Science and Good Intentions
Technologies and Partnerships for Africa's Farmers

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Thank you Ambassador Quinn for that generous introduction. I am delighted and honored to be here, both in my own right as an agricultural scientist and as the head of the Rockefeller Foundation.

I see many key policymakers and leading scientists here. It is a tribute to the organizers of the World Food Prize and the city of Des Moines that this event has become so important. It is also a testimony to the Prize organizers that there are simply too many important figures here to acknowledge them all.

But let me say a special thank you to Norman Borlaug, whose contributions continue to go on and on. The Rockefeller Foundation is proud to have been a small part of your work. Your passion and optimism continue to drive us forward.

Let me also congratulate this year's outstanding prize winners, Dr. Yuan Longpin and Dr. Monty Jones, both of whom the Rockefeller Foundation has helped to support. Their achievements have changed science and they have changed lives.

I also want to acknowledge the presence of Dr. Robert Herdt, who was for many years the architect of the Foundation's agricultural programs.

As some of you know, I will be retiring soon as president of the Rockefeller Foundation, and this seems to me to be a good occasion to reflect a bit on our field, where it is and where it might lead. Our work at the Foundation, in its essence, has been to harness science and technology and to put it to use helping the world's hungry people. And on reflection, it seems to me that we are entering a period of real promise but also one of great peril and cause for concern.

I'd like to use my remarks here today to speak for few moments about the perils, before outlining the positive prospects for science to be of service to the poor. I'll then conclude my thoughts with three principles or "rules of the road" that I think could be of use in navigating the challenges of the next decade.

The perils are obvious to anyone who spends time working in development policy. Africa stands as the exception to agricultural progress of the past decades. The reality is that in many African countries, food production per capita and life expectancy have declined over the past 40 years. Moreover, without a change in policies, the situation will not improve. Hunger and poverty will increase, as will instability and strife.

These are the facts: there are currently about 800 million chronically malnourished human beings in the world, 200 million of them in Sub-Saharan Africa – a third of the population. Most are women and children. Forty million of Africa's children are severely underweight for their age, and 50 million are vitamin A deficient. Sixty-five percent of Africa's women of child-bearing age are anemic, and, as a consequence, they tend to have stillborn or underweight children and are more likely to die in childbirth.

There are many causes of this reality, but one is the low yields that African farms produce. While average agricultural production in Asia has risen to nearly three tons per hectare, Africa remains trapped at a production level of about one ton per hectare. As a frame of reference, that is about the productivity a British farmer during the Roman Empire.

Failure in the agricultural sector is devastating in Africa because it is such a huge part of the African economy and society. For most rural Africans there is really not a good choice of employment: 70 percent of African employment is on small-scale farms. Forty percent of all African export earnings are from agriculture. One-third of African GNP is based on agriculture.

The best way out of poverty for most Africans is through development based on agricultural and other rural resources.

Let me illustrate these general facts with the predicament faced by a typical African farmer, a woman we'll call Mrs. Namurunda.

Mrs. Namurunda has one hectare or less of land and it has erratic rainfall and no irrigation. Her farm faces numerous pests, crop diseases, and environmental stresses that would could easily overwhelm her. By the time of harvest, her plants may well have been afflicted by mosaic virus and mealybugs that attack

her cassava; borers and streak virus on her maize; fungal diseases that shrivel the pods of her beans and lower nitrogen fixation; black sigatoka, nematodes and weevils that attack her bananas; and, the twin scourges of drought and the parasitic weed striga.

Mrs. Namurunda's soil is very poor. She has not been able to put much organic matter into the soil and over the years the land has lost its nutrients. In much of East, West and Central Africa, countries are losing on average over 60 kilograms of nitrogen, potassium and phosphorus per hectare.

As a consequence, at harvest Mrs. Namurunda will gather in less than a ton and her family will be susceptible to malnourishment and disease.

However, there are technologies that could help Mrs. Namurunda and they are being developed. Some lie in seeds: new virus resistant strains of cassava; new maize varieties that are resistant to pests and diseases and tolerant of drought; and, quality protein maize that is being bred into African varieties. These and many others are successes of conventional plant breeding that is also being assisted by marker-aided selection.

But other biotechnologies – tissue culture and genetic engineering - are also playing a significant role:

- Tissue cultured bananas – developed by African scientists - are being produced free of pests and disease and yielding over 50 tons per hectare.

- The new rices, the NERICAS, developed by one of this year's laureates, Dr. Jones.

- And genetically engineered 'Golden Rice' with grains high in beta-carotene (the precursor of vitamin A) is now in field trials. One of the developers of golden rice is here, Dr. Ingo Potrykus. Golden rice holds the potential to be a major tool in combating nutritional deficiencies.

But new varieties - however great their yield and their resistance to pests and diseases - need to be rooted in good soil to realize their potential. Here too solutions are at hand.

Fertilizer use in Africa is very low, in large part because fertilizers are prohibitively expensive. For example, the urea Mrs. Namurunda would like to buy in Western Kenya costs $400 per ton compared with only $90 per ton in Europe. On average, African farmers use only 10 kilograms per hectare of fertilizer while European farmers use over 200 kilograms per hectare.

The high farm gate prices for fertilizer are in turn the product of other obstacles: high transport costs, a lack of rural input markets, a lack of credit for agro-dealerships and a lack of capital to set up fertilizer import and distribution systems.

In countries such as Malawi, Tanzania, Zambia and Zimbabwe, fertilizer use has declined by nearly half since the early 1990s.

