Headlines of the Future

A podcast by Bayer

Episode 3 – Agriculture and Climate Change

[Kate Hayes]

Welcome to Headlines of the Future. Brought to you by Bayer

Fascinating clues to help solve some of the most pressing global challenges from climate change to feeding a growing population to curing diseases can be found through science and innovation. I'm Kate Hayes and I'm your host of the podcast, Headlines of the Future brought to you by Bayer. In this podcast, we get to hear from visionary scientists, thought leaders, and entrepreneurs who are exploring how the science of today may positively impact our lives in the future.

Hello and welcome everyone to our newest episode and a very warm welcome also to my special guests who are joining us today. I think it is fair to say that our first guest, Jess Bunchek, is joining us from the furthest and most exotic place so far: Antarctica! Jess is a plant scientist from NASA's Kennedy Space Center and is currently in Antarctica to conduct controlled environment plant research as part of a joint mission with the German Aerospace Center.

I am already so excited to learn more about this, and we're going to dive into it in just a minute, but first thank you for being here.

[Jess Bunchek]

Oh, thanks, Kate. And greetings from Antarctica.

[Kate Hayes]

Wonderful. So far away. And our other special guest, Dr. Klaus Kuntz has led sustainability and business stewardship in Bayer's Crop Science division since 2018 . Klaus, this is a very interesting job title, and I look forward to learning more about what this role has entailed. So welcome, and thank you for joining us this.

[Klaus Kunz]

Thanks a lot from my side.

[Kate Hayes]

Before we dive in, it would be really good to get to know each of you a little bit better. You both have such interesting jobs.

So, Jess, we'll start with you. I'm very interested in first what you do in Antarctica and also what drew you to this area of work.

[Jess Bunchek]

So what I get to do in Antarctica is to operate a standalone greenhouse container that is located near the Neumeyer Three Station. And it's actually the German station and it's a collaboration.

It's an original project from the German Aerospace Center. And now we have a collaborative agreement with NASA. And the main goal of this is to grow crops for the overwintering team. And as part of the overwintering team, I can say that, you know, I'm one of 10 people who's literally living in Antarctica for over a year and it's beautiful. It's extreme. It's just more picturesque than I could ever properly describe, but there are no plants here and we are literally cut off from the rest of the world. So that means that we're deprived of having green scenery around us, and also with having fresh fruits and fresh vegetables. So part of my role with being part of this overwintering team is to help to give the entire overwintering crew the chance to interact with crops and with other plants throughout our isolation period and also to have a source of fresh leafy greens where we otherwise wouldn't have them.

We want to study the psychological benefits and also the nutritional benefits of having these crops here. But then also with being part of the overwintering team, there's so much more that goes into a part just from my one job. So we're here keeping the station going. We're here doing research for outside scientists and we're also helping each other out because when someone needshelp, you help them and vice versa, we work really well as a team.

So it's living and working here.

[Kate Hayes]

Yeah. Talk about learning the value of teamwork. I'm sure that's crucial to everyday life. Well, Klaus, what is it that you do talk about your role at Bayer? And I know you've been working in the area of sustainability for quite a while, but what does that mean?

[Klaus Kunz]

Yeah, I think that has changed a lot in the last couple of years. When I moved from R&D into sustainability just three years ago, it was at the turning point when we were really asked to put sustainability at the core of our business thinking I would say, and that's not only in Bayer and many of the companies, I know sustainability used to be a topic which feels a bit more on the fence to public affairs and even public relations.

So it was not necessarily scaling up to impact. It was more like a reputational topic, but the clear decision at Bayer three and a half years ago was to put sustainability at the core of the business,

which means identifying the topics which need to change. Look into those areas and then try to connect them to positive business opportunities.

And I think we've made some substantial progress here because if it's just nice topics, it will never get to impact. And if it's not connecting to your products and business, if it doesn't arrive at the farmer, it will never reach the level of impact, which is required to make agriculture different.

[Kate Hayes]

Okay. Yes.

And so you just talked about, you know, getting the product to the farmer. And I think one question that many people would ask is what in the world does agriculture have to do with climate change and how are those things related?

[Klaus Kunz]

I think agriculture has one of the biggest emitters of greenhouse gases.

While at the same time, there's almost no business with opportunities like in agriculture also to be a solution to the climate change issue. Farmers are growing crops. Crops are putting carbon dioxide from the air back into the soil, and we were wondering 'can we find a pathway to make a systematic approach that farmers would do, particularly climate-smart agriculture is being incentivized.'

So we create a value pathway, which didn't exist before for those farmers who change their practices to more climate-smart practices. And at the end of the day, they may be able to not only sell the crops they are growing, but also the carbon, which they are putting and conserving in the soil. That's the basic and big idea behind it.

[Kate Hayes]

So we're going to take a deep dive into all of that in just a minute, but first I still want to get to know a little bit more about how you both got to where you are. You know, especially for our younger listeners, it's always so fascinating to find out how people ended up in the roles that they're in.

