Statement of

Darrington Seward

Seward & Son Planting Company

Louise, Mississippi

Before the

Subcommittee on

Communications, Technology, Innovation and the Internet

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Chairman Wicker, Ranking Member Schatz and members of the Subcommittee:

Thank you for the opportunity to speak with you today. My name is Darrington Seward. With my father Byron, I manage Seward & Son Planting Company and Seward & Harris Planting Company, our family farming business in and around Louise, Mississippi. Currently, we manage about 22,000 acres, mostly within a 10 mile radius of Louise in Humphreys, Yazoo, Sharkey, and Holmes counties at the southern end of the Mississippi Delta. We farm cotton, corn, soybeans, and rice. We could not do this productively or profitably without extensive use of precision agricultural technologies.

Each year, we rotate the 12,000 sandier acres that are devoted to cotton and corn in a 50% cotton/50% corn rotation. Of the other 10,000 acres of heavier ground, which are dedicated to growing soybeans and rice, we rotate 1,000 acres of rice annually among the other 9,000 acres of soybeans production.

Our family began planting its roots in agriculture during the Great Depression, when land acquisition was very affordable. Early on, the land was farmed by sharecroppers, with two commissaries in the neighboring towns of Louise and Midnight providing the supplies needed for tenants to live on and farm the Seward family's land. As farming became more mechanized in the years following World War I, our family took over farming the land itself. Originally, Seward & Son was comprised of 2,000 acres and Seward & Harris encompassed 4,000 acres. It was about 25 years ago that we began expanding. Expansion came in waves as older farmers began to retire, and as absentee landowners sought to cash out by selling their farms.

With the expansion of our operation came growing pains. But as more precision ag technology became available, farming this larger acreage became more manageable. Our main goal in precision agriculture is to farm as many acres as we can, minimizing resources and inputs, while simultaneously increasing our yields. Much of the technology has evolved to depend on reliable and speedy rural broadband. Without the availability of reliable and fast broadband, our production practices and efficiencies in large-scale production agriculture would be completely compromised. We would suffer yield losses and decreased productivity that would greatly affect our profitability, in an industry that continues to see tighter and tighter profit margins.

As Chairman Wicker knows, agriculture is the major driving factor behind the State of Mississippi's economy. This is no doubt true for many rural states represented on this

Subcommittee. It is certainly the driving factor for the economies of the counties where we farm. Without agriculture, these rural counties would dry up completely, and send already high poverty levels through the roof.

Our business has invested heavily in precision and data-enabled technologies to make our operations more productive, efficient, and profitable. They come into play in almost everything we do. But for these technologies to actually deliver, we have to be connected. We depend on reliable, high-speed broadband connections out in the field – where our machines and employees operate. We have been recognized for our embracement of precision agriculture technologies and the conservation of resources they allow on several occasions. We received the 2013 Precision Ag Award of Excellence from the Precision Ag Institute. We were recognized as the Precision Agriculture Farmers of 2011 by the National Conservation Systems Cotton & Rice Conference. And, my father, Byron Seward, was recognized by the Delta Council of Mississippi as The Conservation Farmer of the Year for 2009-10.

As you know, significant economic activity occurs every day on America's farm and ranchlands. Agriculture represents almost 5 percent of the nation's annual GDP, much more than that in rural communities. Farming operations today are substantial businesses that drive significant commercial activity and rural prosperity. Broadband services that are provided to commercial businesses in urban and suburban areas must also be provided to support production agriculture in rural areas. If high-speed, wireless broadband services are not extended out to where agricultural activity takes place – on croplands and ranchlands - the full economic and commercial potential of precision agriculture will be missed. I'd like to share some real examples of how broadband can help meet this enormous potential.

Soil Management & Health

Managing the fertility of soil is critical to any farming operation. We may have upwards of 15 different soil types in any given field; each requires differing amounts of nutrients. If a blanket, fixed-rate application of fertilizer is programmed into a machine, nutrients will be wasted by over- application where they are not needed. Precision ag steps in with variable-rate application of nutrients that ensure each spot in the field receives exactly the proper amount of nutrients called for.

