

**2006 Norman E. Borlaug/World Food Prize International Symposium**  
*The Green Revolution Redux:*  
*Can We Replicate the Single Greatest Period of Food Production in All Human History?*  
October 19-20, 2006 - Des Moines, Iowa

**SESSION FOUR: Looking to the Future**

October 20, 2006 – 9:00 – 11:50 a.m.

Robert Watson

*Moderator*

**Per Pinstrup Andersen**

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Thank you very much, Hans, for presenting this wakeup call in such an effective manner. Let's immediately go to the next presenter. Bob, you have the floor.

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*Agriculture and Food Production: Quo Vadis?*  
*The International Assessment of Agricultural Science and Technology for Development*

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**Robert Watson**

Chief Scientist and Director, Environmentally and Socially Sustainable Development (ESSD) at the World Bank  
Co-Chair, International Assessment of Agricultural Science and Technology for Development

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Thank you. It's a great pleasure to be here as one of probably the few people that's not an agricultural expert. My background is in climate change, biodiversity, energy systems and the like.

What I want to do is to talk about now building on what Hans has just talked about – What is this International Agricultural Assessment. You've heard some very positive things from Pedro Sanchez, a World Food Prize winner, and you've heard some very negative things as well as some positive from Hans Herren, a World Food Prize winner. So what's the role of the International Assessment?

Well, the first thing is – what is an assessment? And the key point is the very first line. It's a critical evaluation of information for guiding decisions on complex public issues. And I do believe we do have some complex public issues, whether it's property rights, whether it's genetically modified crops, whether it's trade policy. Therefore, the question is: What is the evidence and what are the implications, positive or negative, on a series of development goals?

The topic has to be defined by stakeholders. It must be demand-driven, not supply-driven. It has to be conducted by a credible group of experts. We need to reduce complexity for

decision-makers, whether decision-makers in government, whether decision-makers in the private sector, or whether they're the farmer who by definition is a decision-maker, and, of course, the consumer.

We've got to recognize that we have to look at issues in a particular time. A global perspective is not adequate, and therefore as you will see, this particular assessment is posed from a global and a local perspective.

The primary output will be some very strongly peer-reviewed documents where we look at the agricultural sector from both the sub-global and a global level.

There have been some previous examples of these international assessments that have had incredible influence on decision-making, both by governments and by the private sector. Such as the long-range acid deposition assessments that would really change the whole policy of energy and salt-free missions in Europe and North America. The stratospheric ozone depletion, where fluorocarbons were thought to destroy stratospheric ozone, leading potentially to an increase in skin cancer in light-skinned people – I chaired most of those. The whole issue of climate change, the Intergovernmental Panel on Climate Change – this had a profound effect in almost all countries of the world, except one, on how to deal with climate change. Lots of biological diversity. The Millennium Ecosystem Assessment and the Global Biodiversity Assessment have actually had a profound effect on how we think about our ecosystems and the large dams.

So large international assessments, when you're dealing with complex issues and a wide range of stakeholders, can be very important.

What we want to do is evaluate both the relevance, the quality, the effectiveness of agricultural knowledge, science and technology, both public and private sector policies and institutional arrangements. A key issue is we want to create views and create a common vision for the future of agriculture amongst the diverse stakeholders. We have governments involved. We have the private sector, we have NGOs, consumers, producer organizations, and international organizations.

On the Bureau we have people that normally will not come in the room with each other, because they have such divergent views on issues such as trade and genetic modification. So we're trying to pull together in one place the widest set of stakeholders to try to see if – can we come up with a common vision of agriculture?

The assessment is multi-thematic. We are not only looking at nutritional security, we're looking at issues of livelihoods for the poor, issues of human health. Can we have an agricultural sector that is both environmentally and socially sustainable? It's multi-spatial from the village level to the global level. It's multi-temporal: we're looking back 50 years and forward 50 years. And it tries to integrate both institutional knowledge with effective traditional or indigenous knowledge.

It's an intergovernmental process, but for the very first time it has a 60-member bureau that has a full range of stakeholders on it – 30 governments, and the other 30 members are from

civil society, private sector, NGOs, producers, consumers; co-sponsored by 7 international organizations co-chaired by Hans and Judy (Wakhungu); I direct it. It will be completed by October of next year after two rounds of peer review by both experts, governments, private sector and all relevant stakeholders.

