

**2012 THE "BORLAUG DIALOGUE"**

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Panel Moderator: Pedro Sanchez

**CONVERSATION:**

**INDICES AND INDICATORS: CREATING A COMMON LANGUAGE FOR MEASURING SUCCESS**

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*Panel moderator:*

**Pedro Sanchez**

Director of the Tropical Agriculture and the Rural Environment Program, Earth Institute, Columbia University

*Panel members:*

**Leo Abruzzese**

Custom Research and Editorial Director - Americas, Economist Intelligence Unit

**Sara Boettiger**

Founding Director, AgPartnerXChange

**Rajul Pandya-Lorch**

Head, 2020 Vision for Food, Agriculture, and the Environment Initiative, IFPRI

**Sandy Andelman**

Executive Director, Vital Signs

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*Introduction by:*

**Ambassador Kenneth M. Quinn**

President - World Food Prize Foundation

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I want to invite the next panel to come up on the stage. So Pedro Sanchez, come on, all right. You guys are on. Please come up. So I think we've heard this afternoon - we know what we've got to do. The question is - How will we know when we're getting there and how to measure it. And I had several different conversations with Rajul, having IFPRI here with your global index. Sara Boettiger and I were in Ottawa together, and she had so many terrific ideas that came out of her work with World Economic Forum and Syngenta there, and now the new DuPont economist scale and the Gates Foundation is doing.

And so the person to pull all this together is my great personal friend and one of our laureates for whom I have enormous admiration, Dr. Pedro Sanchez. Pedro, a distinguished soil scientist working in South America to Africa, knew where the problem was. Of course, remember I was announcing him when I met Jeff Sachs and had my quote from earlier today. But to have his intellectual acuity, his work in developing the Millennium Villages project - he took all of his money from his Prize and put it into that and has worked now at the Earth Institute in Columbia. So, Pedro, the floor is yours. Thank you so much, thank you, all members of your panel.

**CONVERSATION:**

**INDICES AND INDICATORS: CREATING A COMMON LANGUAGE FOR MEASURING SUCCESS**

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**Pedro Sanchez**

Director of the Tropical Agriculture and the Rural Environment Program, Earth Institute, Columbia University  
*Moderator*

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Thank you very much, Ken. Before I give it to the panel, I would like to put things in a bit of perspective. When I was honored with a World Food Prize ten years ago, in this forum there were a lot of questions – Can it be done? And even today there were some. But since then a few things have happened.

I think the pivotal one has been the announcement by former Secretary General Kofi Annan in July 5<sup>th</sup>, 2004, at a meeting of African heads of states, calling for a uniquely African Green Revolution, which would involve not only agriculture but nutrition, environment and policy.

Since then all sorts of things have happened, including the creation of AGRA, the Alliance for a Green Revolution in Africa, headed by Jane Karuku here, and all sorts of things. But we have also had (“we” as a very broad “we” – interested people) have had several yearly conferences sponsored by Yara, a fertilizer company, first, and Oslo and then transferred to AGRA’s leadership. And the last two have been in Africa, in Accra and in Arusha about three weeks ago.

I was on a panel with some of you present here in Arusha, and we were supposed to talk about technology, increasing yields, and this sort of things. And Gebisa talk about plant breeding, I talk about soils, other people talk about other stuff. When the questions came and interactions with the audience (which was about 300 people – let’s imagine this room just absolutely full), there wasn’t a single question about technology. It was accepted. There is no issue. Yes, you can triple yields, yes, you can do this, you can do that. There was no question. They were interested in the cultural and social connotations, and there was almost a shouting match. And there were farmers and there were private sector people there. And I said to myself, my god, what is the energy, the energy of this group? The energy was amazing.

And I think that indeed the Green Revolution is very much on. It’s organic. It’s not organized in any kind of strategic way. But there are so many deals that were being made in Arusha that between the private sector and governments or scientists and so on that it is on and it is vibrant. And there’s a sense of vibrancy that you caught from Susan, the master farmer in the previous panel. And that is very, very true, and that is happening. And her story is very powerful, but it’s not unique. There are many things like that.

So there’s a sense of excitement. There’s a sense of vibrancy. And, Ken, indeed the World Food Prize Foundation, Symposium, whatever we call it, has been instrumental in helping this along.

Now comes something else. You sit down and you said, okay, this is great, it’s all very successful. It’s by and large very successful. There’s some failures as well, of course. But where are the numbers? Where is the quantification of all this? And this question has been raised on many forums, primarily pushed by the private sector people. They want to get some metrics. They want to get some indicators that are widely used. And the idea now of quantifying - how

do we quantify, put in numbers the successes or failures of different aspects of this African Green Revolution or increasingly world food supplies, or whatever.

So the purpose of this panel is to hear the views of four different groups who are involved in different ways, trying to get at some indicators and some metrics. And they're totally independent from each other. So I'm going to ask each representative to speak for about five minutes while sitting there. Then we will have some interactions among ourselves, and then we will open it for the public and hope we get some real interesting questions.

So I would like to ask first, Sara Boettiger from... She is the head of, the chair of the CIMMYT board of trustees and also professor at the University of California at Berkeley.

### **Sara Boettiger**

Founding Director, AgPartnerXChange

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Can I do it from here? [Pedro Sanchez – You can stay there if you want to.]

So I'm delighted to be part of this conversation today. My perspectives really come from the world of public-private partnerships, a little bit different than... We have a good diversity of speakers on the panel today. And some of my work, a lot of my work has been intellectual property rights, which is where I'm most well-known, I think, among this crowd. But recently I've really shifted my focus to public-private partnerships for the simple reason that I think, unless we can really start to understand practically how to get the public sector and the private sector to work together better, we're not going to be able to meet the challenges that face the global food system in the time and at the scale that we need.

