

CROPS TO END HUNGER

Panel Moderator: *Elwyn Grainger-Jones*
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Panel Members

Mr. Simon Groot	2019 World Food Prize Laureate - Founder, East-West Seed
Mr. Rodger Voorhies	President, Global Growth and Opportunity, The Bill and Melinda Gates Foundation
Mr. Neal Gutterson	Chief Technology Officer, Corteva Agriscience
Hon. Dr. Gerardine Mukeshimana	Rwanda Minister of Agriculture
Dr. Felister Makini	Deputy Director General Crops, Crops Division, KALRO

Panel Moderator

Mr. Elwyn Grainger-Jones
Executive Director, CGIAR

Okay, thanks for your time today. We're going to talk about Crops to End Hunger. I'm going to launch a major initiative. I will say a few words, and then I'll be turning to my colleagues and introducing the panel in a moment when we get to the panel part of the discussion. But first I should say something about Crops to End Hunger.

My name's Elwyn Grainger-Jones. I'm the Executive Director of the CGIAR System Organization, and I've had the honor of working with colleagues and many donor colleagues and many acclaimed colleagues to develop this initiative. For those of us that don't know who CGIAR is, and I suspect many in this room do. But just in case, we're the largest international public agricultural research network focusing on the Global South. There's about 10,000 staff in CGIAR spread right across the globe, operating in more than 70 countries. Crop breeding is part of what we do, a really important part, about a quarter or third of our spend. And this initiative is about improving the quality of that investment.

And it's interesting talking about this here with so many historical residencies from CGIAR in this event. I wasn't around when CGIAR was created, but I get the sense it felt like a completely different world. There was this huge imperative about increasing food production, about increasing the bulk, volume of calories and staple crops, driven by a fear of lack of overall food supply for the world, a fear of famine, a sense that increasing food production was part of or one of the most important parts of response to famine.

What a different time it is now and what this initiative is about is really to accelerate our journey in responding to an utterly different operating environment where, yes, there is still hunger. There is actually growing levels of hunger that we need to be deeply concerned about.

But there's also a huge amount of hidden hunger, micronutrient deficiency. There's also a third of the world population that's suffering from obesity – it's just spiraling in developing countries. We're talking very openly about the climate emergency, something that wouldn't have been possible even five, ten years ago. We're talking about a whole different approach to partnership development where the private sector is in an unrecognizable state compared to when CGIAR was created. Our client countries are in an unrecognizable state. We have many national agricultural research systems that have developed fantastically over this time. So it's a very different operating environment for our breeding efforts. That's my first point.

So Crops to End Hunger is about responding to this. It's responding to this really important part of our work. And as I said, it's only one part of what we do. There's a whole bunch of other work around soil science, around climate-resilient tools, about crop insurance – you name it, there's so many things we're doing that relate and build off our work on crop development, including the gene banks, this tremendous asset that we've got on behalf of the globe. Our other assets are our scientific skills and our relationships with NARS.

We just launched an Annual Performance Report, which talks about what we achieved just last year. To give you a flavor of what we're doing already on breeding, we made 417 improved varieties available for use last year. That includes maize varieties, green soup or rice varieties, improved potato varieties, improved wheat and durum wheat, innovative varieties of ground nuts, sorghum, pearl millet, biofortified varieties of bean pearl millet, wheat and maize. and some wonderful examples of the work we're doing on AfriSafe, essentially allowing the production of maize and ground nut with Saflex aflatoxin levels, great data from the impact this has had in Nigeria, 11.5% more productivity than regular maize, and some really good stuff on cassava where we actually did some DNA fingerprinting that showed that two thirds of cassava growers in Nigeria were using improved varieties and some good economic analysis of that, what that did to improve productivity and poverty levels.

But we can do a lot better to respond to the things I said at the beginning – our changing operating environment. So what this initiative is about is about a rapid acceleration and modernization of our breeding cycles. We need to rapidly accelerate those. Many varieties are the same as what were used 30, 20, 30, 40 years ago, particularly in Africa. And we need to speed that up as one part of the armory to build climate resilience.

