

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 FIVE: 2006 Laureate Roundtable

October 20, 2006 – 2:00 p.m. – 3:30 p.m.

Laureates: Edson Lobato, Colin McClung, Alysson Paolinelli

Moderator: G. Edward Schuh

Ambassador Kenneth Quinn

This is the session at which we hear from the three men who did it. And we are very fortunate to have to moderate this session Dr. Ed Schuh, who has come down from Minnesota and the University of Minnesota, where he is the Regents Professor and the Orville and Jane Freeman Professor, International Trade and Investment Policy at the Freeman Center for International Economic Policy.

He is a long-term expert on the study of Latin America and Brazil and sub-Saharan Africa. He chaired the Board for International Food and Agricultural Development, who was here earlier this week having their panel, and co-chaired the U.S. Food Security Advisory Committee and served two terms on the Board of the International Food Policy Research Institute (IFPRI). So he has acquired a deep knowledge of the Cerrado and of Brazil during his career, and we are very lucky and fortunate and honored to have him to moderate this session. Professor G. Edward Schuh.

Moderator

G. Edward Schuh

Regents Professor, University of Minnesota
Orville and Jane Freeman Professor, International Trade and Investment Policy and
Freeman Center for International Economic Policy

You know, before the ambassador gets very far away, I remember coming to these sessions in the early years, and they were fairly modest events. And there is one person that has played a major role with his leadership and his energy in developing this event into something that is very significant. Let's give him a big round of applause. ...

I want to thank the ambassador for the introduction, but I also want to say what a pleasure it is to be on this program. I've worked with these three men in varying degrees of intensity over a fairly long period of years, not in their soil research but in other activities that they do. And it really is a pleasure to see them get this award and get this award together.

Two weeks ago today I gave a paper at the hundredth anniversary of the Sichaun Agricultural University in China. And the title of that presentation was, “International Collaboration in Agricultural Research – The Road to Peace.” And I won’t elaborate on that, but it gave me special pause when I realized that this particular award went to people who had collaborated across national boundaries to make a significant contribution to knowledge that helps feed the world. And so I think it’s especially significant that we at this time had bi-national recognition in the same award of the World Food Prize.

We’re going to organize the session today with five minutes from each of our speakers, and they’re going to talk about not the past but the future, about thinking ahead and where does this technology and this knowledge that they’ve helped generate, where does that take us? Where does it take us in Brazil, and where does it take us around the world?

And then after that we’re going to try to have some interaction on two questions that I think are particularly significant in today’s world.

One is that the recent data shows that the developing countries are falling further and further behind the developed countries in their investment in agricultural research. Now if you think about the implications of that and the difficulties in transferability, you’re talking about 80% of the world’s population living in the developing countries and their support for research getting weaker and weaker all the time.

Now, the second question that I’ve asked them to address as a basis for getting some interaction is that more generally in the world the support for basic research, both by the private sector and the public sector, is declining. It’s fallen very substantially from what it used to be. The kind of research that these men did is based on more basic research that was done many years in the past. So I’ve asked them to think about and comment on what we might do to sort of turn that around and get going in the other direction.

So let me turn to their original opening statements. They’re each prepared to go five minutes, and I’ve asked them especially to try to restrain it because we want to have time for questions and discussion for the audience towards the end of the session. And we are going to terminate at three o’clock. So those of you who are worried about catching a plane – we will stop at about three o’clock.

Colin, how about we start with you, and you can do it from right here if you like, or you can come up here.

Reflections on the development of the Cerrado; implications for future international food production

Colin McClung

Washington Representative of the IRI Research Institute

I got a nice letter from Judith Pim a couple weeks ago about this subject, and I wrote down some questions that I'd like to raise with my colleagues who have been steadily in contact with what's happening in Brazil, while I haven't. I've been able to follow it somewhat.

But the questions are under the topic of: What will the development of Cerrado, the development we have in the Cerrado, how will that impact on world food production in the coming few decades? And I had two categories under that.

One, the impact of Brazil's direct production and exports; and the other, application of Brazil's technology to other geographical centers. Under the first one, the first item that I have down is expansion of the area of the Cerrado that's brought under agriculture. I asked some questions of my colleagues as to how much they thought there was there; and if I got it right, they have about 25 million hectares already developed and about 75 or 100 million to go. In other words, the top figure might be 100 million.