And I've had the luck to work this past year for the Syngenta Foundation for Sustainable Agriculture and launching a new initiative called AgPartnerXChange. I don't have a book. I do have a website. Unlike Gordon, I can't sell my book but maybe next year. AgPartnerXChange has a mission to change the enabling environment for public-private partnerships in agriculture, providing tools so that all of us can create more partnerships, better partnerships and really add value for smallholder farmers.

And in launching that, of course, the next thing you have to do is figure out what your priorities are and where you want to set your activities. Well, as I sat down to do that, the topic of this panel is really front and center – measuring success. We've been championing public-private partnerships for years, certainly in these halls, and I am thoroughly guilty of this – saying that they're really important tools. But we really can't do that for much longer unless we can start to show their impact, unless we can point and say – yes, this is important for smallholder farmers.

So that's where my perspective comes, and I thought I'd share very quickly with you the three priority areas of our agenda at AgPartnerXChange that have to do with measuring success. And again this is especially in public-private partnerships, so I think some of the views will be a little bit broader.

But in terms of PPPs in agriculture, I think the first thing we need to do is to start building on the work that's done in other fields. We know from socially responsible investing, from corporate social responsibility, from impact investing – all of these three fields have made huge

advances in the kinds of questions that we're grappling with in agriculture and in partnerships. Now, not all of it translates; it doesn't map directly, but I think we really need to look very thoroughly at those communities and engage them in the debate from the start. And I'm not sure we've done that in the way that we need to quite yet.

The second area for AgPartnerXChange is looking very practically at what partners bring to a partnership. The private sector has very different uses of data that's collected in metrics than the public sector does. What do they want to get out of it? What's the purpose of their metrics? And what are the constraints for them in terms of using that data, communicating that data? And similarly from the private sector and from the donor community, I think we need that landscape just practically before we can start building some of the tools that we need in PPPs to measure success.

And the last area is the one that I like the best, because I'm sort of a technology geek, and that's looking at the interface between where metrics interact with new methods for generating data. We're really right on the edge of some very interesting technological advances. Think new innovations in RFID, wireless sensor networks, mobile phone-based data collection, crowd sourcing of data. In the next generation, data is going to be a really big determinant of success, certainly in agriculture and in many other fields. Access to it, ownership of it, and use of it is going to determine some of the winners. And metrics are a huge part of that. So we need to also be looking at the metrics questions with that knowledge, that that's where we're headed. You know, we have sources of data now that are old, and we're about to enter an area that's really very fertile and new in terms of collecting data.

So those are the three areas that we're focusing on at AgPartnerXChange, and hopefully that gives a little bit of fodder for the discussions ahead.

### **Pedro Sanchez**

Thank you, Sara, thank you very much. Next, we go to Sandy Andelman. She is the director of a project called Vital Signs sponsored by the Gates Foundation. She is from Conservation International, and I must disclose in my institution, Columbia University, is also involved in this project as well as the Council for Scientific and Industrial Research of South Africa. Sandy, it's all yours.

### **Sandy Andelman**

Executive Director, Vital Signs

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Thanks, Pedro. And actually your talk, Sara, was a good segue, because we're about data. But as Pedro says, my background, I come from a conservation organization; and traditionally the measures of success for conservation have been the percent of the earth's land and water that's set aside in protected areas. So if you think about that measure of success, it's not surprising then that you get conflict between protected areas and people. Similarly, traditionally the measures of success for agriculture have been change in crop yield or some measure of income. And so from that perspective, it's not surprising that agriculture has diminished water supplies and has degraded the environment, because the signals of success from an environmental perspective haven't been there.

So to get the kinds of convincingly comprehensive solutions that we need for sustainable agriculture, we really need an integrated set of measurements and an integrated set of indicators to give a system level perspective of agriculture – so agricultural outcomes, outcomes for nature and outcomes for human wellbeing.

So as Pedro said, Conservation International, the Earth Institute, and the Council for Scientific and Industrial Research in South Africa launched Vital Signs in March of this year with funding from the Gates Foundation. And this is based on work that was done in collaboration with the government of Tanzania and many partners in Tanzania to really create the model for the system. But basically the aim of Vital Signs is to collect the right information and the right scales and to make that information useful to decision-makers as a set of indicators, so all of the levels of decision-making that are relevant for agricultural development. So from a household of smallholder farmers to a one-hectare agricultural plot or a one-hectare forest plot to a landscape where we really are figuring out how to measure in an integrated way the interactions between agricultural management, the flows from ecosystems, water, soil health, pollination, that support agriculture, but also that support the wellbeing of smallholder farmers directly, and then what are the implications for human wellbeing.

And so the Gates foundation has invested in the first phase of this. We are starting in Africa because Africa is really key to food security, but our vision is really global. And so the indicators of success that we're focusing on are food security, water security, climate security, the health of ecosystems and the wellbeing of people.

### **Pedro Sanchez**

Thank you, Sandy. That's very clear. Then we go to Rajul Pandya-Lorch. She is one of the pillars of IFPRI, which is without a doubt probably the most respected institution in agricultural policy. So without any adieu, Rajul has been around for a long time, so she probably has more results than, for example, what Sandy just said, which is just beginning.

### **Rajul Pandya-Lorch**

Head, 2020 Vision for Food, Agriculture, and the Environment Initiative, IFPRI

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Pedro, you were almost digging a hole there, being there... Thank you very much, and it's a pleasure to be part of this panel. What I would like to do is to make four sets of points within the five minutes I have.

