NWX-DOC-NTIA-OTIA

Moderator: Katherine Bates
July 19, 2017
1:00 pm CT

Coordinator: Good afternoon and thank you for standing by. For the duration of today's conference, all participants' lines are on a listen-only mode. Today's conference is now being recorded. If you have any objections, you may disconnect at this time. It is my pleasure to introduce Ms. Katherine Bates with BroadbandUSA. Thank you, ma'am, you may begin.

Katherine Bates: Thank you, (Holly). Thanks everybody for joining us today for BroadbandUSA's practical broadband conversations, a monthly Webinar series on broadband topics of interest to policymakers, decision-makers, practitioners and consumers.

These conversations are scheduled the third Wednesday of each month but please note we're not going to have one in August. This afternoon's topic is how broadband is transforming agriculture.

I'm Katherine Bates with BroadbandUSA and I will moderate today's presentations by three agriculture and technology experts representing the State of Tennessee, Northern California and an agriculture equipment manufacturer.

Questions from the audience will be taken after all of the presentations are complete. Please type your questions in the go-to-Webinar Q&A on the right side of your screen. We do not open the phone line for questions and you are in mute mode the entire time.

This presentation along with a transcript and audio will be posted on the BroadbandUSA Website with seven days. Please consult the Website or contact us if you would like a copy of it and we can send it to you so let's get started today.

As I mentioned our presenters are listed on the first screen but I'm going to introduce is Kevin Hensley, the Associate Director in the Public Policy Division at the Tennessee Farm Bureau Federation. Kevin's division at Farm Bureau voices the concerns of agriculture to lawmakers at the state and national level and serves as an advocate for Tennessee agriculture.

The Farm Bureau is the largest general farm organization in Tennessee and in the United States. Kevin graduated from the University of Tennessee Knoxville with a degree in agriculture economics and received a minor in political science so Kevin, I'm going to turn it over to you.

Kevin Hensley: Thank you Katherine and I'll go ahead and just jump on into my presentation. The State of Tennessee completed a study that showed that 13% of the state lacked connectivity to broadband Internet which was defined for the purposes of the study as 25 megabytes per second download and three megabytes per second upload.

In December of 2014, 98% of all Tennesseans in urban areas in Census blocks where at least one provider reported offering wire line or fixed wireless

service with the capacity of 25/3 compared to only 66% of those in rural areas which means that only 2% of the state's urban citizens lacked access whereas 34% of rural residents are without coverage.

This is mostly due to the low population density and challenging geography so what does Internet mean to rural areas? While there are many farm uses for Internet which I will get to some of those later, farmers and other rural people want access to Internet for improved quality of life.

I am personally lucky enough to live in an area where there is great Internet and it would be hard to imagine not having this type of service. Just like people that live in more urban areas, people in rural areas want access to social media, streaming services and everything else that the Internet provides.

This is just like electricity generations ago when rural people received electricity, not only was it used to run the milk parlor but it was also used to run the home. Access to Internet is becoming a necessity, not just a luxury. Next slide, please.

We at the Farm Bureau have heard countless stories for years about how students have had to drive into town to complete a homework assignment. More schools are requiring homework assignments to be completed online and if not, often this technology is not even used in rural areas because the students and parents don't have that access to it.

And when they are required to use it in rural areas, they have to go somewhere to do it. For people with readily-accessible Internet, it's kind of hard to imagine having to go to the local McDonalds to complete homework but this happens a lot in rural areas and this is just for middle and high school students.

Today opportunity abounds for students to continue their education online and this will be even more prevalent in the future. Farmers and other rural people want this opportunity. Next slide, please. Even though Farm Bureau is a farm advocacy group, we're still concerned about the overall state of the rural economy, farmers in a thriving economy in rural areas.

This again gets back to the idea of improved quality of life. As we are all aware, most of today's businesses and industry need access to Internet. With limited availability to the Internet, it is difficult to encourage industry to expand into rural areas.

This is important to farmers for many reasons but as this slide says, 52% of America's farms principal operator has a primary occupation off the farm according to the 2016 USDA (nas) survey of agriculture and for most other farms, some family member has an off-the-farm job in search of income and benefits. Next slide, please.

So how does Internet actually empower today's farmers? I've listed several items on this slide but the possibilities are really endless. It is truly amazing how much data we can collect from farms and the information that can be learned from that.

We have seen a huge uptick in interest for people that are interested in where their food comes from and the Internet allows farmers co connect to these consumers. The Internet can lower costs for farmers just like any other consumer can compare prices online, farmers do the same thing on their farms. Time is money and even more so with farmers.

Farmers can use the Internet to save time and increase efficiency. The Internet also provides farmers with current news about market trends and in today's base economy that is very important. Just last week for instance the price of soybeans dropped about 50 cents in one day and a farmer had much to lose in that situation if they were in the market. Next slide, please.

Next I would like to talk about two specific success stories in Tennessee about farmers who have used broadband Internet. First off is Sweet Water Valley Farm in Philadelphia, Tennessee who uses the Internet in multiple ways.

They are a 1300-cow dairy and milk three times a day in two different locations. The farmer John Harrison can monitor activities with cameras that he has setup in both parlors through an app on his smartphone. They also collect much data about how much each individual cow on the farm produces.