In connection with that, there are some questions about what kind of infrastructure, such as roads and so on; that would influence that, I know. Talking about maintaining and/or increasing yields. Now, since I've been here and talked to them, they're not thinking about just maintaining, but they're thinking about increasing. And what kind of potential problems will we see in the coming decades from a tendency towards monoculture?

Then what about other crops for the Cerrado? The big question in my mind was – How will ethanol production be? How much of the new land that's opened will that take up? And again on the infrastructure, what about transportation to export sites?

Then I had a final one: Production research on agronomy, pest control and other subjects. Then under the application of Brazil's technology, other geographical areas, I mentioned some things that I picked up as I went along. Going back to the time that I was first working with the Cerrados, I had correspondence with several people on the subject. When I arrived in Brazil, I believe the general, worldwide inclination to think about the savannas was as a fire-climax vegetation. And we rapidly just thought that was not probably the case but it was the nutrient status. And I found that this idea had already been thought about but never really taken up as a research target.

But there was a gentleman in the West Indies who had been working on it in Central America and in the Caribbean and described very much the kind of thing we'd seen, and he was convinced that the savannas of the Western Hemisphere were mostly what you might call edaphic savannas there because the soil was so highly leached.

Then in more recent times, IRI Research Institute, the one that I worked with when I was in Brazil that has continued as a project interested in worldwide production, did some work in Indonesia on the island of Sulawesi, and on cotton production. And I don't know what the original vegetation was there, but they tried the Brazilian technology, and it worked very well indeed. I've spent time myself in the Philippines, and I'm sure that there are some acid soils there that would respond very much like these. They are not under as good rainfall conditions. They sometimes have very high rain and then some very dry periods. They're not as well supplied with steady rainfall as we are in Brazil.

And I know there are other examples, West Africa and so on. India – I've discussed this with the Indian soil scientists – and I actually sent them some papers that have come out in Brazil in much more recent times than my own experience. And they were really taken up with that idea. And to me it's really short of remarkable that people don't know as much about what's happened in Brazil. It seems to me it's almost like common knowledge, and lots of things have been written. But I think, I think the fact that the World Food Prize was given to three people who worked on that subject will call attention to Brazil's revolution in agriculture, and I hope that the gentlemen from Brazil or myself or whoever can would try to emphasize to other countries around the world what it actually is like.

Myself, when I left Brazil I was given an assignment in the Ministry of Agriculture in Colombia. In that case we had a soil department of about 15 scientists who were trained in, they were engineer agronomists and were doing good work in the field but none in the *llanos orientales*, which is a very large, flat area, and my concept was it might be very similar to the Cerrados of Brazil. When I was asked to present a proposal for what direction we'd take, I brought up with the director what I'd done in Brazil. And I told him I think that's possible for the *llanos*. And after he listened to me, he tended to agree, and he gave very serious attention to what I was saying. But his response was, after thinking it through, he said, "I've got lots of farmers, small farmers that have many problems. Their farming land has been under cultivation for hundreds of years in some cases, and they need help. And we have limited resources, so we'll have to let that one ride." Actually, I think it's still on the sidelines. CIAT has had some work over there, but it's primarily grazing work, or was the last time I saw it.

These are questions that I'd like to put before the group, but I'm putting them before my colleagues as well. And they're not really just hypothetical questions, they're questions which they know answers and that I don't know. So I'm not just asking them for example but for information.

There's a third subject that Ed mentioned was the research needs of the rest of the world. Now, I've been close to that in some cases, but as I look at it, the half-life on knowledge about a subject in agricultural development is about six months. And if you've been away for two years, your percentage of knowledge is pretty low. I'll rather discuss it than make a statement about it.

Thank you very much for listening to me, and those are subjects that may or may not come up.

G. Edward Schuh

Edson Lobato.

Edson Lobato

Former Technical Director of EMBRAPA Cerrado Research Center

First of all I would like to ask you not pay attention to my English and make an effort to try understanding what I intend to say.