And what better place to launch this initiative than this event. Many CGIAR scientists have won the World Food Prize in the past, so this is a great place to talk about what we can do in the future. Bunch of funders helped put this together. USAID played a leading role, Bill and Melinda Gates Foundation equally, and many others, UK DFID, the German BMZ, and Australia.

What is it in essence? It's about modernizing the plant breeding process to make it truly demand-led so that the varieties get taken up, they're valued by farmers, and intrinsic within them, that we are breeding for multiple traits. Essentially we want more nutritious varieties, more resilient varieties, more productive varieties, and varieties that are attractive to farmers, and to taste, smell, etc. And that product profiling and being part of a more developed seed system, which is a whole extra part of our work that we could have another session on just to talk about that itself, is really important. So there's a whole bunch of technical stuff around this initiative, too, around mechanization and digitization, of phenotyping and data collection systems, and of course better demand creation and dissemination, which is hugely important.

So I'll stop there and perhaps just make one last point. This initiative actually galvanized and is part of a bigger change going on in CGIAR right now. There is a discussion taking place about how we can be one CGIAR, how we can have a unified mission, a unified governance, and really remove so many of the institutional boundaries that are increasingly holding us back, where we need institutions that aren't necessarily organized around one specific crop or one specific part of the environmental agenda. So if we are going to provide integrated solutions for our partners, we need to integrate ourselves. So there's a set of recommendations being developed behind the concept of "One CGIAR," and those will come to our system council next month. And if they're agreed, that will be the biggest change in our history that's really essentially entwined in this image amongst other things.

So I will stop there, and I have the pleasure of introducing my close colleague, Rodger Voorhies. Rodger is the President of the Global Growth and Opportunity part of the Bill and Melinda Gates Foundation. And while he's walking up, let me just say a huge thank you for the work of Bill Gates in the Global Commission on Adaptation, which called for a doubling of investment in agricultural research. That's not just to CGIAR but also to NARS, a real recognition that is part of the climate solution. We need more innovation and more investment. So over to you, Rodger. And I should say Rodger unfortunately had a prior engagement immediately after this, so we were lucky to have you here for the opening day.

Rodger Voorhies

Thanks very much. Thanks, Elwyn. I'll just say a couple of minutes of words and then turn it over to the panel, who I really think are going to add a lot to our understanding both of crops to end hunger but the importance of breeding and how that really drives changes in the lives of farmers around the world and especially smallholder farmers.

But let me start off just by congratulating Simon and getting to be on the panel today with this year's winner of the World Food Prize. And on behalf of the whole Bill and Melinda Gates Foundation, we are thrilled and thrilled with the work you've done to change the lives of millions of farmers around the world. So thank you very much.

So as Elwyn talked about, we just came out of the U.N. General Assembly where the Global Commission on Adaptation talked a lot about smallholder farmers and agriculture and climate change. And so I'm just going to talk a little bit about why climate change is something that not only affects us all, as we heard on the last panel, but that low-income people around the world are already experiencing many of the impacts and are most susceptible to the consequences of the changing climate, both in poverty impacts and yield impacts, and, as the climate warms, more unpredictable in their livelihoods as they move forward.

And to solve this problem, we'll take a collective effort to address the negative impact of climate change in a developing country and one that starts where we believe that making agriculture systems more resilient. Because what we believe really strongly in the Bill & Melinda Gates Foundation is almost no one has come out of poverty without agriculture being at the center of that. And unless we have an economy that drives the economic and social mobility for smallholder farmers, we won't build a resilient economy and we won't see low-income people come out of poverty around the world.

And at the Bill & Linda Gates Foundation we believe that the most effective way to drive resilience for smallholder farmers in a changing climate is through innovation. And we focus a

lot on agriculture renovation, because that's how food production steadily progressed over the last century. We believe climate-related agriculture research should have particularly strong focus on developing improved crop varieties that can handle more stressful conditions and that many farmers need to boost productivity and quality seeds are at the center of that. And therefore, we believe that investment in new seed productivity, need seed systems and making sure it understands what the micronutrient impact of that is going to be important, especially for women.

