

**2014 BORLAUG DIALOGUE**

October 15, 2014 - 3:15 p.m.

Panel: *Dr. MS Swaminathan, Moderator*

*Introduction:*

**Ambassador Kenneth M. Quinn**

President - World Food Prize Foundation

---

The trouble with Gordon Conway is that you're never quite sure what he's thinking. That was just sensational. What a great follow-on. So I just want to say to this panel, you're going – you're all invited back for next year. We're going to do this again. So Secretary Glickman, who's here, was the speaker at the first World Food Prize event I ever organized in New York in 2000 when he was Secretary of Agriculture of the U.S. So that's a wonderful follow-on to Ken Cassman. Dr. Cassman did exactly what we hoped – he provoked a lot of strong opinions and analysis.

And now we're going to get to round two and the follow-on, policy people, experts. Dr. M.S. Swaminathan, our laureate, Norman Borlaug's great partner, my personal inspiration. The man I think is the most revered agricultural scientist on the planet today. And I'm going to now turn the session and this panel over to him to continue this dialogue. So, M.S., are you ready to go, or should I filibuster for another minute?

**Dr. Swaminathan**

Whenever you are ready.

**Ambassador Quinn**

Yes, no. We're ready. Nobody wants to hear me. They want to hear you and your panel.

**PANEL:**

**THE BORLAUG REPORT:**

**CROP INTENSIFICATION, TECHNOLOGY AND ENVIRONMENTAL SUSTAINABILITY**

---

*Panel Moderator:*

**M.S. Swaminathan**

1987 World Food Prize Laureate

*Panel Members:*

**Dr. Robert Fraley**      2013 World Food Prize Laureate & Executive Vice President and

Chief Technology Officer, Monsanto

**Dr. Mark W. Rosegrant** Director, Environment and Production Technology Division, International Food Policy Research Institute

**Hon. Dan Glickman** Former US Secretary of Agriculture & Co-chair, Chicago Council on Global Affairs Initiative On Global Food Security

**Tjada McKenna** Deputy Coordinator for Development for Feed the Future, United States Agency for International Development

---

### **M.S. Swaminathan**

Thank you, Ken. I think I was told we are running slightly behind time, so I shall curtail my own remarks. And also I thought what would be interesting from the last discussion is to give it a little more time to the participants here, those who are here, to ask their questions.

May I first of all, I think I want to... you know, last year at this time the Borlaug Report was an idea; it was a concept. We discussed it. But I must first of all say how grateful we are to Dr. Cassman and his colleague, as well as Ambassador Quinn, for giving meaning and content to the concept of the Borlaug Report. I think it is now shaping, getting a meaning and it is a content.

In other words, for example, the United Nations has a program, Zero Hunger program, to be achieved by 2025, the zero hunger. But there has to be some monitoring of what is happening in the world and what kind of course corrections can we do, and so on. So from the discussions already held, you would have had a number of ideas of the utility of this kind of exercise and also what we can do.

May I say also I think in relation to our whole objective in relation to the Borlaug Report is to achieve Borlaug's mission for a hunger-free world. I think that's what the United Nations, when they say "zero hunger." And all of our efforts to monitor the progress, understand the methods of achieving the goal have to be integrated. And I was happy to see that Dr. Cassman has done it.

There's a lot of pessimism about this area of hunger. I'm happy that we're having a session on nutrition immediately afterwards, because that always benefits, not now but a very long time. My latest editorial in *Science* also would have shown that what we need is an approach from purely food security, food security plus nutrition. And also the previous session added agriculture, health and nutrition as a title. I think that's where we can really achieve the zero hunger.

But now from my own country I can tell you that seemingly impossible tasks can be achieved. Last year, 2013, the parliament of India passed a food security bill, a food security act. Many of you know about it. I'm not going to take time. But there's certain important features. One is food security on a lifecycle approach from almost conception to the end of one's life, with special attention to the first thousand days in a child's life, which is very critical from that point of view and so on.

Now, my country, 40 or 50 years ago when Dr. Borlaug and I started the partnership, was described as a nation without hope at all. They said you have to live by ship to mouth, and in my address at the, during the, breakfast tomorrow, I shall describe it in greater detail; this is not the time. But the fact remains, it was considered to be a hopeless country from the point of the ability to feed.

But, ladies and gentlemen, the only nation in the world today, the only nation the world [today, which has the right to food incorporated by an act of parliament – the legal right to food. If you don't give it, then there are consequences described in it. From ship to mouth, to right to food with homegrown food is a remarkable transition. I mention it only because, if there is a combination of political commitment, scientific skill and farmers who want participation, seemingly impossible tasks can be achieved. So I hope the Borlaug Reports will show us a way, will be signposts of optimism, rather than only to say this has not been achieved, that has not been achieved.

Now, we have four very eminent panelists. There's Bob Fraley, last year's World Food Prize Laureate, the Executive Vice President of Monsanto; then the Honorable Dan Glickman, who is here next to me, former U.S. Secretary of Agriculture and Co-chair of Chicago Council on Global Affairs Initiative for Global Food Security; Tjada McKenna, Deputy Coordinator for Development for Feed the Future, U.S. Agency for International Development; and finally, of course, Mark Rosegrant, my good friend for a long time, Director, Environment and Production Technology Division, IFPRI.