Probably something you never even dreamed about when you were in university, like never even heard of these roles or knew that they could exist. I mean, Jess, you're a botanist and you're working in Antarctica. Do I have that right?

[Jess Bunchek]

That's right. But actually, my true background is not with working with controlled environment agriculture.

I grew up in the Midwest of the United States. And so my biggest research interest was with field agriculture. And that's what I worked with for both my bachelor's degree and with my master's degree. And it wasn't until I went to work at NASA that I started to work with these insights systems. So, for me, or with wanting to study botany, it was just growing up in that environment

and wanting to do more to protect the environment, to find more sustainable solutions for our farming practices and this revolved around how do we keep the soil and better health. So this could be through conservation tillage or with managing our herbicide use better or with how do we manage our invasive species. But also we're thinking about how are we in particular getting water at the right place at the right time. So in the Midwest, and the Midwest is just a tiny example of this global problem, but we have extreme droughts and extreme flooding and you know, farm insurance can help with that, but we have to address these problems or else that's not only a huge struggle for the environment, but also for the people who are trying to farm in that environment.

But, you know, at the same time of loving to work with agriculture with also growing up in Indiana, there are a lot of astronauts in a big NASA presence in Indiana. And so I also was really drawn to that. And so it was quite a fortunate turn of events that then I was able to combine those two loves together and start to get to work at the Kennedy Space Center where I was helping to support the veggie system on the international space station. So helping astronauts to grow their own crops in space.

And then with coming to Antarctica that for me was a personal dream as a scientist. I always thought I wanted to come to our seventh continent and to get to conduct science here. But how does somebody who studies plants and not the native plants of the peninsula of Antarctica get to come here? And so with researching and trying and getting creative, and then with proposing something that NASA and the German Aerospace Center found as worthy of funding, then I was, fortunately, able to make it here and get to bring both those research and those personal goals to life.

[Kate Hayes]

That's incredible. I think there's a lot of people who are probably like, holy cow, I didn't even know that was a thing. Like you can kind of create your own path sometimes, and that's very exciting.

[Jess Bunchek]

Yeah. It definitely worked out that way where I realized it wasn't going to be possible that the avenue just didn't exist there. And so how could I take a couple of steps back and really get creative and, also quite persistent about working to get this goal to come to life. Even if that did mean I was going to have to find a brand new way to get it done.

[Kate Hayes]

I love that. And Klaus, you studied economics and chemistry at university. So how did that lead you to work in the agriculture sector?

[Klaus Kunz]

Yeah. Thanks, Kate. And I liked that you said that sometimes life takes it to places where you didn't actually know before that you would ever go there. And when I came to Bayer 20 years ago, I had nothing in mind with agriculture.

When I came to Bayer, I was a life science chemist, and I was just interested to make biologically active molecules. And in the beginning, I didn't care whether they were for plant medicine, human medicine, animal medicine, just biologically active molecules. And the big shift to agriculture came when I left research and I went to development, I was then basically appointed to lead the development of a new insecticide.

And I learned that the world is full of different crops and cropping systems, different climates, different markets, different political environments, different regulatory systems. It was such an amazing, you know, spreading of my perspective at this point of time, new horizons every day. And another one was then when I worked in regulatory affairs, I was responsible for the insecticide regulatory part of Bayer Crop Science.

And in that phase, I also learned that for some of our products, there's a very different perception in the public than internally at Bayer and that was a very critical learning for me because from there I saw that sometimes we are not connected anymore to the public. Even if you think we are completely right and the science is on our side.

It was important because it also helps you sometimes to reflect a little bit about your own position. And one of the outcomes was really to understand that also we have to change. It's not only the others. We have to make our contribution to a positive change. And that was the last step to go then into sustainability and understand that climate change and agriculture are connected and we need to talk about the environmental impact of inputs exists, and we need to acknowledge that we have to play a role in the future changes, and we need to see it as an opportunity. And this was the last step to go into sustainable agriculture.

From chemistry to sustainable agriculture. That's the way I have come along.

[Kate Hayes]

I mean, there's a lot of sense in that the science just kind of leads you from one thing to another. And when it comes to science and climate change, I know there are many people who still don't believe that climate change is real despite the data, but I wonder if you could help us understand the situation that we're in. I know that you know, this is something that global leaders are talking about on a very regular basis right now. There's a lot going on in the world that we can see for ourselves. Areas that have experienced record-breaking heat. There are more extreme weather events happening more frequently, like droughts, floods.

How would you set the scene or set the stage for someone who may not be fully aware of what's going on?

[Klaus Kunz]

I think there are different types of people being not aware and people don't want to be aware. I think for those who absolutely don't want to be aware and there are limited opportunities, but I mean, my call would always be to anybody who is not fully on top of the topic just make a call. Read a bit more about it. I'm a big fan of a difference and variety of opinions, diversity of opinions. That's totally fine, but there are some scientific contents as in which cannot be debated. And I would just ask people to take a closer look. And to draw their own conclusions from this. For those who are completely against it and who don't want to change anything in their lives, they

will always be there and I'm sure we can't convince them, but I think there's a lot of people who are on the way to understanding better that we need to make those changes.

