

2013 THE "BORLAUG DIALOGUE"

October 16, 2013 - 3:00 p.m.

Panel: *Martina Newell-McGloughlin, Moderator*

Introduction:

Bian Li

Director of Planning

I would like to introduce first the moderator, Dr. Martina Newell-McGloughlin. Martina Newell-McGloughlin, she's the Director of Biotechnology at the University of California - Davis. Professor Newell-McGloughlin has also directed Life and Health Science Research Initiatives for UC Davis. She has worked in the area of biotechnology for almost 30 years and has been with the UC system since 1989.

She was director of the UC systemwide Biotechnology Research and Education Program for 11 years. In 2005 she was awarded the Irish America Science Award as one of the top contributors to Irish America science. She was nominated for the Boyle Medal in 2011. Please join me in welcoming the moderator as well as our distinguished panelists, which Martina will introduce. And thank you very much.

PANEL:

RESEARCH AND RETURNS: THE FUTURE OF AGRICULTURAL TECHNOLOGY & INVESTMENT

Panel Moderator:

Martina Newell-McGloughlin

Director of International Biotechnology, University of California - Davis

Panel Members:

James Borel Executive Vice President, DuPont

Brett Begemann President and Chief Commercial Officer, Monsanto

Rob Aukerman President of U.S. and Canada Operations, Elanco Animal Health

Victor Villalobos Director General, Inter-American Institute for Cooperation on Agriculture (IICA)

Martina Newell-McGloughlin

Thank you so much, Bian. This is an extraordinary time to be involved in the area of food and agriculture research. And I'm absolutely delighted to be here to moderate this panel. We have a group of visionaries who are going to give us their worldview on how they see the unprecedented challenges and opportunities in research will revolutionize the food and ag sector.

Now, as a biologist, I'm a great believer that there's nothing like stress to produce interesting responses in biological organisms. Well, maybe not in Washington - we're getting the wrong responses there. But I do think the challenges we're facing right now really do catalyze extraordinary, novel approaches and paradigm shifts and transformational changes in the types of science and technologies that we apply to food and ag. And I'm really happy this year, for we're honoring biotechnology, that we're going to hear from our panelists about how their various companies and agencies are involved in generating the next generation of disruptive research that will allow us to be incredibly productive in food and ag. As we heard this morning, R&D is the principal driver of agricultural productivity. So hopefully we'll get some great ideas on today's panel.

So in order to be diplomatic, I'm going to introduce everybody in alphabetical order, so I'm not giving precedence to any one company or organization. And right beside me here on my left is Rob Aukerman. He is the President of U.S. and Canada operations at Elanco Animal Health, and in this capacity since 2007 he is responsible for the company's U.S. business, and especially he has oversight of global companion animal business. So I'm really... to hear he's involved in this, since there are now more companion animals than humans in the U.S. Rob.

And next to Rob we then have Brett Begemann. And Brett is President and Chief Commercial Officer with commercial responsibility from Monsanto's global business and supply chain. He oversees commercial, manufacturing, and supply-chain operations in row crops, vegetables and crop protection. And it's great - people often forget Monsanto actually does veggies. They think they're just all about maize and soybeans. And actually Brett grew up on a grain and livestock farm in Missouri. He's been all around the world since and has only really recently come back to Missouri. I think he spent most of his life elsewhere. In fact, he always intended to be a farmer and possibly still is to a certain extent.

Then next to Brett we have Jim Borel, and Jim is the Executive Vice President of DuPont, and he's a member of the Company's Office of the Chief Executive, who you heard this morning. He also has responsibilities for DuPont's agricultural and nutrition business. He joined DuPont in 1978, so clearly Jim is a lifer with DuPont, and he's worked for the company in all sorts of roles all over the world on both sides of both oceans, Japan, Canada and the UK.

And finally bringing up the rear, definitely not least though, is Dr. Victor Villalobos. And Dr. Villalobos is Director General of the Inter-American Institute for Cooperation on Agriculture known as IICA - hopefully I got that correct - which works to promote competitive and sustainable agriculture in the Americas. Victor is a recognized expert in agricultural and biological fields as well as in natural and genetic resource fields, and he has made major contributions over the years and has supported much innovative research in the areas of plant production and natural resource conservation.

We are going to have each member of the panel give about three to four minutes of an overview on their position. They're addressing this area of implications of research and innovation. And then we will start the dialog. So with that I would like Rob to start.

Rob Aukerman

Thank you very much. It's a privilege to be here today, my first time at the World Food Prize, and it's just an honor to participate in a forum like this. I'd like to start the conversation this afternoon talking about how we need to change the conversation around innovation, how we talk about innovation in technology. Historically we have grounded ourselves and talked about the science, and that's not wrong - we're very good at that, and we need to be grounded in science. But when we step back and take stock of where we're at, I think we'd have to say that's not winning the day with the consumer, certainly not in all cases. We need to talk about it differently. There's other aspects of the discussion and the debate that we need to cover other than just the science piece of it.

