribute to facilitating transformation through broad based, sustained, economic growth and the reduction of poverty.

Our agricultural programs are focused on increasing rural incomes as a primary driver for reducing poverty, stimulating broad based economic growth and increasing the food self-reliance of rural households. To achieve this, USAID works with national governments, private sector groups, nongovernmental organizations, regional organizations, and other development partners to provide and focus agriculture development assistance. Our actions are aimed at: increasing African agricultural productivity, improving the policy environment for smallholder-based agriculture, expanding agricultural trade and integrating the vulnerable—especially the food insecure—into the development process. Our efforts are adapted to the needs of individual countries and local populations.

In 2003, IEHA, an agricultural focused agenda, began implementation. IEHA provides a framework to collaborate with and strengthen key African organizations at the continental, regional, and country levels to lead and manage implementation of the CAADP process. In 2006, IEHA interventions directly assisted nearly 10 million people; helped 520,000 farmers on 850,000 hectares (1.87 million acres) adopt new technology to increase productivity; helped spur $812 million of international trade and $435 million of intra-regional trade; and in countries as diverse as Mozambique and Ghana reduced periods of food shortage for the chronically food insecure from 4 months to 1.3–1.8 months per year.

A significant part of our efforts, strategically, is our support for regional economic integration that helps create the dynamics and opportunities to achieve Africa's growth targets. The small size, economic isolation, and rudimentary infrastructure of many African economies present development challenges not easily surmounted at the national level. With a regional approach, countries can capture economies of scale and scope unavailable to them individually due to their limited access to markets, finance, human capital, and knowledge. They can address cross-border problems caused by epidemics, pollution, and conflict. By working regionally, countries are also held accountable to a larger group of stakeholders for their policy commitments.

USAID-supported policy reforms are improving enabling environments for smallholders and agriculture-based enterprises by removing key constraints and creating real opportunities. Policy improvements such as new commodity grades and standards are making trade more efficient and reliable. Reductions in tariffs and taxes on agricultural inputs are making investment more attractive to producers and others in the value chain, allowing them to take advantage of these opportunities, increase their incomes, and move out of poverty. USAID also supports the enhancement of policies with respect to key public investments like agricultural research, directing scarce resources to those areas where the results will be of most use to poor farmers. Policy efforts fall under three main categories: agricultural markets and standards, food policies, and public investment policies.

USAID agricultural trade-related programs focus on growing sales by smallholders and increasing exports of targeted commodities, especially into regional markets. Opportunities for increased domestic and international trade are being created through trade-policy improvements as well as through technical assistance that links producer and trader groups to business development services, credit, and ultimately to markets, and also helps them meet international quality standards. Increased producer revenues from these profitable new opportunities are raising incomes and reducing poverty.

USAID agricultural productivity support programs are reducing poverty and hunger by enhancing productivity and income at all parts of the agricultural value chain. The programs do so by providing skills and information directly to farmers, processors, and traders, as well as to producer and exporter associations. They also strengthen public and private research and extension systems to deliver new technology. Through our efforts technology is being developed, disseminated and shared among countries and farmers throughout Africa.

USAID is also the lead development agency in support of biotechnology systems development in Africa, providing support to countries to establish bio-safety policy and regulatory systems that enable them to utilize these innovations, strengthening capacity of African scientists and developing new biotechnology applications for African agriculture and priority commodities.

Agriculture is our front line against new diseases, like avian influenza and cassava mosaic virus that threaten livelihoods and trade, as well as human health. We

are working to strengthen the surveillance systems and knowledge systems to improve the response to these challenges. USAID-funded international research developed cassava varieties resistant to a virus destroying production across central Africa. Through monitoring of the outbreak and partnering with private voluntary organizations (PVOs) to disseminate improved varieties—we have been able to prevent crop failures and restore production systems that had collapsed.

USAID agricultural programs assisting vulnerable households help to build the capacity of the vulnerable, increase their food self-reliance, and connect them to key development services and processes. The vulnerable are hungry individuals, households, and groups that are unable to meet their basic food needs and are likely to experience continuing or increased difficulty in meeting these needs. They live where highly inadequate or highly variable food availability and food access conditions exist, exacerbated by natural and/or man-made disasters such as conflict. These chronically food-insecure conditions require solutions that will improve and protect the production and market structures and systems that will improve their ability to acquire more income and food for feeding themselves. Our policy reform, market development and productivity enhancing efforts are having significant influence on the vulnerable.

Under the new USAID Food for Peace Strategic Plan for 2006–2010, the Agency has expanded its food security conceptual framework to make explicit the risks (economic, social, health and political risks as well as natural shocks) that impede progress toward improvements in food availability, access and utilization. New P.L. 480 Title II development programs are being aligned to support CAADP goals, especially at the country level with FFP development programs aligned with CAADP country compacts focused on underlying causes of food insecurity.

FOCUS COUNTRIES FOR AGRICULTURAL DEVELOPMENT ASSISTANCE IN AFRICA

The role of agriculture in a national development strategy is highly related to a country's stage of development. The United States Foreign Assistance Framework recognizes that countries are in different stages of the development process and face different challenges.

At present only eight percent of Africa's population lives in middle income countries, where average GDP is almost ten times higher than the average for low income African countries. Agriculture is less important in middle-income countries and on average generates less than ten percent of GDP. Higher average per capita incomes typically correspond to lower poverty rates and greater food security.

In general, agriculture plays a major role in low income countries. In Africa, 90% of the population lives in low income developing countries and many Africans in these low income countries are dependent on subsistence agriculture for their livelihoods.

IEHA, our flagship effort in agriculture, is concentrated on two key low income countries in each of three regions: Uganda and Kenya in East Africa; Mozambique and Zambia in Southern Africa; and Mali and Ghana in West and Central Africa. These countries are leaders in policy reform, public investment, and government commitment to agricultural growth and poverty reduction. They are representative of the key economic and agricultural characteristics of their regions and also have the greatest potential for influencing regional agricultural productivity and economic growth through trade and technology diffusion. In 2007 two hunger hot spot countries—Malawi and Niger—are being added to IEHA.

Looking forward, there are very few countries in Africa that would not qualify as a focus country simply based on need. High levels of poverty and hunger are pervasive. Our agricultural resources are focused on strategic countries committed to using development resources effectively to stimulate agricultural growth, break the cycle of chronic food insecurity and establish the policy, capacity and processes for this to succeed. We are focusing on those developing countries that are taking steps to implement CAADP and participate in the peer review efforts that go with the NEPAD and CAADP processes. In 2007, 10 countries have launched roundtable processes to shape an integrated strategy to implement CAADP and achieve African aspirations of sustained growth and food security.

SUPPORT FOR AGRICULTURAL DEVELOPMENT IN FOCUS COUNTRIES

IEHA's strategic objective is to rapidly increase agricultural growth and rural incomes in Sub-Saharan Africa to reduce both poverty and hunger by harnessing the power of new agricultural production and processing technologies; improving the efficiency of agricultural trade and market systems; building the capacity of community and producer-based organizations; and integrating vulnerable groups and countries into sustainable development processes.

IEHA's focus is on smallholders in rural areas who are poor but have the capacity to improve their situation. Programs that target smallholder-based agricultural growth give the hungry access to food by both raising their incomes and reducing the price of food. Increased rural income also has positive effects on poverty throughout the economy, which is especially significant in Africa because three-quarters of the continent's malnourished children are found in households that depend on small farms for their livelihoods.

IEHA invests in several key areas and subsectors to enhance agricultural sector productivity. Key subsectors include maize, rice, cassava, cotton, coffee, and horticulture. In general IEHA allocates 35 percent of its resources to scientific and technological applications, which are raising the productivity of farms and firms and increasing the stability and volume of the food supply. Agricultural technology also improves product quality, relieves pressure on natural resources, reduces post-harvest losses, helps producers respond to markets, helps entrepreneurs develop profitable enterprises, raises farm incomes, and lowers the price of food to consumers.

To help improve the policy environment, IEHA devotes around 20 percent of its resources to developing human capital and institutions, which are fundamental to sustaining agricultural growth. In the public sector, Africans must shape and lead policy and research, and in the private sector, they must organize to advocate for improved policies and must lead producer and other organizations that connect their members with markets and services.

With regard to increasing agricultural trade and private sector development, IEHA allocates 25 percent of its funds to increasing the efficiency of agricultural trade and market systems, which are improving African competitiveness in export and domestic markets, are connecting African farmers to consumers, and are integrating African countries into global markets. More effective market systems add value to products and processes, deliver high-quality, safe products, and reduce costs for consumers. The remaining 20 percent of the resources are dedicated to assisting vulnerable populations.

FOOD AID AND FOOD SECURITY

In addition to the initiatives already underway, the Administration is requesting authority under PL 480 to use up to 25 percent of appropriated Title II food aid funds for the local or regional purchase and distribution of food in those situations where speedy food delivery is critical to saving beneficiary lives. The purchase of food in Africa could also help sustain local production, improve incomes, and stimulate trade linkages—all which can reduce the root causes of food insecurity, malnutrition and cycles of famine, and allow us to use our food aid budget more effectively. While the House Foreign Affairs Committee version of the 2007 farm bill proposes to require that at least $40 million of International Disaster and Famine Assistance be devoted to famine relief and prevention, those funds are required for other critical disaster and humanitarian relief needs. We require this authority in P.L. 480 Title II.

The House Foreign Affairs Committee farm bill includes a non-waivable minimum for Title II non-emergency food aid. We strongly oppose this provision. The requirement of $600 million in Title II for non-emergency programs—$250 million above current levels—would result in an equivalent decrease in emergency food aid. Emergency food aid saves countless lives each year. While non-emergency food aid programs have an important long-term impact, they should not be increased by putting at risk the lives of people affected by emergencies and the flexibility of the US government to respond to emergencies.

CONCLUDING REMARKS

Agriculture can and does play a strategically important role in promoting food security. USAID is playing a lead role, globally and locally, in working with African leaders and the development community to build the necessary coalitions and alliances. Through a united approach combining AFR, EGAT and FFP resources, our development and technical assistance have made important contributions to addressing food security.

Fundamentally, the challenge of food security and agricultural development in Africa must first and foremost be addressed by Africa's leaders. Their vision and aspirations reflected in CAADP are an important stride forward. It is important that we and others provide credible support for these African-led efforts, including the strengthening of the regional food market and trade systems that will play such a large role in securing African food security. Our role is to assist in strengthening the agricultural enabling environment and in tackling the fundamental development challenges related to increased productivity and investment, while making sure that

citizens understand that they and their governments must take responsibility for their future, as this is the key to development.

Mr. PAYNE. Well, thank you very much, Mr. Hess, for those remarks. I also would like to recognize Franklin Moore who, I happen to be a member of the U.N.'s team convention to combat desertification and Mr. Moore worked with us on that convention. It is good to see him here. Let me begin, Mr. Hess. In your written testimony you said that the United States is providing assistance to support agriculture in 20 countries in Africa.

Exactly how much does USAID expect to spend on these programs this year, and how does that compare to what we spent on agricultural development programs last year?

Mr. HESS. Unfortunately, Chairman Payne, I am going to have to get back with you on the record with those numbers because I want to make sure that we compile all of the numbers. As you know we have a new system that tracks those numbers, and I don't have them available for you today, but I will get back on the record for you.

Mr. PAYNE. Okay. You said that USAID has done some studies on the impact that the United States subsidies have made on agricultural sectors in Africa. Do you have that information at hand also or would you have to get back to me on that?

Mr. HESS. I will submit that for the record as well, sir.

Mr. PAYNE. All right. In your testimony you mentioned that agricultural sector in sub-Saharan Africa seems to be on the verge of taking off with its share of the world's traditional agricultural exports growing from approximately 7 percent to 11 percent since 1997. In your opinion what accounts for this increase in agricultural exports, and is an increase of 4 percent over a decade significant?

Mr. HESS. That is a good question, sir, and obviously we think it is important because even though it is a 4-percent over a decade it represents a fairly substantial number when you talk about the overall growth in export. As I said in my remarks markets are key here, not just international markets but regional markets and markets within country. Without access to the markets as Ranking Member Smith mentioned the farmers, even if they had the increased productivity have no way to sell their product and their produce.

We think that this increase in trade, and increase in market availability and access is crucial so that they can increase not only their sales but increase the amount of revenue that they get out of those sales. As I mentioned, we have to be able to connect the farmers to those markets, and sometimes those are across borders. We can't just focus on a country, and that is why we have taken a regional approach to this and the international approach.

We all know the example of the Rwandan coffee farmers who now sell their coffee to Starbucks. That is nice, that is good, but I would like to see it developed on a local basis and a regional basis as well so that we can increase the productivity and the sales to the market structures in Africa itself.

Mr. PAYNE. Thank you. There has been a discussion about the MCA, and as you know MCA is country specific and in some of our hearings even from one of the organizations in Africa, COMESA,

it was suggested that a regional approach might be something that should be considered. Regional compacts are not a part of the current MCA program.

As you look at this whole food assistance question and some of the things you have mentioned what is your opinion on the possibility of MCA going beyond country specific compacts to include a regional compact?

Mr. HESS. Since MCA does not work in a vacuum—we work with them, we work very closely with them in terms of implementing programs throughout Africa, and because we coordinate very closely with them and because we believe in working on a regional basis as well I would submit that if MCA worked in isolation and did not work closely with us in terms of implementing these programs we would have a problem.

By virtue of the fact that we work through organizations such as COMESA obviously that is important for a regional approach and alleviating food insecurity. I think by coordinating better between USAID and MCA, which we are already doing, I think we can achieve the same result.

Mr. PAYNE. All right. My final question, several months ago there was an article in the *New York Times* talking about the breakdown of universities in Africa and the fact that the system needs a tremendous amount of support and improvement. At one time many decades ago the universities in Africa that would specialize. The university in Uganda was the best in the continent in terms of training physicians and the people would go there. Other countries had universities that would have the engineering programs, et cetera.

I just wonder, as you know here in the United States, our farmers benefit from assistance provided by colleges and universities which engage in every sort of research imaginable from how to improve input to how to increase the number of crops per year to how to make marginal lands arable and reliable for productive work. Let me just ask, is USAID funding programs aimed at building the capacity of African universities to do the same?

Secondly, what type of programs do USAID support that are specifically focused on training Africans in the area of agricultural development, agronomy and other highly technical fields that would increase the capacity at the country level to carry out development activities?

Mr. HESS. Obviously, as I mentioned earlier the holistic approach that we are looking at, it is not just food and security and delivery of food and food aid as you suggested in your opening remarks. This has to be a holistic approach, and the education and universities play a large role in that. We have worked very closely with Cornell University and other land grant colleges. We work with Michigan State University, and Mali in particular and Cornell University.

We used them in Uganda when there were problems with—the product is slipping out of my mind. I am having a mature moment.

Mr. PAYNE. I can appreciate that.

Mr. HESS. The banana and the cabasa, the root crops. Cassava. Thank you. It is mature moments.

Mr. PAYNE. Yes.

Mr. HESS. We worked very closely with Cornell and other universities to work with local institutions in Africa and universities so that they can develop these disease resistant strains and also drought resistant strains so that we can increase that capacity because if we don't increase the capacity you are absolutely right, we won't get there. So those are just a few examples of how we have worked through land grant colleges to help rebuild those universities. You are right, it has to be done there.

Mr. PAYNE. Thank you very much. Mr. Smith.

Mr. SMITH OF NEW JERSEY. Thank you very much, Mr. Chairman. Mr. Hess, the President's Initiative to End Hunger in Africa was launched approximately 5 years ago. Is there an evaluation as to its effectiveness? Has it resulted in additional resources being allocated to Ag developmental systems in Africa? My second question deals with and really follows-up on the chairman's question with regards to higher education.

Both Don Payne and I come from New Jersey and probably one of the most effective agricultural colleges that I have ever known is Rutgers. They do an enormous amount of work. They have increased the possibility of farmers—after all, we are the Garden State. Notwithstanding what some people may think from viewing *Saturday Night Live*, we do have an enormous amount of Ag in the State of New Jersey, and Rutgers is critical to that development.

Peter McPherson, the former USAID director during the Reagan administration who I knew very well when he served in that capacity, points out in his testimony that we have become increasingly concerned that the role of higher education is not fully appreciated in the present development of the environment.

He says we are troubled that the present level of emphasis on higher education will not support or sustain a new mission statement of USAID which is, "helping to build and sustain Democratic well-governed states," and then he goes on from there. The point is, has there been a diminution of that kind of support for higher education like Rutgers? There are a number of examples that you provide in your testimony where resources are directed to developing human capital and institution, but is that enough?

It would seem to me that the professors and the experiments that can be had, the Green Revolution which Peter McPherson makes mention of in his testimony or it might have been in yours, the bottom line is that criticism accurate from Mr. McPherson? Those two questions to begin.

Mr. HESS. Yes, sir. I will start with the first one on IEHA and the ability to focus the administration's resources. By going through IEHA, for example, we focus on five of the first 12 CAADP countries, and so we are able to focus resources. We also focus resources on two other what we consider hungry hotspots, Malawi and Niger. As you know, Niger runs a chronic malnutrition rate of around 13.4 percent which is right on the edge of an emergency threshold of 15 percent, and so we focus on Niger, Malawi.

We also focus as I mentioned the five of the first 12 CAADP countries, Kenya, Uganda, Zambia, Ghana and Mali. So as you can see, through this effort we are focusing our resources on those countries where we think: 1) CAADP is taking hold; and 2) where

there is also what we call hunger hotspots. So IEHA has helped us to do that. Now, getting to higher education.

Obviously, I believe in the higher education. I come from Oklahoma. My father went to Oklahoma A&M, now Oklahoma State, another land grant college. I submit the best one in the country, but that is my father, and my son went there, too, but you know, I will have to concede to our good friend, Peter McPherson, back here. Is it enough? It is never enough. I think we can do more, and we are focusing on that.

We are focusing on increasing our technical resources and abilities within USAID to work with those land grant colleges so that we can build the capacities as I said to Chairman Payne within the local universities within Africa itself, and I think that is the critical point. We can't do this for them. We have to give them the capacity and the capability to do it themselves and that is what we are focusing on.

