SESSION FOUR: Looking to the Future
October 20, 2006 – 9:00 – 11:50 a.m.
Calestous Juma

Moderator

Gordon Conway

Our next speaker is Dr. Calestous Juma. He became interested in agriculture, actually, working in Brazil on this thesis about the same time as our current laureates were working there. And he is now become the director of the Harvard Project for Science Technology and Globalization. He's also the co-chair with Ismail Serageldin, whom you heard yesterday, of the African Union's high-level panel on modern biotechnology, which will be reporting very shortly. He's won many distinguished awards and this year was elected as a fellow of the Royal Society of the United Kingdom; and I think in fact he's the first African to be elected fellow of the Royal Society.

One of the things he did with the United Nations was to be head of the Millennium Task Force on Innovation, Science and Technology. And as a result of that, produced an excellent small book on innovation. And I should say that, for all the students in the audience, who I saw large numbers of them at one point, that is a book that you should really read. It's an excellent book on innovation.

He comes from a very entrepreneurial family. He tells the story – a couple of years ago, he went back to his village in western Kenya and stayed with his mother, and his mobile phone wouldn't work. And he said to his mother, "This is terrible. My mobile phone doesn't work." And she said, "Well, go outside, up the tree." And so he went outside, and there was this great tree in the garden full of people way up in the tree, all texting and talking and everything else. And his mother had a really good business going renting out the tree for people. Whether they charged Calestous or not we don't know.

Renewing African Agriculture: Technological Opportunities and Institutional Innovation

Calestous Juma
Director, Harvard University Science, Techno and Globalization Project
Chair, U.N. Millennium Project Task Force on Science, Technology and Innovation

Thank you so much for that wonderful introduction. I think this is the last time I'm going to tell you anything about my mother. I had no idea you were going to tell this to such a large audience.

And I wanted also to just thank sincerely the World Food Prize for giving me the opportunity to be part of this community. And also to thank Iowa State University because I've been getting my tutorials on agriculture from Iowa State, particularly from John Pesek, who is here in the audience.

I also want to congratulate the new Laureates very much. I spent my time in Brazil because I thought Brazil would offer some lessons for the African countries, and that's why I chose to do my doctorate research in Brazil.

And I just want to thank you very much and to connect this with the Borlaug legacy. I was delighted last night to hear from Senator Tom Harkin that the Congress is seriously considering giving Dr. Borlaug the ultimate honor for him that he deserves.

So I thought that maybe we could actually, if it delays a little longer, we could use some tactics that have been developed here in Iowa in getting some decisions made. As you know, margarine was a French invention that was severely opposed in the United States, particularly here in Iowa – the Farm Bureau was very opposed to the consumption of margarine. And there are also some rumors around, flying around saying that margarine causes a lot of health problems: You lose your hair, you get stunted, and it also causes infertility. This was very widely spread here in Iowa. And in the fifties a well-known senator defending, putting forth the bill to repeal all those laws that prevented imposed restrictions on the consumption of margarine, in his closing remarks, he argued that he was really fed up with having to buy white margarine and mixing it with this yellow paint. And he reported that his health was perfect, pointed to his big stock of gray hair and noted that he was 6 feet, 3 inches tall. And finally he reminded the Senate that he and his wife were parents of ten children. And the following day the bill was passed. So I would like to suggest that we use such kinds of tactics to facilitate the granting of this Congressional honor to Norman Borlaug.

For purposes of my talk, what I thought I would do is build it around elements of what I call the "Borlaug legacy," which is really three elements.

The first is the area of technological innovation, and a large part of our discussions here about Norman's work has been really about technological innovation.

There are two other elements that we refer to but we don't give much attention to, which is the role of institutional innovation – that if you develop new technologies, you also need to develop institutions that go with those technologies. And I believe that the Green Revolution

hasn't really worked very well in Africa because we paid too much attention to the technological side and too little attention to the institutional aspects of it. And where you see success stories, like NERICA rice, for example, it went hand in hand with the creation or recreation of an institution that supported its development.

And, of course, the third part, which we often ignore in terms of Norman Borlaug's legacy is the role of technology in environmental management. I think we need to pay close attention to these.

I wanted for purpose of my talk to focus on the first two, which is the co-evolution between technological change and institutional innovation. Because if we're going to think about the future of Africa and how to get the technologies that exist today used in Africa, we'll have to think a lot more closely, more carefully about the role of institutions. And I think some of the comments made earlier today by President Gates really foreshadowed a lot of my presentation. And I think there are lots of important lessons to be learned from his comments today.