We want to guide policy and management decisions, and we want to actually build up local capacity, basically. We do not want to duplicate other ongoing or finished exercises; we want to build on them. So we will build on the Inter-Academy Council Study on Africa, the Millennium Development Task Force on Hunger that you've heard about, the comprehensive study being undertaken by IWMI, the CGIAR Science Council strategy and priority-setting exercise, and the relevant elements from the Millennium Ecosystem Assessment, the IPCC, and GEO. So all of these are basic background information upon which we will build.

We have one overarching question: How can we reduce hunger and poverty, improve rural livelihoods and facilitate equitable – key word – socially, environmentally and economically sustainable development through the generation access to and use of agricultural knowledge, science and technology? So we're looking at the agricultural sector and agricultural knowledge, science and technology.

There are four underlying questions: What are the challenges that can be addressed through agricultural knowledge, science and technology? What are the positive and negative consequences to date and potentially in the future? What are the enabling conditions required to optimize the uptake and diffusion of AKST? And what investments do we need, public or private sector, to realize that potential in agricultural AKST?

There's a global assessment and five sub-global assessments. Within the sub-global assessments we're doing some community-level assessments as well. We have a conceptual framework that leads to indirect drivers of change to the direct drivers of change to agricultural outputs and services. And then the thing that we care about is obviously the development and sustainability goals.

So we look at the issues of economic drivers, demographic drivers, educational drivers, sociopolitical infrastructure, science and technology. Our development goals are hunger and poverty, nutrition and human health, sustainable economic growth, livelihoods and equity, and environmental sustainability. The direct drivers you can see for yourself, and the agricultural outputs.

One key question is: Can you simultaneously meet all of the Millennium Development Goals at once, or are they incompatible between hunger and poverty and environmental sustainability, human health, etc. And it's something we must try and look at.

I've already said this: We're going to look back in the past, the last fifty years, the successes and the failures; try and understand the reason for the successes; try to understand the reasons for the failures. We're going to look at plausible futures between now and 2050, a series of broad, global scenarios, and try and analyze – how could the world plausibly change in the future?

And then the most important part: What are the options for action? What do we need to do with respect to technology, capacity building, policies and funding strategies?

And so sections C and D, the options for action, will build upon our knowledge of the current and historical past, as well as the plausible futures.

Let me spend just a couple of minutes on the scenarios. We have two global scenarios where the world tries to work together in a homogeneous fashion. We call them “global orchestration” and “technogarden,” or, underneath, policies and markets or green technologies. And we have two with a very fragmented world where we don’t work together. One part of the world acts as a superpower, or a couple of parts do, and they tend to fight each other. That’s “order from strength” and “adapting mosaic.” Different people believe we’re in different parts of those worlds today.

We have two worlds very proactive through the environment. In other words, understand that natural resource management, especially water and soils, is central to agricultural productivity, two worlds in which economic forces drive the system and we’re only reacting, at a later date, to environmental or natural resource considerations.

So we try to put plausible futures, they’re not predictions, they are plausibilities of how the world might work from the present conditions and trends to these four worlds. We’ll probably develop one or two other worlds, what we’re going to call “rosy” – where everything was done right, plausibly right, could we still have a world that would meet the Millennium Development Goals?

In the Millennial Ecosystem Assessment, which I had the honor to chair, we actually did some of these scenarios without taking into account all the agricultural policies or technologies that could be used in the next fifty years, so we’re relatively light. But what we did was say – How could you feed the world? And what you can see on the left-hand graph is that we actually believe the area of crop plans and pasture will go up significantly in developing countries and down in industrial regions. But this comes at incredible cost. In other words a significant amount of tropical forest, primary tropical forest under these all four scenarios, was actually destroyed, therefore, potentially a loss of biodiversity.

We did some real plausible thinking of what could happen to nutrient loading. And as we know, we’ve already liberated a huge amount of nitrogen in the atmosphere and through the aquatic system with adverse effects, unfortunately, on ecological productivity in lakes, rivers and coastal zones. And all of our projections show increased nutrient loading over the next fifty years, unless we really do something fairly significant.

We look to see – under the four scenarios, could we get rid of undernourished children? In our global orchestration model it went down from the current level today of 165 million children to about 60 million, and one actually went up. It was in none of our worlds that we played out in the millennium assessment could we achieve the goals that we wanted. So in the new assessment, we’re really looking at agricultural policies, the role of science and technology, the role of extension services, to see whether or not it’s plausible with the right funding

mechanisms to come up with a much more positive picture than it is – because this is clearly unacceptable.

The water situation Hans showed us is a real problem. Every scenario we've looked at, the same as the IPCC – so there's two or three major international efforts – all argue the demand for water is going to grow significantly. And yet the amount of water available will stay roughly constant. Precipitation globally will go up because of global warming, climate change, but not significantly.