The first set of points I want to make is those on the enthusiasm, the energy, the excitement. We have seen that also in the indicators and indices world. This year alone we have a number of new indices, and I'm sure, Leo, you'll talk about the most exciting new index that has come out this year, the Global Food Security Index. But it builds on a number of other indices out there. And so I do my one-minute plug on the Global Hunger Index, that IFPRI together with Concern and Welthungerhilfe is also releasing.

Tomorrow morning, seven o'clock, early, we will share some of the results. But a sneak peek of that, two of the results are: One, that 20 countries have alarming or extremely alarming levels of hunger. And, two, that there are several countries that have seen very large improvements in

their scores from 1990 to 2012, and these countries include Bangladesh, Ethiopia, Malawi and Vietnam. For more, come tomorrow.

But I do want to make a related point. With all this excitement and interest in indicators, what drives that? Why are people excited by these indicators? What do they want to use them for?

There was a very interesting article about two years ago by Edoardo Masset. He identified four reasons why people are interested in indicators and indices. For measurement – we want to know what progress have we made or not made, or are we on track. We want to use this as accountability – can we track the commitments we have made? Can we hold people, institutions accountable? We can use these for targeting, for allocating resources or differently allocating resources or changing allocations of resources between countries, within countries, between hectors, sectors and the like. And then for explanatory tools, to be able to better understand what is driving the progress or lack thereof in hunger and food security.

It's also very important, too, for raising awareness among policymakers, particularly when their countries don't rank as high as they think they should rank them. They do pay more attention at that point and hopefully are making changes in their investments and behaviors.

The third set of points I want to make pertains to the limitations and the opportunities for indicators and indices moving forward. Three points there: One, indices are only as good as the data that they build on or rely on. There, three points – data quality, data accuracy and data timeliness. Many of the indices, in fact all of the indices that I'm aware of, are basically building on data that is several years old. Even the Global Hunger index at IFPRI – we have a 2012 Global Hunger Index, draws on data from 2005 to 2010.

I am very excited by what Sara mentioned – How can we find ways to revolutionize the data that we collect, the data that we analyze? How can we make it more relevant for what is happening now, rather than what's happened three, four, five, ten years ago? And then we have the audacity to say, oh, hunger is dramatically worsening. Well, the data we're using is from five years ago. We don't know.

The second point I want to make is that we need to get the conceptual framework and the metrics right. We need to be clear. What is it we want to track? And then how do we want to track it? What weights do we want to use? Do we have the appropriate methods? Do we have the relevant indicators? Or are we simply measuring what we know we can measure? Is that appropriate, or do we need to rethink? Again, I think what Sara is mentioning will help us get further down to the road to relevant indicators.

The third point I also want to make is how do we, to show the accountability and the credibility, the importance of having independence and rigor as we collect data. And related to that, I want to make the point of how we use data. We are making, we're talking about making a lot of investments in collecting data. We need to make similar investments, if not even faster, in how we demand the data and how we use the data. Who is using the data? It's not just power, it's not simply collecting data. Power is in the demand and the use of the data.

The last point I want to make pertains to the experience I had with a project that I led at IFPRI called "Million Spread – Proven Successes in Agricultural Development." I don't want to share the results here. I've already shared them here three years ago. But when we were undertaking

that exercise and even looking for successes in agricultural development, we were struck by how little evidence we have and where are the successes. Successes are important for us to celebrate, but they cannot be based simply on anecdotes. We at the end of the day could only find 20 proven successes. Part of this is because we could not find rigorous, independent evaluations.

Successes are wonderful but cannot be simply because I tell you it's a success of the work I did. How can we find independent evaluations? How can we find means of actually building in the indicators into the projects as you design them and not to struggle afterwards to try to find those indicators of successes. Indicators are also – how do you find end indicators, not just intermediate indicators. Intermediate indicators are important, but you also have to find end indicators. We could only find one or two projects where the indicators of nutrition were there, but there are great indicators of agricultural productivity, how then to go further down.

So I appreciate this. I really believe we have a golden moment at this time of the revolutions that are taking place in information and communication technologies to speed up the ways in which we are collecting indicators and to create innovative new partnerships by which we can do better at indicators and measuring success. Thank you.

### **Pedro Sanchez**

Certainly, you didn't dig any hole yourself. That was excellent. Thank you very much. Then we go to Leo Abruzzese from the *Economist*, *Economist* magazine's Intelligence Unit, and probably a newcomer to this sort of audience. Another disclosure I have to make is I'm on an advisory committee to DuPont Pioneer on agricultural innovations. And out of our conversations, the idea of having a Global Food Security Indicator came up, and he developed it. So tell us about it.

### **Leo Abruzzese**

Custom Research and Editorial Director – Americas, Economist Intelligence Unit

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Pedro, thank you very much. As Pedro mentioned, each of us on the panel comes from a different perspective. Sara mentioned public-private partnerships and, Sandy, conservation, and Rajul talked about indices.

The particular perspective I come from, and you can tell by the name of the organization I work with, is that we take an economic perspective on many of these issues, hence the name of our group, the Economist Intelligence Unit. I think it's appropriate that I'm following Rajul because many of the limitations that she discussed on building indices are ones that we absolutely face and have confronted over the last five or ten years in building a number of these indices, no more so than on the food security index.

So let me tell you a little bit about this. Hopefully, you're familiar with it. It was released in July. DuPont was gracious enough to provide the funding and to support this, but it was built by the Economist Intelligence Unit using our country analysis teams and our data analytical capabilities.

What we try to do is to begin with an idea or a concept, which is what Rajul discussed earlier. Much of the work that you are doing and that people here on the panel are doing is very specific areas in countries and very targeted focus groups, which is exactly the way it needs to be, because these solutions will be local. But what we were trying to do was to create a blueprint or a roadmap for food security that could be looked at more from a national level. So think of this as a report card.