I am sure Peter wants us to give more, but we are working on that as well.

Mr. SMITH OF NEW JERSEY. Let me ask you, thank you, with regards to your statement that since 1998 USAID has provided an estimated $1.35 billion in DA not including food for peace development food aid to support African agricultural development you mentioned earlier about how you are working in a collaborative way with the Millennium Challenge Corporation and I am wondering how well, and I am sure it is well, but if you could elaborate on it, you work with your own office dealing with microcredit, which obviously for many of the smaller farmers that small loan can make all the difference in the world.

Mr. HESS. That is an excellent point, sir. I sit here as the head of a bureau, but as you know there are three bureaus within USAID that focus on these issues, our Economic Growth and Agricultural Trade Bureau, our Africa Bureau itself and obviously us on DCHA, so I am just a tip of an iceberg so to speak. A very large tip, but a tip nonetheless. That is key because when you look at the holistic, for example, in governance we have to think about issues like land tenure.

I didn't address it. I addressed it in the written testimony but not in my oral one. If we don't address land tenure issues from a governance perspective, if we don't address these cross-border trade issues from a governance perspective, and Africa Bureau worked very hard on that, then we won't succeed. Our Economic Growth and Agriculture, our Trade Bureau works very closely on market development, microfinance, microcredit issues at the same time.

That is what I was referring to very elusively on the holistic approach. We can't just focus on one aspect of this; it has to be a holistic approach. It also involves water. As the chairman mentioned, water is critical here. WHO estimates that 80 percent of the children die from water borne diseases. So water, and clean water, and keeping the water clean and using the water is critical to this as well, and that is what I mean about a holistic approach. That is why we work together across the board on this.

Mr. SMITH OF NEW JERSEY. One final question. You point out, and you might want to elaborate on this because it is a good news story, that in Uganda the share of population living in poverty de-

creased from 56 percent in 1992 to 31 percent in 2005, and you point out how important the food issue is to that. Can I ask you if you would to speak to that issue, but also, the issue of organic farming, what it is they are doing vis-à-vis pesticides and the like?

We have a number of issues in the United States and a lot of us are concerned about the food chain. We know that mercury in fish and its relation as thimerosal in immunizations and the huge spike that we have seen in things like autism are attributable in part to genetic predisposition but also to the contaminants. I am wondering how vigilant we are, and this is again where the universities come in and so much of the expertise to ensuring that the food is as pristine as it could possibly be in addition to being plentiful and available.

Mr. HESS. Right. That is obviously very key, and Uganda is a good success story in it, and there again we worked very closely with Cornell University in terms of developing and looking at their biotech future development.

Biotech is not a bad word obviously in this context because we do look at the organic naturally grown, but if we can use the biotech to increase productivity such as we did in Uganda where we can tell that success story, certainly in the western part of Uganda where we are seeing the rise out of it, but obviously, we focus very clearly on making sure that as much of this is organic and clean as possible because that is how we sustain growth for the future.

Mr. SMITH OF NEW JERSEY. Okay. Thank you. Thank you, Mr. Chairman.

Mr. PAYNE. Thank you very much. Ms. Watson.

Ms. WATSON. Thank you so much, Mr. Chairman, and thank you, Mr. Hess, for being here with us on this panel. So I would like to hear your views on the potential of specialty crops to contribute to African agricultural development. Recently, Starbucks reached an agreement with the Government of Ethiopia to respect Ethiopia's effort to trademark their fine coffees.

Congressman Honda and myself were leaning on Starbucks to work the Ethiopians, and I am glad they eventually saw the value of that approach. Now, are you familiar with what is going on there, and what do you think will be the legacy of this agreement and can it be a model for other countries in Africa?

Mr. HESS. I think these are critical because as I mentioned on the markets it is not enough just to be able to produce more, you have to have the markets in which to sell this. Obviously, if we can get to companies like Starbucks and they can sell the Rwandan model where the farmers now no longer live in poverty because they are able to sell their coffee through Starbucks, I can't afford it but others can, then that is fine, and that is great.

I think we have to do a little bit more than that, and that is why I think we have to focus not on just the international markets. These are excellent. It does a number of things. One, it increases the standards among and within Ethiopian farmers so that they know that they have to produce a certain standard and quality of a commodity, coffee, maize, sorghum, wheat.

When they understand that, when it is up to that level to be acceptable for international trade as Congressman Smith points out

that it is better for their own people as well. When we can commoditize that and do that on a regular basis then we have more access to international markets. I will submit to you we can have better regional trade as well. If you look at issues of trading with other countries in the region and some barriers that have existed if we had the standards then we could increase that local marketplace as well.

I think that is a key when we are working with the World Food Program, I think as you know, to increase the standardization so that they can buy more commodities on the local market, and that is an important step to reinforce that.

Ms. WATSON. In defense of Ethiopia and maybe Kenya their coffee bean were the best. I used to bring them back way back in the 1980s when I visited there. I think that they were discovered by Starbucks, and Starbucks has made a fortune. There are two Starbucks in the same block in one part of my district, so they are doing quite well, there is a tremendous out there for the product, and I am concerned about what then benefits.

It is not that the standard was not there when they found that coffee bean, it was there, so I have to not go along with you on raising, the standard was there. What was concern to me is that the share of the profits weren't proportional and they weren't I think equal or justifiable. So I am hoping now that what they have been able to agree upon will be the model.

Certainly I know about other areas where the standards of growing certain crops haven't been up, but I do know they had an outstanding coffee bean in Ethiopia and an outstanding coffee bean in Kenya before Starbucks came as a major corporation utilizing benefiting.

Mr. HESS. I apologize if I misspoke there.

Ms. WATSON. Okay. I understand.

Mr. HESS. It is not that the standard didn't exist; it is being able to articulate that standard and what the standard is to the marketplace. Unless the marketplace understands that product is up to that level then we have got to educate both the market and the buyers at the same time. Your point on the share of profits is critical, and that is where I think the technology that we are using in SMS messaging, for example, on commodity prices for marketplaces is critical.

Farmers get taken advantage of in many places around the world because they do not have good market information. The more we work on these SMS texting products so that farmers can understand where the best prices are and where we can bring them together in cooperatives, and this is another function that our Economic Growth and Agriculture Trade Bureau works on, is to eliminate that middleman so that farmers can come together and get the best possible prices, and they get the benefit as opposed to the middleman.

Ms. WATSON. Yes. I would hope that USAID would focus on assisting these countries and the farmers, the poorer ones, in how to do business in the global market, because you use the word advantage, they get exploited, and not only in agriculture but in their minerals and so on. Just an example, it spreads across from agriculture into other resources. We were in a little small kingdom

called Mafikeng, which is part of South Africa, within South Africa, and there was a platinum mine discovered.

The Queen Mother, I told my group that she was sending her young people abroad to learn the technology and the skills to mining the platinum so they could build a new town, new homes, new villages for their people. That is coming into the new world in a big way. She just happened to have a son, who is now the King, husband died, who was educated in the West and very familiar with how—she goes to Wall Street.

So I am just saying, we need to assist them more in the technical skills that they need, and I know that USAID is aware of that, and so I really would hope that we would do more in that regard. Let me move on, and then I will yield back whatever time I have left, Mr. Chairman. I just wanted one more.

What priorities does the USAID accord to agricultural development assistance in Africa, and this is in response to the example I just laid out, and what effort is USAID making to raise the priority given to agricultural development in various other countries of Africa?

Mr. HESS. That is a very good point, ma'am, and in our foreign assistance process as you know the budget allocation, which we are currently going through for the 2009 budget cycle, agricultural development is in a number of the program areas and subprogram areas, so independently it has gotten the increased visibility that it needs through the budgeting cycle. I think this is critical because if it is not in those program areas and subprogram areas they were not necessarily on a holistic basis getting the recognition they needed.

I think by giving them the emphasis that they get on the program area and subprogram area that gives them that foothold in the budget process. I think we are recognizing that more and more.

Ms. WATSON. I want to thank you very much and I want to thank the chair, too. The staff has done an outstanding job in giving us some of the data on countries that are really literally starving because they can't feed their people, and so we have a lot of work to do. I do know that USAID contributes greatly to it.

I know your overhead in some places is very high, but I hope that we can balance that with providing the kind of information that will help these countries feed their own people and help these countries benefit from their own resources because I think, Mr. Chairman, that the continent of Africa will be our focal point in the next 10 years because they have all the resources needed to sustain our needs in the West for hundreds of years.

Thank you so much, and I yield back if I have anymore time.

Mr. PAYNE. Thank you very much. Ms. Woolsey.

Ms. WOOLSEY. Thank you, Mr. Chairman, and thank you, Mr. Hess. Congresswoman Watson is a perfect lead in to me regarding overhead. A GAO report recently shows that transportation and business costs represent 65 percent of the total U.S. emergency food aid, which of course is not food to the people. In the rise of these costs it is contributed to a 52 percent decline in average tonnage delivered over the last 5 years.

Is this flattening out? What are we doing about it? What can we do about it?

Mr. HESS. Obviously, the transportation costs; we don't have much flexibility in that regard. We are looking for that increased flexibility in terms of local purchase options which the administration has put forward even in the current version of the Farm Bill where we are asking to be able to produce or to buy commodities locally up to 25 percent. That obviously cuts down on that transportation cost considerably.

With rising fuel prices that is not going to go anyway but up. Certainly commodity prices have been going up as well. We have seen a four fold increase in commodity prices. That certainly reduces the amount that we can buy with the same amount of money obviously, but we think if we have the increased flexibility of the local purchase that will help alleviate some of that problem and get us more commodities delivered to where they are needed.

Ms. WOOLSEY. Well, how difficult is it to move the product locally from area to area?

Mr. HESS. Well, for example, right now we have a drought going on in southern Africa. At the same time we are having some parts of southern Africa where we could be buying commodities. Malawi right now has a surplus in maize, and we could be purchasing there and using local transportation. It is not going to be a total wash, but obviously it is going to be a lot less than it is coming from the United States, so we could have some assistance there.

Two years ago when we have a similar situation we had an excess capacity in South Africa, about 1 million tons of maize was excess, but we were shipping it from the United States So we could save some money there.

Ms. WOOLSEY. How about the transportation routes? I mean, are they in place? Would that be a good way to give locals a way to earn money, and are we investing that?

Mr. HESS. Absolutely. Well, we are certainly looking at that, and obviously, that is the increased need for that flexibility. As Congressman Smith pointed out infrastructure is not always as robust as we would like to see it in Africa, but it does exist, and there are truckers there, and I would rather see them get the money and being able to then go out into the markets and buy as well.

So there is a trade off there, but if we can do it at the local level we can save a fair amount of money.

Ms. WOOLSEY. There is a CRS report that we have in our packet that shows sub-Saharan African cereal yield per hectare to be 11,000 something and fertilizer consumption being 138, 139 grams per hectare and it is the lowest, the fertilizer per hectare, of any. Is that because of good practices or is it because of lack of ability to pay for fertilizer, and is that a direct relationship to less per hectare in yield?

Mr. HESS. Certainly increasing uses of fertilizer and increased productivity are important. We have programs that are ongoing in a number of countries so that when you do seed distribution we are also doing fertilizer distribution. Part of it is an educational process, part of it is availability, and in some countries they subsidize fertilizer distribution as well as seeds.

So when you combine all of these, and that is where I get into holistic approach to this, governments can play a role in this just as they did in this country years ago and still do. So I think, you

know, that is why we have to look at this as a holistic basis. Fertilizer is important. It is education, it is availability and it is making sure that governments were reasonable, and Malawi is a good example of it, help in the distribution of fertilizers. Key to productivity.

Ms. WOOLSEY. And that it is used wisely.

Mr. HESS. Absolutely.

Ms. WOOLSEY. There is that, too. All right. Thank you, Mr. Chairman. Thank you, Mr. Hess.

Mr. HESS. Yes, ma'am.

Mr. PAYNE. Well, thank you very much. I know that USAID had done some studies on the impact of subsidies United States farmers on the agriculture in Africa, so I wonder if you could make that available to us.

Mr. HESS. Yes, sir.

Mr. PAYNE. There is a lot of concern. Of course, you are not in the Department of Agriculture, but many of us have concerns about some subsidies. One of my staffers, Noelle Lusane, visited Mali with OXFAM several years ago. Subsidies make the products in Africa, as I mentioned before. And the current farm bill really doesn't do much for U.S. minorities either.

African-Americans, and Hispanics, and Asian-Americans, and Native Americas receive few or practically no benefits from the U.S. Farm Program when compared to others. According to the new OXFAM study producers of color are effectively shut out of U.S. farm programs due to the program's design that favors large scale commodity growers and large landlords.

Once again, let me thank you for your work for the United States in your previous capacity and what you are doing today. Thank you very much.

Mr. HESS. Thank you, sir.

Mr. PAYNE. Just one other question. Does USAID provide any financial aid to African universities to do their own work with agriculture and so forth?

Mr. HESS. I would have to get back to you on that, sir. I will have to check with our education people. That is a different bureau. I will get back to you on the record for that to get the specific answer.

[The information referred to follows:]

WRITTEN RESPONSE RECEIVED FROM THE HONORABLE MICHAEL E. HESS TO QUESTION ASKED DURING THE HEARING BY THE HONORABLE DONALD M. PAYNE

USAID has had 20 U.S.-African higher education country partnerships in Africa from 1998 through the present. The focus of the work has been in agriculture and the intent of the work has been to involve African higher education institutions in joint work to achieve agriculture objectives and simultaneously strengthen African higher education institutions.

Mr. PAYNE. Thank you very much. All right. Thank you. We will now have the second panel come forward. We will be joined by two distinguished private panel witnesses today, Mr. Peter McPherson and Dr. Calestous Juma. Mr. McPherson is president of the National Association of State Universities and Land-Grant Colleges, a public university association. Mr. McPherson is the founding co-chair of the Partnership to Cut Hunger and Poverty in Africa, and also the chair of the IFDC and Harvest Plus.

He was Administrator for USAID from 1981 to 1987, and in that role was responsible for leading the United States efforts to respond to the devastating famine that occurred in the Horn of Africa in 1984 and 1985. Prior to his time with USAID he was a Special Assistant to President Gerald Ford in the White House.

Our second panelist is Dr. Calestous Juma, a Kenyan national. Dr. Juma is professor of the Practice of International Development and Director of Science, Technology and Globalization Projects at Harvard University's Kennedy School of Government. He is a former executive secretary of the United Nations Convention on Biology Diversity, founding director of the Africa Center for Technology Studies in Nairobi and is currently on the Board of Directors of EARTH University in Costa Rica.

Dr. Juma is co-chair of the Africa High-Level Panel on Modern Biotechnology of the Africa Union and the New Partnership for Africa's Development, NEPAD. He has been elected to several scientific and academic academies including the Royal Society of London, the Royal Academy of Engineering, the U.S. National Academy of Sciences and the Academy of Sciences for the Developing World.

We certainly look forward to our witnesses, and we will start with you, Mr. McPherson.

STATEMENT OF PETER MCPHERSON, J.D., PRESIDENT, THE NATIONAL ASSOCIATION OF STATE UNIVERSITIES AND LAND-GRANT COLLEGES

Mr. MCPHERSON. Thank you, Mr. Chairman. First of all, Mr. Chairman, it is good to be with you all.

Mr. PAYNE. Push that little button there.

Mr. MCPHERSON. Congressman Smith has asked me questions many times in this room, and I am glad to be back to have the opportunity to talk with you. I very much appreciate this committee's putting a focus on agriculture. Agriculture tends to go in and out of style, but in fact in much of Africa with such a dominant rural population history tells us that if you are going to make real progress you have got to have increased food production in such countries.

We forget that periodically, and frankly, almost in a bipartisan manner both Congress and administrations have over now some 15 years, it has gradually been crowded out by other things. That work needs to be not just food, it needs to be long-term work in agriculture, and that means a set of things. I agree with the former testifier that you must have a holistic approach, but it has to be whole.

There are some things which we frankly have just neglected. You take the structure of your last question, Mr. Chairman, about work with the universities in Africa to build them. There is virtually none of that today. Historically, it was a big part of what we do. It needs to be the African universities driving their own structure. A lot more work is now going into K–12 with USAID budgets, but you can't build a nation on high school graduates alone.

The training, it is interesting, in the mid-1980s we were bringing to this country, Congressman Watson talked about this a moment ago, lots of people, about 15,000 on the average a year, last year

it was 1,000. We have almost gotten out of the business of training people in the United States from abroad through the USAID Program. Those people, Africans and others, need to create technology.

You mentioned the Green Revolution, Mr. Chairman. It is that and it is more. When you look at the history of civilization over the last generations, and I think even longer, technology has been a principal driver of real economic change, some other things sometimes, but real economic change. So you have got to look at the university structure, the training of people, the technology, creation, and they all sort of reinforce each other.

Now, USAID in all fairness has really moved away from that effort. I was struck by the written testimony of Mr. Hess, who I have known for some time. We were in Iraq together for a bit. He is a brave, good public servant, but in his testimony it didn't mention research as the priority areas of problems. USAID really has moved away from these efforts. Congress in some ways has moved away from these efforts over now some time.

I want to go back and make a basic point. While I think these are important things to do they are important particularly if Africans want them. When I think of the way assistance was run 25 years ago there wasn't nearly the sensitivity for perhaps a lot of reasons of what we really know, that African countries' leaders, people, need to drive what they are going to do.

Conditionality didn't work very well, persuasion. It needs to be them. That is why the MCC concept has some real value. Ask them. Incidentally, the MCC process has almost uniformly produced big agricultural requests, much, much bigger than the USAID allocations. It is like trying to tell the states or are communities just how they should do it. I mean, we expect to be asked out there, don't we?

These are smart, confident—when you look at countries that have really made progress in recent years in Africa it is countries that took charge of their own future, Ghana, Uganda, Mali, Mozambique. Well, there is a lot that we can do here. Mr. Chairman, you mentioned the CRSP Program which is an excellent example. Not the only research we should do but certainly very important, training and so forth.

