**2013 THE "BORLAUG DIALOGUE"**
**October 18, 2013 – 11:00 a.m.**
**Panel:** *Greg Jaffe, Moderator*

***PANEL:***

## STRAIGHT TALK ON GMOS: FACTS, FICTION AND FOOD SECURITY

***Introduction:***

**Ambassador Kenneth M. Quinn**
President - World Food Prize Foundation

Thank you. That's so important. This is called the Borlaug Dialogue, and so to have a dialogue you have to have people speaking on both sides. Yesterday at lunch I pledged to Cardinal Turkson the Borlaug Dialogue will always be a way of bringing different views and I'm so pleased that we're to do that and have a panel like this.

So now on to – this is a three-course morning, and I don't know if this is dessert, but we're going to have our final panel on the straight talk about biotech and GMOs. And Greg Jaffe is here to lead this discussion. So, please, please if you want to talk, please go outside, please be courteous to the panelists here. Thank you, thank you. There's a lot to say, a lot to hear. And you have your full time.

So, thank you, Greg, for doing this. And with your background, I think you're known as the fairest and most balanced person on this subject. So we're so thrilled to have Dr. Glover and Mark Lynas here and who made such exceptional travel arrangements to be here – just want to say a special word of thank you to both of you for doing that. So over to you.

*PANEL:*

## STRAIGHT TALK ON GMOS: FACTS, FICTION AND FOOD SECURITY

*Panel Moderator:*

**Greg Jaffe**
Biotechnology Project Director, Center For Science In The Public Interest

*Panel Members:*

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| **Sir Brian Heap** | Professor, Biosciences for Farming in Africa |
| **Mark Lynas** | Author and Environmental Campaigner |
| **Anne Glover** | Chief Scientific Adviser to the President, European Commission |
| **Gilbert arap Bor** | Smallholder Farmer and Lecturer, Catholic University of Eastern Africa's Eldoret Campus (Gaba) |

**Greg Jaffe**

Thank you, Ambassador Quinn, and good morning to everybody there. It's the second to last session of this Borlaug Dialogue, and it's so great to see so many people in the audience. The title of this session is "Straight Talk on GMOs: Fact, Fiction and Food Security." This is a topic that's near and dear to my heart. I wrote a paper or a pamphlet about this about a year ago on the issue of straight talk on genetically engineered foods to educate policymakers, media, interested stakeholders, and the public, to try to get through all the facts that are out there. And hopefully this panel will do some of the same.

I hope I'm not telling anybody out there that the global debate over the safety, advocacy and adoption of GMO crops has become, to say the least, a polarizing discussion. The rhetoric is heated, the viewpoints by proponents and opponents are strongly held. However, I would argue that the vast majority of the public in both developed and developing countries knows little about genetic engineering, but at times they are overwhelmed and bombarded with lots of information.

The real issue for many of them is – how do they figure out what is fact and what is fiction. So we can't cover all of the issues around this topic today, but we're going to hope to get to a few of them and we have a very distinguished panel of experts to do that. I'm going to very briefly introduce them. Their more detailed bios are both in the program that you got as well as on the website.

So next to me we have Anne Glover, who is the Chief Scientist to the President of the European Commission. Next to her we have Sir Brian Heap, a professor from the United Kingdom who also runs an organization called Biosciences for Farming in Africa. Next to him we have Gilbert Bor, who is a Kenyan farmer as well as a lecturer at Catholic University of Eastern Africa. And finally at the far end we have Mark Lynas, an author on books on climate change and an environmental campaigner.

To get the session started, I'm going to ask each of the panelists to just give a very short two- or three-minute opening statement. Then we'll have some moderated discussion, and I'm going to leave some time at the end for some questions. So think about questions as you come through. We'll leave some time for a few people to ask some questions at the end. So I'll turn to Anne and ask you to get started for us.

**Anne Glover**

Okay, Greg. Thank you very much indeed. I'm going to be mindful of a comment that was made on a previous panel, and I'm going to try to reduce the amount of blah-blah, so that we can focus on what we can do-do – and I realize what I just said.

So in terms of all the food that we eat – and for me this is very important for us to realize – almost all the food we eat is genetically modified. We've been genetically modifying food since we first identified wild species of plant and we tried select for conditions or components or properties of the plant that we wanted. So we all eat genetically modified food.

We have been doing this selection by either artificial hybridization or using genetic or radioactive bombardment of the plant species in order to introduce mutations and to try and select through a trial and error process for what we want. Genetic modification, or genetic engineering, as we understand in the terms of GMOs, GMOs is one such method. But it's actually rather a forensic method, because genetic modification or genetic engineering that we're discussing on this panel takes one or a few genes and introduces them in known locations into a plant in order to do something that we wish, a property that we want.

It's one of the most – and I'm talking about the facts now – it's one of the most heavily regulated things that we do in terms of any food product.

