

But very seriously, because we have a very limited time together, let's just get right into it. And I'll start with you. And I'm gonna say Agnes. We'll start with you. Today some 100 million of the farmers across Sub-Saharan Africa farm less than 2 hectares of land. Some 80 percent of those living in rural areas are poor. More than 30 percent of the rural population is chronically hungry. And 35 percent of the under-5-year-olds are stunted. By 2050, the bulk of the world's population growth will take place on the continent. In fact, some project that 1.3 billion will be added to the continent, and Nigeria will grow larger than the size of the United States between now and 2050.

Despite those numbers, the economic projections suggest the Sub-Saharan African agricultural market alone will top a \$1 trillion US by 2030s. So my question to you is: is this projection achievable? If so, what role will AGRA play in making it a reality for the continent?

Agnes Kalibata:

Thank you, Ertharin, and thank you, Jeff and Roz – Roz, for having us here. To the question that you're asking, I just wanted to start by looking back at my own life growing up on a farm, two hectares. Because actually if it wasn't two hectares, it would be like weird to me. 'Cause that's what I grew up seeing. Most farmers I know had two hectares. I think the most important thing is not the two hectares. It's how you turn those farmers into viable farmers. 'Cause most of African farmers are going to be – 70 percent, 80 percent of African farmers are going to be two-hectare type of farmers.

So when AGRA was formed in 2006, – which, actually, the AR letter in 2007 – I joined the Ministry of Agriculture as Permanent Secretary – the ability of an African farmer at that time to find seed anywhere was next to impossible. I mean, I don't remember any farmer would get seeds anywhere in the next 50 kilometers, say. Joe, who is here, who was at the beginning of that whole journey, tells you there were 10 seed companies on the whole continent, producing less than 2,000 metric tons. Today we have over 110 seed companies producing thousands of metric tons that is capable of growing 10 million hectares, capable of reaching over 15 million farmers.

So, based on that alone, the ability to close the yield gap – farmers have actually moved from 0.5 tons per hectare of maize when we were growing something called katumane – I don't know if you

know katumane – to now something like 1.6. We've tripled. But even at that point, the gap is enormous. We need to get to four tons. Because you know what? A Rwandan farmer to three tons would be able to compete in terms of price with international markets. Right now a farmer producing 1.5 tons per hectare cannot compete price-wise.

So the fact that the opportunities are beginning to form, the fact that AGRA has worked with number – 18 countries across the continent to produce over 650 varieties that are available within a distance of 10 kilometers now, from over 100 kilometers to a distance of 10 kilometers, through retail shops known as agro-dealerships that are scattered around the continent, the opportunities are beginning to form that actually African farmers can feed themselves and actually can form businesses out of agriculture.

The next thing I wanted to say is private sector, existence of private sector. When I became Minister of Agriculture in Rwanda, my biggest frustration was the fact that there was no private sector in the agriculture sector. It's like you're trying – people have said that in the public sector we have a _____ against private sector. But here you wish for it and there's nowhere to find private sectors. We have to grow it from scratch. So governments are beginning to understand the value of private sector and are thinking through how to grow private sector, putting the right policies in place. A number of African governments are working now with the World Bank on the ease of doing business so that they can help build a private sector. So that's beginning to take shape.

One other thing now, which actually we are working on now as AGRA, is public capacity to drive implementation and delivery, which is one of the biggest weaknesses now. I mean, AGRA as an institution can only do so much. But these governments have the potential and the capacity to reach every corner of their countries. The problem is they are challenged by capacity to do that, by capacity to design proper programs, and by capacity to implement these programs. A few countries are beginning to do that, and we have a few examples: Ethiopia, Rwanda, Burkina Faso. You see a few countries around the continent that have begun to figure it out. And we are learning those countries and using those examples to support other countries to actually come up with policies and models that will allow them to implement.

I mean, here, in the discussion you heard in the morning, people are talking about the type of policies and how you build a policy

environment that will allow delivery. So it's on everybody's mind. So I have no reason to question that, with all of us putting together, we can deliver on this. This is something that is achievable.

Ertharin Cousin: Okay. So, with investing in small-holder farmers to turn them into businesses, increasing access to seeds, the private sector and building the capacity of the public. So I'll turn to you, Kanayo. You've heard what Agnes has said. Over the past decade, as IFAD's president, you led the global response to the challenges and opportunities for agriculture development, particularly in rural areas. And as we said, specifically with small-holder farmers, focusing on small-holder farmers. With the projected population growth on the African continent and the expansion of the number of urban areas into megacities, is there an ideal African agriculture system of the future that will help us achieve these goals? And if so, what does that system look like?

Kanayo Nwanze: Well, thank you very much, Ertharin, and thanks again, Jeff, for this opportunity to share with you my thoughts. Ertharin, I don't believe there's an ideal agricultural system for Africa or for African countries. So if I can turn your question around, what does Africa need to do to turn its agriculture around in order to meet the challenges of future – of the projected doubling of its population, to meet the challenges of food security?

I will start off from what Agnes has just said. First of course is for us to see agriculture, no matter what size or scale, as business. That's crucial. To go from the subsistence level, and to stop seeing poverty – to stop romanticizing poverty. Poverty is man-made. It's not natural. So, when you look at the African continent, one thing that has been very clear to me is that Africa is by no means poor. In fact, Africa is very, very rich. Mineral wealth, from diamonds to bauxite, the percentages are incredible. Fifteen percent of all reserves. Land – about 50 to 60 percent of all uncultivated agricultural land, 200 million hectares. Excess of sunshine. Plenty of rainfall. Kilometers of waterways. I mean, you name it. And a vibrant population. Sixty percent of it's youth below the age of 30. What other part of the world has this sort of – and we don't have earthquakes and typhoons and hurricanes and you name it.

So I think Africa – no country in the world ever transformed itself without going through an agrarian change. No country. Europe, 17th century; Japan, 18th century, 19th century; US, your country; China, 20th century. Why should they be different from Africa? So, first and foremost, have to have total agricultural transformation. But Agnes already gave the ingredients: seed, fertilizer, irrigation.