Part of the solution lies in developing and implementing integrated nutrient approaches, which use organic inputs in conjunction with fertilizers. There are good examples of these technologies now being used in Africa:

- The MBILI technology, consisting of two rows of legumes alongside two rows of maize is producing yields of over 5,300 kilograms per hectare of maize and over 1,200 kilograms of groundnut.

- Mulching of bananas can reduce losses from leaf spot disease by over two thirds.

- And in agro-pastoral areas, a long term trial shows sorghum yields climbing to three tons per hectare when animal manure is combined with NPK, a tripling of yield over NPK use alone.

However, integrated approaches have their limitations. They are information and skilled-knowledge intensive, and have to be adapted to specific soil and climatic conditions. They often require credit to purchase organic materials, including legumes and other crop seeds. And they are labor intensive. All of these factors militate against a rapid scaling up.

However, there is a larger question: since these varied technological solutions exist or are in development, why is Mrs. Namurunda still struggling to feed herself and her family?

The answer, I believe, falls into two broad categories. First, our new technologies need to be made more accessible and affordable for the poor. And second, we have yet to come to terms with the larger contextual changes that encompass African agriculture.

Let me talk first about technology and markets.

A necessary precondition for the adoption of new technologies, in particular proprietary technologies, is that they are made available to African plant

breeders. Today, much of the advanced agricultural technology innovation takes place in the for-profit sector. And for those multinational companies, there is no profit to investing in expensive research on new products that might only be purchased by subsistence African farmers.

The result is not just the absence of useful private sector work. The rise of a sophisticated global intellectual property system covering building block technologies has also meant that even public researchers have restricted access to useful new tools and limited ability to commercialize new ideas in their field.

As a response, the Rockefeller Foundation has helped establish the African Agricultural Technology Foundation (AATF). It is an African-led organization, based in Nairobi, which was established to gain access to new proprietary technologies and make them freely available to African plant breeders. The AATF is currently helping to negotiate several public-private partnerships that should provide African farmers with new technologies. I hope many of you will be involved in it in the future.

Another impediment to the use of technology is affordability. In Africa today, markets are simply not working for the poor.

As I mentioned earlier, we need a network of input traders: providing seeds, fertilizers, farm equipment and extension advice to the doorsteps of poor farmers. Again, I am proud that Rockefeller is supporting work like that of the Citizens Network for Foreign Affairs, and CARE International in Malawi, Uganda and Zimbabwe to create these rural networks.

In many areas, these efforts will become a key source of supply of inputs for the rural poor. However, there is still a need to increase substantially access to working capital, and I invite the policymakers among us to explore how we can expand these efforts.

We also need to build stronger markets for outputs – for the crops farmers wish to sell.

The poor performance of markets is at the center of the low adoption of agricultural technologies across Sub-Saharan Africa. One approach we are pursuing is to help create cereal banks in villages run by local communities. Farmers bring in their maize and other produce, have it graded and stored and then sell it for the highest price they can get, using regional market prices posted on the Internet and accessible from mobile phones.

At the Rockefeller Foundation, we believe that the best way to help poor farmers is to link markets and technology development together. To achieve this, we need to focus on improving local and regional markets, as well as making the global trade system fairer to poor farmers. When markets work better for the poor, they will act as the pull to drive more rapid use of new agricultural technologies.

So here's the situation: we know what the problems are, and we know basically what types of solutions can be effective.

The question that remains is how we can bring these solutions to hundreds of millions of people across an entire continent. How can we harness the positive side of globalization while simultaneously defeating the negative side?

Answering this question will be the work of many people over many years, or even decades. But let me quickly set out three principles that I believe must guide us as we seek to improve food security in Africa.

First, we need to recognize the nature of the new world we live in.

The new global economic world has many players. Thus top-down, hierarchically imposed solutions simply will not work: Western corporations own valuable intellectual property; international groups, nonprofit and philanthropic organizations posses capital and convening power; Western governments hold the key to trade and subsidy barriers; African governments hold the key to regulatory and market reforms; and, farmers on the ground in Africa have strong opinions and know well what they need.

We must acknowledge this reality if we are to succeed.

Second, the way to be successful in this new world is to create win/win solutions.

While we often view these forces as competing with one another, and they often are, we need to create contexts where the benefits of success accrue to many parties. That means coordination, cooperation and deal-making are the way to make significant progress. In particular, it means that public-private partnerships ought to be the rule, rather than the exception.

Third, we must answer the question: who will decide whether agricultural technology can be helpful in Africa? And the answer, I believe, must be that Africans will decide.

That is a simple answer, and it raises other questions. But I think it is a significant conclusion. Weighing the risks and benefits of these new technologies should be the task of the people who will use the techniques, suffer the risks and enjoy the benefits from them. There are challenges here. African societies often lack the means and access to the intellectual property to make appropriate technology. And African governments and regulators often lack resources needed to make regulatory decisions and enforce them.

At Rockefeller, we've devoted a good bit of our work to the purpose of helping Africans be in a better position to make their own choices. I have already given you the example of the AATF, which is bringing many of the large Western companies to the table. Our goal here is to help poor and excluded people. Our means is to give them and their representatives the tools to decide what is helpful.

Throughout the entire development discussion ahead, I think we would do well to chart a course that is based on the values of partnership, reject ideological extremes in favor of results, and pursue approaches that give to Africans the right, the opportunity and the responsibility to make their own choices.

The task ahead is large, and the obstacles and critics are real. But ultimately success will come down to our shared commitment.

The great and wise Dr. Martin Luther King Jr. once reflected that "in the end, we will remember not the words of our enemies, but the silence of our friends."

I hope the years ahead will find many, many friendly voices working in partnership to bring improvements to African agriculture.

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