So because it's a report card, we want it to be as comprehensive as possible so countries could look at the index and decide where they're doing well and see a score and say, yes, we're doing here relative to our neighbors, and here we're not doing so well. So to do that we had to decide what the major components or dimensions of food security are. There is, I think, a broad consensus, emphasis on broad, within the food security community.

The major developments or the major dimensions are: Affordability – do you have the income to buy food? Availability – can you actually get your hands on it? And third, a term, not a great term from my perspective, called “utilization,” which I think is just another term for nutrition or quality or safety. And Rajul, you mentioned that there actually aren't a lot of nutrition or safety dimensions out there.

So we wanted to start first of all by building a comprehensive framework or roadmap. Now, to build an index you need indicators, and Rajul talked about that. Some indicators are already available. There is not as much data as we would like, but there actually is a fair amount of data on agriculture. People have been counting what people grow and what they consume for a long time. It's just not as broad-based and it's not filled in as much as you'd like.

So we took some data from organizations like IFPRI and the Food and Agriculture Organization and the U.N. and others. But we also developed a lot of our own indicators, especially policy-based ones. So, for example, there was no dimension for looking at, say, food safety net programs, and yet food safety net programs are important in measuring food security.

There were no real nutrition or measures of, say, safety or quality. So we actually developed some indicators that look at the equality of protein in food or look at micronutrient availability. So we tried to not just utilize what was already out there but bring in some completely new indicators, especially policy ones.

The other thing that was important is – This is an interesting index in that if you look at this index, you will not find any information on how many hungry people there are in the world, which is exactly what you will find, presumably, in Rajul's index. We were not looking at outcomes – we were looking at inputs. We were looking at drivers. So we were not trying to determine how many hungry people there were in a particular country, as important as that is. That's the goal, was to make sure those people over time are not hungry. But we were looking at the drivers, the things that influence that. So we were looking at inputs, which we then measured against what you have in your hunger index, which is the outputs. So if you remember your basic math, it's the things on either side of the equal sign in your equation.

Then just two other things briefly. This index has a result – all indexes do. They give you plenty of numbers, people's score, wherever they score. We have results, too, but this index is also interactive. If you don't like the way we scored countries, you can score them yourself. So there are versions of this index online that allow you, if you feel you have the knowledge and the



expertise on a country, to rescore it. So in that sense it's a little bit like a tool. I wouldn't quite call it a videogame – it's not that interesting, but it is a tool that you can adjust based on your own knowledge.

Then the last point is – One other thing about indices is, people design them and they're often very good, but they sit there for a year or two until they're updated; and ours will do the same. But we try to take account of something that's very relevant right now, which is the drought that took place in this and other parts of the country and in Russia and Ukraine and other places in July. And we looked at this element of food prices.

Now, food prices are an interesting area. If you're a farmer selling food, higher food prices are good. But most of us are consumers, not producers. So we adjust this index every quarter based on global commodities prices. So when prices go up the way they did in July, most countries, based on a formula we constructed, would actually become a little bit less food secure because prices are higher.

The World Bank will tell you that when we went through the food price spike in 2010 and '11, by their calculations 44 million people globally were driven below the poverty line. So on balance, sharply rising volatile food prices are not a good thing, so we try to incorporate that into this index by adjusting the scores periodically to reflect either price rises or price declines in global commodities prices. So this way, this is an experiment, and we'll see how it works over time because we've done our first calculation this week, and we've just released it this morning. But we'll see over time whether we can capture some of this price dimension.

So, Pedro, I'll stop there.

### **Pedro Sanchez**

Thank you, Leo. Thank you, all four of you for providing very different and all exciting examples.

### **Dialogue Among Panel Members**

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Sanchez I would like to ask, just to start the dialog among ourselves, and then we'll open it for questions. Sara, what did you learn from these other three people in terms of perspective?

Boettiger I think it's encouraging hearing all of you talk, because I think the fundamentals that are in my little world of public-private partnerships are actually much broader. And I think that the big one that I hear resonating across all three of you is the new sources of data collection. So I hope we can further that some. I would like to throw out an interesting example of that, if I might. And most of the examples come from outside agriculture.

But some of you may know what happened after Fukushima when the government was trying to create or trying to provide information on radio. And a nonprofit citizens' network essentially crowd-sourced radiation data. There were 600,000

radiation readings went up online very quickly and produced a map that had better resolution than the government's map and a higher consistency in the data.

So that's an example and one of a few that I'm working on for a really interesting project at the World Economic Forum that looks at our post-Bretton Woods governance system in a digital age. And it's really very much getting to, you know, who are the agencies that are collecting the data, how are they collecting it now, and how is that going to change in the very near future. So that's one crowd-sourcing.

We also have from the cook stove movement, for instance, there are sensors on cook stoves now that are going out that can tell you, report back wirelessly what the temperature is and how often they've been used in a day. So there's an environmental example. So there's lots of examples of how we are going to begin to be able to collect data in really interesting ways. It's not there yet, but I think we're just on the edge of it.

Sanchez So new methods. Yeah, Leo, please, let's interact.

Abruzzese To add to this, usually when you have a panel on data, people don't get terribly excited. They get a little sleepy when you talk about data, but I'll mention something. We're a research organization, and I will tell you the number one topic, absolutely by far, that people come to us, asking us to research, is this topic called "big data," which you see all the time right now. Now, it doesn't matter whether you're looking at agriculture data or consumer goods companies who are trying to decide what they can sell you based on what you're purchasing in the stores.