Let me take a step backwards because there is something that intrigues me. I believe I came to this life to learn, and I took all the opportunities I had to learn. At one point I decided to learn, what's the situation outside of my experiment station. I decided to be a farmer, so I was a smallholder farmer for almost ten years. And I learned a lot of lessons that were not written in the books I had access to.

I realized that farming is a permanent process of solving equation systems – environmental equations, biological equations, and we add to these equations every day by the hundreds. How a plant or animal reacts to an input, management. Economic equations, culture equations, social equations, energetic equations, political equations, and so on and so forth. Obeying the limits and restrictions of each of these is a permanent exercise, as I said. This is a dynamic situation. Solving an equation is not easy.

I also try to run an industry. I intend to see what's there. I had an industry also – not at the same time. So I did some training. Out of all my experience I have no doubt to say that the most complex activity I have ever had was running a farm. There is a tendency to believe that this is a simple task. It is not. I've seen a lot of good agronomists fail when running a farm. As a matter of fact, we are teaching our young people how to do analysis. This is expression of how to do a synthesis. Farming is synthesis. And I ask, who is going to do this? I miss these professionals, the ones who are able to solve equations, system equations.

Talking about the environmental protection to a farmer who is not making money out of his business is not of good taste. Before talking about environmental protection, I must teach the man how to make money out of his business.

So I believe that in a global economy there is no more place for amateurs. We need professionals. And to be professionals we need good technical assistance. We are not working to provide this kind of assistance. Most of the men who provide assistance to our farms work on the projects – the corn project, the soybean project and so on. What about the project for the farmer? We don't have many people doing that. I ask quite frequently to the farmer, "Where are you, and where do you want to get to?" It's quite surprising. Almost – not to say a hundred percent, I'm talking about small farmers mainly – almost a hundred percent does not know. They work day by day, year after year. This is not enough.

As far as now thinking about ahead, what are some of the challenges? I think we have a tremendous potential, and it is a challenge, on gaining in productivity. Take, for instance, corn. Our national average is four tons per hectare. The Cerrado averages 4.4. Good farmers are harvesting 11 tons. The researchers are getting as high as 17 tons, and that is to the future. But to bring the average 4.4, or the national average, 4 tons per hectare, to the level of the good farmers, I think that's feasible, before putting down new areas.

That's something that puzzles me as well. They youths are kind of abandoning agronomy. They are very enthusiastic about new sciences. But these are just tools. The old agronomy always has the place. It's through old agronomy that we are going to put out the material and genetic material, satellite images, and so on and so forth, into production. Someone in my country even said that there is no place more for agronomists. That's something to think about. I think we cannot abandon this science.

A lot of universities don't have soil departments anymore. I don't understand. There is a kind of a fashion tendency; people are going to the fashion.

So I think this is a real puzzle for us – how to take these smallholder farmers into commercial agriculture. They usually don't buy well, don't produce well, don't sell well. They lack organization. They lack technical assistance, the kind I just mentioned. They lack organization and I believe it's much better for them to stay where they are than come into the city to increase social pressure. And to do that is a tremendous challenge – offer quality technical assistance, and I think this is possible. It's a matter of political decisions and preparing people for that. We don't have many people prepared for the equation solutions. We are too much specialized. This is necessary but not sufficient. We need to invest more on people trained for synthesis process.

I think that's enough to start with.

G. Edward Schuh

Former Minister of Agriculture in Brazil, Alysson Paolinelli.

H. E. Alysson Paolinelli

Former Brazil Minister of Agriculture

I'm a friend of Edward Schuh for many, many years. He gave me advice many times. One of them is to speak just a little. But I insist to him that a government man has two ways to sell his ideas. Oh, it's obvious you could speak just a little. And if it's not obvious, speak a lot and you win by tiring them out.

For this reason, he only gave me five minutes. But I want to sell to you the idea of the Cerrados. Since I can't speak anymore, I'll ask the secretary to translate this and give a copy to

you, because in four pages I can tell the story and make us feel compassion. I like the idea of Schuh, that we talk about the Cerrado from here forward. I always said for those who had money and were in the command. It's like a box of secrets, at least the first one. Opening the first one, then we start right again.