But I think the key problem that we face is the policy dimension. And that is all linked with governance and leadership. That is gonna be our biggest challenge. If we have that corrected and you have the rule of law, then Africa's agricultural transformation is gonna be such where small producers today become aggregated; they have to be aggregated into cooperatives and SMEs and companies, and you have to have the whole value chain.

And if you ask yourself, "By 2050, who is gonna feed Africa? Is it the farmers of today in their 60s? A woman with a hoe in her hand and a baby on her back?" I think that's what you have up there, isn't it? No. It's the youth of today. But they're not gonna be using the same technologies that exist today. Just think of what IT can do: aggregation, organization of farmer's groups. So the elements are there. I see the agriculture of tomorrow meeting the challenge – for Africa meeting that challenge is Africa being at the forefront of feeding the world. Africa has to be able to feed itself first. And we have all the opportunities there.

If we don't do that – it's not gonna happen in my generation. I think my generation has failed. In fact, what my generation has done successful is to fail – failure. And we're out of it. It's the – with my own children. My grandchildren perhaps, or my great-grandchildren. They are the ones to bring about this change.

So I see huge potential in transforming African agriculture. First it's got to be build on what we have: small producers. But to see it as business, as a money-making business, as an economic activity that generates wealth, creates jobs, feeds people, and brings about the emergence of cohesive societies. And until we do that, and until we're able to manage our resources properly, until we have the right leadership and correct governance structures and institutions that function correctly – I think that's what we gonna be looking at the next century.

Ertharin Cousin:

Well, you just made me very sad because I've been saying to the world that we were gonna do this in my lifetime [*laughs*]. But creating wealth, jobs, focusing on people – all of the ingredients that we've heard you talk about before. But the one issue – and I'll go to Raj on this – that we haven't talked about is: how do we finance this work that is necessary? And the Rockefeller Foundation not only provides financial support to AGRA, but for a large number of other organizations and projects around the entire Sub-Saharan continent.

So, Raj, I'd ask: what do you see as the hurdle or hurdles to scaling from development programs to creating the kinds of systems and structural changes that both Agnes and Kanayo has talked about? And how can foundations and other donors – or help us help those who are working in these areas overcome those hurdles?

Rajiv Shah:

Well, thank you. You know, I think Agnes and Kanayo both laid out the groundwork. First, you have to have a goal. And the goal of achieving four tons per hectare of call it maize yields in Africa, if achieved, would be a tremendous step forward in both food self-sufficiency but also in fighting hunger and chronic malnutrition. And I won't get into all the data substantiating that, but it is true that a dollar spent in agricultural research yields \$23.00 of real value to those small-holder farm families.

It is true that every society, as Kanayo mentioned, that's achieved rapid economic development and social mobility has done it based on a fundamental agricultural transformation where those yield increases are coupled with a population decrease of people working in agriculture, right? It's a very small percentage here in the United States that're actually farming. And allowing people to go into other productive sectors of the economy. And that's really what success looks like.

The fact that AGRA has gone from 0.5 tons per hectare to 1.6 is a demonstration that it can be achieved. The fact that the seed program at AGRA has produced more than 150 improved varieties and put them out in the field, supported more than 110 seed companies and built the system of hundreds of agro-dealerships that allows farmers to interact with a commercial market for both inputs and output sales is laying the groundwork for success. But it starts with having a clear goal, knowing how to measure it, and documenting outcomes. And AGRA has done that I think quite rigorously over its 11-year institutional life.

I'd say second is what Kanayo mentioned, which is – we talk about money until we're blue in the face. That's not gonna solve the problem if the policies are in the way. And the chairman of AGRA, Strive Masiyiwa, is here. But Strive played a big role in the 2012 G8 Summit, which you three were a big part of as well. When we said, "Okay, donors can do more and will do more," in that case President Obama used the G8 to get other countries to say, "Let's increase our investments in agricultural development in Africa."

But it started with African heads of state, at a head-of-state level, committing to a concrete and specific set of policy reforms that we

had to hammer out as a precondition to being able to come to that meeting. And I remember at the end some worked better than others, to be honest, but I do remember just putting in the time of sitting with leaders and saying, "Will you commit to these policy reforms?" and some saying, "Yes we will," others saying, "No we won't do the number 11 and number 12." But it's that level of policy engagement to ensure that the groundwork exists for real private investment in agriculture, real commercialization of the ag sector, real access to these improved seed varieties. And AGRA is now doing that as part of its grand new strategy going forward, that I hope Agnes can tell us about, in 11 African countries.

And then, finally, after those two pieces are in place, it takes resources. And in the '60s and '70s when the world made a huge collective investment in agriculture in Asia and Latin America, for example, it succeeded at promoting a green revolution that changed the face of hunger and poverty. In the 1860s, in the midst of a civil war, when Abraham Lincoln signed the Morrill Act and made a huge public investment in land-grant universities and American ag extension in this country, it, over 50 years, transformed the face of our agriculture and made us the most productive staple grain economy in the world.

So resources are required. And the truth is: in the '70s and really in the '80s – by the time we got to the 1990s, the level of public investment in agriculture had just disappeared completely. The only reason I think we're here today is: in 2003, Kofi Annan brought together heads of state in Maputo, and African heads of state started the process by saying, with a lot of cajoling and support from folks in this room, that "We're gonna spend 15 percent of our public budgets on agriculture." Without that kind of commitment, I don't think any of this would've happened.

Then in 2005/6, Dr. Rodin was leading the Rockefeller Foundation, and Gates and Rockefeller came together and I think did an extraordinary thing in helping to create this institution of AGRA as a technical institution focused on this problem. In 2009, President Obama, with your doing a lotta the shoe-leather work, raised \$20 billion in commitments through the L'Aquila Summit, because we said, "There's a global financial crisis. We're gonna spend hundreds of billions of dollars bailing out the financial system. What about those who are suffering from a food crisis?"

And you'll remember: in 2008, we were looking at pictures – the cover of *The Economist* had a photo of a little girl in Haiti eating a mud cake, which is exactly what it sounds like, because of a food

crisis that many in this room worked on, and led to that political motivation.