Our fields are sampled on a 3-year cycle by a local soil lab, Pettiet Agricultural Services, Inc. out of Leland, Mississippi. Samples are taken from every field in a referenced 2.5 acre grid - a very thorough and precise soil sampling by today's standards. Dr. Clinton Pettiet and his lab team then analyze these samples and provide all data on nutrient concentrations in the soil, and the recommended amount of nutrients to be added in order to produce a varying array of crops. We upload this data into the web-based software product of our seed and chemical retailer Sanders, Inc. This software tool, OptiGro, already contains the boundaries of all of our farms and fields. So the new, geo-referenced soil sample data is simply spatially sorted into our farms and field data in OptiGro. Mind you, this data transfer is all taking place in either our office in Louise, Mississippi, or in our pick-up trucks in the field where our equipment and crops are continuously monitored. This cannot happen without reliable, mobile wireless broadband connections.

With the OptiGro tool, I can chose the farm and fields I want to fertilize, for any particular crop we want to plant there in that particular year. I then choose my macronutrients, phosphorus and potassium, that I need to apply. I also choose my micronutrients, sulfur and zinc, that might be called for. I write this tailored prescription, which can then be applied to the field through a host of machines that all have access to controller files from a simple drop down menu.

To apply these prescriptions, we utilize a GVM 4 bin ground machine, or an Air Tractor 802 airplane during rainy spells. The controller files are transferred directly to the GVM machine's controller via wireless broadband. Wireless broadband also provides the means to e-mail the controller files to my pilot who can quickly load them in his plane for application. Since all the data are geospatially referenced, the fertilizer application (whether by ground or air) is completely automated by the machine's mechanical controllers. It knows exactly where the machine is in the field, and exactly which products are called for and in what amounts. This process also generates application maps, which are key to understanding the effectiveness of a specific prescription on improving yields, and provides a check for quality control.

The same methods are employed for our application of nitrogen in the production of corn and cotton. Nitrogen is a crucial nutrient in the production of those crops. We apply nitrogen in a split-season application. This means we apply the first half of our soil sampling recommendation right at planting, and the second application, the variable rate portion, early in the growing season. We can also apply nitrogen either by ground machine or airplane variable rate.

I want to emphasize again that each of these critical steps, from uploading the fertilizer data, writing the fertilizer file, transferring it to the machine wirelessly, and collecting application maps from the machine, are dependent upon high speed rural broadband. Only with wireless connectivity are the benefits of reduced input costs, better land stewardship, and improved yields fully realized.

Planting

Another example of the value of precision agriculture is in planting. The process of planting has changed dramatically in recent years. Planters now include hydraulic drives and rate controllers that govern the amount and spacing of planted seeds in a field. The rate controller can be told exactly how much seed should be planted and where, based on a prescription that can be wirelessly transferred into an onboard computer in the machine. This allows, for example, more seed to be planted underneath a pivot circle where irrigation can maximize yield, and less in the field's corners where the pivot cannot not reach. Also, different seeding rates can be assigned to, and planted on, different soil types within a field to maximize yield. High speed broadband allows the transfer of these seeding prescriptions to the machine, and allows real-time monitoring of each individual row on the planter to make sure it is planting correctly. From the office or pick-up truck, we can see the exact seed monitor that our operator in the tractor sees, along with more comprehensive data --

all in real time. This is imperative for quality control, especially with new technologies that have dramatically increased our planting speed. Today, we are easily planting 1,000 acres a day, and spending upwards of $50,000 an hour on planting and tillage applications.

Crop Harvesting

Come harvest time, these same monitoring applications hold true for our ability to check a combine's performance in real time through high-speed broadband. We are able to analyze the data in real time and make critical decisions about the speed and temperature at which we operate our Zimmerman corn tower dryer. We can make decisions about which bins to load into during the day, and which bins we may need to switch to in order to have capacity to store the entire night's supply of dried grain. In addition, we get a real time look at crop yields, which helps in determining the exact amount of grain we will have available to market – something that's always difficult to forecast going into a harvest. Real time yield data also allows us to evaluate the current crop varieties that planted on our farm. Since, next year's seed has to be booked soon after this year's harvest, this data allows us to plan early and take advantage of seed pricing discounts.

In our operations, none of these management decisions can be made without reliable, continuous access to high speed broadband. Otherwise, it would not be physically possible for me to drive out to each combine in the field, climb up on the machine, and ride each machine for 15 minutes or so to gather this data. With wireless connectivity, I can receive data at the corn dryer as I am operating it and use the information received to maximize the efficiency of the dryer's operation. Access to high speed broadband in the field allows us to farm more acres more efficiently with larger machines, while lowering costs and increasing yields.