Now the procedure that I propose to adopt is to request each of them about six or seven minutes quickly. Because we have had in the previous session some discussion on technology. Technology has come, whether it is, because technology is the prime mode of change. In fact, if we look at the whole Borlaug era, which started in the 60s with change in the plant architecture. The architecture was changed; the physiological rhythm was changed by means of shuttle breeding. Several important technological features were incorporated, and that is how suddenly the progress... the revolution took place, not evolution but revolution took place.

So may I request Bob Fraley to start the discussion? The three areas particularly mentioned for discussion, in this session, are crop intensification, technology and environmental sustainability. Obviously, you can't do intensification without sustainable intensification, what they call the Evergreen Revolution, about 35 years ago, when the Green Revolution was being sort of decried on the basis of environmental concern. I said what we need is an Evergreen Revolution, in other words, productivity and perpetuity without associated ecological harm. Bob, will you take over?

**Robert Fraley**

Thank you so much, Swami.

**M.S. Swaminathan**

If you can deal with these issue in relation to Cassman report.

**Robert Fraley**

I appreciate that. I almost need to start out by figuring out whether I'm more or less optimistic than the previous panel. You know, one of the challenges in being in the third group is a lot of the important things have been said and commented on, and I don't want to lose that continuity. I guess I have to put all the cards on the table and tell you that I'm an eternal optimist, and I think that's important when you're in research to do that; because, as you know, in research we fail a lot of the times before we're successful.

And I think just to again, put all the caveats on there, I think everybody knows. And for me, after last year of being here with the World Food Prize and spending the last year in a lot of dialogues with people around the world about food security, about the impact of agriculture and its footprint on the environment, the last thing I would want to do is give you the impression anything other than... and I always use Ambassador Quinn's comments that this is the greatest challenge facing mankind.

And you all know the magnitude of that challenge, with the need really to double food production between now and 2050. I always say if you say that really quickly, it doesn't seem so daunting. That's 36 years from now. I know I'm 61, so I know in my lifetime, the decisions that we make today may not be as important to me. I look at it through the lens of my 28-year-old, my 24-year-old, and my 17-year-old, that the decisions we make have a huge impact on how this turns out for that next generation. And I do take it very, very seriously.

And we all know the policy implications and the challenges that we face with governments and infrastructure, but I guess I'd start by saying, looking at it through the lens of what's possible. There are absolutely tremendous challenges, but there are incredible innovations and, I think, reasons to be optimistic as we go to the future.

And one of the places I start... And it was commented on a little bit in the previous session, and I give full credit, and I hope all of you had a chance to look at the *National Geographic* that was in your packet, the summary of the incredible materials that they put together this year on food. There is a path forward. I mean, a simplified summary of the five steps that they laid out was—we need to freeze agriculture's footprint around the world. And I'll come back in a minute and tell you we are very close to doing that if we haven't effectively achieved that already.

Second, and really important point around sustainable intensification and key to freezing agriculture's footprint is dramatically raising the productivity on the farmlands we have today. And that means increasing yields in the Americas. It means tripling, quadrupling yields in places around the world where that will be possible with technology.

Third point is we need to be much more efficient in the use of inputs. And I will tell you that many of the new tools, particularly around precision agriculture, precision irrigation, are going to be very important as we produce more with less.

The couple other points that are highlighted here that everybody recognizes is reduction and waste. And there is enormous opportunity to use technology to reduce waste, whether it's better disease protection and better quality seeds so that we have less rejection of grains and fruit, whether it's better logistics. In many places, it's simply better storage that's possible to do. And as you move through that chain, as we get closer and closer to the dinner table,

refrigeration and other technologies and portion size all become an important component of reducing waste.

And, finally, diet modification. We all know there's an opportunity to eat healthier diets, diets rich in grain and fresh fruits and vegetables; and that's an important part of the element.

I believe – and I'll just put all the cards on the table – I believe that we have the tools to achieve food security by 2050. I also believe – and it's really important, I think – any gains that we make in agricultural efficiency through the tools that I'm sure we'll talk about in a few minutes, give us the ability, I believe, to take land out of farming and agricultural production. I've seen estimates, and I've worked a little bit on this myself. I think by 2050, if we can deploy our tools, if we can do the other steps that have been talked about and outlined, we can take hundreds of millions of acres and hectares out of production and take those most fragile farmlands and give us the opportunity to think about reforestation, to think about the opportunities to recreate wetlands or prairie lands. I'm an optimist, and I also believe that it's a goal that almost everybody shares and identify.

And I think now the key is – how do we use the convening power of a forum like this and move us into the action steps that I think almost everybody aligns and agrees on are critical. So those would be my starting comments, Swami.

### **M.S. Swaminathan**

Thank you very much. Dr. Glickman.