So what's happened since? There's been an increase in public investment in agriculture. That's a good thing. I'm deeply concerned about the fact that I think European donors and the United States are decreasing their overall foreign assistance commitments, redirecting the limited amount of money we spend on helping countries stand on their own two feet and be productive and integrated in a global economy. We've taken a meat cleaver to that in this country with the current administration proposing 30, 40 percent cuts. So far, because AGRA has proven it's a results-oriented institution, it has survived that, and in fact garnered even greater investment from the public sector. But we have to change the larger, broader trend around foreign aid and foreign assistance to continue the progress I think we've seen and that we hope for.

Ertharin Cousin: Well, clear goals, policy development, and then resources. And so you talked about the investment that Rockefeller and Gates made. And I talked about your work: that we can't forget about Jeff being at the Gates Foundation then too. Because it was his leadership that we ensured that we had the resources that were necessary to –

Rajiv Shah: Yeah. In fact, I got a lotta my practical training in farming on the Raikes farm.

[Laughter]

So I feel like my earned my right to be here, Jeff. Hard work.

Ertharin Cousin: So, Usha, let me turn to you. Because you're a successful Indian business operator. And your company is now pursuing opportunities on the African continent. And you've heard what your three panelists have talked about of what's necessary. What we haven't talked about are public/private partnerships. Can you talk a bit about the role of public/private partnerships and creating food systems across Sub-Saharan Africa? And how do we move from simply talking about public/private partnerships to creating the ones that really work? And give us, from your experience in India, what you think we can learn to help leapfrog the challenges that you saw in developing those partnerships, as we create the ones that we'll work on for sustainable food systems on the continent?

Usha Zehr: Thank you very much, and thank you Jeff, and Stanford University, for hosting us here. I'll start with the partnership which

really worked well in India and parts of Asia, and very happy to be sitting next to Raj, because I actually wouldn't be here if it wasn't because of the Rockefeller Foundation and the Ford Foundation coming to India in the '60s and promoting partnership with the government of India, with private sector, with entrepreneurs, to promote good-quality planting material. And as a consequence of that, the inputs from the scientific community in the United States primarily led to adoption of high-yielding varieties in sorghum. Everyone talks about rice and wheat, but actually it was not just rice and wheat, but it was the sorghum, the millet, the corn in the central and southern part of the country which led to the overall agricultural revolution that we see.

And all the equation is right for Africa as well. The partners are together. But to me, we've done a lot of talking about public/private partnership. Not so much on the ground on implementing it in a manner, which happened in Asia, for instance, where there was policy, and, most importantly, government will. The government was willing to do whatever it took to make sure that agriculture was transformed at the end of it. So partnership is critical for success, but I think partnership today – we have to look at it on a crop-by-crop basis because in maize the partnership would look very different because there're so many players. In sugar cane the partnership would look different.

So, wanna use the example of sugar cane, for instance – I know it's not a big crop, but still. So when I think about partners for sugar cane, I wanna talk about irrigation partners. Because it uses so much water. So can I partner with a drip irrigation or irrigation specialist who could be public, who could be private, who then allow us to grow the same amount of sugar cane but with less water? So this could be a new form of partnership. Then you still need the partnership where farmers have some assurance about markets, availability. It could be a government partnership. So I think talking about public/private partnership, to me, may be. But partnership – yes, definitely. And we need to look at: for which crop, what is the critical requirement? And depending on that, we think about who the right partners are to get it done.

Ertharin Cousin:

That's great. The policy and having governments with the will to make the partnerships work is I think an important factor, which takes me right back to you, Agnes. Because each one of you talked a bit about policies and government and the role of government. So often on the continent the challenge is governance. And we can't talk about it as a continent. We have to talk about it as countries. And in many of the countries where agricultural opportunities

exist, we have governance challenges. Am I right about that? Do you agree? And if so, what role does AGRA perform in helping countries overcome those governance challenges?

Agnes Kalibata:

Thank you. Just to pick up from what Usha is saying, India became successful because of two things. There was a prime minister that was ready, said – actually, I think Indian revolution begun in front of the office of the prime minister. He planted the seed right there, saw it grow, and said, "I want it everywhere." So the leadership was very critical. Now, the reason AGRA was created as an institution that looks across the continent was recognizing that Africa's leadership is going to be challenging. There are so many countries. There's no one leader that is going to say, "Let's take it to the farmer." You're going to have 101 leaders that are thinking differently.

So AGRA tries to bring the idea that technologies are very critical, but also the fact that technologies need the right policies, like President Kanayo was saying, to be able to take them to the farmer. And those policies are very challenging to build. You have to have the capacity to do a policy like the discussion we had in the morning.

Now, the key challenge we find across the continent is the capacity to build the policies to support an environment of technology delivery to the farmer. Because right now we find that some of the things the people are dealing with are very basic: the lack of regulatory environment, which makes it very difficult for private sector to be in place, the lack of regulatory environment, which makes it very difficult for farmers not to have fake seed. I know fake seed is becoming a huge business, fake fertilizers is becoming a huge business. So AGRA – what we are trying to do is trying to understand: what did other countries do differently where we've seen successful green revolutions?

In fact, as recent as China, for example, what are they doing differently? It's all the way from land and land policy issues that make farmers commit differently when they're engaging in agriculture. Whether it is access to financial issues and the kind of tools that are put in place to make it possible for women farmers to access finance. Whether it is the whole thing I talked about: private sector. So we see that all these challenges need specific policy tools. And what we are trying to do is to work with the governments to understand how to build a policy environment, but also to work with other stakeholders to advocate for that policy environment to take effect.

But from a governance perspective, we are working with countries to actually take on CAADP, plan properly. But a plan is not good enough if a plan is not prioritized in an environment where you have restricted resources. So we are trying to tell our countries: "Prioritize your plans. Be very clear two things that are very critical to you driving a successful agriculture sector." That's what we did in Rwanda. We don't try to drive everything. We pick 2, 3 things that contributed about 60 percent to our ag GDP, and we were able to move.

