NWX-NASA-HQ-AUDIO-CORE
Moderator: CHERYL WARNER
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1:30 pm CT

Coordinator: Welcome to today's conference call. At this time, your lines have been placed on listen only for today's conference, until the question and answer portion of our call, at which time you will be prompted to press star 1 on your touchtone phone. Please ensure that your line is unmuted and please record your name and media outlet, so that I may introduce you to ask your question. Our conference is being recorded. And if you have any objections you may disconnect at this time. I will now turn the conference to our host, Ms. Tylar Greene. Ma'am, you may proceed.

Tylar Greene: Thank you. And hello, everyone. Thank you for joining us. I'm Tylar Greene with NASA Communications. Today we'll be discussing NASA's work in agriculture, which we have recently dubbed Space for Ag. Of course, we work closely with our partners at the US Department of Agriculture, to do so. And we're very glad that they are joining us today. We're also happy to have some representatives from the agriculture community and universities. And I will introduce everyone shortly.

This week, as a little bit of background, some representatives from our Earth Science Division at NASA, have been meeting with producers and representatives in Nebraska and Kansas, where there have been discussions

about the tools and resources that are currently available for folks. And we're also trying to learn about any data gap as we plan for the future and looking forward. I won't go on about that too much, because we have a great panel of folks. So I will go ahead and introduce them and then we can get started.

We have Karen St. Germain, NASA's Earth Science Division Director; Brad Doorn, Program Manager, Water Resources and Agriculture of NASA's Earth Science Division; Seth Meyer, Chief Economist at the US Department of Agriculture; Zach Huneycutt, Owner of Huneycutt Farms; Brian Wardlow, Director, Centers for Advanced Land Management Information Technology at the University of Nebraska-Lincoln; and finally, Susan Metzger, Associate Director for Agriculture and Extension at Kansas State University. So, thank you to each of our panelists.

We'll first hear some brief remarks from everyone, and then we'll open it up to Q&A. And so with that, I'll turn it over to Karen, to kick us off.

Dr. Karen St. Germain: Thank you, Tylar. Good afternoon, everyone. As you all know, NASA is a science agency. And from our vantage point in space, we're observing many changes in the Earth's system. And because we make measurements of the atmosphere, the ocean, the land, and the ice, we know why it's changing. We are working to deliver actionable science to help decision makers mitigate, adapt to, and respond to that climate change. And we're increasing the scope of our work in the agriculture sector because of the potential impact of climate change may have on our nation's ability to feed itself.

And of course, much of the work we do to support agriculture, is in partnership with USDA, so I'm really delighted that Seth Meyer is on the call with us today. There's an opportunity here to grow our understanding of the

agriculture sector's needs, as we grow our understanding of the Earth's system. In sharing our understanding of how a change in one area can drive changes in others.

So this week, we've been engaging with production agriculture, to hear specifically, what kind of data they need that we might be able to provide from remote sensing observations. And we're really excited to see where these new relationships lead. NASA has 24 missions in operations, orbiting Earth today, making detailed measurements of everything from precipitation to bio mass. We have another 18 in development, and by the end of the decade, we'll have the next generation of Earth-driven observation capability, which we call the Earth System Observatory.

The ESO will be comprised of five core satellite missions and three completed Earth Explorer missions. While each mission has value of its own, taken together as a single observatory, the ESO will give NASA a truly 3-D holistic view of the Earth system. So the conversations we're having this week will help us refine the work we're doing today, and shape the work we'll be doing tomorrow. And with that, I'll hand it back to Tylar.

Tylar Greene: Thank you. And next we have Brad Doorn, Program Manager of Water Resource and Agriculture, of our Earth Science Division at NASA.

Brad Doorn: Hi, everyone. As Karen is saying, I'm - and Tylar introduced me as the Program Manager for Agriculture Program and Applied Research. And Applied Research, sometimes that definition gets a little blurry, is really defining the problem on the ground. And that's what our job is, and that's what we've been doing this week, is trying to understand the producer's view of what the challenges are, what they need, what the gaps are, because the solutions are going to be where the producers are.