### **Don Glickman**

I'm not a doctor, but thank you. It reminds me of a story. I'm probably the only politician in the world. It reminds me of the story about the two dairy cows that are grazing along the side of the road, and all of a sudden a milk truck drives by. And on the side of the milk truck in big red letters – PASTEURIZED, HOMOGENIZED, VITAMIN ENRICHED, GOOD FOR YOU. And one dairy cow looks at the other one and says, "Kind of makes you feel inadequate, doesn't it?" So I've got Rob and MS and a lot of other people in this room who are a hell of a lot smarter than I am, but it doesn't mean I can't talk – because I was invited by Ken Quinn.

First of all, I'd make a couple comments. Ken Cassman, your report was terrific, and it was more for the precision of it. I go to a lot of these conferences, and sometimes I left with – Oh, my goodness. There are a million problems and a million possible solutions, and we're left without... There's no charge, there's no action plan. And I think you've given us an action plan for policymakers to go on.

I go on the presumption that there are a lot of asteroids that are headed to earth that have the potential of being devastated – asteroids like water shortages and water quality problems, climate issues, soil degradation, disease, both plant and animal disease, volume of food produced and quality of food, the health of production agricultures and producers, not only smallholder farmers but farmers in the United States and everywhere as well, political instability, population issues, and then health issues generally. We haven't talked about health here, the relationship between agriculture, nutrition and health. If you believe what the French

philosopher said is, "You are what you eat," then the nature of food is a critical part of keeping people healthy and alive for a lot longer. So oftentimes we segment agriculture into a little niche, but really it's as important a part of the health issue as even the pharmaceutical industry in many respects.

So saying all these things, sometimes I think about, that there are so many issues here that it almost becomes impossible to decide what to do next. Or the reverse is true. John Maynard Keynes, the philosopher and economist, once said, "For every complicated problem, there is a simple and a wrong solution." So the truth of the matter is we've got a lot of things we have to do. But I want to talk for a moment about science for a second.

So some of you know that the Congress created a fund of \$200 million, called the Foundation for Food and Agriculture Research, which is to be matched by private sector, university, foundation, and hopefully will build into a very significant fund, perhaps to deal with these asteroids that I'm talking about, things that maybe the private sector can't fund – it's not related to your profit and loss – or things that land grant universities today have decided not to fund for whatever reason. And so we're going to get that started in the next few months, and hopefully it will deal with some of these longer-term research issues and provide some basis in good science on some of the issues that we've talked about.

I worry about people's attitudes toward science, I'll have to tell you. The political left challenges biotechnology, GMOs and a lot of the new technologies on plant breeding. The political right challenges the science on climate change. And it's funny – some people on the political left support their science but oppose the other side's science and vice versa.

And one of the things we have to do in the agriculture world is figure out how we get together and reach common ground on issues of what the facts are in science. It was former Senator Moynihan once said when he was talking to a congressional witness at a committee... he said, "You can have your own opinions, but you can't have your own facts." And that's true in agriculture, as is everywhere else. You've got to have some common agreement on the kinds of things that can help humanity in the process.

And the second thing I'd say about the research – we talk about all these asteroids facing the earth, and the important part is not only this foundation I just mentioned. But the agriculture world and the agriculture community and the food world and the food community – because after all, agriculture is nothing unless people put it in their mouths, and generally it's the food industry in one form or another that put things in their mouths, and they have to be a part of this discussion as well, the producers and processors of food.

But we have to figure out a way where the folks who are looking down the long term at the issues Dr. Cassman talked about realize that our research, as much as we can, should be devoted to these gaps, to these challenges, to these things that we don't know. And then we have to work for people in the outside world to work with us.

Napoleon said that "*War is too important to be left to the generals.*" And agriculture and food policy is too important to be left just to the foodies and the agriculturalists. We have to bring everybody in, in order to build the political support to meet these challenges.

One piece of good news, why I'm an optimist like Rob is – we mentioned this at lunch today. For years and years and years food and agriculture was relegated to a very secondary role in public policy. You'd go to the G-8s and the G-20s and all the bilateral meetings and all the political summits around the world, and they never talked about food and agriculture. It was viewed as an irrelevancy, unimportant, secondary. That has changed. Through the efforts... And I must say, the Obama administration has done a great job of elevating that, and Tjada will talk about that a bit. But the fact of the matter is these subjects are now on the agenda of policymakers all over the world, and they're as important as any of the other subjects that they're talking about as well. And so that's good news for agriculture. It's good news for the food world. It's good news for producers everywhere.

Final point I would make before I end this diatribe is the role of the private sector. I must tell you that I was in Tanzania a few years ago and was about 150 miles west of Dar es Salaam on a road that was unpaved – as Ken was talking about the need for roads – and what do I see? Wherever I go, I see Coca-Cola, I see Fanta, I see soft drink beverages. And I thought to myself, how did they do this? How do they get everywhere in the world? And it struck me that they and the Monsantos and the DuPonts and the auto manufacturers and the high-tech people of this world, working with governments, have found a way to deal with a lot of these strategic impediments that we in the government alone or we in the food industry alone cannot do. The world of the future is going to have a lot more corporate and business involvement in the development of Sub-Saharan Africa, Latin America and South Asia, so we should include and look at these problems in the context of working together with the foundations, with the private sector and with governments to remove where we can the impediments that exist that make food security so difficult to happen. So I'll stop there right now.