This information is collected and sent to a server at the farm office. They have Wi-Fi on many parts of the farm so they can access this information through their phones. They use about 10% of their milk to go into a farm for said cheddar cheese. The rest of the milk goes down to a fluid milk processor down the road.

They sell their cheese at their farm store, in regional supermarkets and online. Their Website and social media use is vital to their operations. Much of their overall cheese sales come from online during Christmastime when they ship all across the United States.

They use Facebook, Twitter and Instagram as a platform to promote the farm. Recently they have produced several videos that explain how a modern dairy farm actually works and posted these videos to Facebook and Instagram.

Another example of how they are utilizing social media is that they are hosting a solar eclipse viewing party in August and are solely promoting that event through social media. Also at their farm store they use the Internet to run their credit card purchases and have the capability of doing pop-up stores across the region thanks to this technology. Next slide, please.

Next is Webber Farms who farm in Coffey and Franklin Counties in Southeastern and Middle Tennessee. They are a diverse row crop farm and also produce the livestock in produce. They're literally at the end of the line for Internet access as their neighbors do not have the same Internet service that they do.

While their equipment does not collect data on their farm about their row crops, they do use the Internet for direct-to-consumer sales. They sell fresh beef, pork and produce direct to consumers or at a farmers' market. Jamie Webber who is the son in this father-son operation told me that they cannot do what they do without their Website.

The consumer wants to do research on the farm before buying from them. They also use social media to advertise and promote their product. Other than that, Jamie told me that they could use the Internet every day on their farm from updating social media, watching a YouTube video about how to repair equipment to checking the weather, news and the market.

This allows for quick decision-making on the farm and they also use the Internet to purchase parts and equipment on a regular basis but for every success story with farmers and the Internet, there are multiple untold stories of limited opportunities so as a state, the governor and the general assembly took on this challenge of getting Internet to rural areas.

Like I said at the beginning, over a third of Tennessee's rural residents do not have access to broadband Internet. On the next Slide you'll see a link from Governor - a YouTube video - that is presented by Governor Bill Haslam on why passing the Broadband Accessibility Act was so important to Tennesseans.

He mentions that as Tennesseans who want a vibrant rural economy and we know that the Internet is needed to have that in the future. We couldn't quite get the video to work so I want to encourage you to check out the link at the end and go back to it and watch the video or you can go to YouTube and search the name of the video which is Gov. Bill Haslam Broadband Accessibility Act. Next slide, please.

But again go back and watch that video but I'll give a quick synopsis about how about what the Broadband Accessibility Act did. Farm Bureau heavily supported this bill which is a part of the governor's legislative initiatives and was overwhelmingly supported by the general assembly.

The bill passed unanimously in our Senate and then by a 93-4 margin in the House. This bill came after years of study by the Tennessee Advisory Commission intergovernmental relations in our Department of Economic and Community Development along with some other attempted legislation that happened in the past.

The bill mainly did three things. First the bill allows rural electric cooperatives to provide broadband Internet and television service. Electric coops are uniquely positioned to help solve the Internet problems in rural areas but because of complex and longstanding state regulatory restrictions to call-up some previously prevention from providing broadband.

Second, the bill established a small grant program of local libraries to apply for that aims to teach Internet literacy. It doesn't do much good to have Internet available to people if they don't adopt it because of a lack of knowledge.

And third, the bill established in the budget over the next three years $45 million and it makes the state grant and tax credits to help Internet providers go into the underserved areas in the state.

In the big picture we kind of realize that this is a small amount and the true cost of taking the Internet to rural areas but we believe it's a healthy start and it may tip some providers over the edge into going into these areas.

This bill is not a fix-all and we won't see broadband Internet in all of rural Tennessee tomorrow but we believe it is a step in the right direction and with that, I'll wrap-up and I'm happy to take questions at the end.

Katherine Bates: Thank you, Kevin. You gave us a good overview of why broadband is important especially in supporting farmers in Tennessee. As a reminder to participants any questions you have, please type-in your questions in the go-to-Webinar screen on the right of your screen that's up there and also we are going to post the presentation online along with a transcript and a recording within seven days.

It will have that link to the YouTube video about Governor Haslam because he does a great job of laying-out why it's so important in a very short amount of time so that's a good video, thanks, Kevin.

We're now going to talk about an innovative pilot project across the country in California so I'd like to introduce Trish Kelly, Managing Director at Valley

Vision, a regional civic leadership organization serving California and the capitol region in Northern California.

Trish manages Valley Vision's portfolios in broadband, food and agriculture and economic and workforce development. Valley Vision leads the region's connected capitol broadband consortium, part of the statewide network of consortia funded by the California PUC to close the digital divide and drive deployment of innovative technologies.

Valley Vision also leads many other agriculture and technology projects in the region while Trish herself is involved in many organizations supporting this work throughout California. Trish graduated from Georgetown University and has a degree from the University of Pennsylvania and I will hand it over to Trish now.

Trish Kelly: Thank you so much, Katherine and we're very happy to be here today and we'd like to thank you and NTIA for this opportunity and as you can see on our opening slide, we have many partners working with us on this project and we'll describe their roles as we go along.

I'd like to just mention that all of the issues that Kevin described are the conditions and circumstances and challenges and opportunities that we face so it's certainly I think a national issue that we're all working on together. Next slide, please.

