

THE ORANGE REVOLUTION: A NOVEL APPROACH TO TRADITIONAL CHALLENGES

Panel Moderator: *Pamela Anderson*

October 16, 2015 - 10:00 a.m.

Introduction:

Ambassador Kenneth M. Quinn

President - World Food Prize Foundation

So one of the biggest moments that came on this stage at this podium when something big was launched came in 2009 when Bill Gates walked up here and launched his program to uplift agriculture in South Asia and around the world, such a great moment in the history of the World Food Prize. And I'd have to say that, having started at the World Food Prize was a good thing, because it's so very successful in making such a big difference in the world. And we are so fortunate to have with us today to lead the next panel the woman who is the Director of Agricultural Development at The Bill & Melinda Gates Foundation.

We've known her for a long time as a great friend, when she was director of the International Potato Center (CIP) in Peru. We'd send one of our students to her each year to mentor and inspire. And so I want to introduce Pamela Anderson, invite the rest of the panel to come to the stage, and turn it over to her. Pamela, thank you so much.

Panel Moderator:

Pamela Anderson

Director of Agricultural Development, The Bill & Melinda Gates Foundation

Panel Members:

Maria Andrade Senior Sweetpotato Breeder for Sub-Saharan Africa & Asia,
International Potato Center (CIP)

Jan Low Principal Scientist & Sweetpotato for Profit and Health Initiative Leader,
International Potato Center (CIP)

Robert O.M. Mwangi Sweetpotato Breeder for Sub-Saharan Africa, International Potato Center (CIP)

Pamela Anderson

Good morning, everyone. It's a real honor to spend this day with a room full of hunger fighters, so it's our day and it's wonderful to be celebrating it here at the World Food Prize.

Borlaug 101 – for the next hour, your lesson is on sweet potatoes, and we brought together some wonderful instructors for you, so I would like to introduce them. These are three of the leading sweet potato scientists working in Africa. Maria Andrade is a sweet potato breeder. She is born and raised in Cabo Verde. She has a PhD in sweet potato breeding from North Carolina State. She went back to Cabo Verde and set up the root and tuber crop program and then 20 years ago moved to Mozambique where she started working on cassava and sweet potato, and then she joined CIP in 2006.

Robert Mwangi is also a sweet potato breeder with a PhD from North Carolina State – good place for sweet potato breeding. He’s a native of Uganda. He returned back to Uganda after his PhD to run breeding for the national program, NARO, and then he joined the staff of CIP in 2009.

Dr. Jan Low is an economist from Michigan State University. She started working in Africa in 1978 when she was an undergraduate and kept going back and forth. She started with CIP first in 1994 as a Rocky doc, Rockefeller post-doc, and then we brought her back in 2005. And she was the regional leader for Sub-Saharan Africa, and then she decided she really wanted to put her energies into sweet potato exclusively. So she developed and is now leading the Sweet Potato for Profit and Health Initiative, which is the partnership umbrella that really embraces a lot of what we’re going to talk about this morning.

So these are your instructors. And Howard made a really important comment. He was calling out the fact that when we usually come into these meetings, we have an almost singular focus on our traditional Green Revolution crops – rice, wheat and maize. I think lesson number one is – if we are truly serious about addressing global food security, we have got to expand that focus and really look at and encompass the other food security commodities, livestock, fish, roots and tubers, legumes, vegetables, small grains, legumes. So it’s really important. We’re delighted, Ken and Catherine, that we’ve got the stage to talk to you for an hour about one of the root and tuber crops, sweet potato.

So your instructors have asked me if we could start out and show you a two-minute video. Because this is pretty special and unique crop, we want to visualize for a couple minutes some of the things that we’re going to talk about. So, Steve, can you roll the video for us?

VIDEO

Mozambique, like other poor countries, has high rates of malnutrition and vitamin A deficiency among young children. Vitamin A deficiency reduces disease resistance, leads to stunting and blindness, and increases mortality.

One small, orange-fleshed sweet potato can meet the daily vitamin A needs of a young child and also provide a good source of energy. But until recently, the orange-fleshed sweet potato and its nutritional value were unknown in Mozambique.

As part of the government’s long-term struggle to reduce the high levels of vitamin A deficiency, scientists joined hands with development agencies in 2001, and an orange brand was developed to promote orange-flesh sweet potato in the country.

Farmers, shopkeepers, and research technicians were trained to promote, sell and make new products from it. Villages were introduced to new recipes that used it and appeals to the whole family. There were talks about all vitamin A rich foods and storage to ensure vitamin A in the diet year-around. Now, the orange-fleshed sweet potato is spreading nationwide as the sweet that gives health campaign expands.

But the crop's potential does not stop there. New drought-resistant varieties that could help the whole of Africa as climate change intensifies will be ready soon. The Eat Orange Revolution has begun.