In fact, I would say we need to start with the consumer, and we need to talk about the benefits of science and technology to the consumer. Bill Northey this morning, the Secretary of Agriculture for Iowa, said that it's not about the science - I thought this was a great quote: "It's not about the science - it's about the people that it impacts." And I think that is very, very true. We need to start with the consumer. And I would say in the most simplistic terms, I agree with Simon Sinek, *Start With Why*. It was public in, I think, 2009. The importance of talking about why we do what we do really helps create the social license for us to enter into other parts of the conversation with the consumer.

Fundamentally, I believe we do what we do in agriculture to place a high-quality, nutritious, safe and affordable meal on the table of the consumer. That's why we do what we do, so that we can place that meal on the table. And I think, if we have the right conversation with the consumer and they understand that, it gives us license to talk about other aspects, other aspects that we also need to talk about, the ethical aspects. So if the U.S. consumer or developing nations' consumer are convinced that we are concerned about what we place on their table, then we can talk to them about the greater hunger problem, the food insecurity problem in the world, more the ethical dimension.

We need to talk about animal wellbeing. So once we talk about the why, we can start talking about some of the how's of how we produce food. And animal wellbeing is a very important concern with consumers, but first we have to talk about the why.

And then we can move on to the economic discussion. We've talked about economics; we've talked about them on our terms, that it's important for us to use technology in order to make our operations and make farming profitable and viable, if you will. The consumer probably isn't as much concerned about that as how it affects their pocketbook. And using safe, approved technologies can improve economics at their table as well.

And then, certainly, always stay grounded in science. My premise is that we need to start with the consumer and start with our why, and then we can start talking about the how and the what, if you will.

Martina Newell-McGloughlin

Thank you very much, Rob, and next we'll hear from Brett his worldview of how research and innovation can...

Brett Begemann

Thank you, and it's a great pleasure to be here and talk with the group here and with all of you about agriculture and where it might go. And I think we're at a really unique time in history when we can sit here today and look backwards on the first century of Dr. Borlaug's life and the work that he did, and we can also look forwards to what's the next century of Dr. Borlaug's legacy going to bring forwards with technology, science, and innovation in agriculture.

It struck me as I started thinking about this - You know, when Dr. Borlaug was born, there was about 1.8 billion people in the world, and today there's about 7 billion people in the world. And if we look at projections, just by 2050, not a whole century, just by 2050, there will be over 9 billion people in the world. So things are changing pretty dramatically.

And the other things - and I've heard others articulate this today, particularly in the last session around some of the animal agriculture around the population expanding of the middle class and the need for protein and the protein consumption. We expect by 2050 another 1.6 billion people to move from rural communities to urban communities and continue to expand that middle class. So those changes are there. And I often think, being an ag company, what's that mean for us in agriculture? How does that change our future and what we need to be focused on?

And I think what it continues to tell me is we're going to need more innovation in agriculture, not less innovation in agriculture. It's going to take all of us all over the world to accomplish what it is that we have to accomplish. And I was really intrigued by some of the comments in an earlier panel here around women in agriculture and some of Ellen Kullman's comments of how we need to focus on working with everyone around the world, whether they be large commercial farmers or whether they be smallholder farmers. Innovation is important at both levels. It's not about how do you make a smallholder farmer and turn them into a large commercial grower; it's about how do we increase the productivity of both the smallholder farmer as well as the large commercial farmer. And to me that probably takes different activity.

I was quite interested in Julie Borlaug's comment when she was asked, "What do you think Dr. Borlaug would want us to do if he was with us today?" And she said, "A lot less talk and a lot more action," or something like that. And I think that's really true. I think often about some of the work that I've done myself in India or Africa, and we talk about the lack of water in some of

the rural communities, and I heard that today. If we only had a gallon or a liter of water for each hour that has been spent talking about how we're going to get after the water or what kind of pump we're going to use to pump the water out of the ground... We don't need to talk anymore about that. We know we need the water, we know we need to get access, we know we need to be efficient, and we know it needs to be healthy. So let's go do it.

One of the other pieces to me, I think, as innovation progresses – biotechnology and breeding have been great tools; they've been utilized extensively. We use both of those roughly half and half in our company today. I think there's a whole, new, exciting world out there for us and how we use data and how we turn data into knowledge to make better-informed decisions. And I'm not talking about just better informed decisions for the large-holder farmer, I'm also talking about data and better decisions for the smallholder farmer.

We're probably going to communicate it differently. To a large farmer, they may receive that information by an iPad in a tractor cab and send that information from an iPad in a combine cab. And to a smallholder from they might receive it on a cell phone or a smartphone while they're working in the field by hand. But it's still using data to inform them to make better decisions to increase productivity. And I'm really excited about how that will change the next 20 years of agriculture as we leverage that space to make a difference going forwards.

Martina Newell-McGloughlin

Next we will have Jim present the DuPont position.

James Borel

First of all, thanks, Ambassador Quinn and the World Food Prize, for the chance to join the panel today. And thanks to you, Martina, for moderating. I look forward to our discussion about how we can find sustainable ways to bring more nutritious and affordable food to people everywhere who need it, not only through technology innovation but also through finding new ways to collaborate and work together.