But right now it's not just because we're on this panel, but big data, processing, sifting through, sorting and analyzing large quantities of data, has gone from being a topic for the statistical geeks, which is what it's been, I think, for the last 50 years, to actually being a topic that apparently captures the attention of a lot of CEOs and a lot of policy people right now. So data is sexy all of a sudden.

Sanchez Yeah, and looking at environment of conservation versus agriculture, Sandy, what's your vision on this and big data, as we're beginning to get acquainted with that subject?

Andelman Okay. Thanks, Pedro, because I'm really a data geek at heart. But, so for Vital Signs it's actually not, I'm not the one out there collecting data. It's not my colleagues at the Earth Institute. We're actually making grants to countries and building the capacity in these countries to collect the data. So it's everything from smallholder farmers with cell phones, collecting measurements to automated climate sensors to camera traps for measuring what's happening to birds and mammals and really providing a real-time data resource at all of these different scales, as I said, from the household to the plot, to the landscape up to the levels where a country is making investments in a bread basket.

And so clearly the policymakers don't want all of that data. What the policymakers want is these higher level indicators and indices but making all of the underlying

data and algorithms available in a transparent way so it's really a global public data resource that's available for everyone from farmers to ministers and the World Bank.

Sanchez Were you going to say something, Rajul.

Pandya-Lorch I'd like Sara a question or two questions, rather. I'm curious, and not that you have to answer it, but I want to put it out on the table. One is - you talked about public-private partnerships. Do you see potential for public-private partnerships also in the data world? And second is - There is a movement, basically a strong movement now towards information, access to information, opening up access, basically. And how do you see that also feeding into how we collect and use data?

Boettiger I think very much so. If we don't engage the private sector in this next generation of what we're doing in this field in data, we're sadly mistaken. There's a lot of, there's just a lot there; there's a lot of assets. On the technologies side, you know, all the technologies I just talked about, we certainly, for instance, innovations in RFID tags - we need the private sector to really make them cheap enough and robust enough to get out to the places we want them to serve. So there's a product development piece.

But there's just also a huge amount in the processing of big data and, for instance, agriculture and bio-informatics. The private sector has huge advances in that, and we really need to move ahead, hand in hand with them.

The second question is a great question that comes up in public-private partnerships all the time, and I think the way that I try and frame it is that, to look at the difference between confidentiality and transparency - and they are two very different concepts that are often confused when you're looking public and private sectors. And I think there are ways to set up governance in a project that has transparency in it, whether, perhaps it's an independent counsel that's checking on things that where you can still maintain the confidentiality. And those kinds of issues are going to be really key, I think, in big data and in all access to data that's in the private sector. We really have to start understanding and respecting that there are confidentiality restrictions, and we need to figure out how to navigate around them and still make the best use of the data that we can.

Sanchez I'd like to throw out a question to any of you. In the previous panel I was so turned on by the farmer, Susan Godwin. And she's not the only one. There are many farmers like her in Africa that have done something very similar. With the scientific underpinnings by the other panel members and the facility that we have to have a value chain approach that Jane Karuku said. But all that is anecdotal, even though the anecdote is a person, and there's no lack of credibility in what she's saying. But there certainly is a lack of quantification. So how can we, you geeks or not geeks, but you people who are responsible now for quantifying this thing, how can you overcome the gulf with somebody like Susan? Anyone. Leo.

Abruzzese I'll put out one idea and maybe let Sara pick up on it. I think technology is a good portion of it. I mean, with technology, whether you're talking about RFIDs or cell phone technology, this has really made it possible, I think, to be able to track information without people having to input it the way they used to have to years

ago. Coming from an economic perspective, we've obviously seen for a number of years farmers now who can use a cell phone, pick up the phone and understand that they can make more by selling their crop at this particular point up the river than at that particular point up the other river as well too.

And the fact that we do have wireless communications in a lot of places... And by the way, not just in rich countries. There is a term, as you know, leapfrogging is taking place. Many of the poor countries have long since decided to forget with landlines and just go to wireless. I mean, this is one way to be able, of course, to gather data in a relatively inexpensive way, so I think that's going to be important. But it sounds like I think Sara and Sandy might have more background on the technology aspects of it, but I would think that's got to be critical.

Sanchez ...is more advance than the United States, certainly in E-banking.

Abruzzese Yeah, Kenya has the M-Pesa program, right?

Sanchez Right.

Abruzzese And we've done a lot of work in microfinance. And it's amazing to me - microfinance is often used to support farming as well, too. And it's incredible how bankers and lenders can get money to farmers through very innovative ways now where they make contact through cell phones and the loans are made whenever the people happen to contact one another. You see this happening even in places like Mongolia - a very big country, people spread out all over the place, and yet you're seeing the technology make it easier to get financing to farmers too or livestock herders or whoever you have in countries.

Sanchez Any other? Sara?

Boettiger So I absolutely agree that the answer is in the mobile phone. We've been looking at a lot of work between farm radio and mobile phone. There's a lot of really interesting work on sort of call-in shows, and so far that's not being used to extract the data up; it's really being used to push for extension. There's voice response surveys that are... There's a lot of movement on that so that you're not having to push in... It's not a survey person going around but the smallholder farmer themselves are answering a real voice in their local language. So those are two examples of how we're pushing this ahead.

There's other, I think, other pieces to come. We know that smartphones are... I don't know if there's anyone from Kenya here, but I think the last I looked, they were about \$60 apiece. They're really going down in price, the cheap smartphones - not that that's the answer for the very rural smallholder farmer, because there still is a technology gap there, and the phones they use are the ones that we're working with, which are not smartphones. But the sort of intermediaries, which might be the agrodealers, might be someone just next to the farmers. There's huge advances to be made and a lot of really interesting sort of soil analysis that are going into smartphones. So lots to do, lots of exciting pieces.