So that's what we are telling countries: "Prioritize. Put in place your implementation mechanisms that help you deliver, and be accountable. Because you're using other people's resources. You have to tell them where their money's going. You have to show them the results. And you're building a base that would allow you pull in your own resources." So unless we do the things and really try to go to the extra mile, we will not be able to – agriculture will not transform, and the next economies will not be able to transform. By doing that in Rwanda, we were actually able to reduce poverty by 20 percent in a period of 6 years, just by investing – rigorous investing in agriculture sector, doing what the CAADP required us to do.

Now, what we are trying to do from a continental perspective is actually taking that to the continent. You will be happy to know that we are actually trying to work with BMGF and others in African Union to actually get a scorecard in the agriculture sector working. And start asking ourselves – so you asked us – if you don't know what to do, there's help. AGRA can help. Sonso can help. There's help. But let's get moving. And this is how we track it and this is how we measure it. So with a scorecard, you can see where you're making progress, but also you can see what is difficult for the whole continent, and then AGRA knows that needs to put its weight behind this with our partners. So I think there's a real opportunity using the energy of one country learning from another country through what AGRA is doing across the continent to actually be able to get the continent to move at a different pace than we've done in the past.

Ertharin Cousin:

I must come back to you on this and ask you, though: do you see scorecards made public, or scorecards just for the government? So the question is: if we're talking about transparency, is it transparency to donors on how they're scoring on scorecards as well as to the governments themselves?

Agnes Kalibata: It's interesting that you say that. For me, a scorecard that does not actually track donor investment is not good enough. Because most of these countries are depending on donor support to get moving. Now, through the policy declaration and everything, we do make commitments. We have to come through on those commitments to support these countries. Exactly the point you were making, Raj, around the fact that support to agriculture is dwindling. It's up and down.

In 2008 we got an up and we've been doing on that. And in fact last year, in 2016, with your support, Jeff, and the rest of the board, we started the Seize the Moment campaign specifically because we were saying, "This is not the time to let go of supporting African agriculture." And we could see that with all these other commodity crises and everything, everybody was losing interest. And we were saying, "No, we cannot let agriculture go down." And I think we've managed. Every RGRF we've been seeing a lot of interest in keeping the momentum going in agriculture.

Ertharin Cousin: Well, Kanayo, if I may come to you. Agnes talks about leadership of governments, the regulatory environment, transparency, scorecards. One area she didn't talk about that you talk about in your book – and I will hold up Kanayo's book. Yes, I'm shameless for you.

Kanayo Nwanze: Thank you.

Ertharin Cousin: If you won't do it, I'll do it for you. *A Bucket of Water*. If you want to know about African agriculture, I would suggest you read his book. But let me go back to the question. The one area she didn't talk about – you talk about governments pursuing to achieve sustainable, more sustainable, durable food systems – is the issue of innovation. And in your book, you say the most exciting innovations don't always emerge from laboratories. So what kinds of examples can you give us, as a scientist, of what role technology and innovation play in achieving this trillion-dollar African agriculture opportunity?

Kanayo Nwanze: Thank you. Before I answer your question, I need to take a second. You know, Agnes, I don't believe that African agriculture – the transformation of African agriculture is dependent on aid. It's not. African agriculture will transform itself when leaders invest in agriculture and rural development. And it has to be intrinsic. It's an internal process. Development is not something we do for or to people. Development is something people do for themselves. Our role is to support, to guide, to catalyze, but not to lead. Because

they must own it. I see the role for international development assistance to kick start, to initiate. But change doesn't come about by itself. It has to be made to happen by those who want to change. This goes back to governance and leadership as well. They're all interwoven. But I want to be clear about that. As I said, no country ever transformed itself on the basis of external aid.

We're all scientists, one way or the other. A tree, a plant can only grow strong when its roots are fairly anchored in its own soil. Only then can it make use of the energy of the sunlight, from air. You see what I'm saying? And this is very clear. It's a fundamental process.

So, having said that, innovation – that is true. Of course a lot of innovation occurs in the lab, Silicon Valley, and of course here in Stanford. But, you know, from my experience in Africa and Asia, Latin America, some of these innovations are very simple. Let's take the case of fertilizer application. We all say, "Well, farmers are very poor. They can't afford to use a fertilizer." Fertilizer and irrigation are as old as the Nile civilization. It is pitiful.

Because the woman that you see up there probably is not part of the 5 or 6 – sorry, 13 or 18 percent of African farmers that use fertilizer, compared to 40 percent in Asia and maybe 60 percent in Latin America. But think about in the Sahel, where farmers have to apply fertilizer to their millet or sorghum or parts of dry land, East Africa. So why did ICRISAT, one of international centers, the one based in India where I spend 18 years of my career, develop the simple bottle cap technology, the application of microdosing fertilizer? Now, you would say, "What has a bottle cap got to do with fertilizer application?" Very simple. The farmers don't have the money to buy 100 KG fertilizer bag of fertilizer, but they can aggregate and use it – simple bottle cap. Applying buttercup fertilizer with the seed to the plant in whole. Is that innovation?

Ertharin Cousin: That's innovation. That is innovation.

Kanayo Nwanze: Then take another innovation, which again is also technology-based. But its use and application is a bit different. We partner with Intel to develop small digital equipment for farmers in Asia to measure when to plant, how much fertilizer to apply, or how much irrigation. And a good story we always tell: partnership with Intel from my institution, IFAD, was ability for rice producers to measure salinity or fertilizer application. In this particular case, a simple technology that was meant to guide them in the application of fertilizer and the rest of them helped a farmer, a woman in this

particular case – like in most cases, it's woman – to reduce her fertilizer application. Because she had been overfertilizing. That simple technology she can use – or somebody can use and tell her how much fertilizer to apply. So she actually saved money.