We've encountered this consistently around the world, of the role of seeds in the role of ag development in our work in agriculture. And it particularly is shown out in smallholder farmers. But smallholder farmers increasingly are going to need new varieties that can handle heat or flooding or drought. New pest diseases are emerging, and we're going to need new resilience for both biotic and abiotic stresses. And unless we anchor into these adaptive changes to seed production and varietal development, we actually are going to leave low-income farmers behind at a point when they need to improve productivity. We've seen that smallholder farmers... Or rather, in general, by 2050 we need to increase ag productivity by as much as 50%. In sub-Saharan Africa that means a three-times growth in productivity, and in South Asia that means a two-time growth.

And we think one of the best investments to get there is in the CGIAR system. The CGIAR is critical for this work, and the Foundation is proud to support the crop breeding efforts of the CGIAR system. And last month in New York my boss, Bill Gates, announced that the global community needs to double its investment in the CG system and overall double its investment in research and development on smallholder farmer crops that matter.

He also announced that the Foundation itself is pledging \$310 million U.S. dollars over the next three years to the CG System and will increasingly support CGIAR's shared agenda to tackle climate change, food productivity, and developing rural resilience and sustainability. An important part of that commitment is our support for both crop-specific breeding and systemwide initiatives to improve the effectiveness of the breeding system with new tools like molecular markers, making them accessible and affordable to CGIAR breeding programs, and of course to their NARS partners.

Our distinguished panel will illustrate that *Crops to End Hunger* is a unique initiative for the coordination of these critical research programs, as well as an important model for aligning the donors and the private sector for modernization of crop breeding across the entire world. This innovative platform just demonstrates how the CGIAR can manage research on a large scale and connect it to delivery mechanisms that actually reach low-income and smallholder farmers around the world. The Foundation is enthusiastic about its initiative and its potential to increase the impact of CGIAR research on the lives of smallholder farmers. And we're excited about the alignment of donors. And we're excited about the particular program and the announcement around *Crops to End Hunger*. And as we heard from Elwyn a few minutes ago, the One CGIAR to modernize the system to deliver for what the world needs today while keeping what it had through all the progress that it's made in the last 50 years. *Crops to End Hunger* is an important example of this evolution. And it's a great partnership for us and a great partnership with many people on the panel.

And so thank you very much, and thanks for allowing me to step out, since I got double-booked, and I'll look forward to being with you for the rest of the week. Thank you.

Elwyn Grainger-Jones

Thanks very much, Rodger, and for this incredible support. We have an amazing panel. I want to second Rodger, Simon, in congratulating you, and it's a real honor to learn from you today. So I think everyone knows Simon, Dr. Simon Groot, the founder of East-West Seed, and of course the laureate.

We also have Dr. Neal Gutterson, who is the Chief Technology Officer of Corteva Agriscience. Welcome, Neal. Then we have Felister Wambugha Makini, the Deputy Director General of Crops in the Crop Division of KALRO, Kenya. So we're looking forward to hearing from you – a key client in all of this so one of the many clients but a key one. And last, certainly not least, we have the Honorable Gerardine Mukeshimana, the Minister of Agriculture and Animal Resources for Rwanda. So we have 29.9 minutes to extract as much advice as we can from this fantastic panel to help guide this initiative.

So you've heard a bit about it. Perhaps we can start the discussion, and of course we want to start with you, Simon. I've got a feeling we can learn a lot from you, and you may have some advice for the initiative, so perhaps you can say a few words about that.

Simon Groot

Yeah, I think we have had our own parts of progress in all the work we did in crop improvements. It always had to be combined with market developments – that was your key words, “market developments.” And I think you cannot avoid getting marketers more involved in all this work of reaching out to the farmers. I even created a sort of a sub-science called “farmer marketing,” which is how to get the farmers to buy your stuff. And that is not the easy thing to do. If you have a low-budget farmer with a highly traditional orientation, it takes more than just good products to convince him. And it has to be clever pricing, clever distribution, and the promotion is mostly going back to the famous [inaudible] for peace, if I may. But they still hold a lot of water even in farmer marketing situations and in small market, family marketing. I think that's really key to success.