Now we're opening the second box. What's this mean? The Cerrado is much better utilized. But for technology, knowledge, sustainability, we from the tropical area work at this with good management of our soils and productive system. We're capable of maintaining the fertility of these soils. And more than this, each day makes it more productive, more competitive, sustainable and conserving water of good quality. I want to show you very quickly one of the innovations created by EMBRAPA.

In my professional life I confess that this technology is one of the most innovative in the 21st century coming out of Brazil. It's the integration of crops and cattle. We're beginning to do in the same area, the same year, production of grain or oil crops, fiber, and pasture at the same time. We use the summer for production of oil or fiber or grain crops. During the other seven months we have miraculously very excellent pasture, weight gains in beef animals or quantity of milk increase that we didn't expect.

What's the secret? And the basic philosophy, it's a rotation of crops, but in tropical areas we do this just continuously. Obviously, for those of you from the temperate climate, it's not possible. But for us it's an advantage.

This is the area of the Brazilian Cerrado. I won't talk much about this, since we've covered it already. This is our projection. We have 204 million hectares. We have a potential for immediate use 127 million hectares. Today we have 120 million hectares used in crops and pasture. Annual crops about 12 million hectares. Perennial crops about two million. Apparently we have only 64 million hectares, according to the EMBRAPA studies, for lands to be used in pasture crops. I'm a beef cattle producer. It's not easy to make money in beef production. And the farmers are not able to maintain the sustainability of their pastures.

EMBRAPA verified that of these 120 million hectares, 42 million are degraded pastures that don't support even half a head per hectare. And this created the opportunity to advance our pasture-cropping system from the suggestion of EMBRAPA to plant the crop, the corn or the soybean or cotton, you can see, and between the plants we plant the seeds of the pasture and we get the formation of the pasture at the same time. We harvest the crop, the pasture blossoms immediately.

We have in Brazil a grass type, brachiaria; this grass works fabulously for these conditions in the Cerrado. The roots of this grass have three times more mass under the soil than it has on top. Therefore, it penetrates the soil and helps to restructure of the soil. It makes a network of roots and sustains all of the things in the soil by leaching and other things. This recycles and fertilizes the soil, creating a cover, alive or dead, that year after year keeps fertilizing the soil. The following years you can do whatever rotation you want, and the results are being much, much better than the conventional tillage plantings.

The photograph shows the corn in the rows and the pasture in the row and between the rows. And when this grows, you have the corn ready to harvest, it's already in good vegetation. You harvest the corn, and the pasture is there – it doesn't look too healthy at this point, but it's not dead. Look at it start to grow. Forty days later it carries three to five animals per hectare.

Here's an example. This farmer, my friend, produced so much pasture, he made silage instead of putting animals on top of it. This is the secret. The roots here in the soil, and they modify the soil for the next cycle, recover the pasture. You apply a herbicide in low quantities, that will not to kill it, just enough to make it dormant for 60 days. Immediately using no-till planting and following immediately, in the first year, you get great production of grain and the pastures are recovered.

This is the formation of a three-tiered systems: the pasture, the grains, and the forest. For example, you're seeing the first year planting of rice and eucalyptus, and harvesting the rice; in the second year, you planted the soybeans with the pasture crops, harvest the soybeans and there you get the pasture. Look, after three years, the size of the eucalyptus tree – because the soils here are now fertilized, you don't even see this growth normally in forests. Within seven to ten years, we're harvesting 250 stories (750 meters) of wood per hectare, on top of the grain and the pasture. This is an innovation.

QUESTION & ANSWER

Ed Alysson, my apologies. I knew when we gave each of them five minutes, Alysson would take at least ten. So I've been reminding him this for two days. Excellent. I think what would be useful at this point, we'd see whether any one of the three of you have a question that you want to make to the other. Because you gave three different presentations, and you might be able to complement each other. Colin, did you...?

Colin The ones that I think would be most pertinent right at this moment that I have on my list would be those about what kind of projections do you see for production expansion of the area? I understand it's been fairly steady for some time now.