And, Steve, can you pull up the first slide, please? So we're going to spend a couple minutes actually talking about the crop so you appreciate it, and it will inform some of the challenges that our scientists are dealing with. We're going to have a panel discussion for about 30 minutes, and then we'd like to open up for Q&A to the floor. So the last we'll try at 15 minutes so you've got a chance to ask some questions as well.

So sweet potato is not a traditional seed crop. You don't take the botanical seed and you plant it. Robert, can you explain to everybody what a clonally propagated crop is? What are we looking at in this slide.

Robert Mwanga

On the motor bike, the gentleman is carrying vines. The farmers cut up the vines into 30 meter cuttings or one foot, and that is what they use to plant. They could use forks, or the women can use bare hands to go out to plant into the mound or ridges. And one seed of maize, corn can give 300 seeds. A vine could give you 10 cuttings, 15 cuttings; so you are comparing the number, the ratio of one seed, one plant, 1 to 10 or to 15, and then 1 in terms of maize, 1 to 300. So that you need like area where you can get the vine cuttings to plant the next field.

Anderson And this says... Well, they're clearly bulky – it says “perishable.” Once you get that vine ready, how long can you keep it before you have to get it in the ground?

Mwanga This is perishable. You know if you have enough humidity in the air, that could protect four days, seven days maximum. Maize, you can leave on the shelf for, as long as there is good moisture, several months. This will rot in three days, four days, so you want to plant it quickly so that you are able to get the next crop.

Anderson I think there's one more slide, Steve, just to show the planting, so this is what you were talking about.

Mwanga Yes, you can plant it on mounds or on ridges, as I have explained earlier.

Anderson Thank you. No more PowerPoint – that's it. So, Maria, if this is an important food security crop, tell everybody a little bit. What are the special attributes that sweet potato has that really call it out as a food security crop?

Maria Andrade

Thank you, Pamela. Before I answer your question, I would like to say thank you to the organizer of the World Food Program for this wonderful opportunity for me to be talking about this extraordinary crop, which is sweet potato. We never have this opportunity to be in a plenary like this to talk about this crop, the sweet potato that I love so much.

So sweet potato, like it's a very important crop for us in Africa, because if we are looking into productivity, there is no other crop that is so efficient in terms of biomass production like sweet potato. It is also considered a very important crop, because it also tolerates drought, and it's very evident when you plant sweet potato inter crop with legumes or wheat, maize. When there is drought the maize and the beans will collapse, but you could see that sweet potato were planted there. Of course, the yield may be lower because there is always a cost of the drought, but you could easily guarantee some kind of productivity.

So this crop that we are talking about is very important because it's packed. It is a crop that, when you plant in an emergency situation, after two months the farmers could have some leaves that are an important source of vitamins and protein. They also can eat the roots nine months after planting. And if we are talking about orange-fleshed sweet potato, it's packed with vitamin A, which is another source of nutrients that is very good for the undernourished children in Africa. It's also very..., cash crops, considered now in Africa a cash crop, because most farmers are really selling about 50% of their sweet potato, and it is a very important source of income for the family to buy school books and for the women to send their children to school. It is considered also like a woman's crop, because for ages the woman in Africa did not have orange-fleshed sweet potato, but they really were doing white flesh. They know how to plant them, and they know how to prepare it in their house.

Anderson You said nine months. Actually, the roots come out... You meant 90 days.

Andrade Three months, three months, 90 days.

Anderson Yeah, so in three months you get a crop out.

Andrade So it's really, really exciting. No other crop is as good under emergency situation, like flood and like drought, because in 90 days, 60 days, you're guarantee some food for the hungry people in the flood or drought-affected areas in the districts.

Anderson A couple of other important factoids: sweet potatoes are not at all related to potatoes. So potatoes are in the solanaceous family. They're related to tomatoes, eggplants, tobacco. Sweet potatoes are in the morning glory family, if you were to look at the flowers, one of those beautiful trumpet flowers. So they're not at all related. And the data that we have suggests they were probably domesticated in Central America. And so from there they went out all over the world from very interesting migration routes out.

And so in the Americas, the center of origin, you have a lot of diversity. We have orange varieties, we have purple sweet potatoes, we have yellow sweet potatoes and white sweet potatoes. And what's interesting is the Portuguese sailors, who apparently took this into Africa, for some reason what stuck there was the white sweet potatoes. So as Maria was saying, that's what was being eaten in Africa up until recently.

So, Jan, we saw in the video that the problem we're addressing, one of the problems we're addressing is a nutrition problem, vitamin A deficiency. What was the idea? How did this idea emerge in the middle of the 1990s to actually use, when everybody was planting white sweet potatoes, how did this idea come about to use the varieties from the Americas to actually address this health problem?

Jan Low

Yes, well, I think it was... I had arrived at CIP as a post-doc, as she said, with the Rockefeller Foundation, and I was working with the sweet potato breeder at the time in East Africa. And I noticed among the things that we were testing in the varietal trials, there were some orange-fleshed varieties, and the people really liked the color of the varieties, and they were attractive.