We are also very careful on testing. So if I give you one example of BT cotton, BT cotton was first described in 1986, but it wasn't until 1996, ten years later, that the first field trial was done. So there is a lot of precaution that has underpinned this technology. So some of the facts.

The fiction – I really don't want to talk too much about the fiction, because it would take me forever to be able to comment upon all the claims and statements that have been made around genetically modified crops which are not based on evidence – that they cause cancer, that they destroy the environment, that they are unhealthy for animals. I'm not against people being skeptical and people questioning, but it is not proper for people to question using tactics that are to my mind not open; they're not transparent, and most of all they are not based on evidence.

The last comment that I would want to make is on the food security aspect of this debate. And there is an enormous challenge – we've heard that. I think that to be able to meet this challenge, there are a whole number of different aspects. But science has a role to play, along with the politics, economics, all the other aspects. What science can do is to offer technologies and offer safe technologies as well – well-tested, well-tried and evidence-based. And I think that it's important to be able to address world food security. We need the best science possible, and that means using every tool in the toolbox – not one, not rejecting any, but let's use all the tools.

So I'll leave it there. Thank you, Greg.

**Greg Jaffe**

Thank you, Anne. Moving on to Brian.

**Sir Brian Heap**

Yes, thank you, Greg, and thank you so much for the invitation to be here. It's a great pleasure and a great experience.

I want to just introduce the topic of Africa again. Somebody said to me over coffee that there's been a lot of emphasis on Africa in this meeting – and of course there has, and that's quite right that there should be. The book by Rob Paarlberg drew attention to the idea that perhaps Africa has been starved by technology. But I think I want to draw attention to the fact that we were asked about three years ago about the possibility of starting a new program on behalf of the John Templeton Foundation, which is based in the Philippines, to look at the question – Can GM crops feed the world? And I said, no, I wouldn't do a project on that, but I would be interested in doing a project on – Can GM crops help to feed the world? And after a long period of discussion, eventually this has happened.

This is in progress at the moment in Nigeria, in Ghana, in Tanzania and also in Uganda. The emphasis is on smallholder farmers, and it's also the emphasis, as Dr. Jack Templeton wanted it to be placed, on the idea of raising smallholder farmers out of the poverty gap and also to look at the issue of food security, which I prefer to call "nutrition security," as was hinted at in the previous session.

We have eight journalists with us here at this meeting, and thank you very much for the opportunity to invite them here, and I know they are having a great time. So what we're doing is to publish a book called *Insights.* I hope you've all got one. If you haven't got it, then there are a few left, and please help yourselves. They're freely available, the purpose of which is short pieces written primarily by African scientists who are doing great work in the continent of Africa in this particular area.

Secondly, to have a program of training and information provision for the media of all types in these African countries. And so far we have 160 journalists who have been through the program, introducing them to basic genetics and also to the principles of plant breeding, whereas conventional plant breeding and also biotechnology.

And then the third area is to look at how we might consider developing innovation farms that introduce smallholder farmers to the new opportunities that exist and particularly through the development of an online learning platform, which can be used on a tablet, by extension offices, or by others who are working with NGOs who go into the field and show the farmer what can be done.

Very briefly, the secondary way in which I am involved is with the European Academy of Science Advisory Council, which is seeking to give scientific advice to policymakers, and supporting people like Anne, who is the chief scientific advisor to the President of the European Commission, and providing foundational information about science that will help policymakers to design policies which are based on evidence. We recently published a key document, which is called *Planting the Future,* which is looking at the whole range of the impact of biotechnology on the food production and throughout worldwide. And we're just about to publish a document on extreme weather events because of our particular focus on climate change. Thank you.

**Greg Jaffe**

Thanks, Brian. Gilbert, can you give us a little bit of a background on what your thoughts are on this topic?

**Gilbert arap Bor**

I want to thank the organizers of this symposium for inviting me to come all the way from Africa and to speak about our experiences on issues of food security and biotechnology.

Africa, as has been said, is the next frontier. Africa is the continent that has the worst situation in terms of food insecurity. And when we look to the future and the debate about the seven billion people on earth moving on to nine billion in the next 37 years, Africa is projected to have one billion of that number. And therefore the discussion and the conversations that are going to take place are about how to get food security into Africa. And biotechnology, as has been said, is one of the tools that is going to be used to do that.

But there are other serious situations in Africa which must be taken care of. One of them is about soil fertilization. African farmers use the least amount of fertilizer for their crops. Other technologies which must come to Africa include agricultural mechanization. Agriculture in Africa is labor-intensive. We need to improve the issue of mechanization in Africa in order to advance productivity of the land and produce more food for the people in Africa.

Africa does not use irrigation, only very few places like maybe Egypt and a few other countries; but most of Africa does not use irrigation. And that has to be tapped in order to advance the issue of food security.