[Kate Hayes]

Yes. And so science has determined that we must basically achieve global net-zero, net-zero carbon emissions by 2050, and limit the current rate of global warming to 1.5 degrees Celsius in order to really avoid the destruction of natural habitats and protect communities seems like a pretty serious situation that we're in. Klaus, do you think that most people are aware of what this actually means?

[Klaus Kunz]

I would say it's a bit different from a regional perspective. I would say in some regions we have a very high awareness and others regions we have less often awareness that also is connected to, to the circumstances and I think in the specific regions and what people really need to look after in their daily lives.

I think there's an increasing number of people who know that's the problem. I don't know how many of them are serious, that they would need to take their own actions that they would need to understand that it comes with a responsibility for everybody to change things. Not only, you know, for the politicians or people who are out of scope for them personally, I think it's still, but there's also a lot to do there for people understand that the changes, which have to come are much more fundamental than we want to believe.

[Kate Hayes]

Absolutely. And Jess, I know one of the things that we often hear talked about in relation to climate changes, like the melting of the ice caps and you're in Antarctica. I wonder if your fellow scientists are seeing any of the impacts of climate change, where you are.

[Jess Bunchek]

Well, we're definitely studying it. And this is in our geological studies, our CIS, our meteorology, the atmospheric chemistry. We're looking at all these different parameters of being in this environment. And it's not just happening right now. This has been happening at least here at the German station for the last 40 plus years.

And so this is allowing the research scientists back in Germany who lead these projects to look at a wide trend over many decades and what, at least the consensus to the best of my understanding is not an expert in these particular areas of science is that the change is coming to Antarctica. It's slower than with the Arctic region, but it's definitely going to be coming here.

And so we just need to keep collecting the data. And Klaus, you had mentioned that there's sometimes this disconnect that exists between the science community or, you know, what you've noticed that Bayer and with the public. And that's something that we as scientists have to take on as our own responsibility as well.

It's not just collecting the data, but we also have to continue to improve the relationship of how we communicate the data to the public and how we can help the public to feel more comfortable and more trusting of science. Because once we start to see the trends, either here in Antarctica or elsewhere across the world, we also have to be able to make people understand and get behind the urgency that we as scientists feel, but that it does take work and it takes time to build that trust.

[Kate Hayes]

Yes. And Jess, you know, I wonder, can I ask, what do you do? Like what do you tell friends? I mean, you're fairly young, so I'm guessing you have you know, young friends and maybe they're very aware more so than my generation, or maybe they're not, I don't know.

But what do you tell people about this climate situation and what are our responsibilities?

[Jess Bunchek]

For me personally, I'm fortunate to be in a community with individuals who, you know, they seem to get it. They understand, and they are trusting of science, but of course not everybody is. And so it does come back to you know, how do we try and meet people halfway because everyone's going to have their own way of communicating and their own kind of things that they worry about.

And, you know, they may be concerned about things that are just a little bit different than with me, but I found that with giving people the space to you know, to come forward and to describe, you know, what they're thinking or what their concerns are, what their doubts are versus just trying to push myself on top of, with all the opinions that seem to work a little better. But with, I think from personal experience with having worked in agriculture before we had the university extension programs, and that's a program at most of the land grant universities in the United States that helps to connect the science and the professionals working in agriculture with the public and to help serve the public best.

So it can take the science and put it into layman's terms. The extension program helps to meet with farmers or other members of the public and to understand what problems they're going through and then to go back and then help to conduct research, that helps to answer the problems that they're having.

So that's just one example of trying to meet with the public halfway and evolving the science with that.

[Kate Hayes]

And Klaus, what about you? How are you communicating?

[Klaus Kunz]

I mean, just listening to Jess, some interesting thoughts come to my mind, which, I mean, similar thoughts I had very often in other circumstances when we talk about science and risk, I think

even there if there are many people who acknowledge that there is climate change, I think the bigger number of people do not see the risk.

And I had similar comments of people who say, okay, there's biodiversity loss, but what's the problem, actually, and this is an interesting question for me because I think that even inside our big companies where we are so many scientists, sometimes we need to understand that there are scientific questions, which you can just answer by facts and data.

But then there are risks, conclusions, which we take, which include preferences. And then you go a little bit out of the pure science. And this is something which is always important for everybody who says the science is on my side. This is for example, safe, or this needs to change. If you start to talk about risk, you also start to talk about preferences.

And if you start to talk about preferences, you need to accept that there might be different preferences from your own. So that is something I think when we talk about climate change and implications of climate change, I could imagine that even have a smarter conversation when we talk a bit more about the risks and why we think those risks will come.