I know our time is short, and Dr. Juma has much to say, but I think if we are going to really change things in terms of our assistance program, one, the Agency has to decide with you that they are going to put a lot more emphasis on long-term agriculture work. I see some of my former colleagues here. I have enormous affection for the dedication of these folks, so this is no way a criticism of the individuals as far as how the institution has come about.

I think part of what might be that effort to get it done is I really believe there needs to be some structural changes within USAID where the university really is an advocate and a driver for this set of issues, of building universities, of training, of research. The university community in this country stands ready. It is a tiny part of university budgets like Michigan State.

You know, I had an outside research budget of $350 million, competitive bid, USAID, was just a couple million, but there are people there that really want to do this. Mr. Chairman, members, it is good to be here.

[The prepared statement of Mr. McPherson follows:]

PREPARED STATEMENT OF PETER MCPHERSON, J.D., PRESIDENT, THE NATIONAL ASSOCIATION OF STATE UNIVERSITIES AND LAND-GRANT COLLEGES

INTRODUCTION:

Mr. Chairman, and distinguished Members of the Committee, thank you for inviting me to speak to you about "Food Security in Africa: the Impact of Agricultural Development."

Africa has been a challenge for the development community. As Administrator of USAID in the 1980s, I was engaged in these issues and as President of Michigan State University, an institution with a rich history of development work in Africa, I continued my interest and concern about African development. In that position I actively engaged a wide array of stakeholders to form The Partnership to Cut Hunger and Poverty in Africa. The Partnership was formed in 2000 to formulate a vision, strategy, and action plan to significantly increase public and private investment in African economic development and to increase the effectiveness of U.S. assistance to strengthen African agricultural and rural development. Now as president of NASULGC, an association of the largest US public universities with a long and distinguished history of development work in Africa, I am deeply engaged in discussions concerning the role of higher education in development in Africa with growing concern about the declining roles of agriculture and higher education in the U.S. government development portfolio.

Mr. Chairman I want to thank you personally for your support on a number of issues regarding food aid, the African Growth and Opportunity Act, and trade. Both the House and the Senate have provided strong report language in the State, Foreign Relations and Related Agencies Appropriations Bill that stresses the importance of agriculture in the development process. This year's World Development Report focuses on agriculture's critical role in development, particularly in Africa. My testimony today emphasizes these points and argues that to develop agriculture we must produce new knowledge, science and technology and to create and sustain that production we need to assist Africa in building human and institutional capacity that are fundamental to any advances in production, marketing and trade.

KEY POINTS OF THE TESTIMONY:

- Agriculture is a critical component of the lives and the economies of Africa. It is imperative that the development community appreciate its role. While funding has diminished over the last 15–20 years, there are some signs of renewed interest.
- Agricultural development is fundamental to any broad-based economic development on the continent and agriculture has been shown to produce more equitable growth in personal income than other forms of development. Generating and extending research, knowledge and technology, building African human capacity to conduct research and supporting the capacity of institutions to produce creative and productive people is essential to the process.
- U.S. universities have a long history of development successes and have played a major role in developing such human and institutional capacity and generating new technologies, both home and abroad. While higher education provides the greatest opportunity for economic growth, the USG development funding has not focused on strengthening higher education in Africa.
- Faced with the retirement and loss of a generation of African scientists (many trained at U.S. universities), we ask for support to devote resources to partner with African institutions to build their capacity and assist them to train the next generation of Africa scientists and scholars. For the past 30 years these resources were provided through a vibrant Title XII (Famine Prevention And Freedom From Hunger Improvement Act of 2000), the CRSP programs and CGIAR; all of which have been or are slated for major funding cuts.

SUPPORT FOR HIGHER EDUCATION IN DEVELOPMENT IN AFRICA

We have become increasingly concerned that the role of higher education is not fully appreciated in the present development environment. The recent 2005 USAID *Education Strategy: Improving Lives through Learning* places strong emphasis on basic education but scantly mentions or recognizes the higher education's role in international development. As an association representing the major public universities that have a long and deep commitment to the development of less-developed countries, we are troubled that the present level of emphasis on higher education

will not support nor sustain the new mission statement of USAID: "helping to build and sustain democratic well governed states that will respond to the needs of their people and conduct themselves responsibly in the international system."

Much greater support for basic education exists in Congress and the development community than for higher education. Based on very limited work in the late 1970s, basic education was found to have a higher rate of return than higher education. Donors focused on those studies to promote basic education. No doubt basic education is critical for development but, as opposed to competing with higher education, the development portfolio should be a balanced continuum of opportunity that allows the best and brightest to succeed. In an information world with a global economy, higher education is critical to developing businesses, negotiating treaties and contracts, and creating the stability that is necessary for comprehensive national development. The university community needs to participate in a coordinated effort to make this point with Congress, USAID and the MCC.

Unfortunately donor support for higher education degree training has waned dramatically over the last decade. USAID's efforts in this regard have diminished substantially. The Agency has gone from training more than 15,000 students who earned higher education degrees in the early 1990s to less than 1,000 today. Many African countries struggle to maintain even low enrollment levels, and the academic research output in the region is among the world's lowest.

We strongly support basic education as fundamental to development and the rates of return of those investments are solid. Still most people understand that a country cannot build a competitive economy in the 21st century on 8th grade or high school education alone. "Higher education produces the entrepreneurs, the creative thinkers, the business leaders that generate economic growth and turn poor countries into prosperous ones. Tertiary education exercises a direct influence on national productivity which largely determines living standards and a country's ability to compete in the globalization process." [1]

In summary, Africa faces a multitude of challenges that will affect how successful development efforts will be. Clearly, agriculture is key to making that development successful. Successful agricultural development is most directly achieved through investment in human and institutional capacity that will generate the knowledge, technologies and leaders to eradicate famine and food shortages, and build economies that support stable and democratic societies in Africa. NASULGC and the Partnership stand ready to assist you in this critical process.

We need to reengage the power of our U.S. land-Grant institutions to assist Africa to build its higher education and research institutions and train another generation of scientists and academic to lead a green revolution for Africa. We ask the subcommittee to reconsider revitalizing Title XII, creating new linkage programs that build African human and institutional capacity and to recognize and advocate for the role of higher education as a vital component of development strategy for Africa.

AFRICAN AGRICULTURE AND IT CHALLENGES.

Livelihoods in Sub-Saharan Africa (SSA) are heavily linked to agriculture and agrarian livelihoods. Approximately 45.2 percent of the region's population is located in areas of low density, with 70 to 80 percent of the total labor force employed in the agricultural sector. Agriculture in SSA contributes about 35 percent of the total GDP of southern Africa, and approximately 30 percent of the region's foreign exchange earnings.[2] The heavy reliance on agriculture for livelihoods underscores the necessity for gains in agricultural improvements in production and efficiency. The state of agriculture in SSA is severely affected by climatic, agro-ecological, natural resource, input, and labor constraints. While inadequate rainfall and poor quality soils are the primary production constraints, high rates of evapotranspiration, high transport costs, lack of access to fertilizers, and access to technology further reduce yield potential. While food production has increased in SSA, it has done so mainly by bringing marginal lands into cultivation. However there are notable successes such as Mali, Ghana and Mozambique where improved policies, new varieties and technologies have improved lives and economies significantly.

In addition, "most Africans live in the subhumid or arid tropics, with few rivers to provide irrigation and a lack of the large alluvial plains typical of much of South and East Asia that permit cheap irrigation. As a result, Africa has the lowest share

[1] World Bank 2002. Constructing Knowledge Societies: New Challenges for Tertiary Education. World Bank, Washington, D.C.

[2] Abalu, G and R. Hassan, 1999 Agricultural productivity and natural resource use in southern Africa *Food Policy*, Vol. 23, No. 6, pp. 477–490, 1998

of irrigated cropland of any major region of the developing world."[3] Thus, despite the appearance of abundant land, many parts of SSA are fast approaching the limits to sustainable agricultural production from existing resources. In addition, as natural resources on arable land are gradually depleted, population growth is gradually increasing, causing per capita food production to decline in almost all of the countries in southern Africa.[4]

Due to limits on agricultural productivity and the relative geographic isolation of the large percentage of the SSA population, food insecurity is especially prevalent. "Sub-Saharan Africa accounts for 13 percent of the population and 25 percent of the undernourished people in the developing world. It is the developing region with the highest proportion-one-third-of people suffering from chronic hunger."[5] In order to address chronic hunger, improve food security, and enhance rural livelihoods, investments in agricultural development are essential.

WHY IS AGRICULTURE AN IMPORTANT FOCUS FOR ECONOMIC DEVELOPMENT AND HUMAN WELFARE IN AFRICA?

The classical and widely held model of development projects that agricultural production increases reduce the cost of food. Since food is a major component of the cost of living for the poor and agricultural is a substantial part of most rural Africans' lives, this increase in efficiency has a broad impact. It reduces poverty for the majority, frees up capital to be spent in other sectors of the economy, and because greater efficiencies reduce labor demands in agriculture, it provides labor for growth in non-agricultural sectors.

In a broad review of African development, a recent International Food Policy Research Institute (IFPRI) study[6] shows that agriculture is truly an important engine of growth for Africa. While its role may vary among countries depending on a diversity of conditions, agriculture is an especially strong force in poverty reduction, because it affects the rural poor who are a large component of the poor of Africa. The study concludes "most African countries cannot significantly reduce poverty, increase per capita incomes, and transform into modern economies without focusing on agricultural development." This conclusion is similar to that of another study[7] of a broad range of developing countries that found that increasing agricultural productivity is the most efficient way to reduce poverty and inequality.

Yet another study[8] of 62 developing countries demonstrates the power of agricultural development to increase national economic growth. The study shows that changes in agricultural productivity explained 54 percent of the growth in GDP per worker and that this increased efficiency, released labor from agriculture to other sectors that accounted for another 29 percent of the GDP growth. The remaining 17 percent of GDP growth is from non-agricultural increases.

Agriculture does not just grow economies it measurably improves human lives. A secure and diverse food supply increases child survival, improves cognitive and physical development of children and increases immune system function, including resistance to HIV/AIDS (a secure food supply also has an impact on the trajectory of this and other diseases). This linkage is aptly noted in the House report language as, "Food and nutrition are important components of a comprehensive approach to HIV/AIDS." The institutional barriers created within funding agencies that prevent critical linkages among agriculture, food and human health and development often frustrate us.

The importance of food can not be underestimated. In a recent study[9] in Kenya, children who received 2 oz of meat on school days (2/3 of the calendar days) preformed 20 percent higher on intelligence scores and achieved an increase of a grade-and-a-half higher in school. Think of the implications of that impact on creative capacity to compete in a knowledge based world when integrated to the national level; then think of the costs on chronic malnutrition to a national economy not only in lost potential but health care costs, lost productivity and wasted lives.

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[3] Sachs et al. 2004 Ending Africa's Poverty Trap Brookings Papers on Economic Activity, 1:2004: 117.

[4] Abalu and Hassan, 1999

[5] FAO SOFI, 2006 The State of Food Insecurity in the World 2006).

[6] Diao et al. 2006. The role of development: implications for Sub-Saharan Africa. DSGD Discussion Paper No. 29, IFPRI, Washington, D.C.

[7] Bourguignon, F., and Morrisson, C. 1998. "Inequality and Development: The Role of Dualism," Journal of Development Economics, 57(2), 233–258.

[8] Gollin, D., Parente, S., and Rogerson, R. 2002. "The Role of Agriculture in Development," American Economic Review, 92(2): 160–164.

[9] Demment, M and L. Allen 2003. Animal Source Foods to improve micronutrient nutrition and human function in developing countries. J. Nutrition 133 No 11s–11 (Special Volume).

WHAT MAKES AGRICULTURAL PRODUCTIVITY INCREASE AND HOW DOES IT AFFECT FOOD SECURITY?

Perhaps the most important revolution of the 20th century was a peaceful and a green one at that. Dr. Norman Borlaug used advanced breeding techniques to redesign the wheat plant and make it considerably more productive, more adaptive to wide range of environments and more disease resistance (funded by USAID, Rockefeller and Ford Foundations). Dr. Borlaug received the Congressional Medal of Honor for his work. Part of Borlaug's genius was his complete dedication to build human capacity in science that both advanced his vision more rapidly and left a sustainable research capacity for developing countries. It is when research, human and institutional capacity are wed that science can generate solutions to human problems and it is when those elements are present in developing countries that we see major advances like those that Borlaug generated. Due to Borlaug, the post war famines of the Asia were extinguished in the early 1970s. For this effort Borlaug received the Noble Peace Prize in 1970.

Food security is achieved by addressing a wide range of constraints. Some of these constraints are more obvious than others and more amenable to our development approaches. While connection to markets, trade policy and other components of what is termed an "enabling environment" are important elements to national development they will depend on two factors. First and foremost, they depend on well-trained, visionary indigenous people to design, implement and support them. In short, highly educated human capital is essential.

Second, we need to increase agricultural productivity. Most of the recent gains in agricultural production in Africa have resulted from expanding the area of land cultivated and not increasing the production per unit of land area. The implications are not just a decline in per acre production efficiency but a use of more marginal land with ever increasing negative impacts on the natural resource base. Increases in efficiency per acre are the result of improved technologies and access to inputs. The sustainable way to increase efficiencies is to create Africa capacity to generate new technologies; that is build the human capacity and build the institutions that generate that capacity—the universities and the agricultural research institutes. We need to make such investments. Evidence from rural Uganda indicates that public investments in agricultural R&D had the highest impact on poverty reduction of development investments throughout the 1990s.[10] In addition to financial resources, agricultural innovation requires human capital and, therefore, sustaining and improving upon advances in agricultural R&D requires concurrent investments in general education.[11]

HOW DOES RESEARCH AND HIGHER EDUCATION CONTRIBUTE?

If increases in agricultural productivity are essential to broad-based economic growth and those are largely dependent on the generation of new technologies, then what supports this development? We would argue that all of the following are critical: increased human creativity; capable institutions that generate new knowledge and technologies and transfer the information to the farmers and produce the human capacity; and valuable linkages to partner institutions to help facilitate that development.

1. *Higher education builds human capital* at a level that is necessary to compete in a global economy. Global economic engagement requires sophisticated business knowledge, the ability to meet international standards of quality, negotiate appropriate agreements, craft complex financial mechanisms, understand and interpret the rules of engagement and to be both entrepreneurial and competent. Increased human capacity to conduct these endeavors will facilitate greater participation in global markets for the poor countries of the world. These are the job creators for all the basic education graduates being produced with the laudable emphasis on basic education.

2. Just as human capital is necessary to conduct business, it is critical to *build and maintain the institutions* that generate new knowledge and technology, establish and maintain standards, create laws, and conduct business in ways that resemble U.S. and international norms. Well-trained people create and sustain functional institutions that promote good economies and support good governance. Of USAID's 40-year investment in higher education degree training an outside review concluded:

[10] Fan, S., Zhang, X., and Rao, N. 2004. "Public Expenditure, Growth and Poverty Reduction in Rural Uganda." Development Strategy and Governance Discussion Paper No.4, IFPRI: Washington, DC.

[11] Hayami, Y. and Ruttan, V. 1985. Agricultural Development: An International Perspective. Baltimore, Maryland: Johns Hopkins University Press.

"Change at the institutional level of this magnitude is unusual in human resources and training programs and testifies to the extraordinary impact the ATLAS/AFGRAD programs had in Africa." [12]

3. *Higher Education and research institutes generate knowledge* that has economic impact, particularly in agriculture. In a study [13] of more than 1,800 rates of return to research in agriculture the median of the rate of return estimates was 48 percent per year for research, 62.9 percent for extension studies, 37 percent for studies that combined research and extension jointly, and 44.3 percent for all studies combined; a profitable investment by any standards but particularly so for a developing country.

4. In a USAID commissioned evaluation of more than 3,000 African higher education trainees educated in U.S. universities, supported by USAID, the evaluators found that the training had a marked effect on the *impact of individuals*, in building stronger institutions, and had a lasting impact on economic development and social contributions.[14] The experience of training in the United States had numerous benefits beyond the technical skills acquired. A number of positive aspects of efficiency and views of democracy were associated with links to an American education.

Investing in higher education in developing countries is a critical component to long-term economic growth and stability, and crucial to agricultural development and poverty reduction. Investments in tertiary education promote "technological catch-up," allowing countries to gain ground on more technologically advanced societies and maximize economic output. To illustrate the economic growth potential of tertiary education on GDP, a one-year increase in tertiary education stock would raise steady-state levels of African GDP per capita by 12.2 percent due to factor inputs, potentially boosting incomes by 3 percent after five years, a significant feat considering the trend towards decreasing incomes in some African countries.[15]

In developed countries this effect has been well measured. According to the U.S. Census Bureau, high school graduates earn an average of $1.2 million, associate's degree holders earn about $1.6 million, and bachelor's degree holders earn about $2.1 million, over an adults working life.[16] In the United States, average rates of return on investment for post-secondary education increased from 5.6 percent in 1979 to 9.1 percent in 2004, consistent with average international rates of return across nine countries estimated at 9 percent.[17] The increases in rates of return likely reflect the increasing importance of education in a technology-knowledge based global economy.

Perhaps the greatest contribution of higher education, however, is manifested in the indirect benefits to society. Based on a Carnegie Institute report,[18] post-secondary education influences individual behavior, encouraging more open-minded, cultured, rational, and consistent individuals with less authoritarian tendencies. In addition, university enrollment has demonstrated a tendency to decrease prejudice, improve knowledge of global affairs, and improve social status. These benefits are in turn passed along to succeeding generations. Leadership training provides countries with talented individuals able to establish policy environments favorable to growth and sustainability. The promotion of education and literacy also encourages a social environment with an increased capacity for tolerance and understanding, and diminished tendencies towards prejudice and misconception, constructing a well-informed society with the ability to think critically and objectively, establishing

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[12] Aguirre International 2004.

[13] Alston et al. 2000. A Meta analysis of rates of return of agricultural R&D. IFPRI Research Report 113, Washington, DC.