The question of smallholder farmers is a major issue. Over 80% of the food consumed in Africa is produced in smallholders who have no access to technology, they have little knowledge about production, and this is the area that we will need to focus by organizing African smallholder farmers into cooperatives so that they can have access to the economies of scale in terms of machinery, in terms of capacity building and knowledge transfer, and use of fertilizers and other inputs.

Now, my country, Kenya, I am proud that in this symposium a Kenyan scientist was honored for her work in application of science, Dr. Mutegi, who is here with us today. Kenya is also on focus because recently the government banned imports of GM foods. I am happy to inform you today that on 11 October the Cabinet Secretary for Health issued a notice. He formed a taskforce of scientists and academicians to advice the government on the way forward. That taskforce studied its work and is expected to report back to the government in three months to, as I said, advise the government on the way forward. And I expect that that taskforce will advise correctly that the government should remove the ban on imports of GM foods and move us still farther and advise the government that we should allow the introduction and use of biotech seeds by Kenyan farmers.

Thank you.

**Greg Jaffe**

Thank you, Gilbert. And finally, Mark, what are your thoughts?

**Mark Lynas**

Thanks, Greg, and thanks to the organizers for inviting me to be here today. It is indeed an honor. I would like to start by paying tribute to the Selection Committee, the judges' panel who had the courage to cut through the controversy on GMOs and to honor three of the pioneers of recombinant DNA technology. This is an award which is richly deserved by them. And I hope that, as a result of this and as a result of the leadership which is being shown by giving them the World Food Prize, we can begin to cut through some of the nonsense which has been talked about this technology where it can begin to be, rather than being the plant breeding method that dare not speak its name, it can take its rightful place in the toolbox along with all the others.

The reality of the situation that we have today is that the techniques that these three pioneers developed are banned in the majority of the world. Most of the world's farmers are prohibited from having access to seeds which have been developed using these techniques, even though they are safer, more precise and potentially way more useful than the conventional plant-breeding techniques which have been used for so long. I call it prohibition based on superstition. As Anne said, there's no evidence underlying just about every allegation which is made against genetically modified organisms.

And there's a false balance to this whole debate. I have never met a molecular biologist who goes out in the night and uproots organic crops. Right? What is happening is that one side of this debate is trying to prohibit the other from being able to use an important plant breeding mechanism.

Now, I am all for diversity. Right? I am all for agroecology. I'm all for organic farming. But at the same time if some farmers want to use BT crops, which are resistant to pests, and reduce

their use of pesticides that way, then they should have the option to do that. It should not be banned because of prohibitions handed down from on high.

And the result is, I think, worse in developing countries. You've heard a perspective from Kenya where, because the public health minister was bamboozled by this one utterly fraudulent study on rats by Professor Séralini, and we have a situation where the entire country has had technology frozen in time. There's a chilling effect which has destroyed the potential for BT cotton and for many of the important crops involving cassava, banana and some of the staple food products which are seriously threatened by new diseases.

When I was in Tanzania very recently, I was meeting farmers whose cassava crops are dying in the fields because they're being affected by brown streak virus, for example. And just the previous day I visited a field trial where GMO virus-resistant cassava plants are being grown. They were the healthiest cassava plants I saw in my whole time in Africa.

If any of the scientists had taken cuttings and propagated them and had honored Borlaug's message of taking it to the farmer, they would be doing ten years in jail. Why? Is there anything unsafe about this cassava? Of course, there isn't. It's been extensively tested, but it's being prohibited because of regulatory mechanisms which are based on superstition – and that has got to change.

**PANEL DISCUSSION**

Greg Jaffe Well, thank you, Mark. As a follow up, when you were someone who argued against genetic engineering for many, many years and worked with people who were against that. And I guess I would like you to sort of step back and talk about… I understand you think a lot of those arguments don't have merit, but they're obviously… What do you think are the most legitimate arguments made by opponents of genetic engineering? And then with that, what do you think are the best facts to counter those arguments?

Mark Lynas I think the important thing to do is to recognize that there is a confusion between techniques for breeding plants and new crops and entire farming systems. So there is an assumption that the use of genetic modification or recombinant DNA automatically means large-scale monoculture with big corporations. That is an assumption which does not need to be founded – right? We can have GMOs produced in the public sector without patents which are offered free of charge to smallholder farmers who are growing them agroecologically. These things are not in flat contradiction, which is the way the debate is so often heard. So I have a lot of sympathy with the concerns of people who say that the seed companies have too much monopoly power. I think absolutely we need more competition in the seed sector.

But this means that at all levels of the chain we need to value diversity. It doesn't mean to say we need to squeeze out a whole technology because of certain concerns here. So as an environmentalist, and one of my challenges to the

industry is that I would like to see a reduction in agrochemicals, that being taken forward by the use of biotechnology. Because in some ways, if you can improve the genetics of the crops, you don't need to use insecticides, you don't need to use other crop protection chemicals. That's for me the way forward, as somebody who's concerned about protection of the environment. So in no way do I see the GMOs and the environment being in conflict. And that realization to me came about through just the sheer process of having better understanding, which by the way happened because I was researching climate change and I was writing books on climate change. And I realize that I didn't understand molecular biology; I didn't have any basic information. It was all coming from activist groups, because you sort of live in a bit of a bubble.