I think most of us in the room would agree that the discussions around food security over the last five years, whether they are in the boardroom or the classroom or the Roosevelt Room have increased tremendously. But more importantly, I think those discussions have expanded beyond a single industry or country or sector. Increasingly we're finding ways to work together on collaborations that will bring agriculture more sustainable opportunities and more productivity.

So what I hope we can focus on today is – What's next? What do we need to do together to really make a difference. Earlier today our chair at DuPont, our chair and CEO, Ellen Kullman, announced progress on our food security goals that we set in February of 2012. And the three goals that we set focus on increasing investment in agricultural education and resources for the smallholder farmers' livelihoods and for product innovation, of course. And not only do these

three goals represent important focus areas, but I think the idea of setting goals is important. Putting measurement where our mouth is, is also just as important.

I'm encouraged that, since DuPont announced those goals about a year and a half ago, other companies, governments and organizations have also set similar kinds of metrics around agriculture and food. Setting goals elevates the expectation, and I think we can say it increases the likelihood that we actually make progress and have success. As Ellen said earlier, what gets measured gets done.

So again I'm looking forward to discussing the goals of everybody here today on the panel, as well as finding ways that we can improve food security around the world.

Martina Newell-McGloughlin

And finally, Victor, your view from the Americas.

Victor Villalobos

Martina, as you heard, it's an honor for me to be here with you today. I am here representing the Inter-American Institute for Cooperation on Agriculture, IICA. This is an institute that was serving as a technical support to all member countries in India, Israel – 34-member countries, which is not easy to serve all these 34 different voices.

However, we have been doing that, and we provide technical cooperation to our member countries. And we have been doing that since the Secretary of Agriculture, Henry Wallace, founded IICA in 1942. So we have been working for 71 years, providing technical assistance to Latin America and Caribbean countries.

So I'm very pleased to share this forum with all of you, and I'm happy to have the opportunity to share some of the experiences of agriculture and how we do agriculture in such many different countries. So thank you very much.

PANEL DISCUSSION

Martina Newell-McGloughlin

And in the interest of fairness, I will start the questions in reverse order. Since you usually end up at the end of the alphabet, Victor, we'll get you to the top. You know, people often think, when they think of innovation, they're just thinking of America and the North, and they seldom see innovation occurring at all in South America or what we would call less-developed countries. But currently IICA works with what, 34 countries in the Americas, to provide technical support and capacity building to improve agriculture and food security. And why would you say, why do you think you would see Latin America as a critical region in terms of innovation for agriculture and the food sector?

Victor Villalobos

Thank you again, Martina. I would like to start saying that there is increasing perception that Latin America can play a more important role, not just to feed the entire region but also to play a more important role providing food for the rest of the world. And this perception is based on different aspects.

Some of them are related with the natural resources, I know, with of course with the access and availability of knowledge and technology. So perhaps part of the perception is related to natural resources.

So we'd like to start saying that in Latin America, particularly in South America, there is one of the few geographic areas that have the land to be able to expand the agriculture from here without damaging the forest. So there is this potential to expand the agriculture from here to there.

The second aspect related with this natural resources is that perhaps in between 20 to 30% of the surface water is available in that particular region, particularly in South America.

And the third part of that is that on the worst ten most diverse countries, five of them are in the Latin American countries, that is Brazil, Columbia, Ecuador, Peru and Mexico. So the genetic diversion, I would say the genes that eventually will be very important and useful for the adaptation of new crops and perhaps to deal with the specific disease and pests in the future are there. So this is certainly an important part of that perception.

But besides the importance of having this access to more arable land and water, there is certainly some need, some specific request that the region certainly raised. First, they have to raise and increase productivity. They have to improve efficiency and sustainable agriculture. So the region still has the lowest, I would say, productivity in comparison with other regions; so there is still a lot of room for increased productivity on the same amount of land.

And for that there are I think at least three important needs: Increasing the public and private investment in agriculture in the region. The second is so it will use a new, more productive and certainly more cleaner technologies and practices. And the third is the access to the state-of-the-art current knowledge and information. The perception that there is a lot of knowledge, there is a lot of information is very difficult to provide this information, this knowledge to the farmers. So there is a lot of information, but how we are able to provide it in an easy and a very simple way this information and this knowledge to the farmers – this is an area where we will see that is going to be very important in the near future.

Martina Newell-McGloughlin

Thank you, Victor. Jim, you were talking about the importance of investment in research and development to spur innovation. Now, being that I'm from the public sector, I of course am of the opinion that you can't be too prescriptive about where you're going to focus on innovation, that some of the most exciting stuff comes from left field. In biotech itself, some of the original tools came from this work that individuals were doing on primitive immune systems and bacteria; and I doubt if DuPont would have put a penny into that research in the 50s – am I right? But perhaps you could tell me how you would see the balance of the focus of the research in the public sector versus within the private sector.

Jim Borel

Thanks. First of all, yeah, as we all know, no one company, NGO or government can solve the challenge of food security alone. We're going to have to find ways to work together, and that means it's going to require continuing investment from companies like DuPont but also from governments and others.