So then we reach back into NASA and as Karen mentioned, we try to refine what we're already doing, to tie it to these challenges. And also, can that help us reshape what we're doing in the future? It's so important for us to understand these challenges, these decision processes. And I'd like to mention, in this - as we're touring with these producers, we have been so impressed. We knew their job was tough, with complexity of their job; how they have to deal with multiple issues from economics, to their agronomy issues, to weather, and then pull that all together and produce the food that we all enjoy, is amazing.

And we're learning so much too, about where those challenges are. And what was awful nice to hear too, is the history and how the history of those farms and those production areas, you know, are so important to how we drive into the future, and how they understand the land. And really some neat ideas that we're going to bring back to NASA. So with that, I'll turn it back over to you, Tylar.

Tylar Greene: And next is Seth Meyer, Chief Economist at the US Department of Agriculture. It could just be my phone. I want to say if you're having an audio issue my apologies. But it could just be my local connection as well. Seth, over to you.

Seth Meyer: All right. Hey, thank you very much. So I wanted to give a bit of an overview. I mean we have a fairly new agreement or MOU, signed at the end of 2020, bringing together NASA's experience with technology development and space-borne science measurement, you know, along with USDA scientific experience, and knowledge or agricultural production; resource conservation; food security; to do among other things, share and apply space-based measurements of things like soil moisture, strengthen predictions of

agriculture and climate trends, support research on the climate cycle, and even do things like grow fruits and vegetables in space.

I mean this is not a first MOU between NASA and USDA. But I really do think it's one of the more crucial and more important for now, more than ever, because the promise of Earth observation and the technology is being realized. I think we've got a real - I think the technology is at the point the contributions can be big. USDA itself, has a long history in the application of Earth observation. We've been a user and a proponent for decades.

One of the key applications for us in the past, has been supplementing our field level observations and assessing US crop production prospects. But it's also similarly, been used in evaluating crop conditions and prospects around the world, where it's not possible for us to get the information within those countries. It may be they are remote; it may be other issues of access, including a conflict, etc. We're a big proponent of use of Earth observation in evaluating crop prospects, and that's critically important right now, in terms of food security.

We're seeing strong and volatile agricultural commodity prices. More frequent and timely observation of crop prospects around the world are going to help facilitate market response and improve global food security. Those opportunities aren't limited to crop progress assessments, although those are critically important and will make an increasing contribution in this area. There are a lot of new potential collaborations with NASA on Earth observations. And they expand with the technology.

You know, as Karen indicated, of course Earth observation and these technologies, can help evaluate the impact of climate on ag, but I also think there's an opportunity to aid ag in fulfilling its potential to be a contributor to

the solution on climate. I always like real world examples. So I would say, you know, throwing out an example, USDA recently announced $1 billion to facilitate markets for climate smart commodities. And this links producers and the way they produce the crop, to marketers and even to consumers, to meet the consumers' demand for climate responsible commodities, or climate smart commodities.

One of the key elements of this program will be the partnership network amongst those organizations which receive these funds. And that'll be consistent - this partnership will consist of awardees and where USDA can work to measure and quantify the climate benefits of participant actions. And I think much can be learned in this process. And we'll be able to apply it more broadly. And I think Earth's observation as one tine example - I think Earth observation can play a role in this process.

So again, it's just one example of the kinds of things that USDA and NASA Can further collaborate on, and it'll be critical in adjusting our goals of sustainable productivity growth. Because global ag is going to need to meet the food and feed needs of the world, but do so in an environmentally, including climate, and economically sustainable way. And so I think this partnership and the advance of technology, I think we're to the point where this can be an even more fruitful partnership. Back to you, Tylar.

Tylar Greene: Thank you, Seth. And next up, I'm happy to introduce Zach Huneycutt, the owner of Huneycutt Farms. Some of us luckily had the chance to meet you earlier this week. So Zach, over to you.

Zach Huneycutt: Yes. Thanks, Tylar. Yes. It was nice to meet several of you the other day, at our place. Just to give some context for our farm, we farm in South Central Nebraska - corn, soybeans, popcorn, for the most part all with irrigation.

We've been asked by a number of people the last couple of days why NASA was at our place. Because again, most people don't instinctively put NASA with agriculture.