Sanchez Yeah, I was going to say something about soils, but I'll go with Rajul.

Pandya-Lorch I took away a different lesson from all of you, also from Susan's experience. I took away two questions. When does one measure success? Because hers took years, and I think we also have to have some realistic, you know, when to measure success or when to see success. And also, what does success look like, I think may be something we may also want to ask ourselves at the end of the day – What does success look like to Susan? Or what does success look like? Because I think we may, not just collecting data, it's also rethinking – what is success, when is a success a success? And what happens if it is not a success in the first 30 days or 60 days or a year? Is it not a success then? So I think those are some more background questions.

I also took away from her a wonderful story.

Sanchez Some hard thinking. I feel the same way about the concept of sustainability. Sustainability without a time dimension means nothing... at the end we're not all sustainable – we're all going to die and so on and so on. So I feel the same way, that there has to be some definition, and that'll have to be subjective or a subject of analysis or something.

Andelman And this is one of the challenges for measuring success, agriculture or ecological systems, is, it's a long-term data collection effort, and not very many people want to support a long-term effort like that where you're not seeing a big flashy endpoint but rather it's this continuous flow of information. But as the price of acquiring the data and information comes down, it should be much more feasible.

Abruzzese One thing... easier to measure. Data, you're right, can take a very long time to see the results, but a lot of the issues that we're trying to resolve at least start with having the right policies in place. One of the things that we like about indices is, even though people like to measure quantitative data – so how much money are people spending on food, or what are the yields from farming?

You can also look at policies. Now policies can be enacted, and they can just be left to die on the vine. Governments enact policies all the time and then nothing ever happens. But generally you need to start with a policy. At least that is some indication that the government has taken the right step. I mean, without the policies, the chances of having anything happen are usually not very good.

So when we build indices, we always include some policy indicators. And if the country is not fulfilling that, we mark them down heavily the first year, they get quite upset, and then a few of them actually will start moving and passing laws in a second or third year. And then when you begin to give the country some credit for that, you begin to see a little bit more implementation. So data takes a long time to collect, but you can see policy results. I mean, governments can change policy as quickly as the head of state or the head of government in the country changing policy as well. So that might be a shorter-term way to get maybe some better results.

Sanchez On the policy side.

Abruzzese Yes.

Sanchez Okay. Well, you know, you all have very... you're coming from very different points, but you all sort of feel comfortable with the fact that we have to get more data, that we have to get more indicators that are more robust and so on. Could we do something like looking at this and say something for next year's World Food Prize Symposium? What would you think of some effort, not necessarily by you but by a group of other people who may, I don't know, Ken - are you here? No. Okay, well, then we'll talk about it without him. But anyway, what would you think about, as a follow up of this conversation anything that could be done together?

Boettiger I think we've identified some of the places we're looking for advancement in. It would be great to have a yearly check-in to see, you know, what's been happening, what's the progress being made. There's a lot going on, and I think this is a good platform in agriculture to just check in on the exciting things that have been happening.

Pandya-Lorch I think it would be very exciting to have a panel building as Sara - not that I keep asking you, Sara, but building on what Sara said earlier, learning from outside of the sector. That'd be exciting to hear from them next year. And then what can we learn from all these initiatives outside of food and agriculture that we could embody in food and agriculture.

Sanchez There's a lot of information there.

Abruzzese Well, I mean, as Rajul said - the best thing about an index is you're attaching a number, a score, a benchmark to things. So it's actually relatively easy, as long as you're calculating the index every year, to look at progress over time. That's the whole point. Whenever we do an index for more than one year, we always look at who the risers and fallers were from one year to the next.

So one of the things we could do, Pedro, as I suggested earlier is this time next year to look and see whether some countries have implemented, say, better food safety net programs or whether countries have put out dietary guidelines that weren't there before, and try to look to see whether we've had some movement on data collection in a few of these areas. So we'd be happy to report back next year.

### **Q&A from the audience**

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Sanchez Okay, very good. Let me open it up for the audience, and I'll get out for that and ask for people, questions from the audience. Anybody can come in if you'd like to ask a question. Thank you. Please identify yourself, and then we'll have three or four questions at a time. Yes.

Q My name is Patrick Delhury, and I'm a former elected official here in Iowa, and my question is - Do you really think we've turned a corner that the data that's available and being collected is making or is about to make a big difference in the next 40

years on public policy? And that's the question. The lead-in to the question, which I've put to the end, would be – When I taught, I said to many students, “As Adam said to Eve, we live in an age of transition.” And it constantly strikes me that transition never seems to happen. But I listened to your panel, and I think, no, maybe transition really is happening and we're about to be on a new path with regard to the subject of this conference, which I take to be world hunger.

Sanchez One in the back, please?

Q My question is primarily for Sara. With regards to your partner, your AgPartnerXChange, in addition to looking at raw data outputs of different public-private partnerships, will you also be monitoring and measuring the implementation issues regarding – How quickly does the private partner adopt and replicate throughout their supply chain operation best practices that come out of a positive experience? And secondly, would you also be looking at, to what extent is that private party prepared to either treat it as a competitive advantage and not share that knowledge, or to go with a more public, like a patent-pooling approach of best practices with alliances, such as the Sustainable Food Alliance, and so forth?

Sanchez Please tell me your name?

Q Patrick Benz...

Sanchez Okay. Yes, ma'am.