And if we eventually even allow a more open conversation about those risks, because I feel like we are in two camps at the moment.

[Kate Hayes]

I wonder you can help me understand. I mean, right now we know that food systems account for more than a third of global greenhouse gas emissions worldwide, and that's a lot. So are we looking at ways through science that we can reduce agriculture's emissions and how is that possible?

[Klaus Kunz]

Totally. It's totally possible. And I think that's the really good news of the last few years. Not only from Bayer but there are also more and more companies investigating and innovating in that space. It starts with economic practices. It doesn't even start with rocket science. Farmers who try to avoid tillage for example, who try to have cropping systems without tilling the soil, already make a significant contribution to keeping carbon dioxide in the soil or carbon in the soil and not emitting it. If you do this in a consequent manner, they can come down to net zero or even net positive. That is something which I think is attractive, which does not stop this huge innovation or technology.

But if you then add, for example, digital farming to this, a precise understanding of the capabilities of the soil. Understanding where the soil has the biggest potential for sequestration. I think then you come into another dimension of potential progress. Along with new plants, stronger plants, which also require less inputs, less inputs lead to reduced emissions as well.

And my favorite example actually is from Asia. There's a very traditional way of producing rice. It's the so-called patty rice. It's grown in water. And that is very helpful because actually the water also works as a herbicide and helps to keep the weeds down. That's good. But. There's a big but. Actually. There are two big buts. One is that it's using tremendous amounts of water. And in some areas of Southeast Asia, these amounts of water are not available. It's very simple. And that is

the biggest concern from people in that area. But the other one is really huge amounts of methane are formed in the water underground conditions at the roots of the rice plants.

So switching from patty rice into dry seeded rice brings tremendous opportunities to save water, but also to reduce greenhouse gas emissions by avoiding the emission. I like that example very much because it shows that there's not that golden pathway. There's not one single way of doing things, which is just good.

You will have to potentially increase inputs. You may use more herbicides if you do dry seed rice but you can really reduce water consumption. And I think what we need to strive for is that fact-based conversation in the respective region with the respect of decision-makers and all stakeholders who are involved in this process to come to an educated conclusion, what is the most sustainable way of growing crops?

But I like the example of dry seeded rice because it shows the potential of innovation.

[Kate Hayes]

Yes. So when you talk about dry seeded rice, I mean, for me, that means basically innovation is the seed, right? It's a seed that's bred to grow in a different type of environment.

[Klaus Kunz]

That's correct. Absolutely.

[Kaye Hayes]

Yeah. So what are some of the other innovations that you can give to farmers? Like, well, what is science developing that makes it possible for farmers to adopt practices like no-till? How are they able to be more sustainable now than they were 50 years ago?

[Klaus Kunz]

Yeah, I come back to digital farming because I think with digital farming, we will be able to give the farmer in the future lots of very precise and powerful recommendation supports. I mean, in the end, the decision will be taken by the farmer at any time, but we will help the farmer and support him in, in decision-making by super-precise ways of telling him, for example, when the insects are coming in when pests are arising, which we'll have to make very precise, just treatment on the spot when needed. Even the way of treating, for example, a field will be very different. If you have precision application where the drop of your herbicide just reaches the plants and not the left and right to the plants. So, I mean, with these technologies, we will be able to reduce inputs by a significant percentage. On the one hand, we will reduce emissions by a significant percentage as well.

That's the digital piece. And we will understand where the soil is capable to do what, maybe we will even understand which parts of the fields are so low in terms of fertility that we can use them for biodiversity. Activities for landscape measurements rather than growing crops in those areas where profitability is anyway low.

[Kate Hayes]

Yes. And I want to come back to that in just a minute, cause I think that's also a huge part of this conversation, but first I wanted to go back to you, Jess. You talked about basically, you know, growing plants in Antarctica, which I guess is akin to trying to grow plants, perhaps like an outer space someday, or just trying to grow them in an environment that they would not normally thrive in. Is that correct?

[Jess Bunchek]

That is correct. Yes.

[Kate Hayes]

So I wondered about the seeds you use to like, are, do they have to be specially bred for these environments or can you just pick up any packet of like garden carrots or whatever, and then grow them?

[Jess Bunchek]

One of the fun things about the seeds that we use either on the International Space Station or here in Antarctica is that they're all commercially available.

So if someone at home is ever curious about growing some of the crops that we have grown, either in space or here, then yeah you can find them just by Googling them and finding a vendor that will support them in your country. So no, we do not do breeding at the Kennedy Space Center but we do a lot of crop selection work.

The International Space Station, for example, is a pretty challenging environment in addition to having microgravity, it also has a higher concentration of carbon dioxide than we have here on Earth. And one might think that plants, they photosynthesize, they take in carbon dioxide and they give off oxygen.