So as a quick overview, Katherine mentioned our broadband consortium which we manage through the statewide network of about 14 consortia so the role of the consortia are to help collaborate with local partners and we really try to identify the biggest areas of gaps and the priority infrastructure projects,

work on identifying funding sources including that which is available through the state California advanced services fund which supports the consortia.

We advocate for the resources and policy changes we need. There's a lot of educations have really helped people understand what the circumstances are. A lot of people think because we're in California we're the state capitol here and we're close to Silicon Valley that everybody should be all connected and that is not the case.

So we're looking at the many ways that broadband can improve the economy, public safety and quality of life and so especially this is a huge issue for us in our rural communities. Next slide, please, so there is a documented urban and rural divide across the country.

You heard in Tennessee and then we have this in California as well as our own region. In California only 43% of the state's rural population has the same Internet access as our urban areas and most of this population resides in the Great Central Valley which stretches in our state from Bakersfield in the south to Redding in the north.

This is a huge global economic engine in terms of our food and ag industry as well as other industries and we just simply do not have the infrastructure to compete as a level playing field.

In our region in Sacramento which is basically a six-county region with a broader food shed. We have a food and ag collector that generates more than $7 billion in direct economic impact so it's a very important economic sector for us.

Our council of governments SACOG has been doing a lot of research over the last several years through an innovative planning project called Rural Urban Connection Strategy that really looks at the interdependence of our urban and rural areas and has done a lot of research to document how we can build more sustainable food systems and looking at our infrastructure needs including transportation and broadband.

We are the home of UC-Davis which is one of the preeminent agricultural universities in the world. We're generating ag technologies but we can't use a lot of these technologies unless we have access to broadband as an enabling platform and nowhere has the need for this technology come home more for us than in the we're just coming-out of a five-year drought.

Now we had the opposite. In the last year we had huge storms and floods. We had an almost catastrophic flood with challenges with our Oroville Dam so the way that broadband is needed in rural areas is both for food and ag but also hugely for public safety and trying to get our fairgrounds connected because they're public staging areas for emergency services.

We're also particularly proud that our central valley has a federal designation from the Economic Development Administration as one of 24 manufacturing regions nationally and there's only one in four and we're one of the four for food and agriculture.

So poor broadband has been identified as a major infrastructure challenge for us to address to really help accelerate the growth of manufacturing in our region so here we are, we're the sixth-largest economy in the world. The capitol region has over two million residents and we still have this big divide. Next slide, please.

So going down to a more of a local level, through our consortium work over the last several years one of our counties Yolo County is food and ag is their primary economic driver and they conducted a broadband strategic plan with all of their jurisdictions and community stakeholders and they documented gaps in both urban and rural areas.

And a lot of what they did was try to really understand the differences between reported levels of service and actual levels of service so we used tools, it's an app called CalFeed which is developed by the PUC that helps people document real-time reporting on what their service is.

And so what we are finding-out is that more than 90,000 in our region are underserved or unserved and if you look at our primary infrastructure grades just for Yolo County, based on analysis of CPUC data as reported from our providers, we have grades that range from C minus to D or I'm sorry, C minus to F plus and part of the criteria is not just feed, it's the level of competition.

So we may have good speed in some areas but we don't have enough competition and there are issues with pricing and reliability and service quality so you will note also too that this is a standard of only six down and 1-1/2 up so our state standard is far below the federal standard so again if we're going to compete, we need to have really great broadband.

If you can see on the next slide we took the data from our analysis and just overlaid them on our counties and when you go to a more localized level, you will be able to stay in your own community or your Census designated place what the broadband is. The C represents the City of Sacramento, the urban-metro area.

We have several larger suburban communities and we have a lot of small rural towns spread throughout our region. We have a very large region, over 80% of it is in open space and ag and/or forest up in the foothills and towards Lake Tahoe which you see to the right-hand side of your screen.

To the left-hand side of your screen is the Bay Area so we're only 90 miles from the Bay Area and again I submit that these grades are not what they should be for the capitol region so next slide, please, so in response to some of our challenges we've been very fortunate to partner with the California Emerging Technology Fund.

This foundation was created out of a merger of the telecoms about 10 years ago and its mission is to address the digital divide but also as with the consortia to promote the adoption of very innovative projects looking across many different kind of areas of application.

And so (chee) has funded Valley Vision and Fresno State to do an ag tech pilot in two of our leading agricultural counties and Fresno State is our partner who manages the San Joaquin Valley broadband consortium so we each received a grant of $75,000 and we're working closely together.

To implement the project we're testing the same three crops - grapes, almonds and tomatoes - but we are using different technologies and different ways of interfacing with our growers and technology providers.

We were also fortunate through our state broadband coordinator from USDA (Robert See). He connected us with the Internet Society, the San Francisco Bay Area chapter and they have been generous to fund Chico State University which is just north of our region with a $20,000 grant to do mobile broadband testing in Yolo County.

So we also have an advisory board including UC ag and natural resources, USDA public and private partners so we have a lot of intellectual (heps) that's trying to help us sort through this project. Next slide, please.

So our pilot has several goals. Overall our purpose is that we want to document the need for and the benefits of reliable cost-effective broadband access in rural areas for agriculture but also as Kevin mentioned our rural economic vitality.

So we want to document how broadband increases on-farm productivity, decreases energy and water use which is really incredibly vital for us and helps reduce chemical inputs to improve soil health and other kind of aspects and also there's a food safety component that's more and more important.