[14] Aguirre International under the Global Evaluation and Monitoring IQC, Contract FAO–I–00–99–00010–00, Task Order 13. 2004. Generations of Quiet Progress: The Development Impact of U.S. Long-Term University Training on Africa from 1963 to 2003: An evidence-based impact assessment of the value obtained from major investments in graduate education for 3,219 African professionals by USAID and its partners in the ATLAS and AFGRAD program.

[15] Bloom, D., Canning, D., and Chan K. (2006). Higher Education and Economic Development in Africa. World Bank Human Development Sector, Africa. [On-line]. Available:http://www.sciencedev.net/Docs/Higher%20Education%20and%20economic%20developmnet.pdf

[16] Day, J.C., & Newburger, E.C. (2002). The Big Payoff: Educational Attainment and Synthetic Estimates of Work-Life Earnings. (Current Population Reports, Special Studies, P23–210). Washington, DC: Commerce Dept., Economics and Statistics Administration, Census Bureau. [On-Line]. Available: http://www.census.gov/prod/2002pubs/p23–210.pdf

[17] Hamermesh, Daniel (2005). Four Questions on the Labor Economics of Higher Education. Secretary of Education's Commission on the Future of Higher Education. [On-Line]. Available: http://www.ed.gov/searchResults.jhtml

[18] Rowley, L.L., & Hurtado, S. (2002). The Non-Monetary Benefits of an Undergraduate Education. University of Michigan: Center for the Study of Higher and Postsecondary Education.

the foundation for democracy: a critical component of developing a more secure and stable world.

WHAT HAVE U.S. LAND-GRANT INSTITUTIONS DONE FOR DEVELOPMENT IN THE PAST?

The USAID dual training/capacity-building model was initiated in the early fifties and provided global leadership until the 1980s.[19] Four early capacity-building experiences chronicle the success of this model:

- *Philippines:* Cornell University (with U.S. funding) helped elevate the college of agriculture at Los Banos in the Philippines to form the University of the Philippines Los Banos (UPLB) (Turk 1974). Today, UPLB is an important regional graduate training center in agriculture for many students from Asia.
- *India:* USAID assisted India in developing a new university model called the State Agricultural University Model (Read 1974; Lele & Goldsmith 1989). Currently, 31 State Agricultural Universities serve India. India's National Agricultural Research System has approximately 25,000 agricultural scientists in government and universities, representing 8,000 person-years of scientific talent.
- *Ethiopia:* From 1952 to 1968, Oklahoma State University, with USAID funding, assisted in building a productive College of Agriculture. Later, the College was upgraded to become Alemaya University of Agriculture. Today, Alemaya University is a household name in Ethiopia. The USAID mission in Addis Ababa recently awarded a $10 million contract to Virginia Tech, Cornell University, Virginia State and ACDI–VOCA (an NGO) to strengthen research and extension in the Amhara administrative region.
- *Brazil:* In 1963, the government made a political decision to build a human capital base for a modern agriculture. With USAID financing, four American land-grant universities spent a decade assisting four Brazilian universities in strengthening B.Sc.-level training in Brazil, followed by another four years of support for postgraduate education (Sanders, et al 1989). In 1972, the government established EMBRAPA (Brazilian National Agricultural Research Corporation) to coordinate its national research program. EMBRAPA launched a massive human capital program and spent 20 percent of its total budget from 1974 to 1982 on training programs in Brazil and abroad. In fact, in the late 1970s and 1980s, EMBRAPA had an average of more than 300 researchers enrolled each year in postgraduate training programs. Today, one-third of EMBRAPA scientists have a Ph.D. degree, half have an M.Sc. degree, and the balance has a B.Sc. (Beinetma, et al, 1998).

This major effort has been the basis for substantial improvements in developing countries capacities and their development. Without these individuals and their institutions, development certainly would be impaired.

U.S. SUPPORT FOR AFRICAN AGRICULTURAL DEVELOPMENT LAGS OVERALL.

The trends in agricultural funding at USAID have not been encouraging. The long-term trends show agriculture not keeping pace with other funding objectives and certainly not consistent with the problems of African food production. When African countries are allowed to design their portfolios with the Millennium Challenge Corporation (MCC) they choose agriculture. But that funding is not enough to tackle the problem nor is much designated for human or institutional capacity building nor research. In USAID research and higher education will be increasingly marginalized with the new organizational structure that proposes to reduce the Development Assistance Account moving funds to the Economic Support Funds. As you know, the DA account funds much of the central bureaus' activity that supports most of our few remaining university projects under Title XII (Famine Prevention And Freedom From Hunger Improvement Act of 2000). These research and human capacity building programs (such as the Collaborative Research Support Programs, the CRSPs) are slated for 30 percent cuts next year. The other major agricultural research program, the Consultative Group on International Agricultural Research (CGIAR), has lost ground as well. From a high of $46 million in 1986 funding has declined to$25 million in 2006. Long-term degree training, once the pride of USAID's development

[19] In 1963, 72 universities in the United States were performing training and technical assistance tasks under 129 different contracts with USAID (Gardner, John W. 1964. *AID and The Universities*. New York: Education and World Affairs). The Gardner report recommended that a new unit be established within USAID to deal with education and human resources and universities and foundations.

portfolio has declined by 95 percent. At one point in the 1960s U.S. land-Grant institutions had more than 70 partnership programs with developing country institutions of higher education.

The distinct role of agriculture in the development of Africa is both recognized and heavily supported by African institutions and political leadership. In July 2003, following the endorsement of the Comprehensive African Agriculture Development Programme developed by the New Partnership for Africa's Development (NEPAD), African heads of state pledged to allocate 10 percent of national budgetary resources to the Programme's implementation based on conclusions that "agriculture led development is fundamental to cutting hunger, reducing poverty . . . agriculture must be the engine for overall economic growth in Africa."[20] Indeed, the role of agriculture in development programs is regaining popularity, as evidenced by the inclusion of agricultural development initiatives in the Millennium Development Goals, poverty reduction strategy papers, and its emphasis in the Rome Declaration on World Food Security.[21]

However, despite the apparent resurrection of agriculture as a catalyst for overall economic growth and poverty reduction, recent trends in bilateral aid contradict policy gains and concessions aimed at agricultural investment and development. According to an extensive analysis by Taylor and Howard[22] overall U.S. support for agricultural development in Africa has not increased significantly since 2000, despite efforts by USAID to focus more available development resources on agriculture-related projects. While USAID support for agriculture-related programming actually increased by 9 percent (adjusted for inflation), the increase was offset by absolute declines in funding through other channels. Indeed, even within the USAID Bureau of Africa channel, the largest channel for agricultural development assistance in the Agency, "the amount of funds available for that purpose [agricultural development] grew by only 7% from FY2000 to FY2004, from $284 million to $304 million, which means a 3% decrease in real terms after adjusting for inflation." Increases in another source of USAID funding for agricultural development within the Initiative to End Hunger in Africa (IEHA), came from the reallocation of funds from within the Africa DA account, rather than from any real increase.

Taylor and Howard further characterize the discrepancy between USAID objectives and aid:

> *Most of USAID's gains occurred in one year (from FY2002 to FY2003), and there was an absolute decline in estimated funding for African agriculture by USAID and the U.S. government as a whole in 2004. A central constraint for USAID is that although it has placed agriculture at the center of its economic development strategy for Africa, the level of appropriated money available to support such development declined in real terms between 2000 and 2004 (Taylor and Howard, 2005).*

STATEMENT OF CALESTOUS JUMA, PH.D., PROFESSOR, HARVARD UNIVERSITY

Mr. PAYNE. Thank you very much. Dr. Juma.

Mr. JUMA. Thank you, Mr. Chairman, Ranking Member, and members of the committee. I am very pleased to have this opportunity to be here to share with you some of the thinking that is taking place in Africa at the moment. In the last couple of years I have had the privilege of working very close with African Union, but also with individual African Presidents, and so I thought maybe the best way to share this experience is to summarize them with a focus on a very few critical areas that I think are important.

First, the African countries are currently redefining fundamentally their economic policies to place science and technology at the center of the development process. This is reflected both in the de-

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[20] New Partnership for Africa's Development (NEPAD). 2004. "Infrastructure Short-Term Action Plan (STAP): Review of Implementation Progress and the Way Forward." Johannesburg. Available at www.nepadst.org/publications/ docs/doc12__032004.pdf.

[21] FAO 1996. Rome Declaration on World Food Security. Rome, Italy. Nov. 13. http://www.fao.org/wfs/index__en.htm

[22] Taylor, M and J. Howard. 2005.Investing in Africa's Future: U.S. Agricultural development Assistance for Sub-Saharan Africa. Partnership to Cut Hunger and Poverty in Africa. Washington, D.C.

cisions of the African Union, but also in the actions of individual Presidents across the continent. This transformation of the economic policies is shaping the way these countries are choosing their friends and allies.

I can give some examples of that later on. What is particularly interesting in this transformation is the recognition of institutions of higher learning, particularly universities, as being central to the process of economic development.

One of the key obstacles that these countries are facing at the moment is the fact that the model of higher education that prevails across the continent has separated research, training and extension in the different institutions, and as a consequence they are in fact not in a position to do or say for agriculture what this country has done using the land grant model.

What is also interesting is seeing them experiment with similar approaches in countries like Rwanda that have essentially invented new universities that look like the United States land grant institutions. What is reassuring for us is the recognition that the United States in fact has previously worked with other countries, particularly Costa Rica, and I am thinking of EARTH University as an example where I serve on the board, where USAID working with Kellogg Foundation in fact helped to adapt the land grant model to the Costa Rican conditions.

I think it would be very helpful to see the United States engage with Africa using that same kind of approach. I would like to propose at least four areas where I think this cooperation could be advanced. The first is in the area of regional cooperation. Most African countries are starting to work closely together in groups of countries, and this is going to be the model for the future.

I think that if the United States continues to work only with individual countries it could render itself irrelevant to the emerging trends of regional partnership among African countries. Secondly, there are significant efforts within government to reorganize the structure of cabinets, for example, so that they can reflect the importance of innovation in developments.

Again, this is an area that I think could offer new opportunities for partnership between the United States and African countries. Entirely the area of realigning the missions and the structures of university to reflect community development essentially to bring institutions of higher learning to serve community needs which is essentially the perimatic role of the land grant model applied both in agriculture but also in other sectors like industry and environmental conservation.

Finally, areas of partnership on specific technology missions. I have in mind, for example, the area of power technology in which this country is a leader, that this could represent a new opportunity for strong partnerships between the United States and the African countries. Just in closing I think most of us are aware of the growing interest and the strengthening of relations between Africa and the Chinese Government, Africa and China.

It is remarkable to note the differences in the character of cooperation between Africa and China. Last year there were 2,000 African students in Chinese universities, mostly in the sciences and the engineering fields. China plans to double this number, this an-

nual intake, to 4,000 students a year by 2009. I think this change to me represents in fact the fact that Africa is starting to pick its allies based on their ability to contribute to the continent's interest in placing science and technology at the center of the development process.

I hope that we can have some serious discussions around this really if you like transformative policies among African countries on the way they deal with economic growth. Thank you very much, Mr. Chairman and the committee, for giving me an opportunity to share these experiences with you.

[The prepared statement of Mr. Juma follows:]

PREPARED STATEMENT OF CALESTOUS JUMA, PH.D., PROFESSOR, HARVARD UNIVERSITY

SUMMARY

This year marks the 300th anniversary of the birth of Carl Linnaeus, renowned as the father of taxonomy. Less known are his lifelong efforts to find permanent solutions to the persistent famines in Sweden. Linnaeus drew attention to the economic value of living things: "each country produces something especially useful." He argued, however, for the importance of reason and scientific knowledge for sustainable economies. Three hundred years later, Sweden is among the wealthiest nations on Earth and famines are the subject only of history lessons.

Efforts to promote food security in sub-Saharan Africa must remember the lessons of Sweden: (a) "food security" is inseparable from economic development. Rich countries do not starve; (b) science and innovation are a necessary part of economic development and so of "food security"; and (c) universities in most countries are engines of development and must be so in Africa as well. International cooperation is critical for promoting the adoption of new agricultural technologies such as biotechnology. It is especially regrettable, then, that international agricultural assistance to Africa has been reduced in recent years. This disengagement in turn has weakened cooperation between the US and Africa on strategic economic issues.

African heads of state and the African Union are currently working toward agricultural improvement in particular and economic development in general. Both the tone of policy discussions and the evident results (6% per year growth for the last five years, resulting in a doubling of GDP in sub-Saharan Africa) are cause for optimism. Africa's newfound dynamism offers the opportunity for the US to cooperate in economic initiatives and help bring Africa into the global knowledge economy. Cooperation in agricultural development is one obvious starting point.

Cooperation with the US could involve four key areas. First, special attention needs to be placed on promoting regional integration among Africa states so they can diversify their economic activities beyond local markets. Although increasing food production throughout sub-Saharan Africa is obviously important, lack of regional integration is what makes crop failures so deadly in Africa: although food is produced elsewhere, bad roads mean that transported food is unaffordable, inadequate, spoiled or simply unavailable.

Second is building skills on how to *govern the economy*. Many African countries are reorganizing their state structures to make them more *entrepreneurial* so that government can be responsive to the needs of the people and act as a champion of innovation. The US could help strengthen the capacity of African states to build necessary infrastructure, to train future generations of leaders, businesspeople, and scientists, and to generate and use science and innovation advice for economic development.

A third key area of cooperation is *reforming existing African universities and supporting the creation of new models of higher education*. The US has a long history of sharing its experiences in using universities as engines of regional and community development. For example, it supported a pioneering adaptation of the land-grant model in Costa Rica by helping to create EARTH University in Costa Rica, the first dedicated sustainable development university in the world. The US can help African universities by (a) revamping university infrastructure and missions, especially by providing affordable access to information and telecommunications; (b) reforming curricula to make them more applied and relevant to local needs; (c) making teaching more experiential and promoting exchanges of teachers, students, and researchers; (d) helping universities adopt appropriate management practices including university autonomy.

Finally, the US and Africa should to forge long-term cooperation in advancing specific *technology missions*. Prime candidate is the application of biological innovations in areas such as agriculture, health, industry and environment. These efforts should be supported by additional funding that is devoted to promoting agricultural science and innovation cooperation.

INTRODUCTION [1]

It is often stated that sub-Saharan Africa continues to suffer from food insecurity because it was bypassed by the "Green Revolution." [2] It is concluded from such statements that an African Green Revolution is needed to help enhance Africa's food security. While some elements of the Green Revolution are essential for addressing Africa's agricultural challenges, food security is not a function of agricultural production alone.[3] "Food security" is a term that covers critical attributes of food such as sufficiency, reliability, quality, safety, timeliness and other aspects of food necessary for healthy and thriving populations. It is therefore intricately linked to economic health.[4]

This testimony outlines the critical linkages between food security, agricultural development and economic growth and explains why Africa has lagged behind the agriculture of other countries. It argues that improving Africa's agricultural performance will require deliberate policy efforts to improve higher technical education, especially in universities, and bring it to the service of agriculture and the economy. It concludes by providing a set of options for strengthening agricultural cooperation between the US and Africa.

1. FOOD SECURITY, AGRICULTURE AND ECONOMY

Food security in Africa has worsened since the early 1970s. Food availability has failed to keep up with the growing population, as reflected in the rise of the absolute number of undernourished people. Between 1990–92 and 2001–03, the number of undernourished people in Africa rose from 169 million to 206 million. Of the 39 countries for which data were available, only 15 reported reductions in the number of undernourished people.[5] The situation is projected to worsen if current policies continue. These trends could be reversed through a variety of measures addressing rural development in general and agriculture in particular.[6]

Agriculture is central to African economies, making up 30–50% of national income, employing nearly 60% of the population and generating about 40% of its foreign exchange earnings. But policymakers often treat agriculture as a separate sector with little regard to its relationship with the rest of the economy.[7] A more realistic view is to treat economies as integrated "systems of innovation" where new actors and institutions constantly are being created, changed, and adapted to suit the dynamics of scientific and technological creation. Government, the private sector, institutions of higher learning such as universities, and civil society organizations are important parts of a larger system of knowledge and interactions that allows diverse

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[1] I am grateful to colleagues at Iowa State University, particularly Professor John Pesek, for helping to develop many of the ideas contained in this testimony. I want to thank Professor Elisabeth Moyer (Department of Geophysical Sciences at the University of Chicago) for her valuable contributions.

[2] The term "Africa" is used herein to mean "sub-Saharan Africa."

[3] This is clearly articulated in InterAcademy Council. 2004. *Realizing the Promise and Potential of African Agriculture*. InterAcademy Council, Amsterdam.

[4] These connections were graphically captured by UK Prime Minister Gordon Brown: "When I visited Africa . . . I saw not only the potential and promise of economic and social growth in Africa but also mothers paid only λ5 a week begging for free education for their children, supporters of AIDS orphans asking only that they have free healthcare, and men and women everywhere with a yearning that their growing political and constitutional rights now be matched by economic and social opportunities. We know that despite increased aid, trade and debt relief, coupled with improvements in economic growth and governance in Africa, those opportunities will not be realised unless and until the foundations of economic growth—sustained investment, innovation, education, skills, science and technology—are in place and built on over the long term," Brown, G. "Foreword," in Juma, C. 2005. *Going for Growth: Science, Technology and Innovation in Africa*, Smith Institute, London, p. 5.

[5] FAO. 2006. *The State of Food Insecurity in the World 2006*. Food and Agriculture Organization of the United Nations, Rome, pp. 23.

[6] Thomas, G. 2005. "Innovation, Agricultural Growth and Poverty Reduction," in Juma, C., ed. *Going for Growth: Science, Technology and Innovation in Africa*. The Smith Institute, London, pp. 74–85.

[7] Omamo, S. and Lynam, J. 2003. "Agricultural Science and Technology Policy in Africa," *Research Policy*, Vol. 32, pp. 1681–1694.

actors to come together to pursue broad common goals, including agricultural innovation.