So I think we need to have much better information. I think it's really incumbent on the scientific community, particularly scientists who work in public sector universities and who are clearly independent, to go out there and make the case to the general public.

Greg Jaffe I think, Anne, you also brought up similar to what Mark has been saying, that there really is sort of a disconnect between what consumers know about where their food comes from and how it's made. And since the biotech company Syngenta a couple months ago released some data. They had done an online survey of 13 countries throughout the world, and they described it also as a disconnect.

And I think their data was interesting, and I'll talk about it here. It said that they found a majority of the respondents in all of the 13 countries surveyed – and these were from all five, all the major continents. A majority of them were open to the latest technologies, that when you talked about it generally, when you said just technology, they were very open to the use of technology to help produce more food. And that included countries like France and Germany, even countries in the EU. Yet, when you asked the specifically about, did they support the use of pesticides, fertilizers and GM seeds, a majority of consumers in those countries of the online survey said no, they actually thought not to use those. And the one exception was Indonesia. The Indonesians said they thought they could use more of those. But all the other countries – France, Germany, South Africa, Kenya, a majority of people said no.

So that suggests this disconnect, and I think that goes to your opening remarks and some of Mark's. And I guess the question is – How do we change that disconnect? What are your thoughts on that?

Anne Glover Okay. This is a really tricky issue, and it's something, since I started my position at the European Commission at the beginning of 2012, I have been trying to have an open dialog about this. But what I and others like me have to realize is that, if there have been 15 or 20 years and I know it's a bit of an emotive term, but there has been a kind of brainwashing where many people have been encouraged to think of GM food as very dangerous. As I mentioned before, there have been a number of assertions for which no evidence is provided around the technology.

And if you're like the casual observer, if you're living in Europe and you don't have the specter of hunger directly in front of you and also in North America. And we live in a state of relative luxury. We have the luxury to say I don't like the sound of that, and so I'm not going to support it; and indeed I'm going to lobby for others to prevent the use of this technology.

And I say, and it is important we have the luxury to do that. But actually do we have, if you like, the moral imperative? Or do we have an understanding of what the ethical implications are? If we in Europe make these lofty statements that we want to see – and I've heard it said – organic farming feeding the world, I can't see the evidence that would persuade me that is even remotely a possibility.

So we do need to use lots of different options and technologies. And I think we have an obligation, particularly in Europe with half a billion people there. We have an obligation to understand the implications the policies that we make have on others. They may well be unintended consequences, but nevertheless they are consequences. And we just heard from Gilbert that Kenya has banned the imported GM.

Mark mentioned brown streak virus in cassava. So cassava is a staple food crop. It's also a plant species with very limited genetic biodiversity in its gene pool. And so to be able to deliver a virus-free crop, there almost is no other possibility other than GM for that particular crop. And do we just say that, actually no, with half a billion people depending upon cassava for their calorie intake? And if we say no, what happens to that half a billion people?

So for me we have to understand the ethical implications of policies that we generate. And how we persuade people, actually, I wish I could say what the answer was. I don't know, but we must continue to communicate. If we don't do that, I think we are sadly on our way to losing a battle against global food security.

Greg Jaffe You gave me a good segue, Anne, to Brian. Brian, I know that you have some background in some of these ethical issues that Anne brought up, one of these ethical issues. But I think similarly, when you're talking about the debate over genetically engineered foods out there, a lot of scientists want to think this is all about the science. But let's just assume that everybody could agree on the science, that everybody could agree that the current crops are safe out there and the food made from those crops are safe. I still think there would be a lot of opposition here. And it gets to other factors – socioeconomic factors, ethical factors. And maybe, Brian, you might talk about what you think those other factors are, and again how do you deal with those in this debate that, when you get past the science, even if we could agree on the science, this issue would not go away.

Sir Brian Heap Yes, thank you. I think you touched on a key issue here. And just going back to what Mark said, who commented that it's very important that scientists communicate what they're doing. Of course, scientists always get the blame, and

I would say that, wouldn't I, because I'm a scientist. But let me just remind you that in fact the scientists in the Royal Society, the UK's leading academy of science, started the dialog and the conversation, many of these scientific issues in the 1970s and the 1980s, with a very strong drive to look at the question of the public understanding of science. Of course, that debate has moved on. It's now moved on to the scientific understanding of the public. And it's moved on even beyond that point, of course, which we might come back to later.