And when I went back in and talked to my supervisors there – “Oh, you know, they tried orange-fleshed varieties. They'd been introduced in the '80s in some countries in Asia and Africa, and they failed – people don't like them, so that's why we don't use these.”

And I said, “Well, that's not what I'm seeing in these taste tests.” And it turned out really it was a question of texture, not color. The color was well liked, but, unlike the sweet potatoes we have in the United States, which are sometimes here incorrectly called “yams” – they aren't yams, they're sweet potatoes – the ones in the United States have very low dry matter content, meaning they're easy to mash. But those aren't preferred, except we found that young children like them very much in Africa. But the high texture, like a bread substitute in the morning... They're very much a morning breakfast food in East Africa.

So we began to realize that we could select at that time – at that time there was very little money for agriculture – that we could select among the best bets that we have in that massive germplasm collection; and we did find a few of what we call local land races that were also orange-fleshed in Africa, and we were able to start at least testing whether people would eat and adopt those. And one thing we learned in that early work in the 1990s was that it was very important to have the nutrition education component to go alongside the agricultural component to ensure that it would get into the young child's diet. And that we learned quite extensively.

Now, the problem is in those days we weren't able to do the extensive consumption studies and bloodwork to show the impact on young child nutritional vitamin A status; because, while there was... It was, the very first study we got was \$75,000, very limited resources, but it started the work. And in those days in the 1990s, much

of the nutrition community was focused on supplementation as a strategy that you could do to address vitamin A deficiency, and there wasn't much evidence for food-based approaches. And so I set up and spent actually three and a half years trying to raise money for a study that would show that using an integrated approach of agriculture, nutrition and marketing, that we could make a difference in young child nutritional status.

And it was a classic problem in that era of silos. The ag people said, "No, this is a study that you should take to the health people." The health people would say, "No. Take it to the ag people." So I'm always grateful to the Micronutrient Initiative of Canada for seeing the integration; and once they came on board as the major funders, they were joined by USAID and the Rockefeller Foundation, and we were able to conduct the research in a very resource-poor part of Mozambique and show the actual impact on nutritional status in terms of the serum retinol indicator. And that study done in Mozambique was published in the *Journal of Nutrition* and I think helped convince the nutrition community that, yes, a food-based approach—and we don't say it's a magic bullet. As you saw on the video, we talked about other vitamin A rich foods that you use, and it's an integrated approach to talking about improved young child nutrition.

But with that evidence base, then we were able to convince the nutrition community that biofortification and particularly using the orange-fleshed sweet potato with an integrated approach could make a difference to young child vitamin A status. And in Mozambique you have 69% of the children that are vitamin A deficient. So it's really a question of addressing the underlying problem of intake of vitamin A.

Anderson But what impressed me in watching how you all went about this was—I mean, you have this idea to use the orange-fleshed sweet potato, and you didn't rush out and just start doing the agronomy and the breeding. I mean, you stopped and you actually did the science. Because that was back when people still believed that food preferences were locked in. So you did a serious study to make sure that people would accept it and what it was they were looking for, and then you did the serious study and published it to document that there was enough bioavailability that it was a real solution.

And that actually took ten years of work to get that proof of concept. And I think sometimes we kind of rush to solutions before we actually... and you made a good point that the funding is very often a problem in doing this. But I mean it speaks a lot to the way you thought through this in terms of, you know, can we convince ourselves that this really is a way forward? I found that impressive.

Did you get pushback? I mean, even as this was going to publication, did the health community push back? Because the supplementation was so strong as an approach to vitamin A alleviation.

Low Well, I know, I think there was a... there's always been a call for greater evidence by the nutrition community for food-based approaches. And of course it does take more time and it is more costly to get that evidence. And so I didn't find pushback from

the nutrition community. In fact, I think people were very excited to finally get some evidence to do it. Now, getting those studies funded has become much easier, because fortunately, I think, in the last five years the need for more integration of nutrition in agriculture has come to the forefront. So this is really an exciting time for people that have always been interested in nutrition-sensitive agriculture and what nutrition can do for diet quality. Because if we don't improve the quality of the diets, we aren't going to resolve these problems of chronic stunting, because a lot of these micronutrients are essential for good young child growth. And certainly we still have two billion young children suffering from some kind of micronutrient deficiency.

Anderson So you get the proof of study, proof of concepts worked out and that really means... So you two are not sitting around not doing anything – you're getting out the varieties that were there. But that meant that then there was really a mandate to double down, go back to the agronomy and double down on how do we improve these varieties and get them deployed.

Robert, what were you seeing in Uganda? I mean, what did that look like? What were the challenges that you were confronting as you then looked at this opportunity to get out orange-fleshed sweet potatoes?