Today private companies are the largest investors in ag research, and that's going to continue as long as there's an

economic incentive to encourage that. So companies large and small will continue to invest if they see an opportunity to create products that create value and give them an opportunity. At DuPont we're investing over \$3 million every day in research just aimed at agriculture and food, because we think there's an opportunity to create products that are good business opportunities and because they're aligned with our value around trying to make a difference in people's lives. So one thing is we do need to continue to maintain strong private investment through a good investment that encourages or provides the right kind of incentives.

But I mentioned that private organizations are the largest investors. If you look at the last 50 years or so, it's moved from roughly two thirds public and a third private to the reverse, and that's in my view a real concern. You mentioned a really important piece of it. There are a lot of really important types of research that are being done at universities and public centers that are unclear. They may be the next big opportunity, but they aren't certain enough for private companies who have shareholders that expect a return to be able to invest.

And so we need that. Who's going to be developing really the next frontier around agronomy and soil science? Who's going to be really doing the work on optimizing ag systems and food systems, things that might go beyond what an individual company could see the opportunity to do?

So first of all, we think public investment in research is very important in ag research. And we had an opportunity last night to honor Ethiopia. If I take a quick side trip, we launched the Global Food Security Index about a year ago. We had the second generation of ratings come out in the summer. And Ethiopia moved up 11 positions out of 107 countries, and so we had an opportunity to kind of highlight their achievement.

But one of the things... There were many factors and many activities that they've been... One of their activities has been focused on investing, along with the Millennium Development Goals, at least 10% of their investment in agriculture. And is it ground-breaking research? Not necessarily, but it's really important research and investment for the local market. So whether it's biotech,

the next version of biotech or whether it's really localizing things around the world and developing countries, public investment in research is really, really important.

I mentioned the idea of collaboration, and I might share one example – there are a number that we could pick from – that I think is exciting as we think about food security. This is a project that we've had underway for a number of years now, but it's around Africa-fortified sorghum. And so as a private company, we had technology that could help enhance a staple crop like sorghum and particularly in Western Africa that tends to be not very high in vitamins and some of the key micronutrients like zinc and others. So we have the technology that could make a difference in that, but the economic opportunity just wasn't there for us to be able to invest and get that to market in a way that we could ever make any money.

So we have a choice – put this on the shelf? Well, that didn't feel right. So, through collaboration with the Africa Harvest, some early help from the Bill and Melinda Gates Foundation and then more recently from the Howard Buffett Foundation and others on the continent, we've found a way to put science and technology and... along with funding and along with local people... and can actually get that science and products onto the market to make a difference.

And so oftentimes it's not just developing a product; it's oftentimes finding ways to get things in unconventional ways to really make a difference.

Martina Newell-McGloughlin

I guess to use a cliché, it takes a village to go from the scientists at the bench right to the hands of the people that really need to deal with, and you need the major networks along the way to get this to work.

Jim Borel

And it doesn't always come naturally, but it's worth the effort.

Martina Newell-McGloughlin

It's worth the effort to do it, yes. Now, Brett, most people, when they think of Monsanto, they think of biotechnology. And some years ago I remember giving a talk where I said I saw the future was the convergence of biotechnology with information technology, and clearly you've decided that's the direction to go too. So, yeah, I'd just love to hear the context that you have for deciding to acquire an IT

company and to see how that can support farmers of all scales in developing agriculture productivity.

Brett Begemann

I really do think this is going to be a turning point in agriculture and have a big influence on the future of where we go in helping farmers of all sizes. One of the things that I constantly hear – and I’ve had the, I call it, luxury (some would call it hard work) – I’ve had the luxury of walking hand in hand with farmers on six different continents of the world, talking about agriculture and talking about their farming operation and asking them what we can be doing to help.

And one of the things that I constantly hear – whether it’s the most sophisticated farmer in the United States or Latin America asking me to help utilize the yield information they’re getting off of their field, or whether it’s the smallest of the small in India or Africa asking for advice on how to make decisions better to grow their crop – what it comes down to is: How do we use information to make better decisions.

The typical farmer today, somewhere throughout growing a crop, makes 40 to 50 decisions on any field or any crop throughout a growing season. Now, those may be conscious decisions, they may be decisions that we just take for granted because it’s the way we’ve always done it and this is the way we’re going to continue to do it. but it’s about taking data and information and informing those decisions so that we make better decisions to raise a better crop. And if we can do that, we can increase the productivity and we can increase the sustainability of agriculture by oftentimes reducing the inputs in areas where we’re probably overutilizing, and increasing them in areas where we’re probably underutilizing them.

So that’s the concept behind using big data, if you will, to help transform decision-making in agriculture. And I’m really excited about how we can make this work, not only for large-scale agriculture but also small scale.

We started a few years ago... It started out as a pilot project, and now it’s a full-blown way of communicating to over 900,000 farmers every year in India, called Dr. DeKalb. And it’s all done electronically; it’s all done with cell phones. And it just simply informs them throughout an agronomic season of the way to help them increase the productivity.

