REGENERATIVE CROPPING SYSTEMS: *A SOLUTION*
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Well, good afternoon, everybody. Time for something a little bit different. That was an amazing panel that we just heard. I'm going to go into a little bit more of the science behind our sustainability, regenerative ag and one of the new products that we're looking at to really help us advance sustainability and climate change.

So if we think about regenerative agriculture, we've talked about it quite a bit at Bayer Crop Science. And really what it means is that we're trying to do something a little different than implement sustainable solutions or just generate new products for growers. We're trying to bring all of these things together and put them into a system that can actually help regenerate the soil health and the environment. It's very early, so I'm not going to be able to give you a lot of data on that today, but we do have a lot of work going on.

And one of the things that we've had to look at is one example in corn, especially in North America, mostly the Americas in general. But in corn, if you take a look at where we've been—so 80-some years ago—the picture on the screen here depicts what the land size would have been to generate the same yield in each of these cases. And if you look all the way on the right where we are today, it's dramatically different over those 80 years. But what's been happening to get us there is that we've been able to control insect pests, provide new protection molecules, new herbicide tolerance, traits into crops like corn—and that's done an amazing job. If you think about the 80 years in development of our, you know, corn across the world, between our genetics and innovation, we've done a great job of getting to a point where we can produce more with less. But that's not enough, as we've heard pretty much all day today, climate change is definitely a force to be reckoned with. And if we don't do something different, we're going to end up with a lot of products and portfolios that are used independently that help—and they've always helped—but they don't help as much as we probably need to advance in terms of managing and mitigating the changes due to climate change.

So one of the things we do have to focus on, though, is what happens to growers when they experience climate change. We hear about drought—we know that can be completely devastating, but there are a lot of other factors around the world that challenge farmers every single day. On the right-hand side here, there's a new paper that came out just highlighting the fact that some crops have actually, most crops have actually gained a lot of efficiency and productivity over the years. Corn, on one hand, though, would have actually been more productive if it hadn't been faced with climate change.

The other thing that we've done is we've surveyed growers around the world and asked them many questions—it was a long, long survey. But one of the things that came out of this was the impact of climate change that they perceive on their farm every year. So you can kind of see there, you know, what growers are saying about having their revenue impacted, believing that

climate change is actually impacting their productivity, and also being open to new technologies to help alleviate this.

So it's very promising, but one of the things we do need to understand is that the product concepts can't… It's not a one size fits all. If you do look at the climate change factors, just a few of them on the bottom right, these are actually very unique kinds of sets of problems for us to try to figure out—do we have the genetics, do we have the understanding of the farmer ecosystem to help alleviate these problems? Some of them are pretty daunting. Plants need water to grow—it's not like we can create plants that don't—but we can make them more efficient, as you just heard from the last panel as well.

So what have we come up with? At least in maize right now, we've come up with, and just launched—a product here in the U.S. Actually, it did launch in Mexico a few years ago too—of short-stature corn. So you might think about short-stature corn as—okay, well, why is that so important. If you think about a corn plant and you reduce it by 30% height, you're just making shorter corn. Well, what we're finding out is that, when you have strong storms—and we're getting more and more of those across the Midwest; they're called derechos. They're straight-line winds up to 70, 80 miles an hour, and they can flatten entire fields of corn and then make it really hard for growers to harvest it. And then all the corn that was on the ground is gone, it's a waste. And so that productivity is gone from the system.

What's happening with the shorter-stature corn is it's being able to resist the strong winds—it doesn't break, it doesn't fall over, whereas their taller counterparts do. So that's been the big advantage, and that we thought was probably going to be the biggest advantage. It was some sort of an insurance program for growers that are experiencing these derechos every single year.

Well, as we got into this a little bit more, we started thinking shorter corn means you can probably access the crop the entire season. There's equipment that you can get into when the crop is short. And so what that's allowing us to do is test the concepts that you can get in with precision applications. You can get in with fungicides, insecticides, herbicides where you're not applying it to the entire field—you're applying it to where the problem is. So this has been a real benefit to us, and we're thinking through what those systems look like and how to make almost prescriptive recommendations to growers using digital tools, imagery of how to manage every acre of corn that they have, almost uniquely, compared to what they've been able to do in the past.

What's really cool about this is on the far right-hand side. As the shorter corn plants grow, they're actually putting more energy into their root systems. And so what we're seeing is that the root proliferation is bigger, and under severe drought, or moderate drought even, corn plants are able to scavenge the water and the nutrients in the soil that they're planted into.

And so we're actually seeing the corn plants are shorter, withstanding wind; they're getting access to water that they might not have had before; and they're also able to get to nutrients, which could in the future get us to a point where, you know, fewer nutrients are actually needed in this cropping system. And when you go a little bit further—and this is where more research is ongoing—you think about corn/soy rotations, cover crops in the middle, you can begin to put the pieces together of crop inputs, the genetics and the new product innovation that's coming with these kinds of plants for the future, and really see a big change in the agroecosystem that could be adaptable around the world.

We believe in that so much that we're actually using three different ways to get the shorter-stature corn. The first way is through conventional breeding, and that's what's been launching. The second way is through biotechnology, which makes the production of these plants a lot easier. And then the third way, which we are still working on in discovery, is using

genome editing to get to the point where we can create the shorter-stature corn plants that could be grown in geographies that don't currently today allow biotechnology to be cultivated.

So when you take that in sum, we can probably access around the world where maize is grown the opportunity for growers to experience this kind of a sustainability play as one tool to get us to more of a regenerative agriculture type ecosystem.

And with that, I just want to add this one last image. It was one of the most motivating images that I had early in my career. So some 20 years ago, Dr. Borlaug came to our lab, and he wanted to learn more about how we were doing biotechnology, understand about insect control, how are we inserting genes into plants and making them more tolerant with the reduction in the use of pesticides. But one thing he did impress upon us was that, while that's great, and we have to keep doing it, but we can't forget about the impact that climate change is going to have on our cropping systems.

And so, with this launch, what we've been able to do is actually realize some of the visions that he had, already getting past the point where we could control insects and weeds and all of these other things that were just beginning—I mean, these were just happening at the time when he was visiting the lab 20 years ago—to the point today where this product concept, as well as many others that we can access now through genome editing and other molecular tools, give us the opportunity to really change and revolutionize how agriculture will look in the future, given the forces of climate change that we're facing.

So with that, thank you very much.