Broadband optimizes our operations in several other, important ways. Our management of grain storage capacity depends on transmission of real-time bin use and availability data. The bins have a plumb bob sensor system that drops a cable from the roof of the bin until it touches the grain. In this way, the system transmits how many bushels are currently in the bin, and how much storage capacity remains. Our corn dryer operates at 100,000 bushels dried per 24-hour period, which fills the bins to fill quickly. The sensor system allows one man to run the dryer from a central point, without having to step out to climb each bin, peer in, and guess how much grain is in it. Instead, he simply logs in to the web-based logistics platform that contains each numbered bin, prompts the desired bin to conduct a measurement, and uses the results to determine where to divert the grain coming out of the drier. Our bins also have sensors that measure the relative humidity outside versus inside the grain bin. Algorithms then calculate the relative moisture of the corn or soybeans in the bin and turn the exterior fans on or off, either to dry or rehydrate the grain to the optimal moisture for storage and sale. The bins that store our rice use exterior fans (equipped with heaters), combined with interior moisture cables, to dry the rice to a moisture level acceptable for sale and milling. All parameters and settings can be monitored and changed remotely. This data is all transferred via broadband, without which these systems would be useless. Broadband enables these systems to operate and maximize the efficiency of our operation.

Machine Communications

The telematics information we receive from our fleet of tractors, sprayers, combines, cotton pickers, and fuel truck is essential to the daily operation of our farm. With the amount of equipment and the broad acreage that we farm, our efficiencies would be completely undermined if I didn't know – at any given time, from anywhere on the farm -- where each piece of machinery is and how it's performing at that moment. Operations would grind to a halt.

On our farm, we use almost all John Deere equipment because of its advanced precision ag systems and capabilities. None of the telematics systems on board our 22 tractors, 5 combines, 4 cotton pickers, 3 sprayers, and 1 fuel truck would provide anywhere close to the degree of operational value that they do without reliable broadband connections. Any one of the innumerable settings on any one of these machines can be monitored remotely, through online platforms such as JDLink® and MyJohnDeere.com.

Continuous monitoring of machine performance is extremely important. Improperly set machines or machines experiencing technical issues could result in any number of costly operational problems: an improperly planted crop; improperly applied fertilizer, herbicides, or pesticides; lost efficiencies in tillage operations; lost efficiencies in the general equipment operation; or even yield loss during harvest (imagine grain being blown out of the back of the combine due to incorrect settings). All John Deere machines feature equipment diagnostics that trigger real-time warnings, typically well before an operational problem occurs. With over $15 million of capital investment in farming equipment, it is imperative we maximize these assets and generate the highest returns on this investment. Machine communications - telemetry – drive significant reductions in machine downtime and avoid costly delays in field activity. Without reliable broadband connections in the field, the benefits of machine telemetry in our operation would be lost.

Irrigation

Our irrigation systems today include 25 pivots, all of which are monitored telemetrically. Each irrigation unit is able to report its position and the amount of water being applied in real time. These pivots can be sped up or slowed down remotely, allowing adjustments in the total volume of applied water from anywhere across our operation. They also can be shut off remotely, and will send out an alert if they shut down for any unexpected reason.

In addition, the majority of our irrigation wells are powered by units with telematics monitoring systems, which can record the exact amounts of water being applied using flow meters. Each monitoring unit has its own modem that transmits the data to a web based management platform, which helps us to fulfill USDA/NRCS and local water management district requirements. Alerts will also be issued if wells shut down for unexpected reasons. All these capabilities on both pivots and irrigation wells allow us to efficiently manage large acreages with fewer men. Productivity is greatly improved through more rapid alert, diagnosis, and repair of irrigation unit problems.

Problems with Connectivity

Given our reliance on precision ag technologies, our farming operations are susceptible to broadband coverage disruptions and connectivity problems. In areas where we have experienced poor broadband coverage, we have experienced costly disruptions in continuous monitoring of tractors, sprayers, irrigation pivots, and wells. This translates directly to less efficient operations and lost productivity.

For our machines alone, I would estimate a minimum 10-15% loss of operating efficiency when connections are disrupted. Lost coverage means the machines cannot send or receive data during operations. Our inability to download seeding prescriptions in a timely manner results in a suboptimal crop. Or planting could be delayed, causing us to miss the optimum planting window. Or the quality control from continuous monitoring is lost, which could result in erratic seed placement and depth. Our losses are measured in reduced crop yields. For our operation alone, any of these events could amount to 5 bushels lost per acre, or $20,000 per day of lost revenue, based on current prices.