Mwanga In East Africa and possibly most of Sub-Saharan Africa, the varieties, the sweet potato varieties that we find are starchy, mealy, and this is what the consumers want, what the farmers want. And there was the practical plant breeder, and I am, so in the field he would plant out his varieties or introduce varieties from all over the world, from South America, from the U.S. You plant them out, they are good to utilize, and there are still thieves, they come and steal them. When they eat the orange ones, they don't even taste like oranges, and they don't taste like sweet potato. And then they were calling for, they wanted varieties that they were used to, and these were low, they were mushy, they were soft. And so we had to breed the varieties that they were used to. And that took time, because it takes time to raise a variety, and we had to introduce resistance to diseases and also those that would grow well in different environments.

So the challenges were: Fix the diseases, provide what the consumers, what the farmers want to eat, what do they like to taste, and then of course the other case of the seed system.

Anderson So how long does it take you to actually breed a new variety of sweet potato?

Mwanga When you have two seasons, that takes eight years, seven to eight years. If we have only one season in a year, you're talking about 14, 15 years. And so really what we have done now has been to try and cut short, bring down the cycle to about four years by trying to multiply the material that is required very quickly in the other cycles of breeding so that you can go to much locations that maybe you can say something about it.

Andrade Yes, in Mozambique, for example, we released in December 1999, eight varieties of orange-fleshed sweet potato, and these varieties were selected from material introduced from the U.S. and other countries in Africa. So as you see the work on building evidence base, it's taking place in Zambezia. We also are looking into different methodology for the best disseminating of our vines in a cost-effective manner. So the work did not stop in there. We are disseminating what we have, while we are looking for a better variety of orange flesh to be released later on. However, during this work we were doing, there was a serious drought in 2003 and a big drought in 2005, which took three quarters of Mozambique under drought. That is when we realized that the materials introduced into Mozambique from several countries were not withstanding the drought when we compared with the local white flesh variety that the farmer claims as a drought-tolerant material. It is then that we realize that we must start a breeding program in Mozambique, for Mozambique and the rest of Africa. And in this breeding program, we have to look into traits that are related to drought.

So it was really interesting that we approached the Rockefeller Foundation to really assist us with some funding to take up on this very interesting breeding. Because before most of the breeding had done in Lima, Peru, or in some places in the U.S., and what we were receiving does not really adapt to our agroecology. So they were very kind and generous. They said, "Okay, we will provide you materials, we'll provide you funding to do this work, but [like Robert was saying] it takes eight years at least to release a variety. But we cannot wait at least eight years. We're only giving you a fund to only produce varieties that are tolerant to drought with those attributes which are taste and to not be very soft. But this material was to be producing in four years."

Together with our colleague, Ruth Genger in Lima, Peru, were worked out a methodology which we call, "escalated breeding scheme," which is to produce a variety in four years instead of eight years but in what consist this escalated breeding scheme. Because if you follow the normal cultivation of breeding, you cross the seed, you put your seed in the nursery to germinate, then you multiply this seed until reasonable amount, then you have the first-year trial, the second-year trial, on to the seven-year trial. Eighth year you are putting them on your farm and to submit them to variety release. But with this methodology, when you have one seed, you wrap it and multiply them into 12 small cuttings. And then you plant these 12 cuttings, 3 each, in 4 different sites. And this site should have drought, because drought is one of the major characteristics. Let's say, vine is like Robert said, is a problem. We must pick a site that has the virus problem. And then of course plant the sweet potato. And as you do these, in four years we managed to release 15 drought-tolerant varieties in February of 2011, and after that we have also 9 in the pipeline. But this is not only the story, because all other African countries are also starting this network, are also releasing varieties or using this escalated breeding scheme, like I said, using eight years in four years. So this is the reality, and it is really shortening the cycle, and our gain, genetic gain is really much faster than originally, using conventional plant breeding.

Anderson So we've seen the opportunity for this. You guys come back and you start breeding to increase the high dry matter, the starchiness so it's more acceptable, dealing with the pest problems, the viruses in particular, and climate proofing the crop so that we've got some sustainability going forward. And they actually call themselves the "speed breeders" now. And this is a page from the playbook of Norman Borlaug. I mean, he had the same need to actually accelerate the breeding, which is what he called "shuttle breeding" – right? He was working between different agro-eco zones in Mexico. So 50 years later, we're still using Norman's playbook, so you've cut the time in half.

We'll come back to it in a minute, but this week we've been paying tribute to our laureate by really weaving a theme on gender throughout the week. We started with a great panel on empowering women and girls. What is the gender dimension related to the orange-fleshed sweet potato? I'm going to ask each of you to just quickly talk about that, because I know it's a really important part of your work. Jan.

Low Yes, well, particularly in Eastern and Southern Africa, home consumption control of the family plot of sweet potato has been considered in the woman's domain. So one of our greater concerns was, as we try and commercialize this crop, by improving market opportunities, how do we protect and ensure that men don't come in and take over? Because we've seen this happen with many crops in Eastern and Southern Africa, and it has happened in certain areas with sweet potato. But, obviously, as larger fields go in... and this isn't a negative thing, necessarily, because it often brings more resources into the family, and it all depends on how that ultimate money is spent.