But on this question of the ethical issues, yes, there is huge evidence that the products of biotechnology are safe. And just recently there's been a paper published from the University of Perugia – 1,738 papers were reviewed to see what the consensus position was on safety. And it was demonstrated that these papers were overwhelmingly pointing to the fact that this is safe for human consumption.

However, and the European Union, for example, has spent 200 million euros looking at this particular issue. But of course there are the other aspects to do with safety, which is the question of safety to the environment.

And so the four ethical principles that I think we have to touch on here are: Is it safe? These are the questions that we are faced with by people who ask questions about the technology. Is it safe? Is it natural? And of course we now know from the study of the genome, and particularly the plant genomes, that the brilliant work that has been done by plant breeders over the last decades, which has actually prevented us falling into a huge world famine crisis, this work, which involved crossing and moving on to the development of new varieties, that these genomes now have a very different composition than they had at their beginning. And this, as Anne indicated, has been going on for years.

Then the third question is – is it fair? Of course, this is a complicated question, which was touched on by the Cardinal yesterday very helpfully, I thought, in which we look at the question – Is it helpful? Is it fair to industry, which makes the investment? Is it fair to the public, who have invested through the public sector? Is it fair to the farmer? – the question of whether he can gain access to the products of this technology.

These are questions that have to be addressed and looked at seriously these days, which is the fourth hurdle, of course, which caused the huge problem in Europe. And many people have asked me already during this meeting – Why is Europe so different? And if we just go back 20 years or so, may I just remind you that there was the first biotechnology product that was brought into Europe, which was bovine somatotropin, the purpose of which was to increase milk yield in cattle. But we have milk lakes in Europe. Why would Europe want to increase milk production in dairy cattle? And so around that time then the GM crop issue came in, but at that time we had grain mountains because subsidies and the government agricultural policy had resulted in excess quantities of material.

So the fourth hurdle is the one which I think becomes critical – Is it needed? And Anne has already referred to the fact that we have the luxury in Europe and being able to say that we can buy food from wherever we wish to go. Now, that may not always be the case, and I think the situation in Europe is changing; because now there is a recognition that food security and nutritional security has become such a big international question that we have to face up to.

Greg Jaffe So, Gilbert, you're in Africa, and obviously a lot of this meeting has been talking about Africa and how we can alleviate hunger and poverty in Africa. And obviously one thing that is being explored in Kenya at least is the idea of growing GM crops, and you're a farmer out there. But I'm curious, and I know that you would support growing those and would want to grow those. But I'm curious – what are the misconceptions that you hear from the public, from citizens, from other Kenyans out there about genetic engineering. Brian has talked a little bit about that European perspective, but I'm curious what your perspective is of what do you hear are misconceptions? And then how do you go about trying to set the record straight?

Gilbert Bor Now, before I go to that, I want to just say something about the ethics that has just been mentioned and to refer to a conversation with a bishop two years ago who was asked about the church's opinion on GM food. And he said, "If the church is between death because of hunger, and GM foods, I would go for GM foods."

So the church supports GM foods in Kenya. The government, the politicians support it, but we have the lobbyists who bandy around myths that are not true. And one of the major ones is that this is the productive multinationals who want to control the seed industry and to kill our seed system. And Mark just referred to that, that competition by seed companies will be there. We have our own seed-producing companies in Kenya and other countries. They have the capacity to compete.

It is not true that Monsanto, for example, wants to dominate the seed system in Africa, because many of you who are scientists here know that, in order to produce a good crop, you do not use saved seeds. And many farmers no longer use saved seeds. Since 1965, when I was a young boy growing up, I've know that we buy, farmers buy seeds from the seed companies. Every year we buy new seeds for the next season. So the myth about multinationals controlling the seed industry should not be the case.

Other myths are that, because we sell many of our products from Africa to Europe, for example, tea, coffee and flowers, roses and so on, Europe will refuse to buy our products if we go GM. And I say that is politics, and this is competition between political science and life sciences, and this is an assignment for scientists to communicate to send out awareness to the policymakers, to the farmers, to the consumers, that all that is not true. In any case, trade between African countries is greater than between African countries and Europe. African countries should open the barriers to trade among themselves so that the

question of where do we sell our produce does not arise; because that trade can be done within Africa. And eventually Europe will see the sense and, we heard, they're coming up, they're seeing sense. And they should soon remove the barriers they have put against biotechnology.

And I would like to invite all the scientists who are here to take up the challenge that I mentioned, that the government of Kenya has set up a taskforce to advise it on the way forward. I will provide the notification so that it shall be put on the website of the World Food Prize so that you can respond and give your views to that taskforce, so that in the next three months we should see the Kenyan government changing its position.

And you know what? What happens in Kenya is what happens in Africa. What Kenyans do or the Kenyans' government does will be emulated by other African countries. So when you get Kenya doing the right things, then you get Africa doing the right things.

Thank you.