We have a project we're working on for the last six years in Africa called WEMA, Water Efficient Maize for Africa, working with SIMET from Mexico, the Gates Foundation, and Monsanto and a host of local companies in Africa to develop those hybrids. And I'm really excited, because we get to sell the hybrids this year. And hopefully the biotechnology with better insect control and better drought tolerance will come shortly behind that. But it's using that kind of information system to communicate to them to help them make better decisions real time as they're growing the crop. And I do believe it will make a huge difference.

And I think I would be remiss if I didn't say – and Jim said it several times, and I think it's so true – we won't get there by ourselves. This is going to take partnerships and everybody working together. And through this decision we've made and the acquisition, we've tried to make it crystal clear from the very beginning, this isn't about how we do something without others; this is about how we do something with others. So we are immediately engaging in conversations with others about – let's think about this together, and how do we work on this together, so we build a system for all of us to utilize to better inform decisions that growers are making.

So I think it's an exciting time for agriculture to look at new ways of increasing productivity versus the ways we've looked at it before.

Martina Newell-McGloughlin

So you believe in bringing all technologies to bear to get to the end result. And actually to that point then, Rob, the end user is going to be the consumer. And every day I have to deal with issues of perception about the technologies that I work in. And being Irish, I really believe in telling stories, and clearly you also said this. So how do you view the best way to get the message across to the consumer and even to have a good notion of exactly what the consumer is looking for?

Rob Aukerman

I think we have to be very careful how we gauge consumer perceptions and opinion. Over the last five or six years, probably the number one thing that we've heard in our conversations with packers and processors and grocery retailers is – well, the consumer doesn't want your technology, or they don't want to utilize technology, they don't want to hear about that in terms of food production.

So it's important that we understand how they're drawing those conclusions.

We just learned recently a major grocery retailer in the Northeast primarily gauges their consumer perceptions on things based on their consumer complaint hotline. Now, I'm not saying that that's a bad source of information, but it certainly shouldn't be your only source of information - right? That's a generally pretty small segment, vocal segment, tends to be more activist oriented in a lot of cases. So that certainly is not a great methodology in and of itself or solely by itself.

So it's really important that we, when we're doing consumer surveys, also the methodology that we employ there... I started my career in Elanco in market research, so I have a little understanding of methodology. And what happens way too often when we're doing consumer surveys is we lead the witness, just like we most often do in political surveys. That's how we get some of the answers that we do on these political surveys.

So if we ask a consumer, "Are you concerned about artificial growth hormones in your milk?" what do you think the answer is going to be? If on the other hand you don't lead the witness and you used unaided questions and you ask, "What primary criteria do you base your buying decisions on in the dairy case or in the meat case or in the produce section?" then you get more of a flavor of what's top of mind with the consumer. And then if you back it up with actual spending data, what the consumer says and what the consumer does, myself included, all right, is often two different things. So if you back it up with spending data, then you really have a true picture.

We commissioned a couple of ag economists to compile research studies that were done with that type of methodology, looking at studies over the last twelve years. And the studies were, I think, 36 studies, 28 countries, and the results keep coming back the same. The more data we look at, the more data we compile, 95% of consumers - this is global now, this isn't just U.S. - base their buying decisions on affordability, taste and nutrition. The other factors fall a lot further down on the list in terms of how the food was raised, what technologies were employed to produce the food - they fall very, very low on the list.

So we present that data very regularly with retailers and others in the food chain when that objection is raised, and it's credible data because it's been compiled over ten years. So it's just really, really important that we do our consumer research in the right way, we get away from headlines and start monitoring what the social conversation is out there – we have the tools to do that today – that we stop looking at just consumer complaint lines and look at spending data, and that we get away from aided, leading the witness type of surveys and go to more unbiased and unaided questions in our surveys. And then we get a truer picture of what the consumer really wants.

Martina Newell-McGloughlin

And actually to that point, Victor, we often hear that in less-developed countries there is a clear suspicion about agricultural biotechnology. Yet, if we look at the most recent numbers that have come in from Clive James' work, of the 17 million farmers that grow biotech crops, a full 90%, over 16 million are smallholder farmers in less-developed countries. So clearly, you're doing an exceptional job in getting the story across. And I'm just wondering exactly the approach that you take and what's the Latin American...

Victor Villalobos

Thank you again. I would like to say that, from the Latin American – Caribbean perspective, there is a, I would say, very positive attitude for biotechnology in the brother sense. So biotechnology is being used in our region for many years for cloning. A superior... is being used to clean from virus and other diseases, is being used to... and the change material from one country to another to assist in plant breeding.

However, these perceptions change when we start talking about GM crops, and that's in Latin American, Caribbean countries, as well as what's happening in other regions in the world. There is a lot of discussion, a lot of controversy and discussion regarding the GM crops. And as you know, well, the South American in particular has been doing very tremendous progress in the cultivation of GM crops. But that's not happening in other parts of the region.