Alysson I need to confess to you we have practically twenty years since our economy has been turned off. We did seven economic plans – that was a disaster for the farmers. Each one of these I advised them, Prepare your back pocket, because you're the class that's going to pay. It's two classes – the salaried workers and the disorganized farmers, and that's what happened. We've had a paralyzed situation with respect to growth. The economy has been stagnant. But happily now our economy – I don't know if they're following the suggestion of Edward Schuh – they started to maybe think right, control inflation. Our currency is strong. And we're moving forward seriously with our economy stable. This is allowing us now to work with financial security, which is allowing us to expand the production of our lands, especially in the Cerrados.

Now there's a special, another fact. With the high price of petroleum, we're producing ethanol equivalent to less than \$30 a barrel of petroleum. It's a great

achievement and probably the ethanol producers will take space close to the great urban areas, and they'll push agriculture further out into the Cerrado. So this is very simple. To transport ethanol is very complicated. To transport grain is easier. It's a natural solution. Beyond our expectations to also produce ethanol in the Cerrado, we are looking to develop new clusters of ethanol production, principally for export, putting in place an infrastructure to do that – it could be an alcohol duct, or pipeline. And I think there will be a great expansion of energy. Like we did with alcohol, or ethanol, production in 1975, the current government is doing the same for biodiesel. They're giving incentives because the balance of the economic equation is not yet profitable – like ethanol was in 1977. And now (the economic equation for ethanol) positive. As you can see, EMBRAPA now is developing a new national center for agrienergy. This in a short period of time will change the economic equation for biodiesel.

Ed I want to emphasize a point that the minister made early in these remarks, the importance of the economic policy to complement the science and technology, the new technology – that really has been the key to Brazil's success in virtually the last ten years. It's got its domestic prices right, favorable to agriculture, and it had EMBRAPA that produced this flow of new technology. Edson, do you want to add something to this or ask Colin or somebody else a question to complement what you said.

Edson That's something that at this point you mention. This shortage of money for research, I can't understand that. Definitely. I can't ??? such a tremendous benefit for agriculture. Like ours, our exports were \$44 billion dollars, something like that, isn't it. I don't think we have to prove anything else. To put Cerrado into production is another outstanding accomplish of our research work. And I just don't understand the rationality of those decision-makers for cutting the budget for research as the way we are experiencing. The Cerrado, if I'm not wrong, has not more than 8% of its budget for research property? That's something I can't understand. I have the same concern. The public/private may help us. We don't have in Brazil as far as I know the same amount of research done as you have in this country. And I think we have to push on that. There is a tradition that the research is something for the government, but I understand to a certain point we have a strong debt. Because of debt, public debt, consumers, most of our money, and it has to be worked out. I'm not happy at all with this shortage of money for research work.

Ed An interesting point here. One of the interesting things about China – China spends currently about \$3.4 billion on agricultural research, which makes it arguably the largest agricultural research system in the world. I think the U.S., if you put the private sector together with the public, it would still be the largest. But when you think about China as a poor country and it's investing \$3.4 billion, it makes you wonder why countries like Brazil and other countries – Latin America or Sub-Sahara in Africa – invest substantially less. So if we can sort of come back to that original question about – what does one do to get the continued support of EMBRAPA in Brazil or to get more investment in agricultural research, not just in Latin America

but in the other countries, in Sub-Sahara in Africa and places like that? Do you want to pick up on that again, Colin?

Colin Well, I have the feeling that some of the countries would jump at it if they thought they could get involved with these gentlemen and send people to Brazil or the Brazilians go to India or Africa. My own guess would be that India would be one that could move quickly on this kind of extrapolation. And they have a good central research capacity there. Some of the other countries, like Indonesia, they spent a lot of money and effort in the 1980s, but their success, as far as I've seen it, has been mostly with rice. In rice they're staying up, and I think it's partly because they draw so much from their neighbors. It's sort of a unified system. But that's part of the second question that I have is – Would Brazil be amenable to, say, explaining their technology and helping people adapt it to other conditions? Now, what I'm thinking about is more, it's not basic research, but it's adaptive research, extrapolating from what's been done here, with similar soils elsewhere. The similarity could be identified without a great deal of startup work.