Greg Jaffe Thank you, Gilbert. I think that's great that they're doing that taskforce, although I do a fair amount of work in Africa, and I guess it's better to do that now; it's better late than never. But the reality is, I think a lot of people in the room would like to get to the situation where, when a study like Seralini comes out, that the policymakers look to the experts, whether it's the National Biosafety Authority or other experts in the country, before they make their decision, instead of making a quick decision and then all of a sudden a few months later trying to reassess that decision. And I guess that's a challenge to everybody here, but I think that's something particularly that's been difficult in Africa, whether you're Kenya or Egypt, which also stopped, was growing corn and stopped growing it all of a sudden because of misinformation. So I think that's something to think about.

Gilbert Bor I think that's true. The previous government, which out of office on the 4th of March, was quick to react to Seralini's study. But we have a government that is promising to follow what science says. We have a government of politicians who are scientists. And my sister there, Dr. Mutegi, is evidence that we have enough scientists in Kenya who can actually support the debate so that the government can work, using evidence from scientists, not from lobbyists.

Greg Jaffe Thank you, and I hope that is the way it's going. Mark, did you have a comment you wanted to make?

Mark Lynas Just, Gilbert is being too diplomatic. Let me share a horror story or two with you from my own experiences in Africa. To give you an example, in Uganda there's groups who take Photoshopped pictures of ears of corn with babies' heads coming out. And they take these into their rural areas where farmers are growing maize, and they say, "This is what a GMO is." And of course they don't even know what Photoshop is. They don't know these pictures are fake; they think

this is real. And who's funding these? Well, this money is coming from Europe; it's coming from the activist groups.

When I was in Tanzania, I was doing a talk in a town called Morogoro, and there were organically trained farmers who, one of them stood up and said he knew that GMOs would turn your children homosexual. And I would have walked out in protest had he not said that in Swahili. I didn't understand when he was talking. And where was this funding for this? This misinformation was coming from the organic movement in Europe, which is funded by the European Commission.

I will let the cat out of the bag here. You remember the golden rice crop that got destroyed in the Philippines by an activist group called Masipag. I looked into their funding. Their money comes from the Swedish Government and the Swedish international development agencies put hundreds of thousands dollars into this group which is now destroying the food security prospects and potentially holding back a project which could save tens of thousands of lives per year. Why is this acceptable? I think this is a moral outrage.

Greg Jaffe Brian, do you have something to add?

Sir Brian Heap If I could just add another anecdote from Africa. An experience we had recently, which was brought to our attention by one of our journalists who was writing about the experience in Uganda where things are very, very finely balanced at the moment in terms of whether Uganda is going to establish its national biosafety bill and enter into the development of matters that arise from that. In this particular case, a group of Ugandan parliamentarians were going out to see the experiments that are being done on trying to introduce resistance in bananas to banana wilt, and these are GM bananas. And one of the lady NPs said before she went out, "If I see that genetic engineer, I will kill him." So they went out and the genetic engineering person gave a very nice presentation and explained how the bananas, this GM work, would actually transform and save bananas in Uganda from devastation, which as you know is a huge issue in Uganda. Seventy percent of the diet in Uganda is dependent on bananas. She saw the genetic engineer scientist explain his work, and she fell in love with him. When she went back to parliament, she said, "This is exactly what we need in Uganda." So here was a show and tell.

Greg Jaffe Well, I think that the comments that have just been recently made by Brian, Mark and Gilbert show that the European situation has a big influence on Africa. And I guess I want to ask Anne the last question before I take some questions from the audience, which would be, you know, I guess a lot of people think of Europe as a non-GMO zone. The regulatory system isn't really operational. It's somewhat dysfunctional. And I guess the question is, what do you see about the current situation changing? Will Europe change in the immediate future, or is it really going to stay the same?

Anne Glover Okay. Well, I think you've fairly summed up the situation about the policy in Europe. And what I'm going to say is certainly not an excuse, it's an explanation. The European Union is a partnership of 28 member states. Now, if I look at the voting by parliamentarians or indeed by the European Council, rather, on GM issues, then I see that some member states such as Austria and Luxemburg consistently vote 100% no, no matter what the policy is. And at the other end of the scale, the Netherlands, Sweden vote 100% yes. And the evidence is the same, whether you're in Austria or you're in Sweden. So we have an enormous problem.

And for me, and one of the things that I'm trying to do by speaking with my colleagues inside the commission, also speaking to parliamentarians – and sometimes being in a very uncomfortable space in that whole environment – is to challenge people on their views and their rejection of evidence and their willingness to listen to unfounded propaganda which is coming from other places.