But actually, there can be a limit for plants where it becomes a little bit too much of a good thing. So some plants can thrive in the environment that we have in space, and others just can't handle it. So part of our crop selection work is to see which ones can work in the environment because they also have to be crops that can grow at the temperature, the humidity that we're also going to be seeing in space since we do not dictate the conditions of the ISS, that is we have to find plants that will work in that environment, but we also have system challenges as well. So we have to also find plants that are pretty resilient and can grow very well in the hardware that we have, but we also have to have plants that can do well given that water is a big challenge in space. So in microgravity, fluids move very differently than they do here on Earth. They don't have gravity to draw them down. We have to have fans in our systems to help, create conductivity, to keep the airflow moving. So we have to find plants that are going to work given all of these systems and environmental constraints, but they also have to grow well.

They have to grow very compact, but since we have a pretty limited-sized space in space to work with, they also have to be something that the people want to eat. So we also do taste tests and texture tests as part of our selection process to make sure that it's actually going to be something enjoyed by the crew.

And then finally, we also do microbiological testing and nutrition testing to make sure that everything that we're growing is going to be safe for human consumption. But also we know that the astronaut diet can be lacking in particular nutrients. One example of this can be vitamin C. We also lack that here in our Antarctic environment.

So right now on the space station, we have the very first grow out of fruits and these were chili peppers, and this actually concluded just at the last week, so right around Thanksgiving. And that's a boost of vitamin C for our astronauts. So we do a lot of work to try and find the perfect crops for our system, but fortunately, because that's a lot of work to get there, you know, we don't do the crop breeding. So if you're interested, you can go and find what we're growing and then try it at home too.

[Kate Hayes]

I was going to ask you, what are you growing? Like what are the most popular crops that you can grow?

[Jess Bunchek]

In Antarctica? It's a variety of things. So cucumbers are a really popular one. We also have a variety of tomatoes. We have chili peppers here as well. Kohlrabi. We have green beans, so you can just eat them raw, just pick them off the plant and eat them. And we have herbs. So basil, mint, thyme, oregano, chives, and rosemary, and then a very wide list of leafy greens.

That's going to be like lettuces or different kinds of mustard greens. So, the biggest thing that we can try and do is to provide variety for the crew in color, but also the list that I've just described those are a lot of different kinds of textures or shapes or flavors. And with being here for over a year, it would get very boring if we were just growing the same crop over and over again.

So it's been fun to grow something new. And then, you know, every few months to have something that the crew has it had before and then to get to bring it because in it's just adding something fun to our schedule when otherwise, you know, we may not get that.

[Kate Hayes]

Absolutely. So I'm guessing, I mean, I know that you're doing this for a purpose and it has to do with NASA, but can you also see, like, are you guys also thinking about the potential implications of this research for, you know, people dealing with the effects of climate change?

[Jess Bunchek]

Yeah. One of the things that this research can ultimately work to help, we're not studying it exactly in just the setting. That's a little bit beyond what we can do, but we hope that this can ultimately help us as researchers and as engineers to help people who live, particularly in places like food deserts to get better access to food or have more potentially resilient areas of food production. So I know one of the areas of research that the Canadian Space Agency and some of the researchers at the German Aerospace Center are working on is a collaboration with individuals who live in the Canadian Arctic. So they don't normally have access to fresh produce.

And so kind of like growing food here in an isolated polar environment, the people, I mean, of course, we talk about the cops, but the people are really the main factor in this story. And so what these researchers are working on with the individuals up in the Canadian Arctic is how to give these people the tools that work with their culture and with what they're needing so that they can have better access and more resilient access to fresh fruits and produce all throughout the year.

But it's not just going to be the Canadian Arctic. We also have to think about places, you know, in warm/hot environments and everywhere in between that you know, need better access to technology to have more constant and resilient access to fresh food.

[Kate Hayes]

Absolutely. Klaus, I wonder if you can speak to that as well because I know the agriculture industry is also investing a lot more in vertical farming and glasshouse growing. So what can you tell us about that?

[Klaus Kunz]

Yeah, I think the agricultural industry is indeed moving away from just selling seeds and crop protection inputs. And I think the big change is away from those just selling inputs into providing solutions and the solutions have to be tailored to the respective needs and opportunities in a given country, including cities, where you would have vertical farming as a great opportunity.

If I just go back to simple agriculture, it's not just selling a bag of seeds and putting some insecticides and fungicides next and left to it. It's providing a real solution to the grower, which helps them to get the optimum yields of the fields. It's combining of course the elements of the best seat with the best crop protection, which can be a combination of chemical and biological crop protection, along with those digital farming tools, which I already mentioned, which can really significantly enhance productivity and also profitability and sustainability at the same time.

[Kate Hayes]

Absolutely. So, for people who may not be as familiar with farming tools and practices. So say 100 years ago or 75 years ago, I mean, it was pretty straightforward. You know you plant the seed, you put some fertilizer on top, you know, pull the weeds, pick the bugs off the crops there mean there wasn't a lot to help the farmers in terms of technology.