So in that respect perhaps I can divide the region in three different contiguities of countries regarding the GM crops particularly. I would say the first group could be the countries that are able, not just only to understand the

technology but also to develop; they have the capacity, they have the scientific groups to do genetic engineering, they do transformation, mainly for scientific purposes. But the technology is there, they have the capacity, they have the physical facilities. So in that group perhaps I would like to include Argentina, Brazil, Columbia and Mexico.

There is the second group that I will perhaps refer to the groups that grow and utilize the GM crops and not just only have a very important production but those are able to export those products abroad. So in this group we can include Argentina, Bolivia, Brazil, Paraguay, Uruguay and Mexico, and Mexico I would say in the lower portion and particularly mainly for cotton, GM cotton mainly.

And the third group is what perhaps I can call the anti-GM crops. And this is a group of countries that have the rights to decide that they will not use, so they are not using the technology. And here we can include Nicaragua, we can include Peru and Venezuela and Ecuador. Ecuador perhaps may change in their attitude against GM crops; perhaps soon we may hear that they are interested to learn more and eventually to be able to do some field trials and eventually to get into another group.

In the region we see there are some challenges and certainly there are some opportunities regarding the GM crops. There is the need, certainly, to have more information, and we as regional organizations are engaged in how we can change the perception of the public regarding the GMOs. And we are working along with the governments in these aspects.

Also we are working on... We identified the need to implement the biosafety... This is very important. Whether they will eventually make the decision to get into the biotechnology and to use GM crops, it's important to them to have the regulatory framework in place in order to make the proper decision. And for that, there are countries, as I mentioned, that have the scientific experience, they have the people that not just understand but also can advise, the policymakers in this important aspect. And in others there is a lack of this knowledge and understanding of the situation.

So in that respect our institute is assisting all member countries to develop their regulatory capacity on biosafety. And this is an important work that we are doing. We

recognize that the countries have the rights to decide how they will do, but certainly our responsibility is to provide the information based on science. And that's what we have been doing.

We also, at the request of the countries, we train the national staff. We assist to provide some information to legislators. We work with the journalists, we work with the teachers, we work with many different parts of the society in order for them to understand what the biotechnology can offer to agriculture in a sustainable way.

And we also work some regions at the regional level, and in that respect we provide a Regional Regulatory Commission, and that we recently managed to put together in this commission all the countries in Central America so we can discuss, along with all these countries, issues related to biotechnology and GM crops.

So finally, again there is at the end the right of the countries to decide how they will use and when.

Martina Newell-McGloughlin

And actually, Jim, getting back to one of the points that Victor made there about the regulatory environment, and you mentioned yourself about you don't want to see good stuff sitting on shelves in labs. Do you think the regulatory environment that exists at the moment is somewhat of a disincentive to go forward with some of the most, shall we say, interesting opportunities in biotech, especially in improved nutrition, etc.? Or do you find companies will tend to work around rather than having to deal with it?

Jim Borel

It's kind of tough to work around it, so I don't know if that's a real option. First of all, sound regulatory systems are really important. Why? Because they can help assure the citizens that things are appropriate in whatever the regulatory scheme is trying to... We actually are very supportive of good, regulatory systems. We think it's important to be based on sound science. It gets kind of not very helpful when it's based on political types of things.

So science-based, sound science-based regulatory frameworks are good. If we could have everything we wanted, it would not only be science-based but would be harmonized around the world, because that creates a lot of extra impediments just because things get slowed down.

Does it create an impediment? It creates an obstacle, it creates an extra barrier. Maybe just to put some numbers around it, this isn't just the regulatory piece. But to discover and develop a new trait for an agricultural crop, it's probably going to take you ten years; it's probably going to cost you \$150 or \$200 million. To discover and develop a new crop protection product, it's going to take you seven to ten years; it's going to cost you about \$150 million. So the timelines are long, the hurdles are big. And are reasonable portion of that timeline, certainly not a lot, a reasonable portion is for regulatory. But if it's science-based and it's efficient, that's okay. But we would just try to urge countries everywhere to have a good one that's science-based and appropriate.

And so companies will continue to look for ways to get things developed if they possibly can. That's an appropriate cost if it's well done. It's a real impediment..., and I can give you an example. We have an exciting technology called Plenish - it's a soybean and oil that's 75% ___ acid, much healthier oil profile, much better performance in frying applications, more stable, a lot of really good things. It would extend shelf life, or life in the fryer for fried, fast food restaurants - many, many benefits. It's approved around the world for cultivation here and for importation in 96% of the importing markets, but not in the European Union yet.

And you say how long can one system stand in the way of something which would be the first biotech product to have true consumer benefit? And so, yeah, it's a frustration certainly, but we just continue to find ways to work with it, through it. And unfortunately there's not a way to work around it, but we'll continue to try to improve it wherever we can.

Martina Newell-McGloughlin

...I meant taking other approaches like marker system selections or maybe going forward with... where it would be almost impossible to determine whether it will be almost impossible to determine whether it was transgenic approaches that were used. And actually continuing on this notion, especially with respect to consumer choice, Brett, you I know have said that, when it comes to the choice of whether or not to use biotechnology, that this should be the choice of the user, the consumer. So I'm just wondering exactly why do you think this is an important concept?