In many African countries, the state still plays a key role in undertaking productive activities. But the private sector is increasingly becoming an important player in adapting existing knowledge and applying it to new areas. This in turn is changing the role of the government, making it largely a facilitator of economic change. Democratic change and elections have helped to bring to power new leaders who are pressing for improvements in public sector performance. They are often at odds with their own bureaucracies that are still steeped in old practices.

Africa's food security can only be guaranteed through long-term economic growth, not by emergency interventions alone. This shift in policy will entail placing emphasis on renewing infrastructure, building human capabilities, stimulating business development, and increasing participation in the global economy through export of manufactured goods. These areas that constitute what can be called "the learning economy" should be the foundation upon which to base international development partnerships.

This view is already informing the reformulation of Africa's foreign policy. African countries are increasingly paying attention to the role of science and innovation in diplomatic interactions and are already starting to assign technology-related tasks to their key missions to countries such as the US and Japan. Others are revising their foreign policies to make economic cooperation a centerpiece of their diplomatic interactions. Part of Africa's growing cooperation with China, for example, is influenced by the higher technical education opportunities granted to African students. In 2006 China admitted nearly 2,000 African students, mostly in science and engineering. The number of African students admitted to Chinese university will double by 2009 and the long-term diplomatic benefits of such arrangements are immeasurable.

This approach is justified by the historical evidence from other developing countries. The main explanation for the success of the industrialized countries was their ability to learn how to improve performance in a diversity of social, economic and political fields: their focus on practical knowledge and the associated improvements in skills needed to solve problems. At least three key factors contributed to their rapid economic transformation. First, governments invested significantly in *basic infrastructure* and more efficiently providing infrastructure services.[8] Secondly, they created and nurtured the development of *small and medium-sized enterprises* (SMEs) through a network of incentives and support systems.[9] And thirdly, governments supported, funded and promoted *institutions of higher technical learning*, as well as academies of engineering and technological sciences, professional engineering and technological associations, and industrial and trade associations.[10] These are discussed below. Africa's economic growth will likely follow the same path.

Basic infrastructure

Infrastructure is defined as the facilities, structures and associated equipment and services that facilitate the flow of goods and services among individuals, firms and governments. Conventional infrastructure includes: public utilities, such as power, telecommunications, water supply, sanitation and sewerage, and waste disposal; public works, such as irrigation systems, schools, housing and hospitals; the transport sectors such as roads, railways, ports, waterways and airports; and research facilities, such as laboratories and related equipment.

Poor infrastructure in Africa is a critical barrier to economic growth and improvement of human welfare in general and agricultural improvement in particular.[11] In Uganda, for example, transport costs add the equivalent of an 80% tax on clothing exports. Transport costs directly contribute to food crises by hindering the shipment of food between regions. Infrastructure is also critical in investment decisions. Farmers will not plant crops if there is no way to get them to market. Agri-

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[8] Juma, C. 2006. *Redesigning African Economies: The Role of Engineering in International Development*. 2006 Hinton Lecture, Royal Academy of Engineering, London.

[9] Juma, C. and Lee, Y–C. Lead Authors. 2005. *Innovation: Applying Knowledge in Development*. UN Millennium Project Task Force on Science, Technology and Innovation. Earthscan, London, pp. 100–118.

[10] Juma, C. 2006. *Reinventing African Economies: Technological Innovation and the Sustainability Transition*. 6th John Pesek Colloquium on Sustainable Agriculture, Iowa State University, Ames, Iowa, USA.

[11] Studies have shown that "apart from traditional variables (income, assets, education, and direct health interventions), better access to basic infrastructure services has an important role to play in improving child-health outcomes," Fay, M., Leipziger, M., Wodon, Q. and Yepes, T. 2005. "Achieving Child-Health-Related Millennium Development Goals: The Role of Infrastructure," *World Development*, Vol. 33, No. 8, p. 1267.

businesses will not invest if there is no cost-effective way to transport produce to markets. More broadly, infrastructure is essential for the delivery of health and education services, creation of employment and dissemination of knowledge.

Telecommunications infrastructure is an area of particular concern for Africa. Investments in basic telecommunications infrastructure have allowed the rapid diffusion of information technology in recent years: for example, rates of cellular telephone and Internet usage are exploding among people of all income levels. Electronic information systems, which rely on this infrastructure, now account for a substantial proportion of production and distribution activities in the secondary and tertiary sectors of the economy. But investment could be still larger, and high telecommunications costs are at present a substantial drag on economic growth. High costs have also hindered education, training, and the use of advances in fields such as geographical information sciences in sustainable development.

One of the main challenges in African higher education is the isolation of campuses and training facilities. University textbooks are often decades out of date and students have little access to more recent information: road travel is difficult and slow, air travel expensive; and Internet connections are prohibitively expensive. It is not possible to spread information about available agricultural practices when it can cost a day's wages for an African student to log on at an Internet café to download a paper or brochure. Most students have no Internet access at all through their universities. African universities of the size of the University of California Berkeley or the University of Texas at Austin have the Internet capability of a single US household.[12] They do not buy more capacity because even this limited connection can cost up to $15,000 per month.[13] A digitally-isolated Africa cannot effectively educate its students or provide adequate post-graduate training.

In much of Africa, communications prices are far higher than the cost of infrastructure warrants. Africa (other than South Africa) is currently linked to the developed world by a single fiber-optic cable down the West Africa coast. It is the most digitally-isolated region on the globe. Even so, that single cable is still underutilized. That cable is operated as a monopoly, and the owners (a consortium of Africa and foreign, including US companies) have set bandwidth prices so high that most users connect via satellite instead. Bandwidth in much of Africa is sold for prices 40–100 times higher than in the US although operating expenses are not significantly different. Monopoly firms have adopted a "high cost, low volume" business strategy. The vast majority of potential Internet usage is cut off and usage is restricted to those who can afford stratospheric rates. Paradoxically, this makes free information a very expensive resource. The curbing of the monopolies in Africa is a necessary step in its economic development.

Energy is another area that stalls Africa's agricultural development and economic growth. The continent has abundant new and renewable energy resources—hydropower, geothermal, biomass, solar, and in some countries, wind potential. Africa accounts for only about 5% of world primary energy demand and this is unevenly distributed. Only about 36% of the population has access to electricity and most of this is in urban areas. Nearly 80% of the continent's rural population has no access to electricity. The majority of these people rely on traditional biomass such as wood and agricultural residues as their main energy source with far-reaching ecological implications.

Much of the discussion about Africa's energy situation focuses on trends in supply and demand and their environmental implications. What is often ignored is the importance of technological innovation associated with energy use which can be a springboard for technology used to tackle wider conservation challenges. Discussions should be placed in the context of using technological innovation to boost the transition to sustainability.

Geothermal energy is a good example. Using existing technology, Eastern Africa (Djibouti, Eritrea, Ethiopia, Kenya, Tanzania, Uganda, and Zambia) has the potential to generate over 2,500 MW of electricity from geothermal energy (out of the current global output of 8,100 MW). Geothermal energy production involves building capacity in a wide range of fields including ecology, chemistry, geology, engineering and electronics. The expertise needed is similar to that needed for natural resource management. Building geothermal energy capacity can therefore go hand in hand with efforts to meet longer term sustainable development as well as sustainable energy targets. Many have invoked the need for a Marshall Plan for Africa. An even more appropriate metaphor is President Franklin D. Roosevelt's New Deal that fo-

[12] The effectiveness of those internet connections is more or less as one can imagine if 30,000 people all try to share a single household connection.

[13] Scaled to mean national income in Africa, that is the equivalent of nearly $1 million per month.

cused on providing low-cost infrastructure services. African universities need a telecommunications New Deal now just like farmers need one on low-cost energy and roads.

Small and medium-sized enterprises

The development of small and medium-sized enterprises (SMEs) has been an integral part of the development of all industrialized economies. This holds true in Africa. Building these enterprises requires development of pools of capital for investment, of local operational, repair and maintenance expertise, and of a regulatory environment that allows small business to flourish. Africa must review its incentive structures to promote these objectives, and the international community must promote investment in African businesses.[14]

A range of policy measures are needed to create and sustain enterprises—from taxation regimes and market-based instruments to consumption policies and changes in the national system of innovation. Policy-makers also need to ensure that educational systems provide adequate technical training. They need to support agribusiness and technology incubators, export processing zones and production networks as well as sharpening the associated skills through agribusiness education. The US can help in all these avenues.

Banks and financial institutions also play key roles in fostering technological innovation and supporting investment in homegrown domestic businesses. Unfortunately, their record in promoting technological innovation in Africa has been poor. Capital markets have played a critical role in creating SMEs in other developed countries. Venture capitalists not only bring money to the table, they also help groom small and medium-sized start-ups into successful enterprises. Venture capital in Africa, however, barely exists outside of South Africa and needs to be introduced and nurtured.

Institutions of higher technical learning

Industrialized countries have supported, funded and promoted institutions of higher technical learning, as well as academies of engineering and technology, professional engineering and technological associations, and industrial and trade associations. Higher technical education is increasingly (and belatedly) being recognized as critical for development.[15] While primary education has been the focus of the donor community for decades, secondary and higher education and research are now beginning to gain policy attention.

Primary education is not unimportant: economic and educational data suggest near-universal primary education is necessary for economic development, it is not sufficient: countries with high primary enrollments can still be quite poor. National per capita income is instead remarkably well correlated with enrollment rates in higher education. Africa has both the lowest income and the lowest mean university enrollment in the world. No rich country other than Switzerland has university enrollment below 50%. Mean enrollments in Africa are close to 5%. For Africa to advance, this must change.

The urgency of investing in higher technical education is compounded by several factors. Increased primary and secondary enrollments have created a generation of students eager for university training but barred from it by the lack of facilities. The impact of HIV/AIDS and other infectious diseases has also struck hard at Africa's university graduates, affecting Africa's economic growth in general and agricultural development in particular.[16]

Finally expansion of women's access to higher technical education is also important, not only for equality and social justice but for the practical purpose of changing social attitudes and preparing the next generation to adapt to changing world

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[14] Pragnell, M. 2006. "Agriculture, Business and Development," *International Journal of Technology and Globalisation*, Vol. 2, Nos. 3/4, pp. 289–299.

[15] The 8th Summit of the African Union adopted far-reaching decisions on science and technology at its January 2007 session in Addis Ababa. The presidents committed themselves to "Encourage more African youth to take up studies in science, technology and engineering, and invite Member States to pay special attention to the teaching of science and technology," African Union. 2007. *Addis Ababa Declaration on Science, Technology and Scientific Research for Development*. Assembly of the African Union, Eight Ordinary Session, African Union, Addis Ababa. They also pledged to ensure "the enhanced role and the revitalization of African universities and other African institutions of higher education as well as scientific research institutions so that they can play an effective role as loci of science, technology and engineering education and development and also contribute to public understanding of science and technology," *Ibid.*

[16] Corrigan, P., Glomm, G. and Mendez, F. 2005. "AIDS Crisis and Growth," *Journal of Development Economics*, Vol. 77, pp. 107–124; Misselhorn, A. 2005. "What Drives Food Insecurity in Southern Africa? A Meta-analysis of Household Economy Studies," *Global Environmental Change*, Vol. 15, pp. 33–43.

conditions.[17] But if universities are already oversubscribed and overcrowded, adding more female students cannot happen without investment in building additional facilities.

In the industrialized world, research and higher education are a valuable resource for business, industry, and society. Higher education and research institutions are integrated into the production sector and into society in many ways. They conduct research and development for industry; create their own spin-off firms; are involved in capital formation projects, such as technology parks and agribusiness incubator facilities; introduce entrepreneurial training; and encourage students to transform research into enterprises. African universities should follow suit and play their role.

Most African countries already possess the key institutional components they need to become players in the knowledge economy. But the separation between government, industry and academia is a source of inertia and waste in Africa's knowledge-based institutions.[18] Africa's economic growth depends on bringing these together to increase the production of university graduates, give students training that meets the needs of the modern business world, and provide capital to help university graduates generate businesses and jobs.

2. LAGGING BEHIND

Interest in Africa's future is rising among donors and governments. This trend coincides with a new awakening of interest within international development agencies in the role of technological innovation in economic growth. But the two ideas have not been connected. Much of the discussion on Africa's development focuses on improving the lives of subsistence farmers. It only marginally addresses the need to harness the world's existing fund of knowledge for long-term development. Any long-term strategy for Africa must include assistance to its universities.

To function effectively as engines of development, universities and other institutions of higher learning in Africa must adapt and change, forging closer links with the private sector, training graduates for professional careers, and diffusing knowledge into the economy. In other words, they will need to become "developmental universities," working directly within the communities in which they are located The US, with its long tradition of entrepreneurial private universities and applied land-grant ones, can help with this transformation.

Hobbled talents

The main role of the original generation of African universities was to create civil servants. Unfortunately, this classical model has become the template within which new universities are created, even though social and economic needs have changed radically. The continent needs a new generation of universities that can serve as engines of both community development and social renewal.

The task ahead requires deliberate efforts by governments, academia, agribusiness and civil society to reorganize and redirect higher education and reorient it to serve all the African people. To achieve this, a qualitative change in the goals, functions and structure of the university is needed. As part of this process, fundamental reforms will be needed in curriculum design, teaching, location, selection of students and the management of universities. Laws governing higher education and universities will need to be overhauled and parliaments will need to play a bigger role in this regard. Courage and leadership will be essential because of the political nature of such reforms.

Curriculum reform is needed to create an adaptive generation of professionals.[19] South Africa's Stellenbosch University offers a shining example of how to adjust curricula to the needs of research and development (R&D) organizations. It was the first university in the world to design and launch an advanced micro-satellite as part of its training. The aim for the program was to build competence in new technologies in the fields of remote sensing, spacecraft control and earth sciences and to offer other services such as mailbox, speech and data relay experiments to the community. In Uganda, Makerere University has developed new teaching approaches that allow students to solve public health problems in their communities as part of their training. Similar approaches should be adopted by students in other technical fields such as infrastructure development and maintenance.

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[17] InterAcademy Council. 2006. *Women for Science*. InterAcademy Council, Amsterdam.

[18] Oyelaran-Oyeyinka, B. and Barclay, L. 2004. "Human Capital and Systems of Innovation in African Development," *African Development Review*, Vol. 16, No. 1, pp. 115–138.

[19] Coursework in most African universities is overly theoretical and lacks an applied focus. High school examinations, for example, are set to reflect the lack of laboratory facilities so there no incentives to spend more time in the laboratory. Similar disincentives prevail in universities.

Many of these examples are the result of isolated initiatives. The challenge is to move away from relying on luck and tenacity, and to create an environment that helps to realize the developmental role of universities. This must start with government policy. Little will happen unless governments realize the strategic role that universities can play in harnessing the world's fund of scientific and technological knowledge for development. It also, however, requires an infusion of funds and knowledge. International donor agencies in past years have supported the trend of cutting funding for African universities. Though this misguided attitude is changing, most of them are still reluctant to support alternative university models and they support is helping to entrench outmoded practices. They are doing Africa and themselves a disservice.

Slashed budgets

International donors started to cut back on international agricultural assistance in the 1980s. In 1980 the US was a leading international advocate for agricultural development assistance, with nearly 25% of official development assistance (ODA) going to this sector. A decade later the share had fallen to about six per cent of the total. By 2003 it stood at one per cent. Although this drop occurred at a time when overall US foreign assistance was rising in constant dollar terms, the net effect is still a dramatic decrease: between 1980 and 2003 total bilateral ODA increased by 69%, but agricultural aid dropped by 98%.

The cutting of agricultural development assistance in the US Agency for International Development (USAID) has been so thorough that the term "agriculture" is hardly used. The agency still has an agriculture office, but its total budget had dropped to just $27 million. The total US development assistance to agriculture from all USAID offices now stands at a mere $169 million, or 1% of the total ODA. This has significantly undercut the capacity of the US to be a serious diplomatic player in Africa where agriculture still remains a core economic activity.

Africa has lagged behind other regions of the world in agricultural development for two main reasons. First, its institutions of higher learning hardly played their role as promoters of agricultural innovation. They focused on producing functionaries for the civil service. Second, reductions in foreign agricultural assistance undermined the local research efforts as well as international university partnership. The challenge now is to forge a new partnership between the US and Africa that will bring new financial resources to enable US universities to team up with their African counterparts.

3. BUILDING CAPABILITIES FOR INNOVATION

The role of universities as vehicles of community development is exemplified by the US land-grant system, which led to the founding of 106 universities, including Colorado State, Rutgers, Texas A&M, and the entire University of California system.[20] The system not only played a key role in transforming rural America, but also offered the world a new model for bringing knowledge to support development. While the model largely is associated with agriculture, its adaptation to industry also occurred. Universities such as the Massachusetts Institute of Technology (MIT) and parts of Stanford University owe their heritage to the land grant system.[21]

The drift of the land grant model into other sectors is not limited to the US. Their central mission of bringing higher education to stimulate community development is practiced around the world in a variety of forms. African countries must look critically at these variants and adapt them to their conditions. These institutional adaptations are often faced with opposition from advocates of incumbent university models. Arguments against the model tend to focus on the claim that universities that devote their time to practical work are not academic enough. As a result a hierarchy exists that places such institutions either off or at the lower end of the academic ladder.

The US has played a key role in promoting agricultural development around the world. Its role in championing the Green Revolution is well-known. Less known, but probably more important for Africa, is its support to countries seeking to adapt the land-grant model to local conditions so that higher education can help to contribute to human welfare. The case of EARTH University in Costa Rica illustrates the importance of focusing on institutional innovation as a way to bring higher technical

[20] McDowell, G. 2001. *Land-Grant Universities and Extension into the 21st Century: Renegotiating or Abandoning a Social Contract*. Iowa State University Press, Ames, Iowa.

[21] Etzkowitz, H. 2003. "The Evolution of the Entrepreneurial University." *International Journal of Technology and Globalisation*, Vol. 1, No. 1, pp. 64–77.

education to bear on economic development in general and agriculture in particular.[22] Similar institutions or curricula could be introduced in Africa.