And what we're doing is we're looking at the - we're trying to verify - the claim to provider performance with actual so that we can identify where we need to fill our gaps and we want to test the performance of farmers who are using technology versus those who aren't to see what the benefits are.

And then our final opportunity really here is to introduce these new emerging ag tech capabilities to our growers who are innovators in and of themselves. Next page, please.

So our ag tech pilot has several project activities and Valley Vision's role is to conduct research on the state of where the ag technology trends are. We partners with support and leveraged new partners and we helped connect technology providers with growers so we kind of have a facilitative role as well as an overall project management role and reporting role.

So the first phase was a literature review on ag technology trends and impacts of technology in the field and part of this aspect on research is the first ever mobile broadband testing on broadband speeds related to 150 farms in the county and that's what the Chico State University research is working on and that's kind of an ongoing process through our year-long project.

Phase 2 is a survey of growers to get more qualitative input on the availability that they have on broadband on and off the farm and we worked with the Yolo County ag commissioner on this project who included the survey questions in the annual letter that they do to the farmers requesting their data for the annual crop report.

The third phase is actually out in the field. Yolo County we're working with three farmers in two technologies and in Fresno there's three farmers but one technology so here we've ben partnering with our ag start incubator to test cutting-edge technologies and differences.

And I want to note that this incubator came-out of a grant that we received, UC-Davis and our technology alliance several years from EDA to do a sustainable ag tech innovation center so we're really proud that this is resulting in the next stage of building innovation infrastructure in our regions.

So our sensors where we're using sensor technology were installed in the spring of this year. We had a late spring because of the flood and all the water and we are doing research and field testing from the sensors and other technologies which will be analyzed in the fall post-harvest and presented in the fall of 2017.

So just as a quick recap on kind of major research findings that we are using as a policy brief to inform states and local policymakers is now important

broadband is for ag production and operations and the availability really has serious implications for our competitiveness.

Deployment research shows that farmers are able to use 20 to 30% less water using ag technologies but they also have increased crop productivity and in fact we found talking to many of our growers that they actually adopted these technologies for productivity improvement and then found the benefits when they went through the water years that is actually helped them continue to farm as efficiently as they could.

Precision ag data is evolving into big data - huge growth, huge analytics - so this is a new field of practice and we want to make sure our ag sector's ready. The precision ag market is projected to reach over almost $8 billion globally by 2020 and in our region and in our state we want to make sure we have part of that market because we are innovating on these technologies from UC-Davis and others.

So some of our emerging issues are that we have a chronic labor shortage and this is especially critical with aging of farmers and integration issues. Food safety is a huge issue so our young farmers as well as our older farmers really need these ag technologies to help them better manage operations and our farmers are part of our leadership that is trying to carry that message forward.

Next slide, please. This reports on the results of our grower survey. A survey went-out to about 800 growers and we had about 100 responses which is a very good rate of return and 27% of the farmers report that they have no coverage at all and in some cases this is cellphone coverage as well as Internet access and 73% of the farms report some coverage.

Some of this is from mobile hotspots so what happens is farmers will collect the data in the field and upload it from a mobile hotspot or like Kevin reported people have to go into town to a Starbucks and download their data, upload their data, conduct their business.

They have to report to the state on things like pesticide use so we promote that it's not just ag in the field or broadband in the field but we need this in our communities and also in our homes so kids can do homework and our rural communities can thrive. Next slide, please.

This is the ag tech field study. This is the process that we're in now and we required that our technology providers meet three performance criteria, that their technology would lower resource input, increase crop or yield productivity and increase access to markets to boost the bottom line and this includes export markets or regional markets.

We're really working hard to build access to our regional food systems. That's a huge issue for us as America's farm report capitol but also it's important for our growers because agritourism is very important in our region so this is an important way to reach markets and customers.

Valley Vision coordinated with our ag start incubator to connect ag technology companies with growers so the growers actually had a chance to see a demonstration.

Most of them were out in the field and they could talk to the technology providers about things that how the technology would work and our participating farmers have been paid $1000 each to beta-test the technology and work with the company so this is the next slide shows the technologies that we're using.

And at first when we started we thought everything would be sensors or something like that in the field. There's a lot of soil sensors but there's some new research on leaf sensor technology and other approaches but one of our companies Lexus is working with our tomato grower is actually focusing on the irrigation pump efficiency and maintenance needs.

And it plugs into our local utility so Polaris this monitors and supports the hardware device installation and then Lexus runs the consumer interface so what it does is it tracks energy and water use and provides that to the customers so they can reduce their costs by kind of when they load and when they water and in California a great deal of energy is used to transport water.

So if you reduce water use, you also reduce energy use and we had one reported farmer from another project that saved $40,000 a year on this approach by just changing the timing of when he watered and maintained pumps.

So our other technology providers are using aerial technologies to deliver imagery and we're doing that on grapes and almonds and then in Fresno County they're using automated irrigation systems through an on-farm sensor network so when the project finishes we'll be able to look across at the same crops and see how different technologies perform. Next slide, please.

And then we're doing on-site testing in the field through Chico State using the Cal State application. They're actually going-out and testing in 150 farm areas. The first phase was on roads to the reporting showed a little bit better access but the next phase is to actually be on farms and that's going to really document the need for where we need to target infrastructure priorities in broadband adoption infrastructure.