Brett Begemann

Well, I think, and several of the panel members have talked about this – I think there's an interesting phenomenon that's going on. If I go back to when I started in agriculture, which is when I started my life, since that's all I've ever done is be involved in agriculture, there were a lot more people involved in agriculture and, I can say, informed about agriculture, or they were a generation removed from agriculture.

Today there's very few of us involved in agriculture, particularly in the developed world. In the developing world there's still the masses are involved in agriculture. But what's interesting to me is there are far more consumers interested in agriculture today than there was when we started out in agriculture 35, 40 years ago. And they have less information than they had then about what we're doing in production agriculture. So how do we close the gap?

To me when you start talking about labeling regimes, it's jumping really fast to a solution that I'm not sure really informs anybody at all. And oftentimes the ones that we see are so broken up and so inconsistent I just call them, they're just really bad policy. It's not something anyone would want to live with going forwards, because it doesn't really inform the consumer that wants to know. And I go back to – there has to be a simpler way, sitting down together, having a new conversation about this and figuring out what is it that the consider wants to know. Of course, they have a right to know what's in their food. I'm not going to stand here and tell you they don't. Sure, they do. And we should be able to find a way to provide them that information. Yet, at the same time it should not be provided in a way that creates false impressions about what it is that they're learning.

So it's that balancing act of figuring that out together. And I often say, you know, we label everything we sell. It just happens that we sell it to farmers. And, yes, they're consumers, but they're that small group of consumers. This is a whole supply chain that's involved in this, and it's far more complicated and far more complex than most people understand – not because they're not wise people, not because they're not intelligent, it's because they just haven't been involved in it, and it's a complex system.

But there has to be a way that we can sit down and figure out a system together that works better than what I say we have today that doesn't really inform but creates a lot of conflict. When I sit back and look at it, there's so much that we need to get done in agriculture. It drives me crazy that we talk about it like as if we're all well fed. Well, there's 900 million people that go to bed hungry every night; 600 million of them are farmers. That doesn't make sense to me in the world that we live in today. And then we're having debates about things where we've been utilizing these technologies for 15 or 20 years, and they're working fine. And can I call it the wealthiest people in the world have been consuming them and they've been fine; virtually all over the world soybean oil has been comingled. And yet we forget about the 900 million that are still hungry.

Let's go solve their problems now so that we can worry about the next 2 billion people that are going to join us in the next 30 years, and we can feed them as well. So that when we get to 2050 and we have 9 billion people, we don't have 2 billion that are still hungry, we're feeding them all. And those are big issues that are going to take a lot of time. And I feel like sometimes we're wasting time on issues that we could resolve and move on, not that aren't important, just that we could resolve and move on.

Martina Newell-McGloughlin

That gives us a little bit of the arrogance of the affluent where we think we have all the answers, but, yeah, we don't really know the questions that are being asked in some areas. And actually to that point before I throw it open to the audience, we've been talking about crop agriculture; and clearly, as certain societies evolve or move into the middle classes, there's a real demand for animal protein. So I'm just wondering where innovation is as far as you can see in the animal agriculture side.

Rob Aukerman

First of all, I'd start by defining innovation from our perspective, and that would be anything that improves the efficiency or productivity of animal protein production with the assumed sparing of natural resources that's implied with that. And that could be anything - management practices, genetics, product, information, knowledge, anything. I would define innovation that way.

Now, why is it important in the protein sector or the animal protein sector just like it is in the plant sector? Well, it's already been said - we're growing from seven to nine

billion, but even more importantly in this equation is the three billion that will be entering the middle class in that same time period. So the middle class will grow from about 1.8 billion today globally to 4.8 billion by the year 2050.

And the very first thing that people do when they have more disposable income above and beyond their very basic needs for subsistence is to add animal-source protein to their diets. So there's going to be a huge need for animal-source protein going forward. And why is that important? Well, as much as I enjoy my plant-source nutrients, I have to say that it is the animal-source protein that really adds quality to my dining table, if you will.

And there has been a very famous study cited several times today, done in Kenya by the University of Nairobi in conjunction with UCLA and UC Davis, that shows that, when children's diets are supplemented with animal-source protein, their test scores, their cognitive function measured by their test scores increase dramatically, their lean body mass increases substantially, their leadership behaviors improve. And the conclusion of the researchers was that it actually, if you're going to boil it all down, helps children reach their full potential as human beings. So it is important.

And we do have a gap today. We already have a gap. So it's not just about the population and the middle class growing. We already have a gap today. Take the milk gap. We've doubled milk production in the last 50 years, and we have 14% less milk per person today than we did 50 years ago. So right in that one segment of animal protein production we have a gap. So innovation in the animal protein sector is every bit as important as it is in the plant sector, for those reasons.

Martina Newell-McGloughlin

We just have to... We're still awaiting the first approved animal biotech livestock products to be approved. The fish have yet to get approval. So with that I'm going to actually open the questions to the audience. We have time for about one or two questions. There's a roving mic, I believe around; we have a mic at the very center there. Any questions? ... And while that gentleman is starting, if you have any more questions, if you could line up behind him, because we just have about five minutes left.