**M.S. Swaminathan**

Thank you very much for these important comments. The food emphasis and the food reminds me that at the moment, according to the latest calculations in the world by FAO, over 1.3 billion tons of food grain are wasted, either the production stage or the postharvest stage. In fact, there's a report by the High Level Panel on Food Security or the Committee on Food Security. I used to be chairman, and now Dr. Per-Pinstrup Andersen. I would like those who have not seen that report, please do work through that report, because really the huge losses can be prevented. Now, can I go on to Madam McKenna.

**Tjada McKenna**

Yes, thank you very much.

**M.S. Swaminathan**

And I'm sorry – Tjada, is it?

**Tjada McKenna**

Tjada.

**M.S. Swaminathan**

Tjada. Sometimes the J's are absent.

## **Tjada McKenna**

It was my mother's gift to the world, a complicated first name. Yes, I want to commend Ken Cassman on the report. We're big fans of the Global GAP Analysis. And the report, like Dan said, was very specific and very thought provoking. In the report he asks a simple question – Can we do this, yes or no? And I would posit that we really don't have a choice. We are going to be driven to address and solve these issues, whether by crisis, which is what kind of reignited and relit the fire under the U.S. Government in 2009, or by our partner countries themselves really leading us into this. But we don't have a choice, and the better path is for us to get on board, sustain the political momentum that we've seen, and to keep progress going.

Feed the Future – the U.S. Government, like I said, our commitment was reignited in 2009 with the food price crises, and we restructured our commitment to agriculture. But we also really devoted ourselves to doing things differently and building a broad coalition of partners from other donors to our partner countries, following them in country-led development, as well as to the private sector and others.

Even in the down years before we started Feed the Future, the U.S. Government was very committed to research and science and technology. So even now upwards of 15% of our budget is really spent on basic research and science and technology, like climate-resilience crops, strengthening NARS systems in countries, looking at the drought-tolerant, heat-tolerant crops, investing in biofortified crops, a lot of basic science and technology. But we're focused now much more than ever on bringing together broader coalitions, working with CIMMYT, Monsanto, Pioneer, others, to really take that from the research lab into the field more aggressively and with farmers themselves. And so we will continue, I think, to see advances in supply and yield and increasing yield potential.

But the food security challenge is really about much more than just supply and yields and technology. People must adopt those technologies, they must have access to those technologies, and they must feel that those technologies are relevant to their day-to-day lives. So the food security challenge is really about income, poverty and nutrition. This is what makes me very optimistic. The work... I think there's a great... It's almost a given that we have to focus on value chains.

And the conversation increasingly is about women and smallholder farmers. It's not, as someone else I really admire likes to say – we've gotten to the point in the conversation where smallholder farmers aren't the problem; people see them as the solution. And now we have to determine – how do we move forward with them to build strong rural economies so that people can stay in rural areas, that there will be adequate labor and jobs and value addition and other things there. Part of building a sustainability plan and building stable societies is having strong rural societies. And I think there's increasingly a focus on the value chain and building that in the countries in which we work.

The other things that gives me great optimism – Dan talked about the political will and the fact that this is on the agenda at the G-8 and G-20, even the G-7 now. So even if we start to fall down and lapse or forget our commitment and move on to the next thing, what's giving me great



hope is that our partner countries themselves are displaying tremendous amounts of political will.

This year, 2013, was the African Union's Year of Agriculture and Nutrition and Food Security. There's a brand new Malabo Declaration really trying to recommit people to the premise of CAADP. Obviously, Minster Adesina from Nigeria was here last year – I'm sure he made a great impression. Some of the gains and activities we're seeing in Nigeria are really phenomena and things that people didn't see as possibilities even two years ago.

And if we look at Ethiopia, the invention of the agricultural transformation agencies, you have a whole new agency that's brought together that works across the different agencies – agriculture, finance, trade – to really drive a concrete difference in the food security outlook in Ethiopia. And I think, as you see some of these new institutions being developed, there is also a focus on strengthening existing institutions. So, instead of just creating a new department, how do we also strengthen the Departments of Agriculture, how do we also work with our local universities. And I think that focus on human and institutional capacity-building is quite strong.

The final thing that really gives me hope is really the work on policy and enabling environments. I think as countries come into this space, as countries take leadership themselves, they're increasingly saying... There's a healthy competition that you see in some of these forums. There's something called, "Grow Africa." It's a new thing that's an alliance between the African Union and the World's Economic Forum. And they have these investment forums. And different countries talk and meet with private sector and say, "Hey, these are the opportunities in our country." And what you'll see sometimes is you'll see one country saying – Hey, how come there's a bigger crowd in Country B's session? I need to go over there and see what they're doing. Or Country C saying – Okay, next year I have to have a better presentation, because I notice what this other country's doing.