Edson I think the real paradox in this situation is that evidence on the rate of return to investments in agricultural research is exceedingly high – it's 60 to 70 to 80 percent – and you would think when you get finance ministers or often economists, they would understand that. That was a story that gets missed in the case of Brazil. It had an economist who was finance minister, and he understood when the research showed in Brazil the rate of return to those investments was about 80%, that's when he put the money forth to create EMBRAPA and get it on its way.

Colin Of course, I don't know what the percentage has been with Cerrado, but it must be a lot bigger than that.

Edson Yes, must be, sure.

Colin But I think that the thing that would catch fire in the other countries would be to see how fantastic it has been here.

Schuh Okay. I'm going to let this be the last set of remarks, because we want to get some interaction with the young people in the audience here, maybe some of the older ones too.

Alysson I give all reason when I say the economic gurus are getting serious and they've got it right and have become very powerful, and they have in front of them a mathematical equation. We haven't yet understood in Brazil that two plus two is four. And therefore there's a lack of money for everybody. I'm part of a private-sector initiative with new funds approved from the Brazilian legislature to recuperate the investments made in agricultural research. The President of EMBRAPA represents the scientific community on this initiative. And we encounter two very serious problems. The first, that worries me the most, is that Brazilian society thinks that agriculture in Brazil is perfect. That it is the most competitive in the world, and that we don't need to do anything. But they don't realize that they pay the highest interest rates, some of the

highest tax, and without subsidies, and even some of the highest transportation costs – and we're still competitive? And so therefore we don't need to invest anymore. It's an error. The money in research has gone down so much, that we probably won't recuperate within this year, or even the next five years. But I have advised that, if this policy continues over the next 15 years, we're going to be back like we were in the sixties. Because science advances very rapidly and we need to follow the trends.

The second problem is, the economists cut funding without any discussion. We don't have the force to change this. Recently there was a new law passed in the Brazilian legislature, permitting association and cooperation of the private sector and the government sector, to work together to achieve mutual objectives. We're entering into a new phase and I'm working a lot with the president of EMBRAPA to implement this quickly. Because the initiative from the private sector is becoming very strong, and they need to participate in this, because who will be hurt the most, if we don't (implement) this, is the private sector. It appears that they understand this. But I can confess that the red tape in Brazil is very slow. We're slower than we should be.

Schuh We have a little bit less than 15 minutes for questions, comments from the floor. So if you get your hand up and wave it, the lights up here sort of get in the way of seeing your hands out there, so... Or if you want to just stand up and then we can call on you. Oh, excuse me. Yeah, they need to go to the microphone. There's one right up here. Did you want to comment? Why don't you come up to the microphone, or you've got one there. Go ahead.

Q My question is – Has the opening of the Cerrado reduced the destruction of the Amazonian rain forest? I would think that they have since you've had the movement and the development of all those, that there wouldn't be quite the push to keep working away at those rain forests. Or am I behind the times, that it's pretty well stopped?

Alyyson No, it's a good, it's a very good question, very good question. We shouldn't mix the Amazon with the Cerrado; they're completely different. Maybe the pre-Amazon, but it's not Amazon. Even in Brazil, sends out a lot of false news that goes out of the country.

Q What about the cost to break out a hectare in the Cerrado compared to the rain forest?

Alyyson This is what I wanted to say in the first place. The farmer doesn't cut down the forest. It's not economic for him. The cost of deforestation, in the Amazon, is much higher – by planting grains, it will take him many, many years to pay that back. EMBRAPA has shown that we have 42 million hectares of pasture that can be planted, and you don't have to cut one tree. And the cost of production is much lower and it recovers the pasture. This technology of EMBRAPA, I'm a user of this. I haven't just seen it. For the first time, I've been able to lower my price. And even with the low price of meat in Brazil, I'm still making money. The Brazilian farmer has the sense; he