Next slide, please, shows kind of that we found Chico State found that there were three areas in the county with limited broadband and three with higher so that's where they're going to go deeper to measure the variability.

That data will be compared to the performance needs that the growers have and there'll be information on spreadsheets in the GIS geos database and this can be replicated in other areas. The next slide just shows where our testing sites are so you can see they're really spread throughout the valley through the counties.

The left-hand part of the upper left-hand, that's an area called (kaypay) valley. There are a lot of organic growers and to the lower right-hand side is the delta. That's an area that doesn't have very good access and yet it's 10 to 15 minutes from the capitol so next page, please, this is our conclusion just to say is that we are really excited about this project.

It's unique I think and it's given us a great opportunity to really highlight how important our rural economy is and how important it intersects with our urban and it's giving us a lot of tools and information to document good solutions and strategies and help our growers compete and get the tools they need.

We have gotten a lot of new partnerships from this project. Our chamber of commerce carries this issue as a regional leadership priority on our federal (cap) business and through our food and ag committee so we're very grateful for that support and then as I mentioned some of our other partners UC ag and natural resources, UC-Davis, USDA, the state broadband council, etcetera.

So when we get the final mapping results we'll be preparing materials for dissemination and working with the state and others to really help advance our

issues and again we'd like to thank our partner the California Emerging

Technology Fund and (isoc) for their support and thank you.

Katherine Bates: Thank you, Trish. That's an amazing project you have going-on there and

going to produce a lot of data so I appreciate you sharing that with us. I just

wanted to give a couple of reminders. The questions will be taken following

the next presentation. If you have any, please type them into the go-to-

Webinar Q&A box.

We're also skipping the Webinar series in August. It's a big vacation time in

Washington, D.C. so we decided to skip it so the next practical broadband

conversations will be Wednesday, September 20th and the topic will be on

digital screening and workforce development.

And lastly today's presentation transcript and recording will be available on

the BroadbandUSA Website within the next week. Trish mentioned the

importance of precision agriculture and our last speaker Ben Craker will give

an overview of the many technological facets of farm equipment.

Ben is the Product Manager - Global Fuse data partners and standards at the

AGCO Corporation. AGCO is a global leader in the design, manufacture and

distribution of agriculture solutions and supports more productive farming

through its full line of equipment and related services.

AGCO products are sold through five core brands, Challenger, Fendt, GSI,

Massey-Ferguson and Valtra all of which are supported by FUSE precision

technology and farm optimization services.

They are distributed globally through a combination of over 3000 independent dealers and distributors in more than 150 countries so most likely Trish and Kevin have come across these farm equipment.

Ben is a 2004 graduate of the University of Wisconsin-Platteville where he earned a degree in ag business with an emphasis on engineering technology. After graduation he joined AGCO and he currently has global product management responsibilities for field data transfer and machine-to-machine communication.

He is also very involved in industry organizations focused on agriculture data including ag gateway and ag data collection in the agriculture industry electronics foundation among others so I'm going to hand this off to you now, Ben.

Ben Craker: Thanks, gee, I'm just going to do a high-level overview of all the different kind of technologies farms use in the field but first I wanted to kind of start-off with something out of a November 2014 Harvard Business Review article by Michael Porter and James Heppelmann where they kind of talked about the progression of technology in the ag industry going from kind of the machines all the way to the system of systems.

So if do the next quick get a little circle pops-up, this is roughly where I think we are today. We're starting to get smart connected products so as equipment manufacturers we've been building a lot more intelligence into our machines in the past several years.

And now we're to the point where we're starting to build-in cell modems in most of the machines at least for larger production agriculture are coming-out of the factory with some sort of cellular modem or Wi-Fi device built-in to

them from the factory trying to get those connected so we can start moving-out a little bit farther to the right there to get to the system of systems.

So if you go to the next slide, we'll kind of go through what some of these technologies are the different applications that they're all used in so the first little bubble that popped-up there is over the farm office and I think Kevin went through a lot of the different things that farmers use this for just for managing their business and being able to run Websites, reach-out to consumers and things like that.

They also are going to use a lot of connectivity there to manage their operations so I think it was mentioned being able to go-out and shop for different inputs so if they're looking for new seed chemical equipment, things like that, they're going to be doing a lot of research online, looking at different forums, things like that where you really need an Internet connection to be able to do that.

They're also going to be doing those transactions with those different service providers transferring data back and forth to get recommendations. All that's going online now and then just their overall farm management system, most of those are starting to move to the cloud and not be PC-based programs anymore.

So just being able to manage all their operational data, the business system they use to run the farms, things like that, definitely all need some sort of connectivity to make that happen. Go to the next one we'll look at the sprayer over there in the field running around.

Wireless transfer is getting to be pretty important for these types of machines so all the precision technologies that people think about on reducing the

amount of seed and chemical used in the field based on putting just the right amount in the right spot.

You have to get a prescription map out to that machine so it knows where it needs to put what stuff. Historically that's been done with you know, things like SD data cards or USB sticks which are kind of prone to getting lost in the truck or forgetting to, you know, get plugged-in to the terminal.

So that's where we've really started to see this movement towards growers wanting these machines connected and they can wirelessly send those work orders to those machines so they don't have to worry about physically transferring that prescription out to the machine.