One of our greatest challenges is to manage our water, and as Ismail Serageldin said, we have to get more crop per drop. It's one of the biggest challenges the world faces.

A macro question that we've got to look at is – What are the consequences of agricultural food systems, the technologies, the on-farm conservation of local genetic resources, irrigation, etc., on the development goals? So it's a macro question. If we fail to answer this question, the assessment will miss.

There are three key cross-cutting issues that we're going to look at, both at the global and the sub-global level. One is the whole issue of natural resource management but also looking at the issues of availability of resources, who has access to them, and how they're managed. This really is a challenge.

The second one is markets and the whole issue of subsidies, tariffs and the way markets work – and the implication again for the development goals.

And the last one effectively is – what are the institutional arrangements and policy changes and funding levels that will affect the generation's access to and dissemination of AKST.

Key challenges: How to bring together institutional and traditional and indigenous knowledge; how to ensure scientific rigor and differentiate evidence-based findings from different people with different value systems and ideologies – a key issue on trade, an absolutely key issue on transgenics.

How to address a number of the key cross-cutting issues and how to deal with uncertainty. What does uncertainty mean to a decision-maker? Not all scientific uncertainties have the same relevance in the policy framework, so we need to think through the whole issue of, effectively, what uncertainty means.

So the overall structure of the assessment – there will be a global assessment, ten chapters each with an executive summary. There will be a summary for decision-makers very specifically. There will be these five sub-global assessments that go in some cases down to the local village level. They will each have a summary for decision-makers. Then there will be an overall synthesis. We'll look at these issues of natural resource management, markets. We'll look at the whole issue of science and technology. And then we're going to grab some other issues such as human health, and especially animal-human health interaction.

And one which I really think is something to become a major issue that's incredibly contentious – and that's the issue of bioenergy. At the moment some governments and some individuals think bioenergy is the savior, it's going to help rural development, energy security and climate change. There's equally some evidence this is a wrong path to take, at least with the current generation of technologies, and that's where we use food as the source of the bioethanol or the biodiesel. The second generation of using enzymes and cellulosic research has incredible potential, but it's ten or fifteen years off.

So we'll look at the issue of bioenergy from a social perspective, an economic, a trade perspective, and an environmental perspective.

Thank you very much, and we'll leave you with a statement of Albert Einstein: *You cannot solve the problem with the same kind of thinking that created the problem.* And another one from Ghandi: *You have to be the change you want to see.* Thank you very much.

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## **Per Pinstруп Andersen and Audience Q&A**

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Moderator Thank you very much for two fascinating presentations showing the complexity that we are faced with when we try to understand the interaction between the food and agricultural systems on the one hand and the natural environment on the other. We are fortunate to have about five minutes for one or two or three short, burning questions for the 2 speakers on the podium, or if you prefer you can address the questions to the earlier three speakers. So the floor's open for questions, though you may have to wait – yes, go ahead. I see you waving, so yes.

Q Thank you Mr. Chairman. My name is Bob Hurd; I'm at Cornell University. I wanted to thank Pedro for, as usual, his inspiring and fiery talk. I guess I do want to put something on the table, Pedro. We know when we grow crops that, if we have great seed, fertilizer, water, they're planted right and we take care of the weeds, we're going to get high yields. And that's true in Africa, it's true everywhere. And the issue of course is, how do we make sure we have institutions that can deliver those things, and markets that can support them? And you made those points. The Millennium Development Goals, as I understand them, essentially are goals to which we all aspire, and all the countries have signed on to those goals. The challenge is in how to achieve them. And the Millennium Villages are an example of how to deliver the goals to villages. I guess my question is, how do we develop the institutions and policies so that countries are able to reach those goals on an ongoing, sustainable basis? Not with unending gifts, but with an economic base that enables those countries to deliver them? I believe it will take a combination of technology, institutions, and policies indigenous and well-adapted to those countries. And I guess the challenge for the Millennium Villages is how to ensure that those larger institutions as you said the global and national really play in and show us how to make this ongoing and scaled-up to the needs that are there.

Moderator Thank you very much, Bob. Pedro, could you give a very short answer to that because –

Q Actually, excuse me, my question is almost the same, and then he can answer them both together. I was a Peace Corps Volunteer in a village very close to the Millennium Village in western Kenya, and I was back there about two months ago, and it was pretty much exactly the way I'd left it 10 years ago. And so I wanted to ask you about the dynamic between these villages who are suddenly delivered everything and the surrounding villages who are not touched by this thing. And also what the time commitment is, that you're bringing these things into these villages. I'm Jocelyn Zuckerman from Gourmet magazine.