I can give you several others. You must have heard this story about the re-greening of the Sahel. And this was a very simple technology of how farmers were able to capture rainfall and to add simple mulch in. I recall them in the Sahel – basically this started in Niger, in the village of Batodi. It's a half moon. It's a half-moon structure that you build with rocks and things. And it captures rainwater. It's a small catchment and you can plant your trees and what have you. And over 20 years, 25 years, the whole of Batodi, hundreds of acres or hectares of Sahel dry land was reforested. Reforestation.

Now, this is a very small structure – half-moon structure. Not only that. They can now add mulch, as well as some animal manure, and produce vegetables as well. Now, is that innovation? Of course it innovation. Basically what we – at least what I learned in all of this is that innovation doesn't always start in the lab. It actually starts if you listen to what farmers are doing or listen to what they are saying. And sometimes it's just taking a very simple idea from the farmers and turning it around and doing it differently. Innovation is not always something new. And innovation is not necessarily a negation of the past, of what is old. It can basically mean throwing a new light into an old technology and doing it differently. It's innovation.

Ertharin Cousin:

We get it. It doesn't need to be high-tech. Even here in Silicon Valley, you can say that and say it proudly. Raj, I wanna come to you on a statement that Agnes talked about, the need for financial assistance resources. Kanayo says, "Nope. It's not about the aid." I would say: but what about investments? And that we need investments in agriculture. And in fact, IFPRI, the International Food Policy Research Institute, and the International Institute for Sustainable Development issued a joint report recently that said that "We will require \$11 billion in additional investments to support the achievement of SDG 2. They say that \$6 billion of that needs to come from the countries themselves, but \$4 billion needs to come from outside.

Now, here's the challenge. What we're beginning to see is that, for example, you had some of the richest philanthropists come together here in the United States recently to talk about investing for achieving the sustainable development goals, \$500 million.

And they prioritized education, the global health, and inequality. Agriculture and food security weren't on that list. We don't have a food crisis like 2009 happening right now that would suggest that we have the attention on the front pages. How do we keep agriculture at the top as a priority for investors, and what do we need to do to ensure that agriculture is seen as a viable investment?

Rajiv Shah:

Well, you know, it's obviously difficult. But I think it starts with maybe admitting that it's been – the policy environment in many of the countries that everyone here has a lot of experience working in has been over the past period of time relatively unstable. Where you have a leader and a policy framework that says, "Okay, we welcome investment. We're gonna protect commercial property rights. We're gonna invest in the kind of infrastructure that can reduce the in-country transportation of – cost-related transportation of goods, like fertilizer in or backhaul out." And then there's a change and investors are stuck in an environment that's much less conducive to private investment. So I think, first and foremost, you have to have a set of principles, which now have been agreed to as part of, Agnes mentioned the CAADP. That's the Comprehensive Africa Agriculture Development Programme, right?

Agnes Kalibata:

There you go.

Rajiv Shah:

As part of that, there are a set of principles on private investment that countries have agreed to that AGRA has supported. There has to be visibility, like on this scorecard, to making sure people stick with those principles even as there are leadership changes, and leaders understand the very long-term consequences of expropriating land or corporate assets and disrupting property rights in that context. So one is policy stability.

The second actually is a little bit of a slight difference from what Kanayo said, although he's entirely right in his points about innovation.

[Laughter]

But some of us – and he was there of course – we were just in this phenomenal presentation about the data and big-learning revolution. And Thomas Friedman wrote a nice piece yesterday or today about Nandan Nilekani and what's happening in India. But it is true that communities in rural African countries that're part of the AGRA program, for example, are already or will soon be data-rich before they are financially rich. And it's something that this community at Stanford and Silicon Valley can do is help all of us

understand what that means to accelerate just sheer opportunity, whether it's opportunity for commercial investment, which is your question, or just opportunity to be more efficient at the public mission of support for agricultural development.

And we've supported at Rockefeller a couple of examples in that area. Like: using that data, you can do a much better job of designing private commercial insurance products for farmers. Really no big country's been really successful in the agricultural transition without taking risk out for farmers. And it's a lot to ask farmers to buy all that fertilizer when it might rain; it might not rain. They might lose their investment, and there's no public insurance program supporting them. Well, maybe it's the case that big data and machine learning will allow us to get so efficient at providing insurance products that either the public subsidy required to put that system in place will go down dramatically, or it can be done on commercial terms, as it's being done in some really interesting places around Africa.

So that's just one example. Another one's the one we saw: where you all presented that phenomenal information about using satellite data to really map and understand crop yields and performance, and it's only a matter of time before aggregating different forms of data allows you to be really predictive in that context, which can have big impacts. We already see information technology – the fact that everyone has mobile connectivity, everyone, in Sub-Saharan Africa, means you can have a different form of pricing systems and market pricing systems, access to traders, and options that you didn't have five or six or seven years ago.

So unlocking the data revolution to create commercial opportunities in agriculture I think will be a big part of the innovation going forward. And we gotta take advantage of that too.

Kanayo Nwanze: Sorry. Raj, I'm not saying you're not correct. I mean...
[Crosstalk]

Rajiv Shah: I'm just giving you a hard time.

[Laughter]

Kanayo Nwanze: What I was saying basically was: all innovation doesn't necessarily have to come from the lab or from Silicon Valley or from Stanford. There are innovations, practical innovations, which are just basically ground-up. And we should listen to what farmers are

saying and what they're doing. And there's a lot that we can learn from them, and then see how we can apply that.

Ertharin Cousin: So, we talked a lot about seeds when we talk about – and I wanna talk about – since we're talking about innovation and seeds, and I go back to Usha. Because you've done a lot of work around seed innovations. And at the Maharashtra Hybrid Seeds Company, which is one of India's largest seed company. And it's been reported that the company is planning to move your new technologies, including genetically modified seeds, to South Asia and to Africa. So what role do you believe that GM seeds will play in helping Africa feed itself in the world? And how do you overcome the kind of regulatory restrictions that you've seen in India around these issues as you move to bring this technology onto the continent as an innovation and to move us forward?