But really we started think about it - basically all of the tractors around here are being driven by GPS. You know, we're using GPS and RTK technology to make the job more precise; make the labor a little easier; just do a better job of producing food. So that's been a big part of what we've been doing for the last 15 to 20 years. In the last few years you've seen a lot of increase in the use of satellite imagery for in season decision making, mostly from commercial providers.

You know, you get scans anywhere from a few times a week to once a month, depending on the provider and the service level. At this point the - it's a little unrefined; it's a little more of a hey, there's a problem over there, you should maybe go check it out, without having a lot of detail. Sometimes we can get a little more detail about whether it's maybe a weed pressure or an irrigation problem, a bug infestation. But we're still working on getting more precise and getting more useful data from that.

You know, we're - between satellites and drones, we're getting better at seeing what's going on, on the farm, from up above. But trying to figure out what data is useful, what still needs some refinement, and what gaps there are, I mean that's - could be a pretty big piece of this puzzle the next few years, and so it's exciting to see this conversation begin with NASA. The - if you're looking down the road, as we were talking the other day at lunch, brought up NASA being good at looking at things over longer periods of time.

Right now we tend to be more focused on our in season decision making which is just a few months at a time. So just to begin to use some of this data

to think on a longer scale, like looking at how do pests move; how do insects or (bat) fungus move? As we learn more about how the climate's changing and what effect that has on our climate in this area, long term, how does that affect potentially the crops that we raise? How do we respond to that?

And then even figuring out some of the longer term effects of not just temperature changes, but wind patterns, movement effects on a lot longer scale. So I think there's a lot of excitement here over this conversation. And I'm excited to see where it goes. Back to you, Tylar.

Tylar Greene: Thank you, Zach. And next is Brian Wardlow of University of Nebraska-Lincoln.

Dr. Brian Wardlow: Good afternoon, everyone. So the University of Nebraska-Lincoln has a long history of working with NASA in the area of remote sensing and agriculture and even operational drought monitoring. So I just wanted to spend a few minutes talking about both drought applications and crop-related ag applications that Nebraska has been heavily involved with NASA in, over many, many years. So I'll start with drought first.

University of Nebraska-Lincoln is home to the National Drought Mitigation Center, and to the fairly high profile tool in the US drought monitor that they produce in combination with the USDA and NOAA partners, that's used to map and monitor drought conditions across the US. And the drought monitor is used widely by USDA to trigger eligibility status for several federal disaster assistance programs like the Range and Forage Program. And it's also used by many other drought monitoring activities and decision making activities both at national and state scales.

And over the past 15 plus years, Nebraska and the drought experts here along with scientists at NASA, really have a strong collaboration to develop new tools that NASA helps support to provide more timely and spatially accurate information to improve the drought representation and the US drought monitor. And satellite-based observations from NASA have been key to that. We've had a number of projects developing tools with NASA, data inputs, or what NASA deployed water program that Brad Doorn leads - funding them.

To be able to characterize different parts of the water or hydrologic cycle related to drought that can be plugged into the US drought monitor. For drought monitoring, we'll never have enough stations on the ground that measure things in (situ). So the observations that NASA provides and some of their model of products, help us fill in many of those spatial gaps, and ultimately improve the US drought monitor. Based on those experiences, Nebraska's extended many of those tools that have been developed through NASA partnerships, to other countries.

We work in many countries to develop operational drought monitoring and early warning, capacities supported by other organizations like USAID and World Bank as well. And those tools heavily rely on NASA Earth observations, which are absolutely critical. So we're really excited about some of the future planned missions by NASA, to see how we can innovate and further develop new tools to help both national and international drought monitoring early warning capacities.

The other role that Nebraska's played for a very long time in partnership with NASA, is trying to look at innovative ways we can apply Earth observations from NASA and other organizations, to do crop management. And that dates all the way back to the 1970s. So I direct our remote sensing center (CalMet) at Nebraska that was established in 1973, with a mission initially, to explore

the use of satellite perspectives, and how we can use that in agricultural management decisions. And NASA was a key partner of that. And we've had many, many projects over the years.

But probably what we're most well-known for is (CalMet) had the ability to do some basic research and then eventually convert that into practical applications in terms of field management. So we've used airborne and ground systems in concert with satellite Earth observations, to develop a wide range of tools related to crop management including nitrogen applications, crop stress identification, and water resource management that can be scaled up to satellite.