Moderator Thank you very much. The last point also on the Millennium Villages? If not I will ask Pedro to answer and then we will come back to you. Okay, Pedro, want to give us a real short answer? I know you could talk about this for days, but please don't.

Sanchez OK, can you hear me? OK – the key thing, many other times, Bob, increases in production took place, but there was no place to sell them. The key is to have – develop the markets so that people can get into the markets, both the input and the output markets. And your former organization, the Rockefeller Foundation, is setting the way kin both working with agrodealers in the input markets, and with cereal banks, microfinance, and also we're adding crop insurance in terms of the output markets. Institutions – first you want to reinforce existing institutions instead of creating new ones. And this is open, this is – there are 100,000 such villages of that size in hunger hot spots in Africa, so the scaling-up challenge is immense. I don't know how to do that scaling up, but there are a lot of people who are trying to work on that and figure it out. I know it has to be government led.

To make it sustainable, that's very simple. There are two kinds of sustainability – at the village scale, you have to have this economic transformation from subsistence to small-scale entrepreneurs selling diverse products and getting a lot of people out of agriculture and into agroindustry. That's the key to sustainability, it's not increasing yields only.

Time commitments of the Millennium Villages is five years, and possibly ten. We've got five years of funding from donors, it's not an easy thing to do, and it takes a long time. Like the Marshall Plan, it wasn't done on a two-year basis. Surrounding villages – well, they want to get in. So it's a matter of resources. In some cases in Kenya, the government is beginning to do surrounding villages and in Ethiopia also, they are planning to do with their own budgets, and the villages are being developed in clusters. The challenge is, really, how to go from 78 to 100,000 people, and that's really beyond any one institution's capacity. It's the whole world.

- Moderator Thank you very much, Pedro, that's great. That's shorter than I expected. Thank you very much. If anybody would like to discuss this further with Pedro, please find him during the lunch, because I think this is a very important issue. Hans wants to add just a couple of words to this point.
- Herren Just to say that what Bob mentioned out there is also – the policies. If the policy environment is not right at the national level, and also the regional level, again things may happen at the village but it will not be able to adapt to many more villages because all of a sudden you have too much of certain crops and products. So again, this has to be well-coordinated and planned, I think, both from top-down as well as from bottom-up, and this is very important. So I think that things have to happen in parallel. If not we are going to do the same thing as we have done again. We know if you put enough resources into a community, things will work very well, but how do you make them sustainable? And I think what you need is conducive and supportive policies for such undertakings.
- Moderator I think this is an extremely important point – how do we scale-up these successful projects? I wish we had two hours for a panel discussion, because there's a lot of interest in this group, but unfortunately we do not. Let's go to the last question, please.
- Q Bill Allaway, Santa Barbara Association for UNESCO. I congratulate the speakers this morning for finally bringing in the elephant in the room – the dilemma that has been posed seems to be very sharply here between the use of agricultural resources for biodiverse fuels in the face of the hunger that still exists. And I would like to hear that discussed a bit more.
- Moderator Extremely important and timely question – would anybody like to answer that?
- Watson This is clearly one of the key issues. If indeed we were to use maize – a relatively low-energy crop, first it's totally uneconomic to use maize for ethanol. Sugar in Brazil is by far the most favorable economic conversion of a food crop into a fuel. But even there, to convert let's say 20% of the world's fossil fuel use, i.e. gasoline, into liquid biofuels, even with sugar, would take a huge amount of land around the world. Therefore the chance of scaling-up either maize or sugar to be a truly major player, I think, is unlikely. Given that we have to significantly increase food production, both the quantity and the quality of food, and all indications are you can't do that on just intensification alone. So the challenge is, and this is what we have to do in the analysis at the local, national, regional, global levels – where can bioenergy be economic and socially and environmentally sustainable? So a lot of analysis has to be done, country by country. The competition for land and water is a critical one. The one possibility for the breakthrough is to go to the second generation of bioenergy and that is cellulosic fuels where you can use the whole crop. There you might well be able to scale-up, but there are at least 10 years, maybe more, of research, before that is likely to become fully commercial.



Moderator Thank you very much, I believe you will all agree with me that we had a great morning with lots of very, very interesting presentations and discussion. Unfortunately, we didn't have as much time as we'd all have liked for discussion. Please join me in thanking the five speakers of this morning.