We developed that situation with a sequence of events. We trained product development support people who are the first step in getting the final farmer blessing on anything new to enter the markets. We even are now running what we call a PDS, which is our acronym for product development support in a year where we train ourselves about 10 or 12 candidates each cycle from different countries including our own more and more Africans. That's why this whole process of getting them to understand varieties and varietal potential is still a very new concept. But this is one of our key elements, and then we follow up with a clever way of introducing the approved products, farmer-approved products into the market. And now that will take way beyond my allotted time, maybe I won't go into the details. But I think that is the real rather key element.

Next to that, we do the knowledge transfer where we also add a technical training component for certain groups of farmers where we feel that this specific training in slightly sophisticated crops can provide additional benefit to the use of those seeds. And I think that's another feature that we have developed. The problem is most of these things have to be done country by country. They are very often country-specific, culture-specific, and you cannot just generalize this in a global system. You need local teams who know the land themselves and who first

need to be fully trained in handling this kind of work. So that's more or less what I could say now.

Elwyn Grainger-Jones

The way you put it, it sounds so obvious that this is the right approach, and yet here we are talking about an urgent need to do that across the international system. So clearly there must be some challenges involved in doing this, or it would have happened already. And we have a bit more time. What were the obstacles you faced in doing this? I wonder how many of those might relate to our efforts to do this.

Simon Groot

Well, I lived in the... Where I started out, I was a simple seedsman, and I thought, well, we'll just make better the seeds, like building a better mousetrap. And that will be the path to your doorway. But it didn't happen. And so we had to find out where were the obstacles, and that's what we found out country by country. And the hardest was the first time, and that was in the Philippines. The farmers were exceedingly reluctant to go in for seeds at a reasonable cost. That was the main thing.

Of course, we had some hybrids. Not everything was hybrids, but on the hybrids, we developed hybrid seeds, quality seed from suppliers that was the multiple of the seed's value that farmers had to spend on it. And the higher the quality seed from the supplier, the faster was the acceptance. There was a key correlation if we would reach the level of 25, 30 times on the quality seed multiplier, the farmer acceptance was faster. So that was a key correlation, and that I think is a useful concept—the quality seed multiplier. And I think in seed marketing that might be a useful tool. So, I had to do my own little analysis of where the obstacles were and how we could best overcome them.

Elwyn Grainger-Jones

Simon, I'll resist the temptation to ask you more, because I need to bring your colleagues in. I wish we had another hour. Neal, obviously a key partner in this initiative. It would be great to hear more from you on how you see your role but also on the broader question of how the world has changed in terms of where the private sector is now and where are the niches and gaps where we still need an international agricultural public-funded system. So, please, over to you.

Neal Gutterson

Well, I can start by reassuring you we certainly need a very active public system to help deliver value to farmers around the world. And it's a great pleasure to be speaking on behalf of Corteva as a partner with the CG for many, many years now, going back to our legacy companies of Dow and Pioneer and DuPont in the years before.

So first of all, we're really enthusiastic about the *Crops to End Hunger* initiative. You know, breeding is a foundation of what we do, but we've evolved from thinking about, let's just say, just the new varieties that we deliver, to farming systems—right?—and the improved farming systems and the solutions that we can deliver as a company. And I think this is the same evolution in many ways that we've seen at the CG, to move from, you know, breeding was

everything maybe 30 or 40 years ago. But today it's about how we improve the livelihoods of farmers through farming systems. Having said that, of course, the right varieties adapted to those right systems are critical.

We've been fortunate at Corteva to have a pretty large footprint and therefore to be able to invest in technology at the very cutting edge—right?—whether that's markers or genomics and all the tools that we have at our disposal. But we don't serve all the markets and all the needs that the CG is looking at in trying to address the smallholder farmers around the world. So therefore we can see this wonderful complementarity and hearing from Rodger about the Gates and how they see it and the work that we've discussed and done together, where we can help leverage the systems that we've built on behalf of the mission of the CG. And I think *Crops to End Hunger* is one example of that and a great example of that. So we're excited about the additional commitment.

Many of my colleagues, some of whom are in the room and others who have worked for a number of years with the Excellence in Breeding Program, which I think is a key piece of the CG effort that links to *Crops to End Hunger*—right?—to up, increase the level of performance of breeding systems in the major crops around the world. So we're very excited about that.