The next one is kind of on the other end of that so as you're out in the field with your combine harvesting, you also want to get a record of what yield came-out of which spot in the field so if you're going to do management of multiple different zones at a sub-field level, you need to have the historic yield information to know which part of your field yielded better than others.

You can do infield trials to see how different fertility programs work within that field so that as applied information gets to be pretty important again putting it on a USB stick and hoping that makes it back to the farm office, can sometimes be a little bit risky. There are also a lot of times where there's pretty time-sensitive information needed.

If a farmer is going to do a fall fertilizer application for example, they want to get that data off the combine right away because as soon as that machine's out of the field, the next one's coming-in to put fertilizer out.

To be able to generate that variable rate prescription, they're going to need that yield file so driving a couple of hours back to town with a USB stick so somebody can analyze that and generate that prescription is not real feasible.

But if you can wirelessly transfer that data, you can get a lot more of this stuff done on a lot more timely basis. Going to the next one, we have you can kind of see little irrigation pivot tracks in the field there so a lot of the same stuff happens with the irrigation system.

So as we try to get more efficient in the use of water, you can essentially, you know, begin creating prescription maps for watering different areas of the field at different rates. We're also seeing more (chemigation) where some of the fertilizer or pesticides can be included with the irrigation water.

That needs a work order going out to those so the machine, the pivot or whatever irrigation method they're using knows where to apply different amounts of water and the same thing, you want to have a record then of where that water was applied, how it was used and things like that.

So very similar to the equipment, just those are kind of stationary in the field, they don't really drive around much and additionally to that there's a big monitoring aspect to that so these irrigation pivots are often not very close to civilization.

So having to have somebody drive out to all those, start them up, make sure they're running all right, nothing's broke down, gets to be very time-consuming and expensive for farmers when they're, you know, constantly forced into looking at labor shortages, the ability to hook a telematic system up to one of those to be able to remotely turn it on, monitor how it's

performing and identify any issues without having to send somebody out there is a really big benefit.

The next thing that's called-out there is a GNS correction signal so going forward most of the farm equipment now can actually steer itself in, you know, straight rows down the field. To be able to do that you need to have a correction signal to augment the normal GPS position you get through things like your phone or, you know, your (tom cop).

With this correction signal the machines can drive actually be within one inch of where they're supposed to be but you need a way to get that signal out to those machines.

That's transitioning rapidly to come via a cloud-based platform so you need a cellular connection for that machine to be able to connect with the Internet and get that correction signal to be able to operate at those high levels of guidance accuracy. Next one, so just remote monitoring in general, a lot of the logistics and coordination.

As you can see, there's a lot of different machines out in the field running around so from the farm office, the farmer wants to be able to see where they are, which machines are running low on product in the tank which combines are getting full, need to be unloaded, which machines are low on fuel.

From the AGCO perspective, you know, wanting to support equipment through our dealers. We want to know how many hours are on a machine, is it due for routine maintenance, are there any things that are out of the normal on the operation of that machine where, you know, a potential failure could occur.

The nature of farming's very time-sensitive so being able to instantly get notified that a machine has an issue to be able to get out there and know exactly where it is when you're dispatching service trucks, that's a huge benefit to be able to keep the focus on up-time and reliability on these machines as well as things like terminal mirroring so you can remotely see what an operator's looking at.

If they're having an issue, it might be just a training or coaching activity to make sure they know how to run the terminal in the cab. Same thing for software updates. I think everybody's pretty familiar with that today. Right now you got to drive out to all these machines and Flash in the software on them.

Eventually if we get enough Internet access to them, we could be able to push those updates over there and wirelessly keep those machines up-to-date to help reduce downtime and maintenance. The next one is over at the grain bin there.

Similar story to the irrigation system so a lot of grain dryers and grain bins can be connected to the Internet now so again you can remotely monitor those during the heat of harvest when a lot of grain's coming-in, the dryer is, you know, it's not uncommon for those to run 24 hours a day for, you know, a month or two straight as different grain comes-in.

And a lot of times those aren't located real close to the house either so a farmer has to get up very few hours and go check on those all through the night. If it's connected to the Internet, he can do that from the, you know, the comfort of the app while he's sitting on his Laz-E-Boy at home, makes it a little bit easier to monitor all that.

And not as much time spent driving back and forth to check on things that are going on. Same thing with the truck there, you know, you see in the commercial trucking industry a lot of focus on the logistics on monitoring where trucks are.

Same thing on the farm operation, they want to know where those trucks are if they're waiting in line, if they need to do anything different in the field because the truck isn't going to be back in time to unload a combine.

Next one is the livestock building so as it was mentioned with dairy farms, they have cameras and things to remotely monitor those. Most of the cows now have RFID tags in their collars so you can monitor how much feed and water each cow's getting, how much milk they're producing.

At AGCO through the GSI brand we do swine and poultry building so we can do the same thing to monitor feed consumption, water consumption, the temperature, humidity, basically the HVAC systems within those barns.

So we want to be able to monitor that remotely because again those aren't always located real closely to civilization so you got to have a pretty good drive to go-out and check on those buildings sometimes.

And those systems are often used to monitor for health and other things. You can tell if water consumption goes down. There might be an illness going through the herd or flock so you want to be able to access that information pretty quickly, be able to get to it remotely so those monitoring systems are pretty key to be able to access through the Internet.