Usha Zehr: I think Raj and Kanayo already talked so much about innovation, and I just wanna build on that and also talk about very briefly on the GM technology, but talk about innovation and what role, from a technical – from a biological standpoint, it has had in agriculture, and what impact it has had. So, as a plant breeder, we're always talking about innovation. So when Jeff grew his first hybrid maize on his farm, corn, it doubled their yields, or at least increased them significantly. Now, the question the plant breeder is asking is: what innovation is appropriate for which farmer community or which crop? So if we talk about an innovation where you go from a variety to a hybrid and it improves productivity, then that is the appropriate innovation for that particular farmer.

In some situation we have used GM technologies, which have been appropriate, particularly in cotton. And of course Africa has significant acreage under cotton. So that technology would be very appropriate for the continent. And I don't think, from a safety standpoint – because the safety of that technology is proven in the Americas and Australia and South Africa, Asia. So that really is not a concern. And the suspicion and resistance that we see for GM technologies is of course real: that you have to come up with strategies and approaches to address that.

But I think in the process what has happened is a general negative environment, to a certain extent, towards innovation in agriculture, which I feel is bad for agriculture, for farmers to have the best of technologies. Why is it that the African farmer and the Indian farmer should not have access to what the American farmer has access to today and reaps benefit from it? And so from that perspective, and from a perspective of a plant breeder, we need to

really talk about the toolbox. So it's the hybrids, the varieties, the GM technology. Tomorrow it'll be the gene-edited products. And after that we will talk about the satellite-based imaging data that we will use for developing draught-tolerant crops for that very very small micro environment that existed in the one district in Nigeria.

And so I really wanna not focus so much on GM technology, but really emphasize on the importance of innovation for agriculture from a science perspective. We have had many examples of the other innovations which also help the farmers. But farmers must have access to the best if they want to get themselves out of their current situations.

Ertharin Cousin: I love that: farmers must have access to the best. And to innovations, to the policies, to the regulatory environment as well as the resources. Before I go any further, I'd like to open it up to the audience for questions. We are at Stanford. And I know that there're a number of people who are probably chomping. Let me start over here. That's the first hand I saw. And then I'll come over on this side. Go ahead.

Audience: Yeah. My name is Gabrielle Hecht. I'm a senior fellow here at FSI in the Center for International Security and Cooperation, and also a professor of African history in the history department. And I would love to hear the panel talk explicitly about three issues: biodiversity, food diversity, and climate change, and how these figure into your plans. Thank you.

Ertharin Cousin: Okay. We'll take one other question and then we will go back to the panel. Your hand – go ahead.

Audience: Hi. Thank you. My name is Kiri. I'm a founder of an organization called Blue Raya. We use solar energy and remote monitoring systems to actually provide access to clean water and irrigation water. My question is about systemic change. Because I'm more interested in seeing the long-term impact on rural populations, people at the bottom level of the pyramid. So, to me, I think that we need to think in a more wholistic way, like taking into account the minimum annual income need of a given household or population and then finding the best solutions to actually address their issues all over the way so that they reach at least an average annual income that's decent in order to have a decent life. So my question is: why the governments are not open enough to new approaches that are kind of venture-oriented and fast-moving, which creates large impact but requires intensive investments? Thank you.

- Ertharin Cousin:* Okay. Thank you. So why don't we take one more before we go back to the panel? Go ahead.
- Audience:* Hi. I'm Timothy Childs. I'm CEO of a company called Treasure8 and the Future Food Center on Treasure Island, and I wanna say what an amazing panel. I just wanna say the fact that the board came all the way to Silicon Valley to have this meeting is a nice signal. And welcome to the Bay Area, if not people haven't said it. I'm interested about: are there any programs in the new phase that are focusing on creating – transforming their commodity crops into more value-added processed foods? Or pre-processed ingredients that could be tied into entrepreneurialism in the cities and/or for export?
- Ertharin Cousin:* Terrific.
- Kanayo Nwanze:* What was the question again?
- Ertharin Cousin:* More value-added processing that could be transformed into foods –
- Audience:* Try to _____ the commodities to create better value for the farmers. In-country, but also –
- Ertharin Cousin:* Perfect. All right. So who wants to start? We could spend another couple hours on here. Let's start with Agnes.
- Agnes Kalibata:* Maybe we'll start with that very question. In this case, I make reference to my favorite – the baby food factory in Rwanda that – Wild Food Program has participated in helping the country come up with a way of adding value to food that actually takes value to the farmer. Because the baby food factory in Rwanda signed up to purchase significant volumes of their food from small-holder farmers, following up on the Patches for Progress program that was started by Wild Food Program.
- So this company – \$50 million investment produces hundreds of tons of baby food to address the issue of malnutrition and purchases maize from farmers. And these farmers are definitely getting now better prices because they are directly linked to the factory. They supply the factory. And what the factory did even better: they have access to very affordable finance, something very difficult to find in that part of the world. So they negotiated with banks to give farmers that are supplying them very good rates of

financing so that they can supply. So it's beginning to happen in a few places.

Kanayo Nwanze: I think earlier today we saw a video of – is it Elsie, from Ghana? Transforming cassava into high-value products. I think also this is happening at village level. What I've noticed: that in the African context, there hasn't been as much progress as you will see in parts of Asia, but while India, where I lived for ten years, or in Latin America, where I saw a lot of transformative processes, cooperatives, women's cooperatives, transforming produce. In particular, one that impressed me in Bahir is the Umbu. It's a tree. Produces – the fruit can be used to make baby food, alcohol as well. And a few other things. But I think the opportunities are really huge.

And what AGRA is also focusing on is looking at the whole value chain. I think for Africa this is gonna be very key. And this is where agriculture should be seen by youth not just as famine, as a food system. And that's where there's a lot of entry points for them, value addition. The simple value addition of harvesting and storage. Prolonging the shelf life of fresh produce, for example.

And I keep telling young people [*mic moving*] by renting a room a buying a 1.5 KVA generator, like in my country, where you have to provide your own electricity. And you can store fresh produce, mangos or oranges and whatever you have for a few more weeks past and release them. Then just clean them up, wash them, put them in plastic bags, slap a label on it, and there you go. You can add value to that. Or digital technology, for example: linking farmers to produce and stuff. So there's a lot of scope for that. And I don't think – we really haven't explored and exploited the potential here in value addition, in transformation of food crops.