Q My name is Kris Green. I've been a teacher here in Iowa for 35 years, and I'm looking at it at a different point. I've always taught about qualitative and quantitative data collection and so on. One of my things that I think needs to be taught to students or it needs to be seen as important from people that are doing it out in the field is making sure that they're looking at a wide variety. Students, many times they'll come to school and they'll say – “Oh, did you hear about this?” and that becomes the new truth. Sometimes it happens with organizations too, you know, that, I heard so-and-so this. I think that just qualifiers for the data that's been collected; because even at a young age the 12, 13, 14 through 18-year-olds that I work with, they need to know that authorship, the fact that it's good data collection, that it's a wide sample, or otherwise they tend to pigeonhole themselves or pigeonhole the data. So I guess my question is – What qualifiers are you going to use? And I guess you were getting at that. What are the indices? What is it that you're going to use to measure data? Thank you.

Sanchez Thank you, and then the last questions from the back, please.

Q My name is Mark Chafey, and I work in rural economic development here in Iowa. And I have three questions, three points I'd like to bring up. Sara, you sort of touched on something I've been thinking about for a long time, and that is in crowd-sourcing. Combines and tractors and so on today in the developed world, in the more developed world, I should say, are so loaded with data it stuns the software engineering groups at Iowa State. They just, they sit there, guys who are out of the

urban environment and come and sit in a tractor or a combine, and they get off just shaking with the excitement that they understand the amount of data being created.

But the problem for me in watching that is that in farmers in the United States at any rate, and I've worked across country in different areas, have this wonderful model of we're rugged, independent characters, and the best way we make that rugged independence is we never share anything with anybody that we're not just telling a fish story. Yeah, we had this much and that much and that much and so on.

So this fall, for instance, I've sat in combines where in one field we watched the data unfold - 7 to 73 bushels an acre, all in one field. And in corn - that was in soybeans - and in corn 17 to 234 bushels an acre in one field, as we have this impact of the drought.

And so one of the things I think is something to consider, because I notice how many of the conversations sort of focus on the more developing market as opposed to the more developed market, and that is - these farmers could use an awful lot of information as to what their data is telling about who they are in the world and how they're doing. And part of that is then they need in a sense anonymity in their data creation that nonetheless is able to be aggregated and brought some sort of mechanism of their access so that they can tell their, and know, am I okay, how are we doing?

I was at a friend last year at the Farm Progress Show in Boone, one of the big national ag shows. His soybean field was hit with instant death or sudden death syndrome last year, along Route 30, which is a four-lane highway here in Iowa. And the guys that three hours away were talking about it at the Farm Progress Show - "Have you guys been out on the Eastern side of Iowa and saw that soybean field along Route 30?" And he heard them saying that, and he was like, "Would you like to meet the farmer? I know that guy." "Yeah." "Well, you're talking to him." And then it was the seed company that produced the seed that died. And so suddenly the conversation just chilled across the tent. But that data, he suddenly learned in that accidental meeting just how bad his field was, that it's at a Farm Progress Show as the field in Iowa that year for sudden death.

The other thing that I just wanted to bring up quickly, and it was told, and it was brought up slightly by the qualitative speaker before me, and that is data - I used to teach sociology at the University of Iowa. Data has an immense way to be isolating for people because in a sense it's numbing, numbing experience. And that's not because it takes geeks to understand it, it's because all stories are stories of real people with real lives, and how does that impact us.

And I think that one of the big challenges that food, if we're going to feed the world, we have got to be able to better translate, is what does this data actually tell us as a story? Who are we in the story? What is the story we're trying to build, and who are we trying to motivate with this story? Because we all know, sitting here in the United States with elections going on right now that data can go in some amazing directions.



And so I think that part of what we want is an ability to... We've got to have some great storytellers for this stuff, because this is very, very powerful and important information. Thank you.

Sanchez Okay, thank you, Mark. Maybe we should have you here in the panel. So we have four interesting questions from the first, Patrick.

Q Can I just make one statement, that's all, one FYI, as it is.

Sanchez Yes, your name, please?

Q My name is Sonny, Sonny Ramaswamy. I'm the director of the National Institute of Food and Agriculture with the USDA. And just a month ago the chief scientist of the G20 nations got together in Guadalajara, Mexico, and they came up with a statement of principles about five areas to collaborate on, one of which is on sharing data and information that's relevant to the conversation that took place just a few minutes ago. And the last one is about agricultural statistics, that there will be an effort to collaborate between the 20 different countries of the G20 that might be highly relevant. If you don't know about it, you might want to check into it. This is the chief scientist, the chief agricultural scientist of the G20 countries.

Sanchez Thank you, thank you. Okay, so we have five questions. One was – have we turned the corner on using data for policy, implementations issues, the teacher saying the qualifiers of varieties, Mark saying that the tractors are loaded with too much information – I think that's what you said – and finally data-sharing policies of the G20. One was directed at you, Sara, so please start.

Boettiger So just to start with Les, I was actually at the G20 meetings, and so I think there's some very interesting things that are going to happen with that group of chief scientists. And it was a great meeting. It was a really productive meeting. And one of the most interesting pieces of it was a focus on taking the, from the agricultural ministers, relating what their policies are to the national research systems, which really hasn't happened at the G20 previously. And data and what we've been talking about today is a huge part of that. So thank you for bringing that up. I had forgotten that.

In terms of the question about AgPartnerXChange, I think the point to make clear is – I'm not entirely sure what context to take your question in, so I'm going to sort of draw a more generalized piece out of it. I think there is a need for some independent bodies that don't exist yet in terms of monitoring and evaluation. I'm not sure that, particularly for public-private partnerships, that the existing independence that we've got in terms of sort of contracted out M&E are the right forms. So I think there's a hole there that we need to fill in the public-private partnerships space.

But there's also a lot of other tools that need to be developed. It's never obvious how that sharing piece works. A lot of my, obviously, I come from intellectual property rights. A lot of my work is on open innovation and collaborative methods and where you can share and where you really can't share.