And maybe just to end with, you know, coming back to the comment you made about the importance of the evolution of the CG into One CG. You know, having watched the CG, being on the CIMMYT board for six years, just until recently, the centers have such common goals and purposes, but to bring them together into one sort of group with one purpose that can leverage all the tools that the system has, I think, is a phenomenal opportunity. And as you know, it was a year ago we had these first conversations about it and put in place an MLU between Corteva and the CG just earlier this year. And I think the importance of that it was an MLU with the CG. It wasn't with CIMMYT or IRI. We have many bilateral... Let's just call them relationships with individual centers. But I think the opportunity to partner with the CG itself, initiatives like *Crops to End Hunger* and working on climate adaptation and climate mitigation—I mean these are things that we can do together, bring some of the technologies that we and other companies are working on, to serve the needs that really the CG still has to pay attention to in a big way today.

Elwyn Grainger-Jones

Thanks, Neal, and we really value this partnership. It is amazing if I could hear, if I could just comment—you know, one of the world's major agfood companies talking about climate-positive agriculture. That's a step change from where we might have been 20 years ago or even 10. On that note, and apologies to the audience if you'll see I was asked the same question a half an hour ago, because I wasn't listening to that. Where do you see the role of breeding in the broader context of climate-positive agriculture? What contribution do you see that playing alongside these broader efforts that are needed?

Neal Gutterson

You know, I think one of the beauties about where we sit today as Corteva and where maybe the One CG is, is that we can think about the many tools we can bring to bear on addressing issues like climate change. And we've had... I think Jim probably mentioned the work we did yesterday and the convening with CEO level group, and we had discussions earlier today with you and some of the science folks in the CG and some of our scientists. Clearly breeding plays

an important role – right? I mean if we're looking at improving varieties to, say, do a better job of sequestering carbon, that's going to come from better varieties and how they're then deployed in the field – right? So there's no question that breeding broadly [inaudible] will have an important role there.

And I think it's a range of tools for modern breeding. So if you try to solve everything in breeding, maybe you solve nothing because you're trying to solve too many problems at one time. One of the beauties about some of the modern tools we have like genome editing is we can go at and maybe solve a problem like carbon sequestration across a wide range of crops and let the breeders focus on, okay, delivering improved genetic gain, improved yield, improved resilience that then could be packaged up with, say, carbon sequestration. So I think it's an amazing time in tools we have at our disposal to accelerate the power of breeding to deliver on the needs of a true climate-positive agriculture.

Elwyn Grainger-Jones

We could spend another hour on that one as well, but we'd better move on to Felister. Look, you're one of the key clients, as I said. A lot of this work is designed, getting back to Simon's point about making it country-specific or even..., and more, even more local-specific within regions in a country. And do you want to say something about how this kind of initiative could be helpful to you? What kind of operating realities do you face? How does this initiative resonate with your experience of working with CGIAR and breeding programs globally. So let's hear a bit from you.

Felister Makini

Okay. Thank you for that question. For us as a national agricultural research system within the country of Kenya, first I want to say we've benefited a lot from the CGIAR research and the varieties that are bred. Some of the inbred lines have been used to develop some of the hybrids and varieties which we have released in the country.

And so I look at this initiative, and I'm excited about it, actually, because I think looking at demand-driven farmer preferences, consumer preferences, and that which is really their preferred and demanded, is an exciting approach for me. Because in the past I worked, like for my PhD, I worked on finger millet and you had to get information from the traders, from the farmers, testing some of these varieties' ability and thinking, and I realize the importance of developing technologies that are demand-driven, because that way you are sure of adoption. And so this initiative to me is very exciting, because that's the approach we are looking at, developing demand-drive product profiles which are really for the regions or countries or geographies specific. And I think we are going to really have more impact probably earlier than before. And so it is a good initiative, and I look at it was a way to be more impactful and even more useful to us.