We are, in thinking about Africa today, really making this transition from – and I'm thinking about the leadership and the views in Africa – making a transition from really thinking about development in the context of relief to a new phase, a new narrative which is organized around competence-building, a process of trial and error, experimentation, and subsequently to a certain level of mastery of what you actually do. And most of us would like to see Africa move from that first image to this second image. And many of the decisions coming out of African presidents and African leaders are really significantly emphasizing this transition with a very strong emphasis on technological development.

And so what we see in regard to technologies, a new narrative being written. The old narrative on technology in Africa was every time a new technology was introduced, the first response was – how was it likely to be used to enslave the Africans? Or, how was it likely to be used to extract minerals from Africa or extract crops or tie African labor to producing cash crops that they don't consume. This is the history that has shaped Africa's reaction to new technologies.

But we are starting to see such very, very different way of thinking about technology, which is first of all to think about Africa's own problems and then secondly to think about the technological options open to Africa to solve those problems. And thirdly to think about the risks associated with the introduction of new technologies. And this narrative is very clear in most of the decisions adopted by African presidents in the last five years or so, particularly under the auspices of the African Union.

Also linked to that is the new thinking among Africans, which is to focus first on how to utilize existing technologies. And then secondly how Africa could also be a contributor to research, to the global fund of knowledge. This kind of, if you want to engage seriously with Africa, you need to take this into account. That's how the presidents actually think today.

It's a very new Africa that opens up a lot of opportunities for partnership for the continent and the United States particularly through technological cooperation that I've been discussing with my colleagues from the diplomatic community from Africa, that they should really be

thinking about defining diplomatic relations with the United States in technological terms, partly because that's already what the presidents are signaling. And that offers unique opportunities for building new partnerships with the United States, given its strength in science and technology.

So what I wanted to do is offer you very quickly the way I think about the future of Africa, building upon this narrative that's emerging on the continent – which is to think about development as a process of learning that countries change, improve their performance because they learn to do things better. And therefore you could think of a president. If the president is not conducting his affairs as a head of a school, as a teacher, he's not doing the job right. And if you look at the presidents that have succeeded in transforming their economies radically in the last 50 years, they have behaved as if they were teachers. They inspire the population. They take on new challenges, they take on risks. They are constantly informed about the latest scientific and technological developments and because they appreciate the fact that economies develop as a learning process, as a process of social learning.

Some countries – Singapore is an example of where at one point not long ago the government put in place the head of the civil service, was sort of the chief, the controller of all finances, but also the secretary to the cabinet. The government carefully chose someone who had an educational background because they perceived the role of development and economic performance of Singapore as a process of continuous learning. So they defined the economy basically as a learning commitment. And there are some lessons and things we know – I argue that we don't know what we know because we don't basically collect the lessons from development. But we know a lot more than we think we actually do.

In this learning process there are some things that are important. First, the role of physical infrastructure, which is the foundation around which you develop new techniques. And many of the technologies that diffuse into the economy in fact come from infrastructure-related projects. And I want to emphasize here not to reduce infrastructure to cell phones, because there are very important issues related to transportation, for example. If you can't move goods and services, you can't build an economy. And therefore this is an area we haven't paid much attention to. And I think that investment in infrastructure would do a lot for agricultural production before you can even think of investing in new technologies.

The second area is the critical role of technical knowledge. And here I'm thinking mostly about technical universities – how to bring universities to bear on community development. This is, again, part of the unfortunate legacy of Africa is most of the universities focus on the social sciences. And most of the donors have up until recently been focusing on the primary education. And it's very difficult to conceive of a continent where most of the graduates are trained in the social sciences. I have nothing against the social sciences. We just need more technical people. We need to invest more in the engineering scientists. And we need to get more women into the technical sciences.

This is not – it's all we asked that in the early stages of the creation of African states that we focus on the social sciences, because what is needed is to get people who could run the governments. Today the challenge is getting people who could run an economy, and that requires different kinds of universities. And that is an area that I'm devoting a large part of my time to, just thinking about not just the reforms in existing universities, the creation of new ones but also

the creation of partnerships between African universities and counterparts in other parts of the world.

The fourth area is the area of business development, which is basically creating incentives that promote the creation of local enterprises, particularly small- and medium-sized ones. The reasoning here is very simple, it's that enterprises are the mechanisms through which you transform knowledge into goods and services. So if you don't have enterprises, chances are that you are not capable of, in fact, transforming knowledge into goods and services and therefore promoting economic transformation. There are some interesting statistics showing that 60% of the jobs created worldwide are created in small- and medium-sized and actually startups, creating new startups. So if you don't have a robust environment of support of startups, chances are you're your economy possibly is not growing.