- doesn't do that. The people that are cutting the Amazon are the urbanization and those that cut illegally wood.
- Schuh The answer to your question, part of the answer to your question, is that it has slowed down the process, because what you had were a lot of migrants going to the south, all the way up to the Amazonas, they could stop off at a shorter distance and be successful in this land. There's another person with a question there. Go ahead, and then one up here.
- Q I'm interested in the ethanol program. Now, my father used to mix sorghum with corn to make silage, and so I know sorghum will grow in this area. It may be too cold for sugar cane. Have they tried sorghum proper? How about sugar beets? Do you have any experience with that?
- Alyyson Sorghum just started to grow in Brazil. EMBRAPA has done some nice work. We're doing breeding in sorghum with adaptation to acid soils with excess of toxic aluminum. And the productivity is rising, not just for grain sorghum but also forage sorghum. Where there's less rain, this is a great option. In the northeast of my state, Minas Gerais, it's a dry area. And this integration with animals and sorghum is doing very, very well. And the water use efficiency has improved a lot.
- Schuh Question up here in the front.
- Q My question is for Mr. Lobato. You expressed a great deal of concern for the family farmers and what was happening to them. We have that same concern here in Iowa. One of the things that we see here – and you talk about need for research money – it appears that the big corporations are making huge profits and want to continue to make huge profits. And a great deal of the money in our country goes for the military. The last word on your presentation this morning when you had the screen up was the word “peace.” I wonder – is Brazil needing to put a great deal of money into a military budget? And how much is going towards helping the family farm?
- Edson As a matter of fact, I don't have these numbers. But even the budget for the military people is decreasing in Brazil – not only for us. This is a general crisis as far as money. Most of our money is going to pay interest rates. It's something like \$150 billion a year, just interest, because of our debt. That's amazing. It's a tremendous continuous effort to pay interest rate.
- Schuh So what the minister said earlier is the military suffered more cuts than has agricultural research, as an example. We have another question back at the back.
- Q I have a question with regard to the relationship which may exist between EMBRAPA and the agricultural universities in Brazil. You mentioned partnerships and relationships between state, federal, regional government agencies and EMBRAPA. But do you also have a working relationship with the universities, and if so, could you describe that to us? Do you anticipate that the universities would be doing primarily the upstream research while you do the applied field research? Do

- you share resources? Is this where many of your people are trained? Could you get into this relationship, please?
- Schuh Edson, do you want to start on that? You're working within EMBRAPA, so talk about the relationship of universities and agriculture in Brazil.
- Edson Yes, we do have this relationship, but again I would say the universities experience this same problem of budget. It's a country's problem, and I don't see any public institution with money enough. We experience, all of us, the Brazilian institutions experience this shortage of money. But we interact. As a matter of fact, there is a requirement, EMBRAPA's competing for budget with anybody else. So we have joint problems right now. It's almost impossible to approve a one-person project. We must have a multi-disciplinary team involving all the research institutions over the country.
- Alysson I would like to complete this. There's an integration, EMBRAPA and the universities, they complete... The universities prepare and train research scientists and ... relation very with the research. We are working hard... to bring all the competence, Brazilian competence together and discussing with the farmers, what their points of constraints are and do this research in a network so everybody participates. ... reduction of resources for EMBRAPA, for the state and the universities as well but not in knowledge. They work very well together. When I go to EMBRAPA centers there are university students there doing research... thesis... and many times with the orientation of EMBRAPA. ... gave me the opportunity. I have one deception. You saw the presentation of EMBRAPA... in 1970 we had money, but we didn't have doctors. Brazil puts out 8,000 doctors per year, and the agricultural sector... we have 40,000 PhDs. ... we don't have enough money to use all this potential.
- Schuh Colin, did you want to add anything to this about the interaction? Okay. I was going to make one comment on it, and that's sort of a natural connection in that a lot of their staff are trained in the universities within Brazil – so that gives them sort of a natural connection. Any other comments. We're going to lose an audience here before too very long. Let me begin to wrap it up by thanking the translator who's done a very admirable job of keeping up with this. He's done a very efficient job, and then let's thank our three laureates one more time. And we stand adjourned.

Frank Swoboda

And, Dr. Schuh, thank you for moderating what was an exciting and compelling panel. It was a wonderful conclusion to our celebration and our discussions here. We'd like to thank you all for coming and joining us for the 2006 World Food Prize. It was our pleasure to have you in Des Moines, and we hope to see you next year for the 2007 World Food Prize celebration around World Food Day. Thank you very much.