Elwyn Grainger-Jones

And that's great to hear, and maybe you could say something about... Of course, no one wants to produce varieties that sit on a shelf, so to speak. And you play a key role in getting this stuff into the hands of those people that presumably need it who are not currently changing varieties as quickly as they presumably need to. So could you say something about how the system in which the varietal development takes place, how you're trying to improve that in your

operating environment. And maybe just in the last month at DHL, that's where we were talking about the power of digital, the potential power of digital. Where you see digitization as having potential to strengthen the ability of particularly smallholder farmers to access information on what kind of varieties they could be using.

Felister Makini

At KALRO, Kenya Agriculture and Livestock Research Organization, we really embraced digitalization in a great way. And in fact if you go to the playstore and Google KALRO, you'll find several ops which KALRO has developed for different commodities, different crops, livestock, and so forth. And so we see digitalization also as a tool that is benefit several farmers, because as you know, in Kenya almost 80% of the population is having some kind of a mobile phone. At least in every family they'll have a mobile phone on one of the family members so they can be able to access the information. In fact, even now we are also piloting the Kenyan Agricultural services platform, which we also believe that we can link with focus with an agronomy advisor to enable farmers to make some decisions on what to grow at what time and which season and so forth. Of course, this is still pilot. We've only been in two regions, and so digitalization is going to be very important going forward. Of course, in governmental, the extension actors is also very, very key, and in this initiative involving those as well is going to be very important, because I think that's where the link has been a bit weak in terms of getting those who are taking all the technologies, the varieties out, have not been so strong. And so it will be important also to involve that aspect as well.

Elwyn Grainger-Jones

This is a bit of a tangent, but it's just so interesting to hear from you. I recall a discussion recently where I was getting excited about digital technologies being, you know, the extension services we've always dreamed of, couldn't quite put together. And my colleagues said, you know, "Get real. We're still dealing with literacy issues in many parts of the world." Can you just say a bit more about what are the constraints you're finding to rolling out those kind of digital services, and does it get you equally excited, or do you presumably see the real world and many of those challenges more than we may from kind of a mile high perspective, sitting here.

Felister Makini

It's very exciting, because my view is that in all those families, yes, literacy, the literacy and from a lack of knowledge in terms of the usage of mobile phones properly in terms of what mobile phones can do. They can receive information. But I think we are at place that every family is having someone who has some knowledge. And because of that addition, we were to assist, whether it is parents or whether it's doing the actual farming. So, I still think that digitalization is an innovative tool, and it's still going to be very, very useful as we move forward. So, we're excited about it, and that's why KALRO is really making every effort really to embrace digitalization, and it is sharing information as well in times of digitalization. So it's exciting.

Elwyn Grainger-Jones

Yeah, I know I'm grilling you here, but it's so interesting to talk to you. I guess we have a bit of time to ask you one last question. And this is very broad, but getting back to where we started, the rate of genetic gain, the speed of varietal turnover, the chain, the adoption of new varieties. Is it possible in a nutshell of one, two minutes to get your perspective of why it's not happening faster? What do you see on the ground about why farmers aren't changing their varieties more regularly?

Felister Makini

I think one is on the preference. And I want to use an example where we have a variety hybrid 614, 14 years old, and farmers still prefer to grow it. And it is very popular with the farmers because they talk about the taste when they roast it or boil it. They say it's good for the... We call it Ugali, that traditional meal. And so in some cases it's preferences. Number two, I think also there has been, just like I mentioned earlier, we need more involvement of the extension agents on there. I must say that in Kenya, because it's devolved, it's still a bit weak. And so really that flow information is also a problem. The third thing that we lack platforms and also funding for promotion of new varieties. So because the seed companies want to make money, so they don't want to get into new varieties, which are not known by the farmers, to begin selling them. So if where they are being developed there could be some funding and efforts really to scale out and promote these varieties so that they are known by the farmers to adopt them, then seed companies are likely to license those varieties and to multiply them. So I see that that could be some of the things that... Of course, there is lack of adoption.

Elwyn Grainger-Jones

I will not ask you another question, because that would be unfair, but we could spend another hour on that one too. Last but certainly not least, Gerardine, I'd love to hear from you about this initiative because you have an incredible vantage point of leading agriculture modernization in a country where 50% of the population is employed in some way in agricultural enterprises. You've got really ambitious targets in your strategy for innovation and extension with real specific emphasis on improved varieties and breeds. So I'd love to hear from you, your reflections on this discussion so far.