The next one is like I mentioned with the equipment side of this, the dealers and other service providers, there's a whole service market that can pop-up

that's just kind of getting started now based on having access to the telemetry data coming from these different machines so you can monitor them, optimize performance, identify any outliers, you know, that can lead to things like operator training or identifying failure issues earlier.

So there's a whole host of services and additional things that can come along simply by having machines connected to the Internet. Next was mentioned I think a little bit with the California study is a lot of the infield IoT sensors so being able to monitor things like weather stations, infield soil probes, measuring the soil temperature and moisture.

You also have people putting cameras out there to monitor vegetation growth, watch for wildlife, all sorts of different uses are coming-up but again that data isn't much good if it's stuck on a USB drive that's in the field and somebody's got to drive-out and retrieve it all the time.

You know, if we can get all those different sensors and things connected to the cloud, you can make a lot more real-time timely decisions especially when you're looking at things that are going to impact the health and yield coming-off that crop and that leads to the next one Number 11 for mobile apps and other field-scouting tools.

The farmer isn't always sitting in his office. He's a lot of times out driving around and checking on all these different operations. They have different service providers doing different scouting operations so again going back to the labor shortage, a guy can go-out to the field, identify there's a bug.

He might now know what bug it is but if he has Internet access, he can take a picture of it with his phone and then send that back to somebody that knows how to identify the bug, the disease or other issue that's going-on in the field

so that can be promptly treated to help protect that yield so just having that coverage as they're out driving around is very important.

Again this is not happening near population centers and finally the last one is just the supply chain interactions. Farmers utilize a big network of different advisors, you know, retailers and other people that do a lot of things and most of the time the farmer has to share data about their operation with those providers to get a recommendation.

So if he wants to follow-up with his seed salesman on which particular variety to plant and at what rate, he's got to be able to get that guy soil samples, historical yield information, fertility information, a lot of different data that's georeferenced in these files that needs to be transferred around.

Again if you're trying to do that over a dial-up connection, it can be pretty challenging and also with the, you know, recent interest in drones we've seen kind of a resurgence of aerial imagery coming-back to look at plant health and growth and monitoring all that.

When you start moving around, you know, two or three centimeter resolution image files over a 200-acre field, those are some pretty big files that you just cannot move on a low-speed connection.

So if you're going to be looking at that and doing analysis and things like that, these service providers need to have access to a pretty good Internet connection to be able to use those cloud tools to be able to pull all this data the farmer has together, run some analysis on it, make a recommendation, generate those prescription maps, then transfer it back out to those machines.

So next slide is just kind of a summary of everything I covered here on all the different tools that either is in the farm office or from the machinery level, require some sort of connectivity to be able to make this all happen in a lot more efficient way for the farmer so that's all I had.

Katherine Bates: Okay, thank you, Ben. Your presentation really shows why broadband access is so important to farmers and in the agriculture industry. I think that we at least at BroadbandUSA I learned a lot knowing now all the different things that need broadband on a farm.

We have some time for questions and comments. If you would like to ask a question, please type it in. We've already gotten a couple so I'm going to direct those to I think is the appropriate person.

One of them is to Kevin about the Broadband Accessibility Act. You mentioned that Farm Bureau was supportive of it. What role did you play in helping to craft or pass the Broadband Accessibility Act in Tennessee?

Kevin Hensley: Yes, we were really supportive of the bill. We lobbied for it. We encouraged our members to you know, encourage their lawmakers to vote for it. Before that there had been other pieces of legislation that weren't as successful, that didn't come from the governor's office that we had been involved in and that we were supportive of.

So everybody kind of knew that as an organization we were supportive of getting broadband in the rural areas but also I mentioned the study that took place about broadband connectivity in rural areas and all across Tennessee.

We really encouraged our members to participate in that and at all our meetings leading-up to that study. We helped promote that study to get that

going-on so that way there could be a really true representation of the rural needs of Internet out there.

Katherine Bates: Okay, and when was the Act passed? When did it …

Kevin Hensley: I think it passed, sorry, I should have mentioned that, the bill passed this spring so our legislative session typically runs from January through late April. I can't remember the exact date but it was signed into law this spring and so they are working on the implementation of how they're going to do the grants and that kind of thing so like I said - go ahead.

Katherine Bates: But were the grants specifically targeted to rural areas in that, okay.

Kevin Hensley: Yes, so in order to be eligible for the grant, you have to be going into a the provider has to be going into an underserved area so I think by the definition of the bill an underserved area doesn't have access to at least 10/1 capability and then but preference would be given to areas that don't have any Internet connectivity and then the minimum standard those providers had to provide is 10/1 and again preference given to those that go up to the higher speeds.

The big thing is that we want access to in those rural areas and they're going to kind of score those in our economic and community development department at the state level is going to be the one paying those grants out. They haven't done that yet but providers can apply for those.

Katherine Bates: Okay, there are a lot of questions on your legislation so I'm going to kind of cut that off but then just to know that people are very interested in Net legislation in Tennessee because I think some states are hoping that their state will be next.

I have a question for Ben, how do most farm operations manage the data transfer given gaps in coverage? You mentioned the USB going-out and getting it and then kind of what kind of speeds are required for the monitoring system?