And it's actually practically used a lot in precision ag now. So we're really proud of those efforts that we've had. And NASA has provided fundamental data to allow us to take that work that we do here and apply it to the fields, the landscape scale through their satellite perspective they provide. So collectively (CalMet) and the National Drought Mitigation Center here, are working on using NASA data sets all the way from the field, to global scale, for drought monitoring and crop management.

And we're really excited about many of the new missions here in Nebraska, the really strong climate and remote sensing programs that allow us to do basic and applied research using NASA inputs, that we hope will eventually be converted into practical application. So with that, I'll wrap up and turn it back over to Tylar.

Tylar Greene: Thank you, Brian. And last but certainly not least, Susan out of Kansas State University. You can close us out before our Q&A session.

Susan Metzger: Thank you, Tylar. Again, this is Susan Metzger with Kansas State University, and I'll just echo or say thank you, to Brian and our partners at the University of Nebraska, to the north of us, just to say that those drought monitoring tools that you create in partnership with NASA, are critically important, and I appreciate that work here at Kansas State University. We also have a long time partnership with NASA at our Konza Prairie Biological Station, with our climate reference network, and our National Ecological Observational Network, which we'll have a chance to tour later this afternoon.

But really appreciate the opening comments by Dr. St. Germain, when she talked about NASA's commitment to actionable science. To me that just echos the land grand mission that we embody here at Kansas State University, where it's not just science in a vacuum and that it's not just research to extension, to the producer. It really is a feedback loop.

And we saw that in practice this week, where we had a chance to tour throughout the state; meet one on one in a group with producers; and not only talk about the tools that we have in place through NASA, but to learn more about the applications that they are using on the ground and how that might better inform not only NASA's work but here at the work at Kansas State University. So a pleasure to be a part of this tour. Back to you, Tylar.

Tylar Greene: Thank you, Susan. And now I'll turn it over to (Jill). We can go into the Q&A session, if any media on the line have any questions.

Coordinator: Okay, thank you. If you would like to ask a question, please press star 1 on your touchtone phone. Please record your name and affiliation, so that I may introduce you to ask your question. Once again, please press star 1, unmute your line, and record your name and affiliation, to be introduced. Please stand

by. Once again, if you would like to ask a question press star 1, unmute your line, and record your name and affiliation to be introduced.

Tylar Greene: I do have a few questions for discussion if we don't have any questions in the queue yet, from media. So Zach, I just wanted to hear from you. You talked a little bit about this. But in your opinion, what would be helpful for your operation in the short term, like day to day operations? And what about longer term production tools from the agency like NASA or like USDA?

Zach Huneycutt: Yes. Interesting...

Seth Meyer: Oh, I'm sorry. I thought you said Seth. Sorry.

Tylar Greene: It's okay. We can go Zach first, and then Seth.

Zach Huneycutt: Okay. Okay. Yes, so what was said about the work going on at UNL, I think partly, like having a better understanding of how much NASA is touching already. You know, the drought monitor is a product we're very familiar with, especially this year since it's forgotten how to rain. We've watched the drought monitor a lot. I think getting to where we can more finely identify what's going on here, right now we do a pretty good job of understanding soil moisture deficits or excesses and that's a pretty big part, especially as important as water is, in agriculture.

And it would be helpful in being able to having some understanding of how the -- I guess, the moisture patterns throughout the growing years how that - through the growing season, how that affects what's going on. You know, how does the rain or lack thereof in, you know, down in Kansas, how does that affect what's going on here? Understanding some of those dynamics a little more, even if they will be to the idea of understanding things that are

impacting production besides water, such as weeds or insects, you know, fungus, things like that.

And I don't know exactly how that would be achieved. But to be able to have those tools on a broad scale, would be very useful in the day to day operations. You know, and longer term, having a better understanding of not just the climate patterns and how temperature swings are impacting thi8ngs, but even sussing out a little more how do, you know, we had pretty bad flooding three years ago; we understood the effects that had in 2019.

But what kind of effect does that have the next year, the two years after that? So just understanding now just how weather affects one year, but how it's affecting things in the long term.