Gerardine Mukeshimana

I think in the country love to see movements of innovation and new tools towards being available to the citizens. So I think this initiative is a very good initiative on the... I guess I'd like to tell the CG people—you guys, you sit on an enormous amount of tools and technologies. How do you get them to the farmer? So getting everything to the farmer—to me that is the most important thing. And if we could start there and make sure they are using the technologies and then we go back and do the back work to make sure that the flow keeps moving, I think that is the most important thing.

But again this is, I think, an exciting time for the CG system to be thinking of a new way they are doing business, I mean because the climate change is a challenge that is like unpredictable. We don't even know what is ahead, and it's difficult to know what to do to make sure that you are responding to it. So to me there is really a need of moving things through very quickly, because I think we used to take ten years to breed one variety of potato or maize. And with the skid of the climate change, I don't think we can afford to do that anymore. So we need to know how to do things quickly but so many things simultaneously. That's what I see it. But if you go back to small-scale farmers that we like to be talking about, there are so many things that also need things to be done right. Even agronomy, if we could do the agronomy the right way, I think the technologies on the shelf can do some progress.

But the most thing that I like about the initiative is I guess its inclusivity of the stakeholders, because you are asking why the farmers are not taking all the varieties. Probably they don't have the market for it. Like now agriculture in our world is changing, and if a farmer doesn't

have the value in the market or cannot market what he's doing, he may not grow. But also the consumer, he is also changing very quickly. So having all of this complexity of stake holders, I think this is going to be a challenge for the initiative. And I think it's important that we take the CG system as a brain bank to us as a country, to say this is a brain bank that you can go there and show what can be used. But to me the most critical thing—how do you see to it that your own science people and make sure that your brain is transmitted to them so that they can do things efficiently and work. Because at the end of the day, these countries are going to be developed... all the agriculture in the country is done by the national scientists and the national farmers, so I don't expect that the CG by itself can come and do things. But that nurturing and making sure that we are transferring the capacity to a massive number of people so that they can do their transformation. It is needed. Otherwise, if it is not transferred to a sizable number of people who can have impact at the field, it still would be where we used to be I think 50 years ago. Thank you.

Elwyn Grainger-Jones.

Thanks so much, and just I couldn't agree more on the point on agronomy as well. I mean, the key point and a lot of the anxiety when we first started talking about this initiative was we were retreating back to the 1960s traditional old-style breeding, and haven't we moved on from that. And the whole point of this discussion was to move on from it—but also to see it in the broader context of a sort of critical and urgent need to think about landscape. But anyway, I want to hear from you more than let me talk.

I mean, could you say a bit more about how your strategy that's so well-articulated in your strategic plan for agricultural transformation, how you're helping smallholder farmers innovate better and help them. Can you give us just... leaning a bit to Felister's point, you said more about the reality, their reality and how we can help them.

Gerardine Mukeshimana

I think where they're operating from is very different from what many people be thinking of. Because for them, they face the world's challenges on a daily basis. So if we are talking about drought, they are the ones to face it. If we are talking about diseases and pests, they are the ones to face it. So I think for us our job is to make sure that we are breeding or doing this that then there is funding for those specific needs. And most of the time I fear like I'm not doing it enough and quick enough, because we set up the strategic plans and we have a wish list. We want to breed drug-tolerant crops. We want to have brown streak resistant cassava. You have to do that. But most of the time there is no super varieties. It doesn't happen in the world, and I don't think that they are going to have it even if we have the tools to do it. So helping them is just also listening, knowing what are the challenges, what do they wish to have. And then you go back and do your research, and then you can come back with the solution. And I think for this time there is so much tools that are available that were not there long ago, and that if we coordinate to where I think we can get them.

Elwyn Grainger-Jones

Thank you so much, Gerardine. We've run out of town. There's a symmetry to where we ended, because we actually came full circle back to Simon's point about working with the market and looking at a real demand. So what a great way to end. I want to thank our wonderful panel.

And as I said, honored to have the laureate on our panel, Simon. Let's thank Simon, Neal, Felister and Gerardine.