Supporting innovation in university education

EARTH University emerged in a context that mirrors today's Africa: economic stagnation, high unemployment, ecological decay, armed conflict. Inspired by the need for new attitudes and paradigms, EARTH University was created in 1990 as a non-profit, private, international university dedicated to sustainable agricultural education in the tropics. It was launched as a joint effort between the private and public sectors in the US and Costa Rica. The WK Kellogg Foundation provided the original grant for a feasibility study at the request by a group of Costa Rican visionaries.

Based on the study, USAID provided the initial funding for the institution. The original mission of the university was to train leaders with ethical values to contribute to the sustainable development of the humid tropics and to build a prosperous and just society. Through its academic, research and outreach programs, the university offers innovative solutions for improving the quality of life of the inhabitants of the humid tropics.

Located in the Atlantic lowlands of Costa Rica, EARTH University admits about 110 students a year and has a total student population of about 400 from 24 countries (mainly in Latin America and the Caribbean) and faculty from 22 countries. Through its endowment, the university provides all students with 50% of the cost of tuition, room and board. In addition, the university provides scholarships to promising young people of limited resources from remote and marginalized regions. Nearly 80% of the students receive full or partial scholarship support. All students live on campus for four intensive years.

EARTH University has developed an innovative, learner-centered and experiential academic program. Its educational process stresses the development of attitudes necessary for graduates to become effective agents of change. They learn to lead, identify with the community, care for the environment and be entrepreneurial. They are committed to life-long learning. There are four activities in particular within the curriculum that embodies EARTH University's experiential approach to learning.

Learning from work experience and community service

The first is the Work Experience activity, which is taken by all first, second, and third year students and continues in the fourth year as the Professional Experience course. In the first and second years, students work in crop, animal and forestry production modules on EARTH University's 3,300-hectare farm. In the first year, the work is largely a routine activity and the experience centers on the acquisition of basic skills, work habits and general knowledge and familiarity with production. In the second year, the focus changes to management strategies for these same activities.

Work Experience is later replaced with Professional Experience. In this course students identify work sites or activities on campus, which correspond with their career goals. The student is responsible for contacting the supervisors of the campus operations, requesting an interview, and soliciting "employment." Upon agreement, they develop a joint work plan which the student implements, dedicating a minimum of ten hours per week to the "job."

The second activity is an extension of the Work Experience course. Here third-year students work on an individual basis with small, local producers on their farms. They also come together in small groups under the Community Outreach program that is integral to the learning system. Community outreach is used to develop critical professional skills in students, while at the same time helping to improve the quality of life in nearby rural communities.

The third year internship program exemplifies the emphasis on experiential learning. The 15-week internship is required for all students in the third trimester of their third year of study. It is an opportunity for them to put into practice all they have learned during their first three years of study. For many of them it is also a chance to make connections that may lead to employment after graduation. The international character of the institution allows many students the opportunity to follow their interests, even when they lead to internship destinations other than in their home country.

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[22] Zaglul, J., Sherrard, D. and Juma, C. 2006. "Higher Education in Economic Transformation," *International Journal of Technology and Globalisation*, Vol. 2, Nos. 3/4, pp. 241–251.

Sharpening entrepreneurial skills

The fourth activity is the Entrepreneurial Projects Program. EARTH University's program promotes the participation of its graduates in the private sector as a critical means by which the institution can achieve its mission of contributing to the sustainable development of the tropics. The development of SMEs is a powerful way to create new employment and improve income distribution in rural communities. For this reason, the university stresses the development of an entrepreneurial spirit and skills. Courses in business administration and economics combined with practical experience prepare the students to engage in business ventures upon graduation.

This course provides students the opportunity to develop a business venture from beginning to end during their first three years at EARTH University. Small groups of 4–6 students from different countries decide on a relevant business activity. They conduct feasibility studies (including financial, social and environmental criteria), borrow money from the university and implement the venture. This includes marketing and selling the final product. After repaying their loan, with interest, the group shares the profits.

This entrepreneurial focus has permeated all aspects of the university's operations and prepared students to become job creators and agents of change rather than job seekers. About 17% of its 1,100 graduates run their own businesses. The university manages its own profitable agribusiness, which has resulted in strong relationships with the private sector.

When the university acquired its campus, it decided to continue operating the commercial banana farm located on the property. Upon taking over the farm, the university implemented a series of measures designed to promote more environmentally-sound and socially-responsible production approaches.

Going global

EARTH University has internationalized its operations. It signed an agreement with US-based Whole Foods Market as the sole distributor of bananas in their stores. The university sells nearly 600,000 boxes of bananas a year to Whole Foods Market, as well as mangoes and (through an alliance with a small farmers' cooperative) pineapples. This helps to generate new income for the university and for small farmers while providing an invaluable educational opportunity for the students and faculty. In addition to internships, students have access to Whole Foods Market's venture capital upon graduation. The university uses part of the income to fund sustainable and organic banana and pineapple production research.

The university has US supporters who raise additional funds through a private foundation. In June 2004 the family of the former Costa Rican President Daniel Oduber donated the La Flor farm to the university to be used to develop techniques to improve the quality of life in the Guanacaste area and the dry tropics of Latin America. EARTH University hopes to achieve its mission at La Flor by establishing world-class research and training that promotes entrepreneurship and contributes to the sustainable development of the tropics. As part of this effort, La Flor will host a Technological Center, a Green Conference Center, an Exhibition Center and a housing complex with the aim of contributing directly to the economic transformation of the region and Costa Rica.

Over the years the university has worked closely with African institutions and leaders to share its experiences. Following nearly seven years of study through workshops, discussions, training courses and site visits African participants agreed to the importance of reforms in their own university systems, especially through the creation of new universities along the lines of the EARTH model. This was undertaken through a series of workshops on Sustainability, Education and the Management of Change in the Tropics (SEMICT) funded by the WK Kellogg Foundation and the Norwegian Agency for Development Cooperation (NORAD). The lessons learned during the process provide fertile ground upon which new institutional ideas could grow.

The case of EARTH University is one of many examples around the world involving major collaborative efforts between the US and developing countries to bring scientific and technical knowledge to improve welfare through institutional innovations. Such experiences, and those of US land-grant universities, offer a rich fund of knowledge than should be harnessed for Africa's agricultural development and economic growth.

Facilitating regional economic integration

African countries have adopted numerous regional cooperation and integration arrangements, many of which are purely ornamental. The continent has more than 20 regional agreements that seek to promote cooperation and economic integration at sub-regional and continental levels. Of these, the African Union (AU) formally recognizes eight Regional Economic Communities (RECs).[23] These RECs represent a new economic governance system for Africa and should be strengthened.

While it is prudent for Africa to emphasize international trade, doing so requires greater investment in developing capabilities to trade, including technological innovation, development of business and human resources, and institutional strengthening. Regional integration is a better initial approach. Regional integration offers larger markets (which also stimulate technological innovation), economies of scale, and the diffusion of technical skills arising from infrastructure development.[24]

Another argument for African regional integration is the importance of engineering in sustainable development. Individual African economies are small and poorly endowed with the human, physical, and financial resources necessary to develop and harness engineering capabilities. The cost of building science and technology infrastructure often appears to be an overwhelming task for national economies, especially in smaller and poorer states. Pooled on a regional scale, however, resources and expertise may be sufficient.

Cooperation in engineering can take various forms, including joint projects, information sharing, conferences, building and sharing joint laboratories, setting common standards for research and development, and exchange of expertise. Furthermore, the sheer magnitude of the necessary infrastructure development actually requires regional cooperation in project design and implementation to not only reduce costs but also facilitate greater learning.

Some African countries, such as South Africa, are already endowed with robust science and technology infrastructure, which could easily be utilized by less well-equipped countries. New regional initiatives will need to emphasize the use of science and innovation in their sustainable development strategies.

The Common Market for Eastern and Southern Africa (COMESA) illustrates the importance of regional integration in Africa's economic development and food security. The 19-member free trade area was launched in 2000 and accounts for nearly half of Africa's population. It has a combined GDP of $200 billion and is the largest and most vibrant free trade area in Africa. COMESA aims to improve economic integration and business growth by standardizing customs procedures, reducing tariffs, encouraging investments and improving infrastructure. COMESA will launch its Customs Union on December 31, 2008 and has initiated work on a Common Investment Area to facilitate cross-border and foreign direct investment.[25]

The strength of the RECs lies in their diversity. Their objectives range from cooperation among neighboring states in narrow political and economic areas to the ambitious creation of political federations. They focus on improving efficiency, expanding the regional market, bolstering security and supporting the continent's integration into the global economy. Many of them are motivated by factors such as the small-size of the national economy, a landlocked position, or poor infrastructure. Those working on security, for example, can learn from the experiences of the Economic Community of West African States (ECOWAS), for example, a REC working on security, has considerable expertise on dealing with crises in countries such as Ivory Coast, Liberia and Sierra Leone. Nigeria has played a key role in providing regional leadership on this. Other RECs have more ambitions plans. The East African Community (EAC), for example, has developed a roadmap that includes the election of a federal president. Such institutions, though nascent, represent major innovations in Africa's economic and political governance and deserve the fullest support of the US.

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[23] These are: the Community of Sahel-Saharan States (CEN–SAD), Common Market for Eastern and Southern Africa (COMESA), Economic Community of Central African States (ECCAS), Economic Community of West African States (ECOWAS), Intergovernmental Authority for Development (IGAD), Southern African Development Community (SADC), Union du Maghreb Arabe (UMA), and the East African Community (EAC).

[24] Murenzi, R. and Hughes, M. 2006. "Building a Prosperous Global Knowledge Economy in Africa: Rwanda as a Case Study," *International Journal of Technology and Globalisation*, Vol. 2, Nos. 3/4, pp. 252–267.

[25] Ngwenya, S. 2007. *The Common Market for Eastern and Southern Africa (COMESA)*. Testimony Submitted to the House subcommittee on Africa and Global Health, House Committee on Foreign Affairs. United States House of Representative, Washington, DC.

Improving economic governance

Although Africa's economies are currently growing strongly, continuing these trends will require adjustments in the structure and functions of government to make them more entrepreneurial.[26] More fundamentally, science and innovation must be integrated at the highest possible levels in government. This change will be facilitated by creating science and innovation into policy analysis capacity in universities, scientific academies and government departments. Which in turn may have political benefits: good governance and good engineering are not so different, after all. Both involve working to achieve objectives guided by care, diligence, and data.

Bringing science and innovation to the center of Africa's economic renewal will require more than just political commitment; it will take executive leadership. This challenge requires concept champions. In this case these will be heads of state that will spearhead the task of shaping their economic policies around science and innovation.

So far, most African countries have failed to develop national policies that demonstrate a sense of focus to help channel emerging technologies into solving developmental problems. They still rely on generic strategies dealing with "poverty alleviation," without serious consideration of the sources of economic growth. There are signs of hope, however.

Political leaders must be kept informed about the role of science and innovation in development. Advice on science and innovation must be included routinely in policy-making.[27] An appropriate institutional framework must be created in order for this to happen. Many African cabinet structures are merely a continuation of the colonial model, structured to facilitate the control of local populations rather than to promote economic transformation.

Advisory structures differ across countries. In many countries, science advisers report to the president or prime minister, and national scientific and engineering academies provide political leaders with advice. Whatever structure is adopted, the advising function should have some statutory, legislative mandate to advise the highest levels of government. It should have its own operating budget and a budget for funding policy research. The adviser should have access to good and credible scientific or technical information from the government, national academies and international networks. The advisory processes should be accountable to the public and be able to gauge public opinion about science and innovation.

Successful implementation of science and innovation policy requires civil servants with the capacity for policy analysis-capacity that most current civil servants lack. Providing civil servants with adequate technical training is necessary for wise decision-making. Training diplomats and negotiators in science and innovation also can increase their ability to discuss technological issues in international forums.

Science and innovation diplomacy has become a critical aspect of international relations. Ministries of foreign affairs are increasingly promoting international technology cooperation and forging strategic alliances. To effectively carry out this mandate, foreign ministries need to strengthen their internal capability in science and innovation. To this end, they are creating offices dealing specifically with science and innovation, working in close cooperation with other relevant ministries, industry, academia and civil society.

Aligning higher education with human needs

To promote Africa's development and agricultural sustainability the missions of universities and other institutions of higher learning should be aligned with countries' needs. Africa's own experiences illustrate the important role universities can play if their goals are aligned with national policies. Take the case of Rwanda. Rwanda's genocide was one of the worst human tragedies of the post-World War II period and also destroyed much its physical infrastructure and skill base. To contribute to the reconstruction of the country, Rwanda converted the premises of its military academy into a base for a new technical university, the Kigali Institute of Science and Technology (KIST). The institution, created in 1997, has played a critical role in the reconstruction of the country and stands out as a role model for other countries emerging from civil wars and economic decay.

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[26] Juma, C. 2006. *Entrepreneurship and Development: Opportunities for Private Sector Participation*. Submission to the International Development Select Committee, United Kingdom Parliament, London; Ebner, A. 2007. "Public Policy, Governance and Innovation: Entrepreneurial States in East Asian Economic Development." *International Journal of Technology and Globalisation*, Vol. 3, No. 1, pp. 103–124.

[27] King, D.A. 2006. "Governing Technology and Economic Growth," *International Journal of Technology and Globalisation*, Vol. 2, Nos. 3/4, pp. 311–322.

But most of Africa's universities do not play significant roles in helping to solve local problems. Much can be gained by adjusting the curricula, pedagogy and management of urban universities to address challenges such as sanitation and improvement of the conditions of slum dwellers. Similarly, universities and research institutions located in rural areas could serve as the locus for research, training and outreach on the management of natural resources.

Universities should work more closely with the private sector in the sustainable development activities. Promoting enterprise development, especially in the urban areas, is one of the most effective ways to stimulate economic growth. Similar efforts need to be adopted in rural areas. More specifically, institutions of higher learning and other mechanisms could serve as business incubators as well as sources of ideas and support for upgrading urban and rural economic activities.

Emphasis should be placed on bringing research, teaching and community outreach together. For example, medical schools should be more integrated into hospitals just as agricultural research stations should have a strong teaching role. Similarly, strong links between universities and the business community should be forged. This process may involve reforms in existing universities, creation of new ones or upgrading existing institutions. Equally critical would be to merge the functions of higher education and science and technology, which in many African countries fall under separate ministries.

There is a need to take stock of research and training facilities in Africa, especially those falling outside universities, and explore how they could be harnessed to supplement the contributions of existing universities. All government ministries are involved in one or another aspect of research and training and they hold the seed for populating the economic space with new species of higher learning institutions adapted to specific needs. But their growth is usually suppressed by custodians of the laws governing higher education as well as universities that fear competition from new entrants. Much of suppression of innovation in higher education is orchestrated under the guide of maintaining academic standards. Much of it is either resistance to change or political gymnastics to maintain control over moribund systems. Upgrading is the name of the new game.

Replacing outmoded curricula with new approaches that encourage creativity, enquiry and entrepreneurship should be a priority. These reforms should also include close cooperation with the private sector and the communities in which universities are located. In turn, government at all levels (central, regional and urban) should be at the forefront of creating space and opportunities for the contribution of universities to development.

Universities should enjoy greater autonomy so that they can adapt in a timely manner to a rapidly-changing world. One practical way of achieving all these reforms is to provide funding to support agricultural science and innovation cooperation between the US and African countries. US universities already operate on a model that Africa could benefit from, and US researchers and engineers can serve as a model for professional training. Such fund would be consistent with the growing interest to place science and innovation at the center of international development cooperation.[28]

Finally, one specific and time-critical area for policy action by the US is championing low-cost Internet services for African universities (and for African consumers in general). License agreements on the overpriced monopoly-run SAT–3 optical fiber cable that links Africa to the developed world are currently being renegotiated, and the current crippling pricing structure can be changed.[29] Investors are also currently negotiating to build another cable down the coast of East Africa. Without international leadership and action to improve the conditions, the new cable may operate in the mode of SAT–3, hobbling entrepreneurs and leaving universities isolated. Pressure is needed to ensure access for all.

Even with the highest prices in the world, African Internet usage is exploding. If prices were lowered, usage would increase significantly boosting education and economy both. No effective strategy for health, education, and development in Africa can neglect communications. Many African countries are now recognizing that communications costs and bandwidth limitations are hindering their economic growth. The US should work closely with African countries to ensure that access to the com-

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[28] See, for example, National Research Council 2006. *The Fundamental Role of Science and Technology in International Development: An Imperative for the US Agency for International Development*. National Academies Press, Washington, DC; House of Commons Science and Technology Committee 2004. *The Use of Science in UK International Development Policy*, Vol. 1. Stationery Office Limited, London.

[29] Over 15% of that cable is owned by United States companies, and 30% in all by non-African investors.

munications infrastructure, especially by educational institutions, is considered an essential infrastructure service and that this is reflected in access and pricing structures.

Collaborating on new technology missions

Capturing the wave of emerging technologies is an effective way to galvanize US cooperation with African countries. Indeed, the US has a long history of using its technological pre-eminence to bolster economic strength among its South East Asian allies. Efforts to promote the migration of the semi-conductor industry to South East Asian countries such as South Korea and Taiwan are an illustration of this.[30] Similarly, the Green Revolution was an act of science and innovation diplomacy.[31] Today, emerging fields of biological innovations (which include the application of living processes to economic activities in fields such as agriculture, health, industry and environment) represent new opportunities for cooperation between the US and Africa.[32]

But exploration of technology missions should not be limited to biological innovations. In addition to information and telecommunications technologies, there are extensive opportunities to collaborate in a wide range of infrastructure related fields such as energy and transportation as well as others. Biological innovations are therefore used here purely to illustrate emerging opportunities.

Cooperation in biological innovations can build on the High Level Panel on Modern Biotechnology of the African Union (AU) and the New Partnership for Africa's Development (NEPAD).[33] Its report, *Freedom to Innovate: Biotechnology in Africa's Development*, proposes a 20-year African Biotechnology Strategy with specific regional technology goals to be implemented through the RECs and to develop and harmonize national and regional regulations that promote the application and safe use of modern biotechnology. The African Ministerial Council on Science and Technology (AMCOST) has already endorsed the proposal.