And finally, my image of what government ought to be doing is the government to act as a facilitator of this process of economic learning. These are all things that we know. It's interesting that the same lessons apply to different sectors. Whether you are thinking of agriculture, industry, services, protection of the environment, you get exactly the same kinds of ideas coming through.

So this has led me to the conclusion that we are actually not allowed to be able to make a difference and to really pay attention to some critical elements that come from lessons that we have learned in the last twenty years or so.

I wanted to, given this as a background, to get to the work that we've been doing for the African Union, which is the technology, the biotechnology, what we've been asked to basically advise the presidents on what the regional priorities might be in the area of biotechnology. As you can expect this has really been a very, very controversial issue in Africa with the views about risk that vary significantly.

Of course, in this country, products are considered safe until proven risky. In France products are considered risky until proven safe. So you have already kind of divergent views. And I think in the case of biotechnology, for a large part of Africa up until recently, products are considered risky even if they didn't exist. So we are thinking of really having some debates around biotechnology that are based on actual products rather than hypothetical statements about what is safe or what is not safe. That's why I don't debate with Greenpeace because it will be very useful to actually debate around a particular product. It's very difficult to debate about hypothetical products, and therefore I'm hoping that we can really move this in the context of Africa towards having some products that one can actually discuss.

And I can confirm that, for most of the African presidents today, there's a lot of willingness, in fact, to take risk with new technologies. The challenge is actually getting those technologies in place, especially where those technologies are related to solving problems. So the image we are starting to see in Africa is really a new one of this…

[audience laughter] Now you are thinking about helmets now. Don't think about helmets. I showed this in South Africa, and the first question that was asked was, "Who owns the motorbike."

But the reason why African presidents are starting to act and think along these lines is actually pretty obvious in that they are dealing with major challenges which have to do with the human health, agricultural limitations, supply of clean water, environmental degradation – those challenges that have been codified under the so-called Millennium Development Goals.

And it's this image of really facing challenges on a day-to-day basis that is forcing African leaders to start thinking seriously about science and technology. They're taking steps that I consider to be very, very critical, that they are going to go anywhere to find science and technology at the moment in terms of thinking about how to solve their problems.

And just to give you some kind of piece of data to think about, there are 600 African students in the graduate science programs in the United States at the moment. And this was a product of some investigative work through colleagues of mine at the Department of State. We found about 600 African students at the graduate level in the sciences in the United States. There are 10,000 of those in China. And that gives you a sense of the scope of thinking in Africa about the importance of science and technology in that they're going to focus on new partnerships that are driven by building up the competence needed to solve local problems. Something to think about at the moment.

In terms of all this debate, if I could be allowed some kind of editorial comments around here in terms of biotechnology controversies, which is the context in which Ismail Serageldin and I have been doing this work. We've come into it knowing that all new technologies, especially radical ones in fact, face opposition at the beginning. So the question is – how do you manage your position?

And I give you one simple example, which is a product we all use very regularly and don't recognize that in fact had probably was the most controversial product of all time – which is coffee consumption. First, it's become integral to our professional lives. You can't think of life these days without actually coffee being part of it. Originated in Ethiopia, domesticated in Yemen, and then started diffusing in the Middle East into Europe. In 1511 coffee was outlawed in Mecca. Controversies erupted. A statement was prepared and sent to Cairo to confirm that coffee had been outlawed. And the leaders in Cairo were outraged by that statement, so they sent back a note saying, "Your physicians are asses. Our lawyers and the physicians are better informed. They command the use of coffee, and they declare that no faithful will lose heaven because he drinks coffee."

So all these debates really are not new. I'm not sure what origin of this was – we can go into some discussions – but when coffee made it into Europe, it started threatening wine in Italy, beer in Germany. This wasn't the happiest situation. Just to give you an example, this is a statement by a poet, a well-known Italian poet, who said, "This seditious disturber of the world has, by its unparalleled virtue, supplanted old wines from this blessed day." And the bishop started building a case to have coffee excommunicated from the Christian world. They took it to Pope Clement and said, "Why don't you get rid of this?" The Christians, they called it "Satan's drink," just like we call GMOs Franken foods, then called coffee "Satan's drink." They passed it on to Pope Clement; this was in 1600. Apparently sipped a bit of it and declared, he said, "Why this Satan's drink is so delicious. It would be a pity to have the infidels to have exclusive use of it. We shall fool Satan by baptizing it and making it truly a Christian beverage."

It took 250 years of controversy about coffee. The last attempt to ban coffee was 1823 in Stockholm, and in Sweden if you were caught drinking coffee, the authorities would confiscate all your utensils, cooking plates, everything else. It's was such an offense to drink coffee in Sweden. And you can't think of Swedes without thinking of how much they actually drink these days.