And now you're saying basically we’re at a point where all the data that farmers have been gathering and generating over years like finally, there are tools that they can pull some insights out of that data. Not only from I'm guessing their own fields, but there, there are other farmers' fields as well.

And then they can understand like, which kind of seed performs the best in this type of soil and when to plant it and how much fertilizer needs and when all of that kind of thing, what they can find out.

[Klaus Kunz]

Exactly, exactly. That's the point and thereby replaces the sheer inputs-based models of the past.

[Kate Hayes]

Yep. And it's no longer just pure guesswork or hope for the best. I mean, I guess there is still that uncontrolled element of the weather and that is where, you know, the whole climate change issue becomes, an even bigger concern. We all depend on food. And even though the farmers have better tools and technology than they ever have before, if the weather keeps changing dramatically, if they keep facing these huge weather events that could literally wipe out fields, How can they provide for all of us? We're not all growing our own food we're depending on them. So, you know, in terms of climate change, I know you had talked about how do we make it profitable for farmers to adopt these more sustainable practices?

Obviously, we want them to be able to do that because then they're collectively reducing greenhouse gas emissions. But, how can you do that? How are you able to make that profitable for them?

[Klaus Kunz]

The foundational idea came when three years ago, we as Bayer, as a company, declare to become carbon neutral by 2030. And then we started to calculate and investigate how can we actually become carbon neutral. Very soon we found out that we can of course improve efficiencies and we can reduce emissions in our own operations to a certain extent, but not completely. I mean, imagine an airline declaring to become carbon neutral and not emitting anything anymore. That's impossible.

So there will always be companies who will pay others to put the carbon dioxide back into the soil, which they have to emit by the systems that they are running. So from that angle, we saw that buyers will pay money for those offsets. And we were wondering if those offsets could not be coming from our customers. If we couldn't put the money that we anyway put out to become a carbon-neutral company if we couldn't find a way to direct it to our customers. If the methodologies they use are really certifiable so that we really can talk about a financial, reliable, and solid asset, which has traded.

So that's one stream of value creation, a farmer who adopts verified protocols to grow his crops or her crops. This farmer might have the opportunity to generate a carbon credit and this carbon credit can be traded in the markets and then maybe Bayer or any other company can buy it from the farmer. And at the end of the season, the farmer does not only sell his harvest in terms of soybeans, corn, cereals, apples, or whatever.

They can also sell the carbon, which he or she has put into the soil. That's one way. The other way to look at it is that if a company like Bayer declares to become carbon neutral, we do not only look into our own operations but also upstream with our suppliers. At least to a certain extent, there's like protocols like science-based targets would definitely require that we also, at least to a certain extent, make a request to our supply chain and not only to our own operations, which is great because it puts pressure on everybody to move.

Now, if you look at the big food chain companies in the world who are buying the products from the farmers. For them, the farmers are the suppliers. So I believe sooner or later farmers, I mean

actually farmers who want to be in the system, trading their products, their crops, their harvest to those big food chain companies, they will be obliged to know later to demonstrate how they operate in a climate-smart way. And we want to help those farmers also have access to those opportunities, have a competitive advantage, be able to produce in a climate-smart way so that the big food chain companies can put them into their scope 3 calculations. That's the two pathways. It's one we call offsetting producing carbon credits, which can be traded. The other one is being prepared for the needs of the future and producing crops in a way that the big food chain companies will buy them and bring them to the markets. And I think both ways are equally attractive for the growers.

[Kate Hayes]

That's fantastic. I know we're talking a lot about, reducing carbon emissions, which is essential, but I'm just wondering, are there other benefits to the environment as well? Like what are the other ways that these agricultural practices, new technology are protecting the environment?

[Klaus Kunz]

What I'm dreaming of is that farmers in the future are incentivized for running a perfect ecosystem and the perfect ecosystem includes profitability and high yields. We don't want farmers to have low yields because, with low yields, we would need to turn more land from nature into agricultural land. This is what we need to avoid by any means because that's the biggest source of loss of biodiversity. But to a good ecosystem, we have now carbon as the first additional component. And it's, I think the first obvious component because as I said, there's a market and money to do this, but then we need to talk about water-efficient agriculture. We need to talk about biodiversity preserving agriculture. We need to talk about soil health and agriculture, about forests, and all the other dimensions.

Any farmer who at the end of the day, was running an ecosystem, which has a very balanced profile, taking all those impacts into account in the most profitable and best way, this farmer should be incentivized. The problem is that it's very complex and we need to talk about how do we measure all these dimensions.

And if you talk about, you know, carbon. It's just one dimension. You can measure carbon in the soil, even though it's already very complicated. If you start talking about biodiversity, it becomes incredibly complex because how do you measure biodiversity in a simple way? In a credible way? In a verifiable way?

I think these are the big challenges we have now. Investors have the same questions. Impact investors want to see everybody moving in these directions, but they also don't know how to measure this. So we have a joint interest in developing those measures. What Bayer has done beyond carbon, as a staff from our end was to say, we want to reduce the environmental impact of crop protection.