So I think there is great energy and momentum, and as donors, the government and others, it's really important that we keep the political will ourselves, that we keep invested in this in the long term. And the Obama administration has certainly been quite invested, and I hope that that continues, no matter who takes office, because it's just such a critical core of doing development well. But I think the commitment is there, and we will be driven to this, so I'm really excited to see the new partnerships being formed, the new work in technology and open data. And I think there are really some pleasant surprises ahead.

### **M.S. Swaminathan**

Thank you Tjada. Last panelist is Dr. Rosegrant.

### **Dr. Mark Rosegrant**

Thank you very much. I also would like to thank Ken for setting up the debates so beautifully. I agree both with his deep concern if we continue on the path we are now but also the optimism that he showed if we can, in a sense, get our act together in terms of policies and programs and investments.

IFPRI does long-term projections on food security on a regular basis. And in our baseline where we do assume business as usual policies and investments and consider also climate change, a moderate level of climate change, we see big increases in food prices out to 2050. Of course, you get the short-term declines and shifts up and down. But in the long term you get rapidly increasing food prices. We see 30 to 60% price increases on meats and cereals, depending on the Pulitzer Center commodity. But we also see, because of those high prices and the relatively low amount of income generated through slower growth in agriculture, that we would achieve only about a 20% reduction in the number of hungry in the world, which is a terrible outcome – far worse than any of the kinds of sustainable development goals that are being considered now.

But we also see the tremendous advances that could be made with improved policies. Looking at just particularly focusing on one area of the role of agricultural technologies in addressing food security, we did a major study that we completed this year that looks at 11 agricultural technologies for the three major crops, staple crops of rice, maize and wheat. And we looked at farming systems, such as integrated soil fertility management, no-till irrigation, precision agriculture, which people have highlighted here, as well as improved crop protection. We've also looked at advanced traits, including nitrogen use efficiency, drought tolerance and heat tolerance.

In that study, which we did a combination of biophysical and economic modeling, we then did alternative projections that would look at what would happen under plausible scenarios of adopting those technologies worldwide, including differential rates in Africa, South Asia, advanced countries, and so forth. And in that kind of analysis, we saw that, with just the advances from adoption of these technologies – and the adoption rates by 2050 were out to 40 or 60% of area, and I can discuss the kinds of policies that we think would get us there later in the talk – but we found that those alone, we could reduce food prices in 2050 for these three crops by 40 to 50%, so essentially eliminate those kinds of price increases I talked about. We could reduce hunger by 40% in addition to the 20% that I had talked earlier. And very important, a point that Rob took up, this could reduce the area planted to rice, maize and wheat to 20% by 2050 – so a huge gain in land that's not going to be taken out of fallow or much cutting down forests or converting pastureland.

So there's tremendous potential, and we found that potential actually is widely dispersed geographically and agrically. In fact, Africa and South Asia had some of the largest gains for many of the technologies, partly because, of course, they're starting from a lower base but partly also because there's great potential there to move up from that base – there's a combination of those things.

So in addition to the sort of yield and productivity increases, a number of these technologies, such as no-till, ISFM, drip and sprinkler irrigation, also reduce the footprint of agriculture, reduce the nitrous oxide emissions, reduce fertilizer and pesticide runoffs in water, and in general can also accomplish some of those sustainability goals as well. So we think there really are ways for it, and we can discuss more about how to get there later.

## **Question and Answer Session**

---

**M.S. Swaminathan**

Thank you, Mark. Like I said earlier, we'd like to give greater opportunity to the participants. Who would all like to come, three or four questions together, and then we'll respond. While people are assembling all the questions, may I also say that one of the areas which requires more attention in the whole field food security, food and nutrition security, is the attention to what we call the orphaned crops, our underutilized crops. There's so many of them. The whole area of millets, which are nutritionally rich. Somehow they are called "core cereals" and got secondary importance. And if you'll read books by Vietmeyer, who has also written Borlaug's biography, he has clearly pointed out the last crops of the Incas, the last crops of Africa. So many of the food basket has shrank over a period of time, from hundreds of plants. But I recently read Californian drought has again aroused interest in the older plants, because they were also drought tolerant, more climate smart, and also nutritious. So I hope one of the future Borlaug reports will deal with the whole question of enlarging our food basket and again giving scientific attention to what are called orphaned crops or underutilized crops.

Who will ask the first question, please? Please go ahead.

Question Thank you. I'm Marshall Matz, AGRA's representative here in the United States. I share the optimism of this panel, but I see one glitch in this chain, and I would like you to sort of respond and identify it. I think we are clearly making great progress on seeds, on fertilizers, on markets. The AU is helping to bring together the countries toward a more common policy on public policy. Even trade, I see improving.

I am concerned about Dr. Borlaug's last words, which is, *Take it to the farmers*. Who puts that seed in the hand of the smallholder farmer? I don't see enough attention yet on distribution, how we go from 20,000 agrodealers to 200,000 agrodealers. Somebody has to distribute this. Dan, absolutely, may we go to school on Coca-Cola; they've got distribution, they've got trucks. And that's what I'm concerned about – that break in the chain, if you will.