The panel's main recommendations include the need for individual countries in central, eastern, western, northern and southern Africa to work together at the regional level to scale up the development of biotechnology. It focuses on the key role of clusters of expertise, sharing knowledge, creative ideas, and personnel, and working on problems and projects collaboratively.

The report also recommends the need to: (a) outline priority areas in biotechnology that are of relevance to Africa's development; (b) identify critical capabilities needed for the development and safe use of biotechnology; (c) craft appropriate regulatory measures to advance research, commercialization, trade and consumer protection; and (d) offer strategies for creating and building regional and local biotechnology initiatives in Africa.

The report pays particular attention to the role human capabilities and institutional innovation. It calls for reforms in existing knowledge-based institutions, especially universities, to serve as centers of diffusion of new biotechnologies into the economy. It stresses the need to develop and expand national and regional human resources development strategies that include: (a) biotechnology curricula that focus on specific areas and targets that offer high economic potential for the regions and the continent; (b) a consortium of clearly identified and designated universities that develop and offer regional biotechnology training courses; (c) a focus on female recruitment in the sciences and engineering. Much of the biotechnology knowledge for Africa's development is currently available in Africa and other parts of the world. But Africa lacks appropriate institutions that can search, identify acquire and transform such knowledge in goods and services. This is a primary function of the modern African university.[34]

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[30] Hung, C–Y., Hu, C–C., Hsu, C–S., Babington-Ashaye, Y., Nystrom, M. and Badino, J. 2006. "Global Industrial Migration: The Case of the Integrated Circuit Industry," *International Journal of Technology and Globalisation*, Vol. 2, Nos. 3/4, pp. 362–376.

[31] Juma, C. 2005. "The New Age of Biodiplomacy," *Georgetown Journal of International Affairs*, Winter/Spring, Vol. 6, No. pp. 105–114.

[32] Juma, C. 2002. "Biotechnology and International Relations: Forging New Strategic Partnerships," *International Journal of Biotechnology*, Vol. 4, Nos. 2/3, pp. 115–128.

[33] Juma, C. and Serageldin, I., Lead Authors. 2007. *Freedom to Innovate: Biotechnology in Africa's Development, A report of the High-Level African Panel on Modern Biotechnology*. African Union and New Partnership for Africa's Development, Addis Ababa and Pretoria.

[34] Chile with support from the US experimented with other technology prospecting approaches. However, the country is now looking into how its universities could build on the pioneering technology prospecting work of the Chile Foundation. For a historical account of the model, please see: Bell, Jr. B.W. and Juma, C. 2007. "Technology Prospecting: Lessons from the Early History of the Chile Foundation', *International Technology and Globalisation*, Vol. 3, Nos. 2/3, pp. 296–314.

CONCLUSION

Africa may not have benefited from the Green Revolution partly because its institutional arrangements were not in tune with what was possible in Africa. But changes in African governments, the explosive growth in scientific and technical knowledge, and the availability of inspirational institutional models now make, it possible for the US and Africa to forge new partnerships.

Indeed, African countries are starting to redesign their economic policies with technological considerations in mind. Much of the new thinking has been inspired by the rapid diffusion of practical applications in the information and telecommunications technologies. Mobile phones, for example, have had discernible impacts on communication. Many countries are looking for equivalents of the mobile phone for other sectors such as energy, agriculture, industry and transportation. Many of them are starting to reflect these factors in their foreign policy.

The US is in a better position than any other country to lead in forging partnerships with Africa designed to transfer skills and knowledge. Demand for higher education is exploding in Africa, and assistance by the US would be greatly welcomed. The US could serve the needs of both diplomacy and food security by providing funding for cooperation between the US and Africa in agricultural science and in education and training in general, perhaps specifically to enable US land-grant and other universities to pair with African counterparts. Working together will allow US researchers and their African counterpart to adapt today's knowledge to African conditions and will effectively transfer skills. It will also expand cooperation with other universities around the world with relevant experiences. Other avenues to champion these ideas include the next G–8 Summit to help in Japan in 2008. The Cabinet of Japan is already challenging its scientific and technological to explore how innovation can play a key role if finding solutions to Africa's problems.[35] This historical opportunity is one that the US and Africa cannot afford to miss, for the health of millions of people, for economic development, and for building a solid foundation for diplomatic relations.

Mr. PAYNE. Well, let me thank both of you for your testimony. We have had hearings in regard to U.S. about China and its role not only in Africa but in Latin America. We do know that there are aggressive programs that they are ensuing. As it relates to education I do think we are lagging behind.

Some of us are trying to push to once again—you know, during Colonial days, there were more programs from USAID and other United States programs that brought many African students to the United States to study, but as you mentioned, that has dropped off a lot, and so we need to take a look at reestablishing that in my opinion. Another member, Mr. Delahunt, is very interested in trying to see if we can have some improvement in the number of scholarships.

Once again, of course, it is very difficult today even with the new homeland security questions that we have seen. Initially after 911 there was actually a decrease in foreign students coming which I thought was pretty negative. So some of it we do have to certainly take a look at. Let me just ask a broad question to both of you.

Is a Green Revolution for Africa possible or is it, as we would say, a pipe dream? What specific steps does the United States Government need to take to help Africans undertake such a revolution if possible? Finally, do the programs that we are currently undertaking support a Green Revolution? We can start with you, Mr. McPherson, and, Dr. Juma, if you would want to deal with this notion of the Green Revolution for Africa.

Mr. MCPHERSON. Well, I think it is very practical, but it will be more complex and more multifaceted. There is an organization

[35] Kurokawa, K. 2007. "Challenges for Japan's Scientific Community in the 2008 G8 Summit," *Business Daily*, Nairobi, June 2. http://www.bdafrica.com/index.php?option=com_content&task=view&id=1726&Itemid=5821 Accessed July 15, 2007.

called FARA that the World Bank has put money into and has made a focus, run by a man named Monte Jones who has recently received the World Food Prize. In West Africa FARA is pulling together, or coordinating is too strong, the ideas on how to get this done. Monte Jones, FARA, are working with International Ag Research Centers, the World Bank and Gates.

Gates, Rockefeller should be an important source, resources and an important way to prioritize. I mean, there are hundreds of sort of sub-research issues here to how to get there because it is going to be different climates, different crops. USAID ought to make a real commitment to this, and frankly, they just aren't, they just aren't.

In fact, there is informal discussion over there as to whether or not they should do research, research should be on the agenda at all. That has never been their official policy, and people don't all agree to that at USAID. I think you're focusing on how to drive this, Gates, FARA, the Bank and other donors. This is practical, it will look differently, but it is worthwhile. Sorry, Dr. Juma.

By the way, you are unusually lucky to have Dr. Juma here. He is a very smart, thoughtful person who is one of the leading thinkers in this whole area in this country, and we are lucky to have him live in the United States.

Mr. PAYNE. Thank you. Dr. Juma.

Mr. JUMA. Thank you, Peter, for the compliment. The reason I think a fundamental transformation of African agriculture is possible is because today compared to when we did the Green Revolution in Mexico, in India initially, we have a much larger pool of scientific and technical knowledge than we did when we transformed India and Mexico. That is an opportunity we will have today which we didn't have in the past.

I think the key question is going to be whether we can build the institution, in this case universities, through which we can channel this expertise to serve local needs. So the critical limiting factor for the expansion and growth of African agriculture is the absence of institutions of higher learning that capture the global find of knowledge and bring it to bear on local production. So the key question is in fact institutional innovation to use the scientific and technical knowledge that we have at the moment.

If we do that in fact this transformation can occur, and it can occur very, very quickly.

Mr. MCPHERSON. I guess a good way to say it, we have got to work with African institutions, FARA, to rebuild through strengthening African universities and research efforts. We have got U.S. institutions that have enormous capacity, the CRSP and much beyond.

Mr. PAYNE. Yes. In your opinion, how long would it take to build that capacity? And if there is capacity currently, are we taking advantage of what is there now?

Mr. MCPHERSON. Well, we are taking some advantage of it. The resources to do so from this side of the world aren't there. Now, Gates is beginning to probably pick up some of that, but not too much utilization of that capacity now because there is no focus. Capacity is sort of a never ending process. You know, when have you

really fully built it? Capacity means people, trained, it means facilities.

People are probably the most important part. You could do a lot of building over the next 5 years, but this is a generational issue. This is a deal where we are going to have to say, look, the problems aren't going to be all solved in the next 5 years, but we need to in 10 and 20 years not be where we are now because in many ways we are where we were 10 years ago.

Mr. JUMA. Mr. Chairman, I could use an example here to answer your question which is after the genocide in Rwanda there was a major discussion on how to rebuild the country. A few people came to the conclusion that the only way you could rebuild Rwanda was to create an institution of higher learning to train the young people in the engineering, and it was argued by many donors that building a new university will take forever and therefore it was not the best way to proceed.

But the Government of Rwanda insisted on building a new institution. This was built in 1997. This institution started to deliver results in the first 5 years and has had enormous influence in the reconstruction of the country. They harnessed existing facilities. It is located in what used to be the military academy of the country. The case of the Kigali Institute of Science and Technology has destroyed the mythology that funding university takes too long to deliver results.

I can give you numerous other examples of similar kind in Africa that show that this can be done fairly quickly, and in fact it is the easiest way to do it is to build new institutions.

Mr. MCPHERSON. I think that the way to think about development generally is there are a few key things we know need to happen. We know we need to have trained people; we know we need to have new technology; we know we need the institutions, not totally inappropriate economic policies and some stability. We know those things, and we know that to make progress it takes a long time as it did in our country, but you have to sort of walk down that path.

In the USAID budget it is very appropriate for a lot of money to go in the HIV/AIDS and child survival. What you can't do is spend all the money on those areas. You have to say some things as humanitarians we have to do now, we have to help people, the child that will starve, you have to do that, some money has to be invested, not the majority of money actually, has to be invested in these other things. Often you shouldn't put too much money in.

Our political capacity to sustain commitment for the long-term is what we have faltered on.

Mr. PAYNE. Certainly, with the MCA and countries deciding what they want to invest in, we find that they are going into agriculture and the big projects, probably eventually USAID's funding is going to be reduced because MCA compacts are going to probably eat into that.

So the whole question of capacity building for the university level, which is a concern of ours, we heard and we had educators come and say, you have got to have good teachers if you are going to—now you have universal education in many countries, you know, free from kindergarten to eight at least and even secondary

in many of the collages. All of the east African countries, Nairobi, Kenya, and so forth said we are going to have it.

Well, if you don't have qualified, for example, teachers you have now expanded education five fold, and they are not teachers able to do the job, so the classes are double and triple the size that they were and they were already large. So we do have some very serious issues. Let me just ask my last question because I think I have used my 5 minutes, but I didn't stop Ambassador Watson, so I will just ask this quick question basically on a point I want to get over.

What is your opinion of the impact of United States subsidies on the development of agriculture in Africa, and what should the United States be doing to address this problem created by these subsidies? Then we will hear from our ranking member.

Mr. MCPHERSON. Do you want to answer?

Mr. JUMA. I think you should answer that.

Mr. MCPHERSON. Okay. Well, I think that there is clearly some impact. In areas like cotton, clear case. I would hope that in a Doha round, which as you know is faltering, we could make real progress in that connection. We could reduce the subsidies. Let me say something that is perhaps a little unconventional. As we work to reduce those subsidies in a Doha round, I really wish we could include Africa and its intercontinental trade in reducing barriers.

We are almost all about reducing barriers between Africa, and Europe and United States, but the big trade in Africa is going to take place regionally. Regional trade agreements are a long, hard slide to do it. So I am for a Doha, I am for reduction of subsidies. I wish that we could expand it a bit. Nobody is talking about that by the way even though that is where the real growth in trade has the biggest potential.

Mr. JUMA. I think on this I would like to add and to raise the issue of tariffs on imports from Africa, that this may be just as significant as subsidies where the fact that it depresses the capacity of African countries to add value to their raw materials and therefore their returns on their exports always remains extremely low. Secondly, they don't invest in the technologies needed for industrial processing, and as a consequence the industries don't grow.

So I think that in fact tariffs may be just as significant as subsidies.

Mr. MCPHERSON. Tariff on some items that traditionally have been potential exports such as leather, clothing, et cetera. Is that what you mean?

Mr. JUMA. Yes, yes.

Mr. PAYNE. You are right. In our AGOA hearing just recently we talked about the expansion of agriculture, and we think that is where the real growth can come in Africa, and so we would have to deal as you mentioned with tariffs and also of course with the subsidies.

It is cheaper, a farmer told me in Barbados, if he takes a chicken and feeds it from the time it is a chick to the time that it was grown and ready to go on the market even if it was hatched by a chicken he already owned than to buy one that was shipped in from Perdue Chicken or some other United States firm, so that is a serious problem.

If you can feed a little chick in the backyard for less money than it costs to buy a chicken processed in the U.S., then there is something wrong with that formula. Mr. Smith.

Mr. SMITH OF NEW JERSEY. Thank you very much, Mr. Chairman. Let me thank you both for your testimony. They were very extensive and provide a number of useful insights for Congress to grapple with, and thank you for that. It is good to see you, Mr. McPherson. It goes back to the Reagan administration when you were the Director of USAID, and I remember working so closely with you, so great to see you.

A couple of questions; with regards to what you mentioned, Dr. Juma, about the 2,000 African students and that number doubling. I am wondering why USAID seems not to be as committed in that regard for finding scholarships and the like. How many African students actually come to United States institutions in general for higher education, and how many of those actually are here for agricultural training? Is there any census, any sense of that, that they are coming into other means to get that very valuable training?

Secondly, when we talk about the Chinese—and I did chair a hearing last year about the growing influence of China, and I think it is not so benign a candor. I think they have designs on the assets of Africa from its oil, to its vast mineral wealth, to its wood, and they are the kind of regime, dictatorship I would say in Beijing, that works very closely with people like Bashir and Mugabe and in exchange provide weapons that have fueled the war first in the southern Sudan and now in Darfur.

So the purposes aren't, I don't think, altruistic on the part of the Chinese Government, at least if the dictatorship and the way they treat their own people is any indicator, so while Africans and African leaders may want to exploit some of that, I think they have to be very careful about where China is taking them in terms of this effort to try to access the vast mineral wealth of that continent.

So you might want to speak to that, whether or not there is the depreciation among the Africans that education and that engagement by the PRC does not come without a very steep price for the African continent and for each country.

Thirdly, let me ask if I could about the whole issue of genetically modified foods. I know that South Africa has allowed its chief crop of corn to be grown with genetically modified seed and Burkina Faso is similar, with cotton is their chief export. That, too, has been permitted under genetically modified foods. I was in Europe again, just recently, working mostly on human trafficking, but every parliamentarian I seemed to meet in Europe, and I say that with some exaggeration, many politicians there, bring up genetically modified foods and their angst against it.

I am wondering what your view is of it, Dr. Juma especially, as a way of reducing the need for pesticides and trying to harden plants, increase output. Is there a downside? Because it is a raging issue in Europe as you know so well. Not so much here, but it is an issue here. I am not sure what your sense is as to how it relates to Africa itself. Finally, on the African action plan the status report by the IMF and the Bank showed that there had been progress in 38 of the 46 countries in raising land productivity since 2002.

However, in only six countries did productivity increase reach or exceed 5 percent, so it was all less than that. How are the World Bank Program and their action plan doing?

Mr. MCPHERSON. Who wants to go first?

Mr. JUMA. I will take very quickly the two questions, the China and the genetically modified foods. On China, the reason I gave the statistics, and I tried, in fact, my colleagues at the Department of State tried to cut out an estimate of how many Africans were here at the same time and the number I got, which I didn't get a breakdown of which fields they were in, was about 600.

Mr. SMITH OF NEW JERSEY. That is through all means, not just through the government, you know?

Mr. JUMA. In all fields.

Mr. SMITH OF NEW JERSEY. In all fields.

Mr. JUMA. The reason I gave those figures is to indicate the fact that we could do more with Africa, that Africans would prefer in fact to come and study here because of commonality in language and a lot of other common historical interests. The fact that they are going to China is an indication of limited opportunities in the United States as opposed to simply an interest in studying in China. That is why I gave those figures.

I also gave them to indicate why it matters for strategic purposes because this is going to redefine relations between Africa and the rest of the world. When I talk with Presidents, and I have talked with some Presidents and I ask them directly questions about the various arrangements that they have with China and they say but at least China is training our young engineers. Nobody is training our young engineers.

This is an area that matters very significantly to African leaders, and that is why I bring it to this committee. On the question of genetically modified foods we have just completed a study at the request of African Presidents in which we look at the use of biotechnology not just in agriculture but also in health, in industry and in environmental areas. I notice particularly interesting to see a large number of African countries themselves engaged in biotechnology research not driven by outside but their own internal programs.

Secondly, those internal programs show clear forecast on priorities. We see, for example, significant interest in southern Africa on using biotechnology to deal with the infectious diseases, and crop research in West Africa, livestock research in east Africa, biopharmaceutical research in north Africa, and therefore we have concluded on the basis of looking at Africa's own priorities that this is an area where it will be very, very important to build long-term partnerships between the United States and Africa.

So our position, at least this committee that I co-chaired in fact included people who have a historical record of being opposed to biotechnology, but on this particular committee we had a consensus that this is a very important area for Africa, and therefore we have already had this report endorsed by African ministers of science and technology.

So what we are starting to see is really divulgence if you like in terms of what African leaders and the ministers think the priorities are and what other particularly activist groups think Africa

should be doing. It is very clear to us that when Africans are left on their own they would like to be on the cutting edge of all imagined technologies.

So it is our view that no technologies should be excluded from the package of options available to Africa because every other country that has faced a new challenge has used all the technological options available at its disposal, and those options should also be open to Africa. It will be a mistake for anybody to design a program for Africa that precludes an advance in particular technologies.

Mr. MCPHERSON. A couple quick comments. The numbers of Africans in this country studying agriculture or for that matter other topics, science and whatever, is not great. The numbers I don't have right here with me, but I know at Michigan State, for example, we had a number of graduate students in agriculture, Ag economics, but a number meant, you know, a couple dozen.