And also I think in our discussions we underplay the significance of biodiversity or food diversity with respect to climate change. If you look at the old theory of farming systems in the '60s, '70s, and '80s, where crop diversity was very key in terms of ecological balances, where mixed farming was seen – at that time, mixed farming was a practice that was being encouraged. And then farmers were encouraged to go into mono crops. And now we're going back into mixed cropping, and what it does. And especially when you look at village or domestic village gardens or house gardens and the opportunities that they also offer to women farmers.

Now, along the hill and valleys – and this is one ecology that African agriculture has not really exploited. Because hill and valleys abound in Africa, practically in every country. And this ecosystem, this ecotype offers tremendous opportunities for all-year cropping, and particularly for vegetables and fresh produce. And when you look at climate change, a lot of countries are gonna be affected. Highly productive ecologies are going to become less productive, or you have to look at how you can _____ on the biodiversity of systems.

The question on why are governments not open enough to new – it's not so much as why governments not – Agnes addressed this issue. I think one of the biggest challenge we have, at least in many African countries, is a lack of – what is the word for it? – of functional institutions.

When you talk about a policy environment, it's not that there are no policies. In many countries there are policies. But we don't have functional institutions to implement and carry forward those policies. And as I've said earlier, those policies are just worth the paper on which they are written. If you don't have institutions – successful countries have successful institutions. If you look at the most progressive countries today in Africa that are making headways in the agricultural sector as well as in IT, they're not the rich countries. They have no mineral deposits. Well, they are not exploiting their mineral deposits. The rich countries which a lot of mineral deposits, oil and gas, you name it: the most corrupt, poor governance. Rule of law is zero, zilch.

Take the case of a successful – I will give you two of them: Rwanda and Ethiopia. Based on highly successful agricultural systems with strong institutions, convinced and dedicated leadership, and good governance. It works. So it's not the countries that – it's just basically priorities are wrongly placed. If I could just – one second.

When you look at – historically, we should be ashamed of ourselves as Africans. Why? In the '60s and '70s and early '80s, when India was described as a hopeless case, China, a million people died out of farming; South Korea was coming out of the war; African countries supported South Korea. We sent aid, both human and financial assistance to South Korea. Not one African country was a net importer of food. By 2000, China, India, Brazil, Korea – sending aid to Africa. Why? Our agricultural policies just crumbled. My country discovered oil. So did Gabon and Angola. And that was it. The Dutch disease.

So the whole point here is there's gotta be a total change in mentality. And leadership not only at the highest political level, but leadership down through the whole fabric of the system – it has to change. And that is why I say change only begins from within, not from outside.

Ertharin Cousin: So, you touched on climate change and the role that climate change will play in achieving the sustainable agriculture systems on the continent. But what role does irrigation play in addressing the challenges that climate change is wreaking on many parts of the continent? And I'll just throw it out there.

Kanayo Nwanze: I can talk for an hour, so I'll let somebody else answer.

[Laughter]

Agnes Kalibata: I mean, I can say something about that. A number of countries on the African continent now are thinking through how to support farmers with technologies through subsidies. And really the bottom line for these subsidies is recognizing that no farmer will spend their very hard-earned cash on something they don't know. I mean, why would I trust your maize seed better than the maize seed I've grown for the last 25 years unless I've seen it perform? So these subsidies were started really as a way of extending knowledge to farmers.

Now, countries are beginning to recognize that seeds and fertilizers are not an end in themselves, especially with climate change, that they are going to have to do something to ensure that they secure their water sources. Because the total volume of water remains the same but the spread is very erratic. The farmers are losing crops anyway. So countries have started thinking through not huge-scale – huge-scale irrigation schemes are great at a country level, but they are not great at household level, because not every household has access to that scheme. So they are coming up with small-scale irrigation programs that allow farmers to irrigate anything between a quarter an acre to five hectares, and they are putting subsidy program that support that. And I know that very well because that's the last program I implemented in my country before – as Minister of Agriculture.

And farmers will go to the bank to do that, especially if they have a market. So there are number of things that work together, but securing water in Africa because of climate change is becoming – you have to do that. And programs to do that are becoming

important. And I liked what you said in the morning about the fact that the sources of water and how we manage them is as critical as actually making irrigation affordable. But in Africa, nobody thinks about that because we've not had to worry about the amount of water. It's there. Nobody uses it. And you think that that water is always going to be there. Except now it's beginning to become an issue.

Ertharin Cousin: So we've had what I would call a very provocative and thoughtful dialogue with – and you've put a number of issues on the table that are important to Africa feeding itself, and, more importantly, to Africa becoming a dynamic agriculture system – community, set of communities, set of countries with strong agriculture communities. But one of the things that my colleagues here remind me of often is that you can have a long list, but you need to prioritize. What would you – I'm gonna give each one of you a minute to answer this. What are the three priorities you think that governments must consider, investors should think about, as we look to develop the agriculture systems that will help us achieve these goals?

Let's start with you Kanayo.

Kanayo Nwanze: Oh. Okay. Well, I think if our governments or countries recognize that their national development is highly dependent on a productive and successful agricultural sector to be able to feed themselves, first of all, then the question is – I mean, I would start from what already exists. Seeds or breeds of cattle or seeds, varieties or hybrids, fertilizer, irrigation, and policy.

Ertharin Cousin: That's four *[laughs]*.

Kanayo Nwanze: No. Inputs *[laughs]* I'm gonna subdivide into three. And policy. But, you see, I will start from what we have not talked about, and that is what really gets me really mad. You know, when you look at the seed sector, what percentage – Joe Deveris, what percentage of African farmers are using improved seeds or hybrids?

Agnes Kalibata: Twenty percent.

[Crosstalk]

Audience: _____ about 30 percent.

Kanayo Nwanze: That's in East Africa.

Usha Zehr: _____ in corn.