Tylar Greene: Thank you. This next question is for Susan. Based on your experiences working directly with farmers to test and adopt new technologies, what do you see as the most important challenges and opportunities ahead?

Susan Metzger: Thank you, Tylar. Well, in my own observation and I think it was just confirmed on some of our visits this week, the things I hear more and more, is the technology has to make their lives easier. You know, and by easier maybe it replaces an operation; it helps reduce some of their workforce or change some of their workforce demands. And I'm sure as Seth can attest to, it must make economic sense since there are plenty of tools on the market that are really interesting. Kind of flashy and exciting.

But if they don't (unintelligible) out for making production decisions, then they won't be widely adopted and used. Some of the challenges that we heard about and Zach alluded to this in some of their management decisions, is really having a solid two-week forecast of weather, you know, predictions

might be too strong of a word, but at least an understanding of the probabilities of what might happen at their localized area in a two-week timeframe, so they can really mitigate some risk and make some decisions about input management and risk management in that two-week window in a moving target.

And then the other thing that we heard about is the critical need for high speed internet for every acre and every head of cattle throughout the state. Really (unintelligible) really going to (unintelligible) these tools that are helping them make their management (unintelligible). Back to you, Tylar.

Tylar Greene: Thank you. And this next question will probably be good for Karen or Seth or Brad. And you've each touched on this a little bit, but how is NASA and the USDA working to improve some of the available tools and resources that are available? Is there anything coming up in the short term?

Dr. Karen St. Germain: Brad, why don't you start on that one?

Brad Doorn: Absolutely. Yes. We've learned that, you know, there are some key issues and I'll start with kind of a blunt one. You know, what are the next steps; how are we going to continue this dialog? And we will be awarding a domestic program, a consortium that's going to be dedicated over the next five years, to having a relationship with producers in the ag industry, to continue to refine both the gaps in the needs, help support co-development. We're actually working solutions together with the end users and moving that forward. So that's a near term activity.

There are also some activities that we found. One of them is - and Susan just alluded to it - some of these near term forecasting capabilities that we have. When you're looking at - we had some great discussions obviously about

whether forecasting, climate forecasting, and what we've said is that, you know, when you're looking at the 14-day range there are some things coming online that we think will really help. And in that discussion then too, we get to understand things in this interaction with how do you manage that risk?

What type of information do they need along with that forecast, for instance, uncertainties? How do you handle uncertainties? So I think in that 14-day window our support program at NASA, is going to be able to provide some key information. The other component of this I think is the interaction with the data. And it's - some of you might know, but we're really revolutionizing - Karen's program was really revolutionizing our data systems, and where we have an open science, more accessible system that's on the Cloud. It's more customizable.

The users can interact with it more easily, so that might be - might not be the producers, it might be the producer data providers. And so those are some key ones. And I'll end with one that is coming up in this decade, and I think it's important to note even though we're still years away from it. It's this long promised hyperspectral system. Getting a hyperspectral satellite system; getting this data flowing to end users, whether it's the (unintelligible) universities, our researchers, and we're working on agriculture problems.

But also, getting it down those producers, I think we're going to touch on some issues that Zach talked about when you have information from the satellite data, but it doesn't give you the type of nuance that really helps you make a decision or take some action. And I think that - and the hyperspectral data is going to allow us to give a little bit better detail on, you know, what is going on in the fields, and then of course, how do you - what type of actions the producer can take.

So I think those are some key ones. But if I missed any, Karen please catch those. And Seth, of course, please jump in. Back to you, Tylar.

Dr. Karen St. Germain: Seth, why don't you - Seth, do you want to add anything to that?

Seth Meyer: Oh, no. I mean I agree. I want to put something out there very practical. I mean I think we have these objectives and Karen you mentioned have to be economic. The producer to be sustainable, it has to be sustainable economically as well too. But producers obviously interested in doing - from my standpoint, producers obviously interested in doing the right things quite often.

So you have a better 14-day forecast. Producers are better able to assess this. USDA has put forward a program on split application of fertilizer. That means you'd better watch the weather much more closely and monitor how you're going to do your operations in the spring, in order to get that fertilizer in the ground, which had both economic and environmental benefits.