And that is again complex because the environmental impact is a very broad topic. It's basically the impact of a pesticide on everything which is out there in the environment, but a consortium of universities have developed a measure and we have used it for the first global assessment of all our products.

And I think here we have now a measuring system in place which could be scaled. We want to talk with regulators and others about it to really show which of the crop protection inputs have the biggest impact and should be either replaced or mitigated or reduced further on. So it's beyond carbon, the second piece, which we have put out.

The topics we are working now on are our water and biodiversity going forward.

[Kate Hayes]

Absolutely. That, that actually makes me remember, Jess, I heard you speak recently at the Youth Ag Summit talking to young people about some of the work that you do there, and also, you know, just the importance of not only food but water and protecting and preserving water.

What's the situation there? What do you hope to see happen in terms of the way we conserve our water here on Earth in the future?

[Jess Bunchek]

Yeah. Water is quite the buzzword. Whether we're talking on Earth in space in Antarctica, it's definitely a driving factor for what we're trying to develop with technologies for growing crops, more sustainably and efficiently.

We're thinking about how we're growing crops in space. We have a limited amount of water that we're allocated to work with. So we're already thinking, okay, we have these existing technologies what can we do to use water a little bit, a little bit better in space because on the ISS, it's one thing, but if we're talking about the moon or onto Mars, that could be an even bigger challenge, not only with the microgravity but just with the whole system. So how do we continue to push the envelope on the research? With what we're doing here in Antarctica as well everything that's brought to the greenhouse has to be done pretty much manually, you know, where we're an offline system with regards to our water use.

So, if we're right now, we're using aeroponic systems, not hydroponic systems, so that can help us to use a little bit less water, in an environment where we have to be soilless because we're located on an ice shelf. Given the Antarctic environmental restrictions, we can't have soil here. So we're already having to think about how we can develop better technologies, not just for here, but also for all of controlled environment agriculture.

But when we're thinking about water in terms of a field environment, that can be a much more complicated story. Klaus, you've mentioned incentives. How do we provide incentives for our farmers so that we know we have these technologies that we can help to give them, but how do we incentivize them so that they have the ability to actually implement these on their farm?

One of the recent incentivization, I've started to see, at least in the United States is that farmers can get subsidies for putting solar panels on their land. And they're finding that well, what about the inter-row space in between those solar panels? Well, if they convert that space into growing things like low produce, you know, fruits and vegetables, that aren't way too tall then that helps to keep the soil covered, which is going to be a great benefit for your soil health and bringing in the biodiversity. As you know, what we've mentioned is something we really want to strive to

improve. But also, it's been finding that with having these solar panels rotating throughout, following the sun, they're actually providing intermittent shading to those crops.

And that alone is helping to reduce the amount of evaporation on those crops, which is requiring less water. And in particular out in the west, such as in Colorado, where a couple of farms have been implementing this practice, water is very scarce in the Western United States. So this has some potential, but it goes back to, we need to be able to incentivize this more for the farmers, because at least in terms of this one example, the incentives aren't there quite yet.

So, we're getting there with the technology. It's just trying to build that connection between the development being there and improving the way in which we implement those.

[Klaus Kunz]

I have to confess something here. I'm sitting in my warm room in Germany and I'm getting more and more jealous when I listened to you, Jess.

Because I think you were in one of the places for the most creative, innovative thinking I have ever heard about because you have no choice. It's absolutely flashing to listen to you talk.

[Jess Bunchek]

Thank you.

[Kate Hayes]

So a lot of innovation is born from necessity, right? Like we know this, but we don't want to be in that position when it comes to dealing with the effects of, you know, essentially a broken planet. So hopefully all of the work that you were both doing and all your colleagues are doing will help us not get there.

But you know, at the end of the day, it's gonna require science, right? The science, its innovation, like things don't just improve by themselves. And I think that's just a sense of something that many people don't really connect. Like they think of science as something boring that they learned in elementary school, middle school, and, you know, dissecting a frog or whatever it was they didn't like about science. That's still in their mind like that's science. But in reality, it is every new innovation that we enjoy, that we build our lives around that you stand in line overnight for it to get the latest iPhone. But, you know, it's also the innovation in the food that we eat, the crops that we grow and the ability to do that, even in challenging conditions and hopefully the ability to do it, more sustainably so that we don't come to a real crossroads in terms of how are we going to fix this?

Is it possible, or is it not? But I would love to get both of your takes on that, on science and how essential it is to make all of this work. Klaus, we'll start with you.

[Klaus Kunz]

For me innovation and science are crucial and I can see this digital and with the new breeding technologies I can see even at disruptive opportunity to make things significantly better. I think another milestone can be achieved if you really open the doors for these new opportunities and

innovation. I have to say I'm a bit reflecting on the role of industry here is that we need to be a lot more mindful in the way we talk. I think there, we were not the best in the past when people have concerns, it doesn't have to say, you know, we are the best or we have the best technology. I think we need to connect what we do more to the concerns of people. We should start conversations actually at the concerns of people and not at our new, amazing technology portfolios.