Poor coverage has also meant temporary loss of connections to irrigation pivots and wells. In these instances, we have been unable to receive alerts of malfunctioning irrigation systems. Because of the size of our farmed acreage, we cannot monitor these systems by simply riding from pivot to pivot and well to well each day during irrigation season. For a single pivot that irrigates 450 acres, one lost day at a crucial time in the growing season would cost our operation 30 bushels per acre in yield loss. That amounts to a $50,000 loss at current crop prices, from a mere 2% of our total acreage. The failure of multiple irrigation pivots, if not detected quickly through wireless monitoring, would be catastrophic.

The same is true with the inability to detect malfunctions of rice irrigation wells. An irrigation well typically irrigates 150 acres. At a 30 rice bushels per acre lost, the loss would be roughly a $22,500 at current prices.

Loss of connections also impacts the amounts of nutrients, herbicides and pesticides we use. Instead of broadcasting nutrients, technologies allow us to place them exactly where grid soil sampling calls for them to be in the field. This is good for two reasons: it leads to increased yields and decreased use of nutrients. The same is true for pesticide and herbicide applications, which can be tailored to optimal effect and minimal environmental impact. Technology allows us to write and use prescriptions for the exact amount of herbicide to use, based on the clay content of the soil. With aerial imaging, we also can create zones for pesticide applications to target those areas with greatest insect populations.

From these examples, I hope that you can see just how important reliable broadband connections are to our operations, and how even a temporary loss of coverage can hurt crop yields, increase operating costs, and undermine environmental improvements.

Policies to Support Broadband for Agriculture

From my perspective as a business consumer, any policies that will promote more rural investment in broadband infrastructure – including where farming takes place - should be pursued. Without this support, our ability to keep up with and take advantage of coming technological advancements will be limited, especially as the competition for resources to expand broadband deployment is likely to increase. This makes the rural broadband funding programs managed by the Federal Communications Commission, such as the Connect America Fund and the Mobility Fund, all the more important to the future of production agriculture. I would encourage you take a fresh look at these support programs and consider changes that will directly foster, and eliminate barriers to, expanded high speed broadband deployment that agricultural needs today and into the future. To that end, there are several steps to improve these programs that would make a difference:

First, as I have mentioned, support programs should be updated to direct support specifically to where most farming operations occur -- areas of cropland and ranchland. These are areas of intense economic activity with growing demand for broadband services. Yet, they are largely overlooked in today's funding programs that look only at residential population and community centers to determine whether an area is "unserved" or "underserved" and thus worthy of broadband funding support. Program eligibility, data collection, and other rules should be revised to account for underserved and unserved cropland and ranchland areas – areas with low population density but with highly intense economic activities vital to rural communities.

Second, support programs should not favor, either directly or inadvertently, one broadband delivery technology over another. Ag producers need access to all technology options to address potential uses that may vary depending on ag equipment used, crops, livestock, terrain, climate, proximity to broadband interconnection points and population centers, and barriers to local land acquisition and access. Wireline broadband, fixed wireless, or mobile – all these technologies will be needed for individual carriers to design appropriate solutions to meet the needs of particular agricultural operations. To this end, it makes sense to continue and even expand the Mobility Fund to provide specific and predictable funding for mobile broadband operations. And the equal opportunity that carriers currently have to bid on Connect America Funds should be maintained, regardless of whether they are proposing wireline, fixed wireless or mobile broadband coverage.

Third, these support programs should also make funds available for "stand-alone" broadband. Precision Agriculture technology is data-intensive by nature. Many farming enterprises place a higher priority on obtaining broadband services rather than conventional voice services. My understanding of the rules is that carriers that might otherwise be able to provide broadband in rural communities cannot access these programs unless they also provide voice services. This either forces inflexible service packages onto rural consumers, including ag producers, or it unnecessarily limits broadband deployment.

Finally, the so-called "middle mile" facilities are just as critical to expanding rural broadband deployment as last mile connections. The wireless connections needed across croplands rely on these "middle mile" facilities to tie into the wired networks and the Internet. To be sure that all the needed rural infrastructure can be deployed, support programs should allow the smaller providers to obtain support for middle such facilities. And support for middle mile facilities should be allowed for connecting to facilities that link to wireless broadband, not only to the last wired mile connections.

Conclusion

I want to thank the Subcommittee again for allowing me to appear this morning. My message is simple: precision agriculture is fully integrated with our operations in Mississippi, and with agricultural operations across the U.S. and globally. The benefits from these technologies are well-known and will grow significantly in the years ahead. To fully capture the value these technologies can deliver, policies and programs that will drive investments in rural infrastructure must be a priority for policy makers.