So in our work in Rwanda when we were building a value chain link to improve agroprocessing opportunities, we sat down with our partners and we negotiated, and we set targets from the outset, saying we want to ensure that 75% of the people participating in this value chain are women. And so we set explicit targets, and we also had to arrange special things to ensure that women in more vulnerable households were able to participate.

And so we had two models that we were looking at, the one that the agroprocessors was already using where he did independent contracting with individual growers; and then we had another system where we were organizing farmers with NGO support into NGO-backstop groups, and they would do group bulking and selling, and they would receive group lessons from extension personnel on how to improve their crop production. And they were both marketing-oriented groups, but we also had a special set of groups working with YWCA that were households that were vulnerable groups, AIDS-affected households. Because of the genocide, you have a lot of female-headed households and even child-headed households.

And what was good for the vulnerable groups in particular, if one person couldn't make their delivery of their surplus to get into the processor, they were on schedule, another person could step up. So the group system was actually very supportive of enabling our vulnerable households to participate in the market chain. And by setting these targets from the outset, people knew they had to recruit that way. And

when they went into the villages and discussed group formation and utilization, it was part of the strategy from the outset.

So I think in order to protect and guarantee that women don't lose control of a crop that's been seen as their traditional crop in many parts of Africa, we have to be proactive in that regard.

Anderson Robert, what have you seen with respect to gender? How has this affected how men and women work around sweet potatoes?

Mwanga For example, in most of East Africa, you have the women own the land. So if you are going to have to conduct any training, if you leave out the women... I mean, if you leave out the men, you will have these discussions and the women will remain the same. But if they are all sensitized, then they become aware they all need vitamin A, they all need to get to improve their health. And now, I'm a breeder – so if gender is not limited to men and women, if we are, for example, doing taste tests, we need, we separate the children from the adults, because the children will actually prefer orange sweet potato. The color attracts them, and that's good, because it makes our work easier. And so really the thing is we took that into account.

Anderson Yeah, and that's a really important point. We learned really early we made a mistake. We started doing the nutritional education focused on women alone, and there was just... And so the men were saying, "Well, this is not important – that's not our business." And we corrected for that and really started doing inclusive nutritional education so that there was understanding at the household level. That's a really important point you're making. Maria.

Andrade Yeah, in the breeding program, as we move into the whole farm trials, sets up a target to 50% of those participating farmers must be a woman. And you have to see the advantage of these on-farm trials, because there is a lot of training taking place as you plant the vines and until, it is evaluate to the sensitive test until the farmers decide what to release.

And the seed multiplications, so we have this what we call "community seed multiplication." And this community seed multiplication, we also must include some of the market players that are female. And these females are to have children, at least one-half of children, 50% of them, under five. Also, as we distribute planting material into the general community of farmers, we also distribute plant material to 75% of our beneficiaries to share must be a female with at least one child under five. Again, we don't underestimate the participation of the men, because sometimes they also take decision in the house, and they can complicate the life of the women if they are not involved from the very beginning.

Anderson I'm surprised nobody... My favorite story, one of my favorite stories – I'm surprised this didn't come up – is the work you've done on Mama SASHA.

Andrade Yes.

Anderson This is a very creative piece of work that they did, a project in Kenya. And so two of the challenges – right? – this is about novel approaches to traditional challenges. So the challenge Robert was talking about was – how do you get these vines out? And then another health challenge was – how do you get women to their antenatal visits? And so basically the project said – If you go to your antenatal visits, we'll give you a voucher for 150 sweet potato vines. So you've got the moms going to get the proper healthcare for the growing baby, you've got them learning about this new crop, you've got them with the planting material. And you have this incredible situation where you now have male extension agents that are in the field telling women to go get their antenatal checkups, because that's how they're going to get the vines. So breaking down these intersectoral barriers has also been a very cool part of what you've done.

I want to leave time for questions. Let's go to the impact part of the story, so proof of concept, the breeding work, really working through the value chain. You set some pretty ambitious goals for this work. You said that by 2020 you want to have in Africa orange-fleshed sweet potato being utilized by ten million households. Right now, from what you've told me, we're at 1.9 million, so we're 20% of the way down, we've got five years to your goal. This is a classic problem of scale. And our community struggles with scale, so what do you think has to happen? What are going to be the levers that we pull to hit that goal of ten million by 2020?

Low Well the Sweet Potato for Profit and Health Initiative that was launched in 2009 is a multi-partner, multi-donor initiative. And the first five years really were set up to do more work on the evidence base and really invest a lot in the core breeding in Africa for Africa. That was really needed, because if you don't have the foundation of the adapted varieties, you can't go to scale. And I'm very pleased to say at the end, because of our cooperation with the Alliance for Green Revolution in Africa and the support we've been getting, nine Sub-Saharan African countries released 46 new varieties in the last five years. And that means we're ready to go to scale. We've learned our lesson – you don't want to go to scale with unadapted material.