The contrast of Africa versus large parts of Asia is that African families don't have money to send their kids abroad. I mean, that is why you get an explosion of people from China coming to the U.S., because there is money, family money, resources. You just don't have that in Africa any more than 30, 40 years ago career Taiwan had family money to send people here. We took thousands and thousands of students and educated them and Africa, too.

Administratively the way we have been talking to the appropriators about training is to ask them to make training a line item. In other words, don't allocate X million for training, but rather direct it be in existing or future projects. We moved from about 7,000 in 1981 to within a few years 15,000 a year and most of that money was within projects. I mean, you see how managerially that works. You would say if you got an environment project, a health project, some part of it has to be to train people in the United States.

I think that is one of the ways you can do this without breaking the bank if you will on the formal items. I should mention by the way that as we work forward with the university effort here there is something called Title XII [Famine Prevention and Freedom from Hunger Improvement Act of 2000] which has been an excellent instrument, but frankly, needs to be expanded for utilization for some of the things we are talking about here.

Mr. PAYNE. Ms. Woolsey.

Ms. WOOLSEY. Thank you, Mr. Chairman. I need to tell Mr. Smith something before he leaves. I represent Marin and Sonoma County. You always ask the questions that my district wants the answers to. It is really stunning to me.

Mr. PAYNE. Is that good or bad?

Ms. WOOLSEY. I think it is great.

Mr. PAYNE. Okay. All right.

Ms. WOOLSEY. But it always just so surprises me. Congressman Smith, and others and you have all talked about China, but you know I don't think it is only China. I was sitting here before thinking about the United States. Maybe we are not buying enough now, but as the U.S. keeps building houses on our farmlands, and growing corn for ethanol instead of food and the percentage of our Ag land is decreasing in huge numbers while our population continues

to grow I think we are going to be depending more and more absolutely long-term on international agricultural markets for our food.

I think it will be good for Africa as long as it works for the locals. I worry, and my question would be to you is it good for us to import African products of course, but where do multinational corporations come in and take, you know, the majority of the benefit? Also, if the price of food goes up because the United States will pay a lot more for our food than Africans can afford, right, so that drives up the cost of food, so who benefits in the long run?

How are we going to face that challenge and control it because I think it is really important.

Mr. MCPHERSON. I am not sure just what you mean. How does the U.S. produce more food or how do we import food from other countries?

Ms. WOOLSEY. No. How do we not take advantage of the African people in the long-term? I mean, when we decide we can't grow our own food, we are going to buy it someplace else.

Mr. MCPHERSON. I think that the immediate issue, immediate meaning over the next several years, is: Can African countries produce more food which they can find markets for here, Europe or wherever?

I mean, there are some issues like the Ethiopia coffee labeling question that you mentioned a moment ago, but flowers from Kenya or other commodity products, specialty products or frankly not necessarily such specialty products, what we would like to see is more imports from Africa just as we saw lots of imports from Latin America over the last generation. We need to have markets for those goods plus other kinds of manufacturing goods. I think that is the most immediate issue.

Ms. WOOLSEY. Well, I was thinking longer term because you were both talking about take the big view, look at long-term, where do we go? I mean, I am talking—specialty products absolutely. I am talking about when we need to buy corn from somebody else how do we ensure that the people we buy it from benefit?

Mr. MCPHERSON. Well, I frankly believe that generally global markets work fairly well, that global markets tend to provide consumers lower prices, open markets provide consumers lower prices and provide producers that develop options for export greater income. I mean, that is a broader, philosophical issue, but I think that open markets have by and large benefitted producers as well as consumers.

The subsidies and the trade barriers have worked in a way that poor people haven't been able to produce as much and get as much advantage out of what they could do as well as consumers buy as cheaply as they could. It is a fairly long discussion, isn't it, how that works or not.

Ms. WOOLSEY. Right. It certainly is.

Mr. MCPHERSON. I don't suggest it works perfectly, but I do think that by and large poor people have been significantly harmed by the inability to sell what they produce. Sometimes that is roads that weren't available to get it out of their poor community, sometimes it is lack of quality control, safety or other reasons, that wouldn't allow exports to wherever, and sometimes it is trade barriers.

You work at those issues in my belief, but I realize that some, perhaps you, might think that is not adequate.

Ms. WOOLSEY. Well, I just see it is going to be a challenge.

Mr. MCPHERSON. It will be a challenge, and there will be disruptions in markets, won't there?

Ms. WOOLSEY. Yes.

Mr. MCPHERSON. Disruptions in peoples' lives.

Mr. JUMA. I could just add by saying that I think that some of Africa's challenges have to do with the total integration of the global economy as opposed to being too much of it, that it is exporting too little and what it exports is not diversified enough. If Africa's manufactured exports were to increase, for example, that would also help to address some of its nutritional questions, food security questions.

I have been to Manhattan, for example, in New York and I have not seen any corn growing there, but I have not seen people starving there either as I could think of large parts of Africa that could feed itself because it is exporting manufactured goods.

Mr. MCPHERSON. I know we are about ready to stop here, but Mr. Hess referred to the information exchanged by way of computer. There is some great work going on in Africa in that regard. Michigan State funded a few hundred thousand dollars for a period of years a project where we had 18 sites around Mali sun powered computers where twice a week local people in those 18 cities went out in the market, got the prices of various kinds of rice, cracked or not cracked, so forth, and then communicated it on a computer screen to all other sites in the country so you could see the difference in crop prices.

Now, that is a big deal actually. I said to the people doing it, okay, when are we going to develop a futures market out in this thing? He said well, people are already buying from another city outside for delivery of a certain price, in effect a delivery at a future date. That kind of stuff is really changing. It goes to information, transportation. Everybody benefits. Mr. Chairman.

Mr. PAYNE. Well, let me thank both of you. Let me just make a closing comment. Incidentally, former Secretary General Kofi Annan recently, now chairman of the Alliance for a Green Revolution, was quoted as saying that the alliance would not incorporate genetically modified organisms in its program, and so I hear you, Dr. Juma, saying the options should be left open, but it appears that there has been a decision made at least on one of the leading personalities as it relates to that issue.

The question of China as I indicated it is always discussed. I do have concerns, you know, that the Chinese will also build a soccer field and give the key over to a country and that is very visible, but things we attempt to get involved in such as HIV and AIDS or programs like we do, when we are trying to as you know double the PEPFAR program—as you know, President Bush mentioned that he wants to move $30 billion over 5 years from 2009 forward which is astounding go unnoticed.

I do agree and we have discussed the need for more scholarship assistance and so forth. Two interesting points: Recent polls conducted around the world, in every sector of the world, indicate that Africa, actually, Africans in general, have the highest opinion of

America out of any other part of the world. It is up in the high 80 percent where, for example, in Egypt the United States has a 92 percent disapproval rating.

It goes a little bit down from that in other parts of the world, but Africa in general tends to still have a very high image of the United States of America. Secondly, the study done recently on immigrants to the United States, that Africans immigrating into the United States of all groupings had the highest education and achievement levels of any grouping. Of course Africa is general, but it was grouped as Africa.

So there are still I think many individuals who have a positive image, and I think we need to work on that in the future to try to get more assistance to education and to the institutions of higher learning like I have been pushing myself. We were going to adjourn, but we do have our member, Congresswoman Sheila Jackson Lee, and we will give her an opportunity to ask a quick question if you gentlemen still have a moment.

Mr. MCPHERSON. Sure we do.

Mr. PAYNE. All right. Thank you.

Ms. JACKSON LEE. Mr. Chairman, thank you for that quick question. Let me say to the witnesses I am in another committee on a mark-up. I thank the chairman for this vital hearing. I would like to work with this committee specifically on the question of water, water security, irrigation, and frankly believe that I know that this has covered the whole question of building capacity as it relates to food security, and I again am reminded of the history of Ethiopia and the cycles of drought which face a lot of countries on the continent.

So my quick question to both witnesses if they might comment on the vitalness of a continued water stream if you will and the work that the United States and aid entities can do on the technological side, the educational side, but the creation of water security and permanence in some of the continent's most impacted areas to ensure a continuous stream of water. Doctor, you want to—did you not hear me? Water security.

Mr. JUMA. Border security.

Ms. JACKSON LEE. Water, water.

Mr. JUMA. Water security. Okay.

Ms. JACKSON LEE. Yes. If you just want to briefly indicate the importance of such, and I won't ask any other questions. Mr. McPherson, I am trying to go back for a vote, so I am just interested in your quick answer on the importance of water security.

Mr. JUMA. Actually, what is very interesting is if you look at various critical sectors like energy for the production, transportation you will always find the studies on technological innovation in those areas, but you don't find it in the area of water, so we haven't been investing very much in figuring out how to enhance the efficiency of the use of water, deal with the quality questions. That is also linked to the management of the ecosystems from which the catchment areas from where the water comes from.

I think that a large part of the challenge for water management in Africa is really the technological interventions as opposed to simply looking at the quantity of water, water development.

Ms. JACKSON LEE. Thank you. Very key point to my thought process. Thank you very much. Mr. McPherson?

Mr. MCPHERSON. I guess water would be a question of for human consumption or as we have talked about today for agriculture.

Ms. JACKSON LEE. I would put it in both points, and if you wish to emphasize the agricultural then please feel free to do so.

Mr. MCPHERSON. There is relatively little irrigation in Africa mostly because even though our mind often focuses on the Congo, or Nile, or something, in fact, Africa doesn't have very many feeder rivers. It is part of why it hasn't developed as well because there aren't places for vessels and so forth. I think water is clearly important, and I believe that irrigation technology is part of the picture as well as figuring out how to get fertilizer out there, and that is a transportation issue.

I think that as to water, as to agriculture it is important to look at as part of a whole set of problems. Water is a limiter on production in several parts of Africa.

Ms. JACKSON LEE. Mr. Chairman, let me thank both of the witnesses. I know that their testimony was both eloquent and instructive, and your oversight that we have had in these first 7 months has I think moved this committee forward to the extent that we can be effective partners in growing opportunities on the continent both in terms of health, economics, political process, human rights and certainly food.

I would hope that water could be a strong component of that, and I look forward to working with the chairman on legislation that I am drafting that focuses specifically, Mr. Chairman, on this whole question of water, and irrigation and the technology points that the doctor has made, so important. I yield back to the chairman. Thank you for your leadership.

Mr. PAYNE. Thank you very much. Let me thank the panelists. This has been very informative and insightful. We will certainly be following up, and I appreciate your time this afternoon. Thank you. The hearing stands adjourned.

[Whereupon, at 1:08 p.m., the subcommittee was adjourned.]

APPENDIX

MATERIAL SUBMITTED FOR THE HEARING RECORD

WRITTEN RESPONSES FROM THE HONORABLE MICHAEL E. HESS, ASSISTANT ADMINISTRATOR, BUREAU FOR DEMOCRACY, CONFLICT AND HUMANITARIAN ASSISTANCE, UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT, TO QUESTIONS SUBMITTED FOR THE RECORD BY THE HONORABLE DONALD M. PAYNE, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW JERSEY, AND CHAIRMAN, SUBCOMMITTEE ON AFRICA AND GLOBAL HEALTH

Question:

What types of programs does USAID support that are specifically focused on training Africans in the areas of agricultural development, agronomy, and other highly technical fields that would increase the capacity at the country level to carry out development activities?

Response:

There is a short term training program for African women scientists—the Borlaug Women in Science program—to develop women leaders in agricultural science and a long term training program, Borlaug Leadership Enhancement in Agriculture Program (LEAP), a fellowship program to enhance the quality of thesis research of graduate students, that supports research at CGIAR (Consultative Group for International Agricultural Research) Centers. USAID is also piloting three long term training programs in Zambia, Ghana, and Mali to develop and test new approaches to long-term training. In addition to these programs, there are a number of activities that have long and short term training as a component of their programs—the Collaborative Research Support Programs (CRSPs); the Higher Education for Development (HED) Program; and the Agricultural Biotechnology Support Program. These three global programs have significant Africa components.

Question:

How many agronomists and experts in the area of agricultural development are currently employed at the U.S. Agency for International Development here in Washington, DC? How many direct hire agricultural development experts—and by that I mean people trained specifically in the field—are currently serving in our posts in Africa?

Response:

USAID has a total of 32 direct hire Foreign Service and General Service technical experts worldwide and in Washington filling positions specifically related to agriculture. Fourteen of these positions are in Washington and 18 are in the field, of which seven are in Africa. In addition, there are 150 General Development Officers and Private Enterprise Officers in the field, of which 46 are in Africa. A number of technical experts in these positions are designing and managing programs with an agriculture component.

PREPARED STATEMENT OF THE HONORABLE SHEILA JACKSON LEE, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF TEXAS

Mr. Chairman, I thank you for holding this very important hearing on the role of agricultural development in promoting food security in Africa. Food security in African countries has long been a major crisis and a leading cause of poverty, famine and death amongst the African population. The United States and many others in the international community have made significant efforts to combat this crisis. Unfortunately, such poverty, famine and death still persist. The United States must

continue to live up to its stature as that humanitarian beacon upon the hill that provides a ray of hope to its international neighbors who are in desperate straits and dying daily because of lack of basic life-sustaining resources. That is why we need to reassess the effectiveness of our efforts on this front and create new avenues for improving the food security in Africa.

Today, we have the opportunity to hear from witnesses who will provide this Committee with information that can give us a better understanding of the current food security and agricultural development challenges facing African countries. I would like to take this opportunity to thank and welcome our witnesses: The Honorable Jacqueline E. Schafer, Mr. Peter McPherson, Dr. Calestrous Juma, and Mr. Michael Hess.

Mr. Chairman, the purpose of this hearing is to assess the role of agricultural development in promoting food security in Africa and to seek solutions that provide increased sustainable agricultural development systems. Sustainable agricultural development will not only lead to stimulation in the economy but will also save many lives.

As is well-chronicled, the malnutrition and food security crisis in Africa remains a daunting challenge. Sub-Saharan Africa ("Africa" hereafter) has the largest proportion of undernourished persons of any world region. In 2004, the last year for which global World Bank data for this measure are available, about 30% or 218 million Africans were undernourished, representing about 25% of the total world population of such persons. With some fluctuations, usually upwards as high as 36% in response to droughts or other natural disasters, roughly 30% of Africans have remained undernourished since 1971, the earliest year for which the World Bank maintains such information, though in recent years several countries, mostly in West Africa, have attained reductions in undernourishment. The numerical bulk of undernourished Africans are in East Africa, but rates of undernourishment are high in East, Southern, and Central Africa; in the period 2001–2003 they ranged between 39% in the former two regions and 56% in the latter. West Africa had a much lower average of 15% in that period, although a few countries in the region had exceptionally high rates; these included Liberia (49%), Sierra Leone (50%), and Niger (32%).

Mr. Chairman, it is apparent that agricultural development assistance in Africa is crucial for eliminating the widespread malnourishment, undernourishment among African countries. Undernourishment is largely due to lack of food security in provinces within countries, communities, or households. Causes of food insecurity include: physical unavailability of food in markets or fields; poorly functioning food market and other food delivery mechanisms; lack of income to purchase or grow adequate amounts of food; lack of access due to social status (often at the household level, e.g., children, junior wives in some polygamous societies, or the elderly); lack of nutritional diversity; barriers to nutritional intake (e.g., poor health and lack of sanitation or clean drinking water); agricultural seasonality (e.g., pre-harvest food deficits or variable rains); and natural and man-made disasters (e.g., floods, drought, or armed conflict). All of these factors are present to varying degrees in multiple African countries.

Inadequate levels or types of agricultural food production at the local level play an important role in creating food insecurity in Africa, especially in remote rural areas. Many researchers, however, attribute food insecurity less to an absolute deficit of food, particularly at the international or national level, than to the failure of socioeconomic systems, including markets and political processes, to distribute food equitably or efficiently. In the view of many, better functioning and open market systems are equally or more important in increasing food security than are absolute food production increases. In the absence of better functioning markets and responsive political institutions, however, an absolute increase in production may be most likely to decrease food insecurity. Such increases are also likely to boost the incomes of Africa's rural poor majority, which can lead both to nutritional and act as a multiplier for a range of quality of life improvements for this group, whose members face the highest rates of undernourishment and are often directly or indirectly dependent on agriculture for their livelihoods. By world standards, Africa's food production growth rates are substantially below some other regions, but just below the world average and somewhat above South Asia, the region which it is most often compared, and which in many cases has socio-economic indices below those of Africa While relative rates of growth in African agricultural productivity are just below the world average, the *absolute* rate of growth is small, because African agricultural output productivity measures are lower than those in other parts of the world, in some cases substantially. In large part this is because African agricultural production is accomplished predominantly by manual labor, is mostly rainfed, and employs improved germplasm (seed or other genetic materials, e.g., cuttings) technologies and inputs (e.g., hybrid seeds, fertilizer, and herbicides and

pesticides) at a relatively low rate. Africa has the lowest ratio of tractors per unit of land and agriculture sector value added per worker, and the smallest cereal yields, rates of Fertilizer consumption, and percentage of irrigated cropland.

Mr. Chairman, though there have been substantial efforts to improve the food security crisis in Africa from various sources such as governments, non-governmental organizations, and philanthropists across the world, it is evident that the humanitarian efforts amongst many of these entities have not been as effective, and perhaps as efficient as anticipated at the outset of this monumental endeavor. This ineffectiveness and inefficiency has been attributed to a number of factors two of which are poor communication and transport infrastructure of Africa which prohibits market access and the decline in funding sources for agricultural development.

In a recent report, the Partnership to Cut Hunger and Poverty in Africa, examined U.S. agricultural development assistance to Africa and concluded that: (1) competing priorities and congressional earmarks influence funding for agricultural development assistance; and (2) that institutional factors such as affect the scale and potential effectiveness of development resources.

I look forward to hearing the testimony of our witnesses so that we can continue our efforts to end the food security crisis in Africa.

Thank you, Mr. Chairman. I yield back the balance of my time.