- Kanayo Nwanze:* In corn.
- Usha Zehr:* And only in corn.
- Kanayo Nwanze:* Yeah. Less than ten percent. What percentage of irrigated agricultural land in Africa?
- Usha Zehr:* Three percent.
- Agnes Kalibata:* Sub-Saharan Africa is two percent.
- [Crosstalk]*
- Kanayo Nwanze:* Five percent or two percent. Asia? Forty-six percent.
- [Crosstalk]*
- Agnes Kalibata:* _____ percent.
- Usha Zehr:* Thirty-eight percent.
- Kanayo Nwanze:* Latin America? Sixty-something percent. *[Sighs]*. And fertilizer: 18 kilograms per hectare. Roughly. _____ . Okay? And Asia?
- Agnes Kalibata:* Fifty.
- Kanayo Nwanze:* Ninety.
- [Crosstalk]*
- Usha Zehr:* Seventy-plus.
- Kanayo Nwanze:* Yes. And Latin America, about 160 kilograms. So you see, African agriculture, in terms of productivity, is operating at about 25 to 40 percent its potential. Okay? Simple traditional technologies, as old as the Nile civilization: improved seeds, irrigation, and fertilizer. Now, what is the only factor that determines whether farmers will use or not use any of these? The policy environment. If I give a farmer all of these things and say, "You can double and triple and quadruple your yield," does she have a market? Does she have a road to the market? And if she overproduces, is her price guaranteed, or is it gonna crash? What happens to her produce?
- [Crosstalk]*

Ertharin Cousin: _____ something for your _____.

[Crosstalk]

Kanayo Nwanze: That's it. It's so simple. It's inputs and policy.

Ertharin Cousin: Okay. Inputs and policies. Usha?

Usha Zehr: To add to what Kanayo said, I would say there needs to be a concerted effort to engage with the private sector.

Kanayo Nwanze: Of course.

Usha Zehr: You missed that.

[Laughter]

So gave me an opportunity, Kanayo. But I think private sector not just for seeds, but earlier there was a discussion about solar panels and irrigation. And India for instance now majority of the farmers have solar water pumps. Because electricity is not guaranteed, and so having the solar water pump allows the farmer to irrigate the crop when they want and as needed. And most of those panels and the pumps come from private sector. The government provides a subsidy so it facilitates.

The second point I would say, in addition to engaging with the private sector, for the private sector to operate, they need some level of certainty in terms of the facilitating environment that the government –

Kanayo Nwanze: Policy.

[Laughter]

Usha Zehr: Beyond policy. Policy exists, but then if it's not implemented, then it's a problem. And so some level of certainty for them to operate. And I support Kanayo's seed input as a critical factor at this stage in Africa, where availability and access to good seed is extremely low in majority of the crop. Corn maybe is a little better than in other crops, but in other crops, it's a major issue.

Ertharin Cousin: Raj.

Rajiv Shah:

Well, I'd say first and foremost what Usha and Kanayo are saying, and when it's Agnes' job to lead, which is a clear pathway forward to drive up agricultural productivity in Africa. And we humor ourselves with the micro debates within that, but there's a broad consensus on what it takes to deliver that. And it's well-known, it's proven. AGRA is proving it is an important part of the mix in bringing that to the forefront. And it is politics and inputs and investment, all that, but it's this drive towards four tons per hectare. I love having a quantitative goal because it focuses the mind and it focuses the resource expenditure. I think that's the single most important thing.

The two other objectives I've note are – we haven't talked much about animal protein and protein, but as it pertains to climate change, sustainability, how an African population – hundreds of millions of people that go from \$2.00 a day to \$10.00 a day – how they choose to consume protein will have a lot to do with the future of sustainability and health outcomes. And there's a lot of opportunity there to leapfrog the way we in America, for example, choose to consume protein. And I'll leave it at that for now.

And then finally I do think the data revolution is a transformational opportunity. I think we're just scratching the surface on what it means for agriculture and many other sectors. But it's gonna create a set of opportunities that will allow and unlock more commercial investment and more rapid economic development for people who don't have to be stuck in a poverty trap any longer. And we're just beginning to figure out what some of the examples of success in that space are.

Ertharin Cousin:

Agnes?

Agnes Kalibata:

Thank you. I would stay institutions, and that goes to policy – functional institutions. It goes to what you said about policy, and what we believe in and are driving in AGRA around improving governance of the agriculture sector. So, to me, that is really critical: functional sectors that are able to mobilize their resources, but are also able to drive the right policies.

Then one of the things where we find ourselves really getting stuck is markets: functional markets. And maybe that relates to private sector. To me, a farmer who has a market will buy fertilizers, will buy seeds. So the lack of functional markets becomes an increasing challenge for us.

The last bit – and something we haven't talked about – is how we start thinking about labor productivity and using African youth and women more productively. We have a huge labor force that is not productive. And once tapped into, this labor force can do – so there's a lot to do. But, again, we have to come up with a list of priorities. And I think if we get institutions right, we get markets right, and we get how to make our youth productive, we will get these things moving.

Ertharin Cousin: Well, I think the panel's in violent agreement that inputs, policies, private sector, government, its certainty, the clear pathways to driving and scaling up programs – I love the – wish we had more time to talk about the animal protein issue and diet diversity and the impact that that will have on the food systems when you talk about what's on the fork, or how it drives what's on the farm. And I think the institutional – the changes that are necessary you all agree to.

And I so appreciate, Agnes, you bringing in the issue of women. Because, yes, we need labor productivity. That includes youth and women. But without equitable opportunity for women, we will not see the progress that is necessary for the continent to feed itself, or any of the countries on the continent to feed themselves, or for the agriculture systems to achieve that trillion-dollar opportunity.

This has been – I hope you agree with me – a fascinating discussion that we could go on for the next hour. I have at least two or three more questions I know I wanted to ask, and I saw so many hands out here. We do have a reception afterwards. And I invite you to talk to our panelists there. Because the one question that I didn't ask them that I hope that you will discuss with those here in the audience is: why should people here in Silicon Valley care if Africa achieves that trillion-dollar opportunity?

Kanayo Nwanze: Big market.

[Applause]

[End of Audio]