This is a hopeful sign that these debates need to be managed, and over time they will look back and talk about ridiculous stories around genetically modified products. But just to give an indication that the debates we are having today are not unique to biotechnology.

So it's in that context that, in terms of our reports to African presidents where we are specifically asked to give strategic advice on its application in agriculture, health and environment but more specifically to focus on regional partnerships within Africa but also how Africa could create partnerships with the rest of the world.

I just want to give you a quick summary of what we are going to recommend to the presidents. First of all, to recommend to them to adopt long-term technology missions, in that they need to be focused and decide as groupings of countries why they think they have internal competence to be able to drive twenty-year technology development programs. And in fact the consensus has emerged in Africa that for southern Africa they are very interested in working together as a group of countries on using biotechnology to solve problems associated with the opportunistic diseases linked to HIV-AIDS. It's not HIV-AIDS itself or the virus itself, but work on developing pharmaceutical responses to opportunistic diseases associated with it. This is the main priority of southern Africa.

Northern Africa, which is led by Egypt, is thinking about going into the manufacturing of pharmaceutical products, basically partnering with industrialized country enterprises and moving into manufacturing – starting off with diagnostic use, of which they already have quite a few. West Africa, the consensus that's imagined from West Africa is crop development, and for eastern Africa, the consensus there has been animal biotechnology, initially looking at livestock but also starting to think about biotechnology related to wildlife. And finally for central African countries – Gabon, Democratic Republic of the Congo, and a few others – strong interest in forest biotechnology.

So this gives you a picture, if you're thinking about partnerships in Africa, to think about these imagined priorities where countries want to actually work together.

And in the context of the capability needed within Africa to solve these problems, we're focusing almost entirely on new roles for universities, because we think that you can't effectively engage in a knowledge-intensive activity like biotechnology without bringing research and education together and of course the commercialization component of it. And so we re very interested in basically a re-invention of African universities.

And we are going to be telling the presidents that if they want to spend any political capital, it is this reform that is very critical, actually more important and more difficult than fighting, dealing with ethnic conflicts or ethnic differences within countries. Because these differences between universities that teach but don't do research and then you have research

institutes that do research but don't teach. Those mandates are enshrined in law, so you have to reform the laws, or you need the political capital to go around the laws. So we are calling on presidents to spend some really political capital on these fundamental reforms, which we think without those reforms it will not be possible to actually solve many of those problems.

And then there are other related issues that involve the area of commercialization of biotechnology. In this respect we're recommending that initially African countries should focus on doing what we call technology prospecting – which is to search worldwide, identify technologies of relevance to the African economies, bring them into the research-related universities, adapt them to local environments, and then create enterprises around them. That's a proposal we are putting forth. In the next five to ten years they should devote their efforts to this prospecting exercise, which also creates opportunities for international partnerships. That's essentially we are offering to the presidents.

I wanted to just, by way of closing, get to close on this – to indicate that this area of reforming universities and making universities responsive to local development is something that has happening worldwide. It's not just an African challenge. Every country I can think of is rethinking the role of universities in development.

And there are a few striking examples that I wanted to offer you. The first one is EARTH University in Costa Rica, which has aligned its curriculum with the farming activities where when students, they spend the first year basically on working on the farm like farmers do. And so when they're digging in the morning, they come back and they take lessons in soil sciences. When they start planting crops, they go back and take classes in agronomy so that the curriculum is aligned to practical activities. We are recommending that, in fact, for the African countries as a way to think about new models of university contributions to community development.

And this is not just for agriculture, but similar models could be applied for industry as well. In fact EARTH University is creating a new campus near the San Jose airport to adopt exactly the same model but to more industrial- and service-based activities, which is basically rethinking the role that universities play in development.

There are a number of examples, African examples, where universities have been very instrumental in contributing to incremental changes. Rwanda, for example, the Kigali Institute of Science and Technology has been very central to the reconstruction of the country, not just through creating new engineers but also in fact going out and being engaged in practical activities. We have similar experiments going on in South Africa and Ghana.

And then we have really data I'm very interested in speaking about radical transformations in new universities and thinking about where these universities would come from. So I'm looking into how private enterprises can become incubators of the universities. And there are some very interesting models coming out of the history of Korea on enterprises incubating universities. We think mostly about universities incubating enterprises, but then you have the reverse which is enterprises incubating universities. I'm involved in a lot of discussions with the universities on that.

I wanted to just kind of close this by offering you one central message – that if we can focus our attention in terms of the future of Africa on really competence building, so that we can really start to see whether individuals are effective at solving problems, it would have a scenario along these lines: [video]

Gordon Conway

I think we're all looking forward to the biotechnology report when it comes out, and I think it's going to be a landmark report for the role of biotechnology in Africa.