Question:

Intensified production, which is what we want, involves risks, and these risks are degradation through compaction of soil, induced erosion of soil, leaching of nutrients, impaired aeration, loss of organic matter, all together various other risks. And I would like the panel to address the necessity and ways of implementing sustainability of production rather than risking the degradation that I mentioned.

Martina Newell-McGloughlin

Sustainable production – anyone like to... Jim Borel.

Jim Borel

First of all, sustainability means a lot of different things to a lot of folks, but you've done a great job of outlining the aspects that are really, really important. The solutions to those are not going to be one thing or another, but there is tremendous effort going on already in all of those areas.

For example, work that's going on... Brett mentioned the idea of water-efficient maize, drought tolerance, etc., and work on nutrient-use efficiency – how do you get a corn plant to make much more use of the nitrogen so that more of it goes into crop and less of it goes into the river. So all the things we can do in the plant and around the plant are important, and companies are working hard to drive that forward.

There's continuing work in collaboration with folks like the Nature Conservancy, and I know Secretary Northey was talking earlier about some projects Iowa has, etc., around how do you have planting systems, whether it's cover crops or other things, that can be part of the production system that aren't typical of what's done today, but take it to a new level.

And if you just roll back the clock 20 or so years ago, the amount of conservation or in fact no-tillage today in at least most of the U.S. production is dramatically different than it used to be. So I think production systems enabled by equipment technology and plant technology and other things around the surrounding system are collectively going to be what helps us find a way to sustainably produce the food that we're going to need.

I definitely think it's possible for us to do that. It won't happen automatically, but I think if we do what we're saying here today, if we work tile drainage in new and different ways and continue to make the investments, both public and private, I think we can address it.

You think about sustainability in a partnership with the university we did some work on cellulosic ethanol and taking stover off the field, but how much can you take off and not have that be a problem – right? So we’re excited about the fuel coming from, not a grain crop, but from a waste, but some work with the university helped us figure out how much can you take off and make sure that you’re maintaining soil health and all the other aspects that are important. So we need to work together, but we can do this.

Martina Newell-McGloughlin

We just have two minutes left. I will maybe ask each person to take 30 seconds to wrap up with your notion of where the future is. Because I remember ten years ago I was on a panel with Norman Borlaug, and afterwards he came up to me and he says, “I wish I was young again so that I could work with all the exciting technologies that are coming down the line.” So I’ll just start with Victor and... 30 seconds.

Victor Villalobos

Well, we like to say that in our region we are very pleased that agriculture is in the state it is, because there is a tremendous expectation for the farmers and for the people that are involved in agriculture. So an institution like the one that I represent shares that optimism on what agriculture will do for not just only the large for the uses but the small, middle-sized... in our region. So I would like to share these feelings that this is the proper time for agriculture, and we should advantage of the situation.

Rob Aukerman

We talked about a lot of exciting technologies and the importance of continued investment in technological innovation. One thing that wasn’t the focus of the panel but also important is – how do you get information that’s based on that, out to the users? How do you get know-how out locally? And we just made an announcement at the... global initiative recently, along with a number of others, about a concept called “Food University,” where a collaboration on the African Continent to find ways to get training and information out to farmers and others in a way that can really move them to the next level. And so it’s not just about the technology and the products, it’s also about the information and finding innovative ways to deliver that to the people who really need it.

Brett Begemann

So I saw that we only have a short time, so I’ll be really quick. I want to steal a line from of my previous panel

colleagues sitting up here in the front, that agriculture's not sexy. Well, I think in the spirit of the Borlaug legacy, it's worthwhile to think about the next century of Borlaug and declare at this World Food Prize that agriculture is sexy. Agriculture is utilizing the most advanced science in the world. It is utilizing the most advanced technology in the world. It's utilizing the most advanced engineering in the world. And it's utilizing the most advanced mathematics in the world. And I can't imagine a single industry anywhere in the world that's more exciting than agriculture is today. And I hope that all of us leave the World Food Prize and do as Dr. Borlaug did everywhere he went, is share that with the young people around the world and in particular the women around the world who still produce a vast majority of food in many of the developing markets, because agriculture is sexy, and we need to get that message out there so that we get people involved in agriculture.

Martina Newell-McGloughlin

We need a new twitter hashtag - Agriculture is sexy. And the last word.

Jim Borel

I don't think I could say it any better. We are in this business because we are passionate about what we do and about feeding people, and we just have to do a better job of communicating the why behind what we do, so we can have the social license to talk about the how's and the what's and shape the conversation with the consumer, enter into that dialog with all the tools that we have available to us today.

Martina Newell-McGloughlin

I can't put it any better than to say the fact that agriculture is the single-most important activity that humans are involved in today, because feeding the world and making food accessible and affordable and nutritious is the most important thing that we're facing. And let's start that hashtag - Agriculture is sexy. And with that, I'll close this panel. Thank you all, gentlemen.