And so now it's the time to move. And during that time in the five years, we did the Mama SASHA proof of concept, so we have two great models now – integrated community level, agriculture, nutrition education, marketing support. We have a model that has proved to be very popular where we're linking to health services for pregnant women and improving nutritional counseling and access to orange-fleshed sweet potato vines. We now have proof of concept models linked to agroprocessing. So we can build on the models that have shown, and we have an evidence base to say to the communities – this is how we would recommend going about it. Now, every country, of course, and every situation needs to adapt to that cultural context in that country, but we've got the core-based varieties to move. And that's really exciting. And so now is the time really.

And we've restructured the governance structure, the Sweet Potato for Profit and Health Initiative, and now I'm co-leading that initiative with the Forum for Agriculture Research for Africa. The director of that forum is now one of the co-

leaders, and we have eight organizations in addition to CIP signed on. And many organizations, for example, Helen Keller International, has integrated and mainstreamed orange-fleshed sweet potato into their home garden approach. We're hoping that many other NGOs will come on board and saying we're also going to mainstream, and so we're going to be doing an updated report every year showing the progress towards the SPH goal of reaching these ten million households in 17 target countries. And we may need to expand the number of countries, but we've chosen these countries based on the importance of sweet potato in the existing food system, because we realize all of this has to go to scale in the relevant food systems.

But one of my exciting stories is the work we're doing in Tigray in Northern Ethiopia where they had no sweet potato before and the orange-fleshed sweet potato is the first sweet potato they've been exposed to. And people are excited, because the soils there – Mr. Buffett – I mean, it's rock up there; it's rock and sand, and there's not many things they can grow at all. But the sweet potato can. It can grow on marginal soils. And it's very exciting to see the sweet potato, 30% being integrated into the injera, the staple food and people really adopting it quite quickly with no preconceived notions of what a sweet potato should be.

Anderson So you're saying partnerships are critical?

Low Partnerships are critical, and we can also think beyond the scope into new areas, difficult areas where a short-duration crop that grows quickly, high-energy output per unit time, per unit area, can really make a difference to food security and diet quality.

Anderson Robert, Maria, would you add anything to that?

Andrade I would like to add that the policy in all the 17 countries are in place and in favor of scaling out the sweet potato – the government policies, they all are in favor that we should address vitamin A deficiency by using food-based approach. So they're really in favor of this approach.

At the same time, I would say, like for example, with the support of Reaching Agents of Change, which was a grant given by The Bill & Melinda Gates Foundation, to really advocate sweet potato at a very, very high level, this really was a very positive project, because sweet potato really moved from where it was on the ground to the top. It's very evident everywhere you go that definitely where you go that orange-fleshed sweet potato can really do its job.

Mwanga We don't need huge areas – one, because the vitamin A is high in orange sweet potato. So this fits in very well with small plots, and these varieties, because breeders are releasing varieties, they have increased the rate of release of varieties, so we hope this will spread quickly on the areas, these small areas and different households will adopt and really come up to this number.

Anderson It's 500 square meters for one family for a year. That's right, a family of five. So I'm going to open this up for questions, and while you're coming to the mics – there's

mics here; please come to them – I want to call out Per in the audience. And under Per's leadership, when he was the Director General at IFPRI, the CGIAR started a program called, "HarvestPlus." So we're talking about sweet potato, which was really, as Jan and colleagues have said, really started to lay solid evidence for the bio-efficiency and a food-based approach. But we have now, through the work of Harvest Plus, a whole array of biofortified crops. We've got vitamin A, cassava, maize, plantain. We've got a high-iron bean that's taking off like crazy in Rwanda, high-iron pearl millet and potato, high-iron zinc for rice, wheat and potato. There's a stand downstairs that HarvestPlus has. They have great literature down there, and they've got a wonderful book with briefs that shows what is the progress of each of these. So this is a first great example, but what we're hoping is that we're going to see more and more of the biofortified crop products rolling out across Latin America, Africa and South Asia. So thank you for that leadership, Per, to really take this concept and take it big.

Q&A

Anderson Questions?

Q Thank you. I'm Nabeeha Kazi. I'm with Humanatas Global, and I chair the Community for Zero Hunger. And, Pam, you just addressed actually a point that I was going to raise, but I'd like to unpack it a little bit with feedback from this panel.

So we are seeing in our Community for Zero Hunger work the question around biofortification, the fact that this is viewed as a viable and very effective intervention. However, many communities and many community actors that we're going to rely on to scale up biofortification think immediately – "Oh, it's sweet potato, that's all we have. Sweet potato doesn't really work within our context." And so we know that there are 13 varieties out there, more to come. What do we need to do to change that perception at community level, in saying, okay, we have sweet potato, but there is a lot more out there and this is viable for you, so we're not just sharing this with those in the room and those who are sitting at high-level policy and donor and program levels?