So your organizations, the Chicago Council and the Prize and AID, Global Harvest Initiative, and all of these groups that we're a part of – who's putting the focus on distribution and delivering this technology, plus tractors, plus extension services. My god, we need extension services, so people know what to do with these seeds. That's the glitch. Thank you very much. Comments, please.

Swaminathan Can subsequent questioners be rather brief in comments, so that more people can participate?

Question I have listened to this morning's program very closely, and I think we've spent most of our time, if not all of our time, talking about how to increase agricultural production and how to deal with the problems that surround that challenge. And I think that's marvelous, but one of the beautiful things, to my way of thinking, about the World Food Prize is that it honors all the links in the chain, from growing it to putting it on the table. Have we decided that there are no advantages beyond growing it, in dealing with world food problems? I can't believe that, and yet I don't hear very much about what's possible in the other links in the chain. I think, Bob Fraley, you touched on it, and I think Secretary

Glickman touched on it. But we really have not devoted very much attention to what happens after you grow it.

Swaminathan Next one.

Question My name is Luis Rodriguez, and I'm a farmer from the south part of Brazil, Parana. I'm not sure of the subject is being able to feed nine billion people by the increasing food production side but more about who is going to pay for that and pay in different ways with different resources? I think the question could be more – Are the governments really concerned about poverty and starving on a worldwide scale or just like they are with the climate change and the greenhouse effect gas emissions. Because in the second case, it seems that developing new methods, trucks for oil and gas kind of solved the subject, and the real problem was the lack of oil reserves and the [inaudible] need for its control and not the planet's sustainability at all. So the question should be – Would we be able to assert a sustainable human development for nine billion inhabitants, instead of just watching a massive population growth in countries that are not developed yet and won't be able to pay the bill? So that's the question. Thank you.

Swaminathan Thank you. That is an important comment. Who is the next one?

Question I am Ram Perumal, sorghum breeder from Kansas State University. For crop intensification and the food security purpose, I think many unexploited dryland cereal crops are not considered for the clear focus. Particularly, developed countries like in United State, the greater government policies and the great funding support. How the way, we can focus, so far I think very less percentage of importance is given. Only in Kansas State we started the Perumal research. In the interior United States many of the important less-known cereal crops are not given importance, even for to initiate the crop improvement research activities. I would like to know what kind of policies and research focus would both to private and the public sectors, the funding great supports and opportunities can we expect from these...

Swaminathan Thank you. Two more.

Question Thank you, panelists. I've very much enjoyed this segment of the program. I've listened to most of the presentations all day, and I'll stop there. My name is Brett Blankenship. I'm Vice President of the National Association of Wheat Growers, so I represent the men and women on the family farms from 22 states directly, 20 more states indirectly who don't have associations as members of our coalition.

But I've heard two main paradigms presented – the smallholder farms that we've mentioned in developing countries, but I come from the other paradigm of broad American agriculture where we produce, the way things are now, a hundred percent more wheat than we need. And I farm in Washington State, and in the P&W we export close to 90% of our crop to the Pacific Rim.

So my question is – We saw a presentation earlier of environmental degradation of trading some of the rain forests to grow some of the staple crops. I have operated from the paradigm that the best way to save the rain forest is to help American agriculture prosper, and we can export our commodities to people for an affordable price; because the environmental impact of turning the prairie from bunch grass and bison into corn, soy and wheat – we’ve already sustained that, and the world is still surviving. The best way to save the rain forest is to help us prosper. So how do we marry those two paradigms, and what can I do as a leader of the wheat industry to carry that forward? And I’d appreciate your answer.

Question Under climate change, we are looking at so many floods happening, shifting. The climate change temperature is rising, and we look forward that there could be some shift in the area for different crops. The smallholder farmers, you know with the flood, with the climate change they suffer huge losses. Sometimes the crop looks so good in the beginning, but then they are not able to harvest. So what is the system or scenario we conceive of – insurance policies for such farmers, could there be corporate sectors, government coming forward, so this is the important aspect I think which we need to talk about. Thank you.

Swaminathan Thank you for this important... Next one.

Question Thank you. My name is Florence Wambugu, Africa Harvest, from Kenya. I listened to these presentations, they are very good. I just want to bring an area where I thought there was a gap, addressing the issues we are focusing on, like four major crops to meet the global food security, that’s corn, wheat, soybean and rice. Now, in some of the developing countries, and I think about Africa, there is a whole group of... There are many countries where these are not the key foods; the foods are others. I look at the Sahel in Africa – sorghum and millets are the main crops. Some countries are feeding, mainly use cassava, others use banana, others use sorghum, others use very diverse crops. How are we going to deal with these crops that we are not focusing on, in terms of increasing, meeting the food and nutrition demands of the people?

The other area is there seems to be a narrowing... If we are going to meet nutrition, global nutrition, we have to diversify. The foods are more crops, and focus only these four crops. So how do you diversify into other crops to meet the nutrition of the people?