And what I would say is it will not, I know, it will not be possible for me to overturn the current thinking in the EU around GM and use of GM. But what I am at least trying to do is to make people transparent about why they are rejecting policy. Because the one thing that I think would be constructive is if the politicians in Austria when voting against GMO say, "I accept the evidence." Clearly, the evidence is supported by the vast majority of scientists with no vested interest. So I accept the evidence about safety. But for other reasons I'm saying no – and they could be electoral reasons, philosophical reasons, economic reasons, whatever. Because when that happens, I think then at least in Europe the conversation amongst citizens will be different. Because citizens then will understand, okay, it's not because… Citizens sometimes can be a little lazy; we can all be a little lazy. And we just hear what we want to hear. If they also hear that now we're saying there is no problem with GM, we're rejecting it for other reasons, then I think we start a healthy debate – and that's important.

Greg Jaffe Anne, as an American lawyer, I've always said one of the major differences between the EU system and the U.S. system is in the U.S., you have a bureaucracy that's making the decision, not the politicians; and they have to do it based on an administrative record, a record of evidence. And they have to say what evidence supports their decision. And if they don't do that, somebody can go to court and challenge them and a court will look and see whether they, within their discretion, used that evidence. And so I think that is one of the major differences.

Mark Lynas France has been taken court. Italy has been taken to court. Right? The ban that France has on GM maize gets struck down in court every single time because they can't offer any scientific evidence, and they still go and reinstitute it. So there's something wrong with the processes there.

**Questions and Answer Session**

Greg Jaffe I want to see if there are any questions from the audience. If there are, there's a microphone there, come up. I'll take a couple of questions, very brief questions, please. Just introduce your name and quickly state your question so I can get three or four of them before we go back to the panel for some final thoughts.

Question I'm a farmer from India. I have been growing BT corn for the past ten years. This question is to Mark Lynas. Falsehood on junk science spread by anti-progress and anti-GMO, rumor-mongering, fear-mongering activists spread faster than … on rail trains. How the anti-GMO activists spread the rumors like virus-spreading diseases? How to dispel them, it's cast on the people. Again, this European Union, coming to the European Union, they have been importing cattle feed from the U.S., which is made from GM corn. So I think it is injustice to the European Union farmers. So I suppose Mark Lynas, I would like you to crack the code to revealing the secret. Thank you.

Greg Jaffe We're going to take a couple questions, and then we're going to have a final remark where the speakers can answer the questions at the same time.

Question Yes… Hermann Lotze-Campen from Potsdam, so I am from climate change research, and I had hoped for a bit more controversy in the panel. So let me just ask two provocative questions. One is, or remarks for thought. If you are an American and you look to Europe, you are quite surprised about this resistance to GMO. Now, look at the climate issue. If you are European and you look to the U.S., you are very… it's very similar, if you think about it. You are very confused and disturbed about what's going on in the U.S. And just a thought on how people react on scientific facts. And I think we got two very good arguments about, you have to look very carefully into Europe and into specific aspects, why there is this opposition.

The other remark is on lobbying power. I find it a bit interesting to hear from an industry where big multinational companies play a big role to talk about lobbying power in the environmental movement. I mean, I think we should admit that of course there's a lot of lobbying power in the multinationals and how that plays out. So just some remarks.

Question My name's Adam Riesselman. I'm a senior at Drake University and a past Borlaug-Ruan intern. I guess the good PR crops that you see, like your golden rice, as well as your virus-resistant cassava are mainly developed at like public institutions that are providing these good PR GM crops. What role do public institutions versus like profit-driven institutions, such as DuPont Pioneer, Monsanto or other universities or organizations in the local areas, do to provide access to GM crops for specific areas in developing countries?

Greg Jaffe One more question, and then we're going to go back to the panel.

Question Hi. My name's Piper Martz, and I'm a current Wallace-Carver fellow. I was hoping that maybe you guys could shed light or dispel some of the qualms, environmental qualms against GM biotechnology and maybe talk about some ways that GM technology sort of deals with soil degradation or problems with water. But, yeah, if you guys could just dispel some of the environmental qualms.

Greg Jaffe Okay. What I'm going to do here – we just have a few minutes left for the panel, so I'm going to ask each of the panelists to give some closing remarks and in those remarks to please, where appropriate, if you could answer the different questions that we got. I'll start with you, Anne. Make it brief, please.

Anne I will make it brief. I want to challenge all of you to think about one thing, and that is confirmation bias. So if I give you an example of this – and, Greg, I hope you take this in the right way, what I meant by it to do – I've known Brian for some time, and I really like him. So if somebody runs up to me and tells me that he strangled the desk clerk at the lobby in the hotel. did I hear that Brian did this,? I'll say, "You must be mistaken. That can't be Brian. He would never do a thing like that." But let's say I don't really like Greg and somebody said exactly the same thing, "Did you hear what Greg just did? It was astounding. He strangled that clerk who did nothing." I think, I knew that, you know, I knew he was a guy who could never be trusted.

That's confirmation bias, and it's something that applies to every single one of us, and here is our problem. Because if I somehow inherently believe there's something wrong with GM and somebody tells me, "Did you hear that also it causes babies' heads to grow out of corn?" then I believe it, because it confirms my bias.