Ben Craker: Yes, so it kind of varies widely on the different systems out there so for like the prescription files right now a lot of guys are still using the USB sticks but most of the systems are designed to actually cache the data so if they're more of a telematic system that does more of a live tracking, they'll cache to the information onboard the machine for a certain period of time.

Obviously there are storage limitations there and what the machine will actually hold but then once it gets back into an area with coverage it'll upload all that.   As far as how much bandwidth is needed, you know, a lot of those prescription files it's heavily determined by how big of a field you're going into so you know, they can be 100 megabytes, they can be 50, they can be, you know, even larger than that for some of the more involved operations.

Same thing, the yield files are about the same size coming back off and those yield files aren't updated continuously. It's logged-on the machine until you hit your done button on the terminal that you're finished with the field and then it'd want to try to start uploading that, you know, 100 megabyte file.

But then the monitoring systems they'll monitor anywhere from probably five to 25 different parameters onboard the machine and then it depends on the system. Some of them update all 25 parameters every second so that takes a pretty, you know, continuous pretty good connection.

And then other ones they update on a less-frequent rate so like it really kind of depends on which manufacturer you're looking at.

Katherine Bates: Okay, and then someone asked a question, will the new technology provided through small-cell satellites in the low-earth orbit to cellphones leapfrog the prior current generation of fiber installation technological capabilities and I think that probably is for you Ben. Do you think that the …

((Crosstalk))

Ben Craker: Yes, I think there's potential there. We've only looked at a couple of those. A lot of those satellite networks are at least the ones I've seen have been looking at more like a Zigby or (low rock) kind of IoT bandwidth for the satellite communications.

There's only one or two I've seen where they're looking at more of a broadband coverage so it kind of remains to be seen how those are all going to play-out but if they can get the, you know, those higher connection speeds through smaller-box satellites, I think there is a potential there to, you know, be able to provide coverage everywhere.

Cost gets to be a big piece of that right now. There are a couple of satellite providers out there right now for data but it's pretty expensive and a pretty limited bandwidth so we're really only looking that for more of a, you know, emergency, something's gone wrong kind of notification and not the more general I want to know where my tractor is right now kind of information.

Katherine Bates: Okay.

Trish Kelly: Katherine, this is Trish. Just to add-on to that, one thing we've been working with USDA and UC to look at some emerging technologies and looking at

different levels of scale about where to apply some smaller technologies that kind of help build into a connected system so that's one thing.

And we're also trying to kind of monetize the costs or the opportunity - economic opportunity - by showing it can provide these other kind of services thinking of sensors for instance as economic units. You make a different case for investment too.

Katherine Bates: Okay, Trish, I have a question for you because I think you might through your literature review and the work you've done, what would be the best way to find information about rural areas that lack a broadband connection? Are there any studies that would be useful including yours?

Trish Kelly: We have data, we have maps in California. I think the FCC has maps too. We can provide some links if that will be helpful.

Katherine Bates: Okay, we'll put some of the information up and we'll put the contact information for each of the speakers with their e-mail because we have a lot of questions and so we're not going to be able to get to all of them today so we're going to go ahead and put that up and send it out to the registrants so you can directly talk to the speakers if they're willing to do that.

Trish Kelly: Yes, we'd be very happy to do that and I just want to note that that's why we do a lot of the speed testing, the on-field or the onsite speed testing using the Cal speed app because that's a way to get better data too from the reported data so that verification process has been important for us.

Katherine Bates: And there's also the national broadband map although it, well, oh well, that the FCC has right now so one last question and then we're going to have to

cut it off and like I said we'll send-out the e-mails for the speakers so you can directly e-mail them the questions.

Is mobile wireless the broadband technology that farmers find the most helpful or is it fixed wireless preferred due to the fact it doesn't have a data cap like mobile tends to have so I don't know …

Kevin Hensley: This is Kevin, I'll take a stab at that. Mobile is great and handy but when we talked to our farmers, mobile is used but just like broadband is an actual line is spotty in rural areas. Wireless service is just as spotty and sometimes doesn't work in rural areas.

So it is an important tool in the toolbox for farmers but that wire line service with the data caps with the and really overall speed is not there yet either so having the capability of the wire line makes a big difference. We haven't seen the technology yet other than a wire line service that really provides that type of speed, capacity and the things that are needed - that we need - in the future.

Katherine Bates: Okay.

Trish Kelly: The same here for us.

Katherine Bates: Okay, thanks guys, I'm having to hurry-up a little bit but I did want to put in someone who did mention - it wasn't mentioned - but I know that all of you support the continuing education of farmers and having access to take online training is also important particularly through the extension services that operate in each state.

So someone did point that out so I wanted to give a big shout-out for the extension services in the state because we at NTIA and BroadbandUSA work

closely with them so thank you to everybody for joining us. A copy of the slides will be on our Website within seven days.

Except for August, the Webinars are scheduled the third Wednesday of each month. Please join us on the 20th for digital training and workforce development of which extension plays a role in also.

You can consult the BroadbandUSA Website to learn about our technical assistance programs which also we've been working a lot with rural areas and farmers increasingly so if you want more information on that, please consult our Website.

Our guides and publication and additional tools are available that can assist you with the planning and implementation of your broadband deployment, expansion or inclusion project. I'd like to thank our presenters today and wish everybody a great rest of the day. Thank you for joining us.

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