Low Well, I think it's a question always of communication, and I think the HarvestPlus program does an excellent job of communication, but it's always a matter of seeing is believing. And so that means a greater expansion of countries. And I realize that there's a great interest now on focus, and much of the support we get right now is saying – Let's make a few countries great examples of how we can go to scale of biofortified crops.

But what we're seeing with the orange-fleshed sweet potato is the demand is much more than our target countries. And this is something we all struggle with, because I think when people see it takes time to introduce any variety of a particular type into a breeding program, into a country setting and sometimes a variety, for example, if you're in a closed agroecology like Rwanda, it will probably work in Burundi. But in many cases, you have to make the investment in the adaptive testing in that particular country. So this is a concern of mine; because, for instance, if we want to

make a difference in a poor country like Madagascar right now, we need to be breeding in Madagascar so the things are ready to go and we can go to scale – whatever crop you’re talking about.

So I think on the breeding perspective, we should have a little bigger country portfolio so we can get these things in the pipeline so they are ready to go, because there are a diverse set of crops now; and it’s great to focus and it’s great to go to scale and show those examples, but at the same time I would advocate that we need to be doing the preparatory work in a broader range of countries. I mean, I have had requests and dealt with commissions now from Sudan, Somalia. We have a lot of people coming to our doorstep, and we’re providing the planting material, but you also need ideally to provide the technical support to make sure it’s done right. And this is one of the dilemmas we face – the need is greater than the resources at this point in time.

Anderson There’s also been important meta-analyses done that show our track record when we use agricultural interventions for nutritional outcomes is not a great track record, which is why this work is so important. What they concluded is you’ve got to do nutritional education along with this and have a real gender inclusion focus. So I think that the promotion and advocacy that has gone into the orange-fleshed sweet potato, the nutritional education, the inclusion of women – we’re starting to learn about this. So it’s going to take us a while, but there’s pretty much an army out there now of folks working on this, so I think the nutritional education is particularly important.

Next question?

Q Yeah, this is a great session. I’m really enjoying it, because I’ve been working with a farmer in Story County on sweet potato production. In fact this is what the school lunch is today at Nevada is sweet potatoes, because they have a lower glycemic index. They’re actually lower in carbohydrates, which is healthy.

One of the challenges that this producer has had, he wanted to bring students, young people from the Philippines, here to learn how to grow sweet potatoes and other crops. But he’s met with a lot of paperwork challenges with the State Department bringing those people here. Is that something that could be streamlined?

Anderson Oh, that is over my pay grade.

Low I think it’s over everybody’s pay grade, but sometimes if you do connect to a center, like the International Potato Center, and we can maybe serve as to provide a letter of invitation to come visit our programs in Africa, which may actually be..., or other programs we have in Asia, in Bangladesh, which actually may be more, very appropriate for what the Philippines wants to see, although the Philippines are very advanced in sweet potato processing. So I think sometimes connecting with an international organization could help, at least with a letter of recommendation. But the immigration service, as we know, they’re their own people.

But I would like to add, we talked a lot about the vitamin A, but you're absolutely right – it's a great source of dietary fiber; sweet potato has vitamins C, E and K, several minerals, and there's a lot of reasons to be eating any kind of sweet potato, but it's the orange ones that have the very high content of pro-vitamin A beta-carotene.

There's a program that has gotten going, actually, including the Philippines, called "Food Start," which is focusing on sweet potato in the Philippines. And so the director general of CIP, Barbara Wells, is in the audience. I am sure she'd be happy to connect you. And so I think it's always great to get students to come in, but you might want to have your farmers actually go out there as well and connect in the other direction, do an exchange type of course and look at what their systems are. They're particularly using sweet potato. Maria was telling the story of Mozambique, but if you think about the hurricanes and the cyclones that come through the Philippines, they have moved to a lot of the sweet potato, because it simply doesn't get clobbered the same way as other crops do when the cyclones come through.

Anderson Is that Julie?

Q Yes. We're being blinded.

Anderson Hi.

Q Hello. Yes, Julie Howard from Michigan State University, and there's such wonderful progress. And we at Michigan State are very pleased to claim Dr. Low, thank you. So my question is – I think we are at a particularly wonderful moment now. Finally we recognize these ag nutrition linkages. Think about the challenges of scaling sweet potato. You know, it's actually a challenge now of scaling dietary diversity, all that we're learning about a diverse, nutritious diet. We finally are having more evidence around that. So I just, I don't think we can afford to have the similar type of campaign around these individual components of a nutritionally diverse diet, animal-source products and legumes. So what lessons do you leaders... What can you give us to think about how we should all go forward to more effectively and efficiently promote the idea of... You know, what are the components of a nutritionally diverse and rich diet that makes sense and is affordable to smallholders? A simple question.