And this is the biggest challenge we've got. And the final remark on just one of those questions – and I'll just pick one which is actually very close to my heart. And that is the evidence around climate change and the evidence around safety of GM. Now, I know for sure, as much as a scientist will ever say, climate change is happening, it's rapid, and humans are having an impact on the planet, because all the evidence tells me that. I also know that GM crops, the technology per se, is safe. And yet it's interesting to me that people will choose to believe one thing I say because it fits in with their confirmation, and not the other, when actually I'm an honest broker. So I would ask that we listen to the scientists, the people who generate the evidence, to start off with the platform of knowledge on which we base policy. But policymakers have a real obligation to take some courage and some leadership to listen to the evidence and not to listen to the lobby groups. Thank you.

Greg Jaffe Brian, do you want to give us a quick closing remark?

Sir Brian Heap Yes. Thank you for the questions about the difference between the situation in the USA and Europe. Let me just add another one into the mix. Because if you consider the stem cell discussion, here we have the extraordinary situation where

Europe, and particularly the UK, are world leaders in stem cells, whereas in the USA there is great hesitation about the way that that is being developed, with a few exceptions.

So there are these transatlantic contrasts that we have to consider. And I think it's quite interesting to reflect back on something Charles Darwin said a long time ago – "If the misery of the poor be caused not by the laws of nature but by our institutions, great is our sin." And I think we have a real problem in Europe. I think slightly more pessimistic than Anne. Because unfortunately the GM debate in our population in Europe has now got to the position where people have rejected it repeatedly, as she has indicated, and this has got into the mindset of our citizenry; and it's going to take a lot of change to cause that to be brought about.

And Marty Kaplan in Yale has written a very interesting article on this issue about how do you bring about behavioral change, and let me just quote something he said. "No Fox News viewers ever change their minds because some new data upended their thinking. When there's a conflict between partisan beliefs and plain evidence, it's the beliefs that win. The power of emotion over reason isn't a bug in our human operating systems – it's a feature." And that's a challenge for us for the future.

Greg Jaffe Thank you, Brian. Gilbert, do you have a closing remark, brief, please.

Gilbert Bor Thank you. My closing remarks about GM is safe, and I believe it. I'm not a scientist, but I believe in it because I have lived with sense since I was born. As a child I went through various vaccinations to take care of my life. And many African governments today are very great on those issues of vaccinating babies to save them from various diseases. And I believe that the same thing is for GM. It saves crops from being attacked from pests and by disease.

What we need to do is to make a lot more noise, maybe louder than the opponents of biotechnology, so that we can be heard. You know, if we allow them to be heard more, people are likely to believe what they are saying, which is not the truth. Thank you.

Greg Jaffe Mark, if you could have a couple of closing remarks with an answer to a question or two.

Mark Lynas Sure. The phrase I like is that anti-GMO activists are the climate skeptics of the left. And when I first made my sort of big public conversion on this, I got loads of email from climate skeptics on the right saying, "Well, now at least he's going to realize that, since GMOs are safe, climate change science is a hoax." And I was like, "Aah! Not only are you missing the point, this is just the flipside mirror image of where I was before. Why would that make any sense?"

So how are we going to be able to get through the situation where our sense of reason is mediated by our value system and confirmation bias becomes the most

powerful operating system? And I think that's a very difficult thing to confront, obviously. But in terms of this debate, how things play out in the future… And there was a question from India about how to dispel some of the myths, I think what's really missing at the moment is the voice of the farmers – and I mean the legitimate voice of the farmers – I don't mean activist groups from either side posing as farmers. I mean, real farmers representing national farmer constituencies, saying whether or not they want to use hybrid crops, whether they want to use open-pollinated varieties, whether they want to use GMOs. It should be their choice, and I think that should be respected by everyone.

Secondly, the voice of the scientists – what has kept me strong on climate change, writing about this, is the knowledge that there's a very strong scientific consensus. There's the whole process with the IPCC doing its assessments. We need something similar, I think, in this terrain of biotechnology, because it is so contested. And scientists aren't going to have to say their thing once, they're going to have to say it twice, three times, four times, five times and so on. So the voice of scientists and independent scientists in particular is absolutely crucial here.

Greg Jaffe Thank you, Mark. Just to answer the question that I have been asked, as an American, I can't justify what our government always does. But I do think on the climate change thing, there is a consensus among many of the citizens. And you see that at the state and local level with California and other people really moving ahead in climate change, even when the federal government hasn't.

And just to the question about environmental issues, I think that biotechnology, just like any other agricultural technology, is going to have some environmental impacts; and the question is how we use it judiciously so that we minimize those impacts.

So I want to thank the panel for a great discussion. I realize that we may have not solved all of the GMO debate today, but I hope from an audience perspective you either learned a new fact or a new, different way of looking at something. And so I hope that it was valuable. Thank you.