And the final question is – How do all these fit into the climate change?

Swaminathan Would you like to start?

Glickman They’re all very good questions. I’ll just take a couple of them Marshall Matz asked – How do we take it to the farmers? And that’s an excellent question. Some places it’s, modern technology is helping take it to the farmers. I was in Mozambique. I met with a group of women vegetable farmers. The cell phone rang – all 11 of the women picked up the cell phone. They didn’t know who it

was, but they all had their own cell phones. In Ethiopia I saw the use of modern technology to access a futures or basically a cash coffee exchange to allow them to get information on pricing of commodities so they'd know when to sell their crops. So modern technology, communications technology, can help take it to the farmers, providing that they have the affordable funds to buy the technology, because there are cell towers everywhere, especially in Africa – not all over the developing world but especially in Africa.

The second thing is cooperatives – that hasn't been mentioned today, I don't think. And in the United States cooperatives was largely the factor that built modern agriculture – marketing cooperatives, transportation cooperatives. Now, my experience is that in many places in Sub-Saharan in Africa, cooperatives were viewed as kind of corrupt arms of the state and not necessarily helpful. In fact, in many cases, they were viewed as a way to suck money out of the system and not get it to the producers.

But it does strike me that to take it to the farmers does require a use of associations or cooperatives to help people in bulk, because I don't think that individual smallholder farmers are going to have the market power and the ability to move their commodities in the same way a combined group of producers can do. My judgment is that in most societies – it's certainly happening in China and clearly happening in the United States – there is going to be consolidation in agriculture; it's a natural phenomenon. It's going to take place in Sub-Saharan Africa. It's going to take place everywhere in the world. It doesn't have to replicate the model of the United States, by the way, and it shouldn't necessarily replicate it. But we've got to find ways to encourage, with good governance, the use of cooperatives to help smallholder farmers band together to have more market power. And market power will give them access to markets, better pricing, and it will also allow them to buy new technology to have on-farm storage, refrigeration and other kinds of techniques that are so desperately needed in that part of the world.

So I would say technology cooperatives and, of course, extension. And Tjada talked about the Ethiopian example. They have made a pretty effective effort to have a national extension model. But it's not just agriculture, it's agriculture and health. They give health information as well as agriculture information. They kind of are very holistic the way they view extension, and I think that's another part of the thing. That's enough on that issue. I'll move down.

Swaminathan May I just add one more sentence to what Mr. Glickman said about cooperatives? In India the most successful cooperatives have been the dairy, the animal husbandry sector. We used to produce over 20 million tons of milk years ago; this year it is 140 million tons of milk, largely because it is a decentralized production at the individual level, only one buffalo, two buffalos and so on, but centralized services – processing, marketing, pricing. And this decentralized production supported by centralized services, over 140 million tons of milk, the world's largest milk producer today. That's the power of cooperatives.

Please, Madam Tjada.

Tjada

Yeah, I'll cover a few things and I think answer a few questions. I think on the first one I absolutely agree with what Dan said about cooperatives. You know, the population density in a lot of African countries really means that we've got to commit to a big investment in infrastructure. And someone else mentioned roads. And we still lag behind in that, but just given some basics of population density, things like the White Revolution we saw in India – they're just a lot more challenging in some of these larger, more spread out African countries, like South Sudan, for example.

But one of the things that is encouraging about getting supplies to farmers is there are things like the World Food Program's Purchase for Progress, that have moved deeper into rural areas to help build the market infrastructure and to help strengthen cooperatives in those areas.

We also, in terms of extension and getting to farmers, there's been a whole focus on building agrodealer programs but also using some basic technologies like radio, in addition to looking at how to get more utility out of the cell phone and other digital technologies for farmers.

There was a second question about beyond the growers, and I think this also gets to the nutrition diversification questions. I think there's still a lot of room in our work to bring in social scientists and savvy marketers from PepsiCo and other companies. Even in the U.S., we know what the right foods to eat are – we just don't eat them, or we eat too much of them.

So we do invest in orphan crops quite a bit; we are investing in sorghum and millet. We are trying to biofortify those foods, but there's still a basic human nature about the kinds of foods people want to produce as they become more affluent. And I think we still have some work to do to understand how to really get adoption to turn and how to get people to go back to eating some of the indigenous vegetables and other healthy things that people may feel like they've moved on from.

I guess the final thing I wanted to talk about is addressed to the great wheat grower that asked about exports. Trade is a critical part of making this work, and countries need to determine what's the best thing for them, if it's importing or growing it locally. So, it goes back to basic economics – hopefully, people will continue to grow the things that they're good at growing, but then they will import wheat. But the key is getting people to the incomes where they can make those choices and have those opportunities. Most smallholder farmers are still net purchasers of food. So really it's about getting people the income they need to then decide if they want to grow the food themselves or if they want to purchase the food, and keeping strong trade markets so that people can import and export freely to optimize what's available in the marketplace.