Anderson Very simple question.

Low Well, I think in the long run, you know, we're often dealing in the Sub-Saharan African context in a lot of countries where public sector extension systems have been disinvested in. And in countries where they do exist, I think strengthening those and giving, integrating nutrition training and education into those extension systems is critical.

But also looking in the long run into school systems. This is a great opportunity in primary schools. And if you look at most primary school education, there is nothing on nutrition, there's nothing on a lot of life skills, but nutrition is particularly

lacking. And if we're really going to make a difference in the long term, we have to work with adolescents before they become parents and really improve there and improve the education on diet diversity. School feeding programs is a great way to expose children to new foods and different foods, because we all know behavioral change is easier when you're younger than when you're older. And we do have some program interventions now in a pilot scale in a school feeding effort in Nigeria where the orange-fleshed sweet potato is being used one day a week, and it's very popular with the children.

So I'm looking at the longer term—how do we get better nutrition education into the school system? And that's a natural way to go to scale, because if you've integrated it into a national school system and then they can locally adapt to the crops that are available in their areas, that's one way we can do longer-term scaling that makes a difference to overall nutrition education; and you can have a variety of messages being part of the educational system.

Anderson One of the things that's happening in the foundation that I'm real excited about is, I came in last year as a new director, we have a new director of nutrition, Shawn Baker, who used to run Heller Keller in Africa, and we were actually cohorts in crime in this work in Africa before we went to the Foundation. So we have made a promise that we are going to actually really dig in and link the agriculture nutritional programs. So we now have a formal joint initiative called the Nutritious Food Systems for the Poor. And part of what we're talking about, Julie, is actually kind of flipping it, because your point is really important.

I think that as agriculturalists we don't pay enough attention to the data and the nutritional profiles. So how do you go into communities and areas and say—what is the nutritional profile? What is the burden of disease? What is missing here? What is the consumption system? What is the production system that we have to work with? And how do we start modifying the system to address what the data says has to be addressed? And then you've got the tactics that say—okay, what biofortified foods do we have, or can you diversify the diet? But I think we need to start with the diagnostics, and that points us back to the data, and it points us back to the analytics before we start into the tactical approach. So we're trying to take a couple of places and see how we could model that way of looking at this, and then we look at all these wonderful new crops we have and the diversity, and the affordability is a real issue for a lot of these. So putting that altogether. So we're going to try and tackle that.

I want to talk to the students. I know a lot of you are long breeders. You've got two master breeders up here, so bring your breeding questions now or afterwards to Maria and Robert, please. Sir.

Q My name is Rich Kottmeyer. I run private equity funds, dealing with smallholder production. Simple question: Can you make a business case for changing from an investment in Irish potatoes to sweet potatoes? Is there a market in Africa, and would this be a good investment for a private equity fund and why?

Anderson Switching from what to what?

Q From white potato to sweet potato.

Low In the United States or in Sub-Saharan Africa?

Q In Eastern Africa.

Low Well, I think these crops, they actually occupy quite distinct niches, and the solana potato, what you would call Irish potato often here in the United States, is very adapted to the tropical highlands; and that is its particular niche. Sweet potato can grow in the tropical highlands, but it does prefer warmer climates, so it grows slower in the highlands than when you're at lower altitudes. So even though it can grow from zero altitude to 2,400 meters, it tends to be concentrated into the range up to about 1800 meters. So I really think there are complementary uses of roots and tubers.

Now, the sweet potato, however, can be transformed. Anything you can do with potato, you can do with sweet potato; but you have to have the right variety to have the low reducing sugars if you want to make what we would call chips or crisps. And you'd have to have some special procedures if you want to make what we would call French fries. So that is the one thing we've been doing a lot of work on in Sub-Saharan Africa recently. I didn't get a chance to show our orange-fleshed sweet potato purée that we're using as a wheat flour substitute in bakery products, from 30 to 50% of the bakery products. So I do think there is huge room for investment in sweet potato as a processed product, particularly in the purée form in Sub-Saharan Africa. That's a wonderful opportunity for business investors. But I think the potato and the areas it's grown in will always be a high-demand crop in urban, East and Southern Africa and West Africa, because we are urbanizing; and when we urbanize, the demand for solana potato goes up dramatically. So I think both crops have their roles and their niches to play in the economy; and both are fast growing and you can get a good crop in three to four months.

Anderson The International Potato Center spent the first 20 years of its life trying to develop what they called "the tropical potato," and it actually didn't work, because there was a physiological barrier – at a certain temperature it doesn't bulk up. So their conclusion was, actually the tropical potato already exists – it's called sweet potato. And that is literally, in 1985, when sweet potato came onto the portfolio of the International Potato Center.

Okay, well, if there are no more questions, thank you all so much for being here, and again, Happy World Food Day. Thank you to the panelists – they've done a great job. Good job, you guys.