So those are great questions, and I think they really need to be looked at practically, and that's the role of AgPartnerXChange is more of looking at the tools, trying to figure out where we need to go. AgPartnerXChange won't be that sort of independent stamp of approval organization, but we will call out what we see as needed in moving ahead.

Sanchez Yeah, anyone.

Abruzzese I was going to say, maybe I'll take a crack on that one about whether we've turned the corner on data. I mean, just quickly, I mean, I'd like to say we have. Certainly data is a lot better than it was 20 or 30 years ago. I mean, it's getting better all the time. But I'm not quite sure we've turned the corner yet. I think maybe technology will help us, but it is still in some ways shocking how little data there is. There's still some countries in the world where we don't even have good population data, let alone data on agricultural yields as well. So it's getting better, but I think probably we'll turn the corner in the next ten years but probably not in the prior term.

Sanchez Thank you. Sandy.

Andelman I do see that where we're turning the corner is in terms of the interest of policymakers and in evidence-based approach to decision-making. And we've really seen this with Vital Signs. So for the last seven years before launching Vital Signs I was involved with working with 18 countries on monitoring, understanding what's happening to tropical forests in their countries.

And when we started that seven years ago, you know, there was a lot of discussion with ministers of science and technology or natural resources about, how is this information going to be useful to us. But in the last six months, talking to ministers from Tanzania, like Dr. Maghembe or in Ethiopia where, when we met with the National Bureau of Statistics and said, "Look, here's the kind of data we're going to be collecting," and they said, "This is fantastic. We've just worked with four ministries in Ethiopia to look at, what data do we need to support Ethiopia's resilient green economy." And so there was already a framework in Ethiopia for this kind of evidence-based decision-making. And seven years ago we just weren't seeing this.

Abruzzese It helps to have outside organizations doing it. I mean, we've talked to agriculture ministers. We actually went to a few African countries where we couldn't collect data and asked them for some help, and they were very open and receptive, but their answer was, "I'm not sure I'm going to get my government to actually spend a lot of money collecting data on this as well, too." So sometimes it helps if there are external organizations, I think, is what you're suggesting doing this as well. And I don't feel happy saying this, but a lot of these are poor countries that have a lot of demands on them as well. And sometimes setting up great statistical collection agencies aren't always at the top of their lists.

Sanchez Maybe you'll have to pay for it.

Abruzzese Yup, somebody's got to pay for it.

Sanchez Rajul.

Pandya-Lorch I'm between the two of them. I agree partly with both of them. The one other thing I'll put on the table where we have not turned the corner but I think there is room to turn – we cannot look at just data in silos. I think as we work across silos, agriculture and nutrition health, we need to rethink indicators that are more nexus oriented, more linkages oriented so it will not just be an issue of collecting data there but also looking at what are the appropriate metrics in that. I think we're beginning to turn several corners, some faster, some slower.

Sanchez Okay, thank you. I'd like to give each one of the panelists an opportunity to have some concluding remarks. And just to change the order, can we start with Leo and go this way?

Abruzzese Well, I'd just like to emphasize, I think, what Sandy and Rajul said. Data has an element of accountability about it. One thing that I have seen that where we have turned a corner maybe in the last ten or twelve years is that a lot of the international agencies that we work with, places like the World Bank, InterAmerican Development Bank, a lot of the others as well, too, have understood right now that they have to have results. That's one of the reasons, by the way – and I think both of you mentioned this – why indices are important is it is one way of having some accountability. So data is popular because, even though you can shade data or twist it, at least data has a shot at being somewhat objective, and it has an opportunity to allow you to monitor and to be accountable. And since the world seems to be moving, I think, correctly to accountability and monitoring and outcomes, that means data is probably not a fad. I think it's going to become much more imbued in the whole policy and development area.

Sanchez Thank you, Leo. Rajul, last words.

Pandya-Lorch Last words. I reiterate my point – look across the linkages work and look at data there. And two is, data is important, collecting data is important. Let us also invest in how to use the data to make policy change.

Sanchez Thank you. Sandy

Andelman Thanks. I just want to conclusion by bringing the story back to Susan, because it's not just about collecting data and delivering data to policymakers, but with cell phone technology and other approaches, we can really take that information back to smallholder farmers in a way that's useful for them so that they can make better decisions as well.

Sanchez Sara.

Boettiger So the Grameen Bank branches have a five star metric rating, and the first stars are sort of standard if people have a hundred percent repayment rate in their branch, but I think the fourth star is whether or not all of the borrowers from the bank, their children have either reached primary school or are in school now. So that's to me an example of a great metric. If any of us who have been out in the field, you go back

after you've given a new variety to a farmer and you ask, "What's changed in your life?" And invariably they will say, "I sent my kids to school." That's the answer I get every place in the world. So I think that speaks a little bit to a lot of the different points that you've said - look across. You know, we don't have to stick with yield data or yield metrics. There's really important work to do in designing the metrics we're going to use that I think will draw on a lot of disciplines.

And lastly just to echo the point that my colleagues have made - metrics are a common language for us to talk about our goals and our performance, but ultimately they really drive behavior. They drive investment, and they can change things a huge amount, and it's a big responsibility. And I think in the next coming decade we need a lot of smart people working on this.

Sanchez Okay. Well, this brings this panel to an end. I want to thank the four panelists for excellent, and to me, mind-opening ideas that you threw. I've learned a lot here, taken a lot of notes. I want to thank you very much for bringing in what is really the next stage in this whole process, which is going from the anecdotes into some real data and how do we do that. So thank you very much, and I'd like to thank the audience for bearing with us. Thank you so much. Bye bye.