So again, I think that some of these tools that help producers think about when should I spray; what does the window look like for split application fertilizer for my corn? I think that these are benefits we will see very short run. And I think that there - and short run are still several seasons. But I think that then there are expanded opportunities beyond that.

Tylar Greene: Okay. Thank you, Seth and Brad, for that. So we'll have one final question that I'll ask Brian, and then I'll ask Karen to just say a few closing remarks, before I wrap this up. So Brian, you've been a close collaborator with NASA for a while. What do you see as the greatest gains we can make in terms of next generation research and information delivery?

Dr. Brian Wardlow: You know, I think that our experience with NASA at least from the drought monitoring perspective, because that actually goes into an operational near real time decision making process, is that NASA has done a tremendous job in providing data in formats, in the latency that means the line between data acquisition and delivery to the end user is very short, to be able to package data sets in a way that they directly can be plugged into the tools that we have to produce near real time information.

And of the organizations we've worked with, NASA has been tremendous at tailoring those systems. And Brad alluded to the fact of putting things in the Cloud and actionable information, putting data in a format. We can do that quickly. I think there's a history that I think we'll continue to develop. I think one of the areas looking at the climate perspective and kind of the diagnostics that was mentioned earlier, what's the cause of the climate-driven, is something else in the field.

I think it's really leveraging and harnessing the history of data resources to kind of understand. There's a huge archive of that as well. Mentioning the mission that Brad had alluded to - the hyperspectral I completely agree, gets into helping us in the future, provide new types of information observations at a field scale. Zach was mentioning, you know, many of the things, trying to unravel what is the stress or what's the anomaly in the field? Hyperspectral will allow us to do that. I think our partnerships in Nebraska, have allowed us to begin to unravel is it drought stress and water deficit?

Is it nutrient deficiency or something other? Hyperspectral will allow us to fine tune that a bit as well. So I think NASA and moving into the future, is actually using the model that's established for data ready or decision ready types of data sets delivery. I think that will be helpful in the future, along with

multi scale observation and the hyperspectral. Those are the ones I would probably emphasize the most.

Tylar Greene: Thank you. And Susan, do you have something you want to add to that?

Susan Metzger: Yes. I would love to. So one of the observations I made this week that I think is maybe the biggest potential opportunity in the future, we visited several operations where that land has been in the family for five to six generations. So that means the same family has been managing the land for the entire history, 50-year history of the land (set). So there's a potential connection to be made for on the ground information.

And to get today those producers, are literally collecting terabytes of data from their pivot, from their tractor, from their drone potentially, that all could be used as a feedback loop to better inform the applications that come out of the satellite data. So we really look forward to continuing that dialog.

Tylar Greene: Great. Thank you. And Karen, do you just, you know, I want to turn to you and see if you had any closing or final remarks before we wrap up today's teleconference.

Dr. Karen St. Germain: Yes. Thanks so much, Tylar. And thanks, everybody, for joining us. I hope that with this panel of folks and this discussion, you get a sense of the depth of the partnerships from NASA and USDA as a federal level with - all the way down to our extension programs at our universities, and to producers themselves. And I think yes, the strength is the partnerships and relationships we're building, that's where we get the understanding to know which challenges to go after.

And as you heard, there is a lot of opportunity here. It is often - there's often real commonality between information that would enable solutions that allow more cost efficiencies for the producers. And solutions that are good for the environment and the climate. So we think there's a lot of synergy there as well. So we're really going after these data information and tools to enable the best decisions that could be made on the ground, and I really appreciate the partnerships at every level, that will help us put those into action. So with that, thank you very much. And back to you, Tylar.

Tylar Greene: Thank you, Karen. And thank you to each of our panelists and speakers that joined us today. For anyone who joined us on this call and the reporters, anyone listening to this in the future, if you do have any questions please don't hesitate to reach out to me at Tylar.J.Greene@NASA.gov. My full contact information is in the media advisory. We will be providing a recording and a transcript of this teleconference, within a couple of days. And we'll update the media advisory link to include that access. Thank you, all. And for more information about NASA's Earth Science Program, please visit NASA.gov/Earth. Thanks.

Coordinator: This does conclude today's conference call. We thank you all for participating. You may now disconnect. And have a great rest of your day.

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