Answer I just want to say one final point about the wheat farmer, and that is farmers all over the world have issues surviving with the vagaries and fluctuations of pricing and the weather. So by our discussion about the issues involving the developing world shouldn't take away from our concerns about the U.S. producers, because it's not as if they don't have the same scope of problems as they do – obviously, in Sub-Saharan Africa – but they also face serious challenges as well.

Fralely Let me build on that, Dan, and also on a couple questions from the questions and the panelists. A couple points that are really critical here that I just want to highlight. I used the phrase “dialogue,” and you used the phrase, “common ground.” You know, since winning the World Food Prize last year, I've had the opportunity to participate in a lot of venues – Ken, none more important than the World Food Prize – but I had the opportunity to participate at the Aspen Institute, the Clinton Global Initiative a few weeks ago. This whole conversation and whole dialogue is occurring, and I see a convergence around the planet.

One of the comments was, “It needs to be an integrated plan,” and that's why I like the steps here. Because we need to lay out that plan from farm to plate, and there's room for improvement and efficiency all along the way. The other important part of it that everyone talks about but is so clear – nobody can do this by themselves. A partnership with the three or the four P's – public, private, producers – I think is absolutely, absolutely essential to achieving it.

The last part I want to come back to is, and again highlight, is just how incredibly blessed we are with the kinds of innovations that lay ahead of us. I knew Dr. Borlaug really well – I was with Norm just a few weeks before he passed away. And one of the things, as you know, with Norm was his constant focus on what's next and what the new technologies and innovations are.

We are in a period where, if you think about it and step back, the two greatest innovations of our lifetime – the advances in biology, whether it's the changes in breeding, the information we have from biotech, and information technology – are converging together on farms around the world. And importantly – and this is a key part of the dialogue – in order to achieve food security, we have to raise yields and productivity everywhere around the world, in the Americas, but with smallholders. And what's so important about these technology innovations is – the end result of all of that biological research, whether it's genome sequencing, seed chipping, gene mapping or biotech, is a better seed. And every farmer in the world knows what to do with the better seed. So the barriers to adoption, aren't technology, they aren't infrastructure – they tend to be policy.

And similarly with information technology. There is a model in the U.S. that transmits precise data on 30 million fields directly to the computer in the cab of a tractor, and that's one model that's going to work in the Americas. Right now in Brazil and other parts of the world that model will work as well. In India today we're reaching almost 3 million farmers every day with a text message, giving them for the first time personalized agronomic advice, weather information. And



that model is going to work very quickly in Africa; it's going to work across Asia. And it's the same profile of technologies that have very little barrier to adoption and little demand from the growers for better seeds and better technologies. How we reach the grower is to partner and to largely get the policy barriers that exist today out of the way. Smallholders all around the world want to do better. They want these technologies, and they want those innovations, and I think that is the opportunity to work together from a public and private partnership perspective.

Rosegrant I have two quick points. I see we're about ready to run out of time, but one other point on the, how do we take it to the farmers, that I think needs to be stressed that hasn't, I think, been brought up here so far is that there's really important legal and regulatory reforms that need to be done in most developing countries to reduce the hurdles to approval of release of new seed varieties and other technologies. It's clear we need the improved extension, co-ops, ICT and so forth. We also have to get rid of things like the restricted notified crop lists, excessive testing and certification requirements, foreign investment barriers and ad hoc and unscientific biosafety decision-making, which is really preventing farmers in Africa and India and elsewhere from getting access to important new technologies. So that kind of legal and regulatory reform is essential.

There's also a question on priorities for agricultural research. I think obviously we want to keep investing in straightforward yield-enhancing technologies, but I also think there has to be a shift more to addressing the abiotic and biotic stresses that we know are going to be getting worse with climate change. We know pest and disease pressures are going to increase, and we know the heat and drought problems are going to increase. So we should be putting more of our research dollars to addressing those.

Another one – and I'd say this is the one, I think, factor that was left out most today so far – is the water scarcity and water quality problems are going to be one of the major constraints, along with the land issues that Ken raised. So we need to do research to increase yields with respect to water scarcity and also to address a number of the other policies. Because I'm sure Maggie Catley-Carlson will address that problem tomorrow in her session.

Swaminathan Thank you. I think the time is almost up, but I would like to suggest to Ambassador Quinn and Dr. Cassman and others that, arising from the debate here, technology needs much more detailed attention and also analysis – probably one of the future Borlaug reports, because Borlaug was convinced that, without new technologies you can't make the next progress.

And I said earlier, technology has been the prime mode of change in many years in agriculture. In my country our first Prime Minister Nehru used to say that the future belongs to science and to those who make friendship with science. And that's, we ought to make friendship. There may be a difference of opinion in some areas, but they can be easily reconciled. And I hope Feed the Future will show the way, because you can't feed the future without very detailed

conservation of environmental concerns of soil and water, biodiversity, and so on. So she will take the leadership in the area of Feed the Future by conserving all the ecological foundations necessary for sustainable agriculture.

With these I request you to thank the panelists and also our wonderful timekeeper here. She deserves our gratitude, because she's all the time reminding you your time is up.