Because I think otherwise we fall into the same traps, like in the past that we missed connecting these things to the broader public from the early beginning, which is the most dangerous thing which can happen because then all kinds of gloomy ideas start or start to grow around these new technologies. This is why I think we should be more inclusive in the way we develop our products and the new technologies and the more disruptive they are, the more inclusive we have to be. And one part of it is anyway to develop more in partnerships with other inventors. But the other thing is to develop actually, even to a certain extent in partnership with a broader public.

[Kate Hayes]

Well said. And Jess, what about you? How do you think about the role of science and securing a better future?

[Jess Bunchek]

Well, first off I think science is just so cool. So I'm so glad we get to talk about it, but I think that science can come about in pretty much two different ways. The first one can be out of sheer curiosity for building our knowledge, and connectivity with everything around us, and the other one can come about with having a particular problem that we are forced to find a solution for.

And sometimes those actually get connected together. One example I have of this is implementing cover crops in our farms. So one problem that came about was that many farms have been applying herbicides to control their weedy and invasive crops. And then with over-reliance on monoculture crops. So maybe one, one crop too frequent, you know, whether that's in years or just too large of a space.

And then with relying on too simple of a weed or invasive plant management program, then now we have a widespread problem, which is that there is herbicide resistance. And developing new, they're called modes of action or sites of action. So new ways in which we can help to control our weeds and our invasives with herbicides, it's very complicated and we're finding that it takes a lot of money and it takes a lot of time to develop new chemical methods for doing this. So then that's brought around a problem of, okay, well then how can we help our farmers to be able to control the weeds and the invasives that they have on their land, given the technology that we have. And so with doing the science it's become okay, well, how do we use the technology that we have a little bit more responsibly while also developing other methods that will help us to offset the load that we have been putting just with relying on these chemicals so that they can stick around longer to do their job. Its kind of like antibiotic resistance is probably the best way to describe this in a non-agriculture term. But one of the ways that we can help to keep our herbicides working for us longer and also to reduce the reliance on them when we don’t need to be over-applying them is to implement cover crops. And cover crops as we're finding out from other areas through more of the fundamental sciences that cover crops are potential revenues

for our farmers, so they can get an additional crop out of their system, but also provides incredible benefits for our soils.

So it goes back to improving our water retention, improving our nutrient retention, reducing runoff, improving the biodiversity in that system, and helping to, in some cases, it can also help to control diseases, but those are areas where we're finding that cover crops is just one example of where it's crossing across all different areas.

And so then how as scientists do we work to solve this problem and also work with the other scientists who are working with the soil science aspect or the entomology aspect or the agronomic aspect, and really come together and then help to work with our farmers to then give them the tools that are necessary for whatever they're dealing with on their farm. But, as scientists, it's really wonderful to be able to build this community together and to be able to share knowledge on all of our different areas, because ultimately we need to find practices that are going to be very long-term sustainable for the industry and for our farmers that help to support it and also are supported by it

[Kate Hayes]

Very well said, well, this has been a really good discussion, an important discussion. And I would like to end by asking both of you about your headline, this is called the Headlines of the Future Podcast. And I'm wondering, you know, which headline would you like to see or read about climate change in agriculture in 2030 or even 2050? Like what could the future of agriculture look like thanks to science? Jess, do you want to take the first shot?

[Jess Bunchek]

What headline? Oh, man. I think it's going to go back to the water theme. But, if I could come up with a catchy headline, it'd probably be something like Water: In the right place, at the right time, for everyone.

[Kate Hayes]

I like it. Sounds like it could be like a new marketing tagline for a great new technology. Klaus, what about you? What would your headline be?

[Klaus Kunz]

And maybe after a CEP, whatever 38 or 42, whenever in the, not too near future to read a headline, like The turnaround is completed; farmers are recognized as the best stewards not only of our excellent food but also have a healthy environment.

Something around this. That's the turnaround that farmers are recognized for producing food and preserving the environment. If this would be recognized, I don't know what the best headline is to say that, but that would be what I was really hoping for. Thank you.

[Kate Hayes]

Well, I know that they do play a very important role as do you both.

And I just want to thank you so much for sharing your perspectives with us. Jess Bunchek, NASA plant scientists, and Klaus Kunz from the sustainability team at Bayer Crop Science. I am still processing all of this great information that we've just learned and hopefully, our audience will leave with some good food for thought as well.

Thank you to our audience for listening to Headlines of the Future. We really hope that you found this trip into the world of agriculture and climate change as exciting as I did. If you want to learn more about science and innovations, that help address some of our most pressing global challenges, visit Bayer.com. Listen to our next episode and subscribe. If you want, share the podcast with others or leave us a rating and review. Thanks again for joining us. And we'll hope we'll see you for the next episode.