

MEETING OF THE TASK FORCE FOR REVIEWING THE CONNECTIVITY AND TECHNOLOGY NEEDS OF PRECISION AGRICULTURE IN THE UNITED STATES

September 18, 2024

VIRTUAL MEETING

3 PM ET: CALL TO ORDER AND WELCOME,
ROLL CALL

Emily Caditz, Designated Federal Officer
Dr. Michael Adelaine, Ph.D, Task Force
Chair

Roll Call: [highlighted in yellow if present]

Michael Adelaine, Ph.D., CIO Emeritus & Special Advisor to the President, South Dakota State University (Dr. Adelaine)

Vice Chair:

Sreekala Bajwa, Ph.D., Vice President, Dean & Director, Montana State University College of Agriculture & Montana Agricultural Experiment Station (Dr. Bajwa)

Members:

Ryan Krogh, Global Combine and FEE Business Manager, John Deere (RK) (joined at 4PM)

Andy Bater, Farmer, Fifth Estate Growers, LLC (AB)

Timothy Bradford, Jr., Ph.D., Director of Agronomy, Vayda, Inc. (Dr. Bradford)

Julie Bushell, Chief Executive Officer, Ethos Connected (JB)

Joseph M. Carey, Special Government Employee (JC)

Heather Hampton+Knodle, Vice President & Secretary, Knodle Ltd. Farms (HHK)

Steven Hill, President, Satellite Broadcasting and Communications Association (SH)

Carolyn Price, Executive Director, Upstate New York Towns Association (CP)

Brad Robison, Chief Executive Officer, Tallahatchie Valley Electric Power Association and Tallahatchie Valley Internet Services, LLC; President, MS Fiber (representing the National Rural Electric Cooperative Association) (BR)

Joshua Seidemann, Vice President, Policy and Industry Innovation, NTCA–The Rural Broadband Association (JS)

Joy Sterling, Chief Executive Officer, Iron Horse Vineyards (Joy)

Dan Watermeier, Commissioner, Nebraska Public Service Commission (DW)

Andy Berke, USDA

Opening Remarks

- Dr. Adelaine – This is a chance for the task force to ask the group chairs any questions or concerns they have. To use an analogy, the game is in the third quarter and moving right along. Any questions from the group? [no questions].

Mapping and Analyzing Connectivity on Agricultural Lands

- JC:
 - Gives presentation on initial findings of mapping and analyzing connectivity on agricultural lands working group. Informs the group the deck has changed very little from what was presented in August with very minor adjustments. Suggests that if anybody thinks there is anything to be changed or added, now is the time to tell them.
 - Describes the five categories of recommendations: presentation of map, validation and verification of map's accuracy, the public challenge process, sustainability of the map, and awareness of the national broadband map and outreach. Discusses how passage of the Broadband Data Act led the task force to ask whether the implementation of the Broadband Data Act is meeting the needs of precision agriculture.
 - Presentation of the Map recommendations:
 - Include the cell tower typical load in the map because some of the heaviest loaded base stations are in rural areas.
 - Map should include clear legend that explains to an ordinary citizen how the map is to be interpreted.
 - Satellite view should be enabled by default when the mobile map is being viewed. Notes that this view is possible in the current map, but they needed FCC staff assistance to figure out how to turn it on.
 - Mobile Satellite Services should be added to the National Broadband Map. Currently, the Map includes satellite services under fixed but companies (*e.g.*, John Deere) are developing mobile satellite capabilities that should be included.
 - USDA NASS should produce a map layer that includes mobile coverage over agricultural land.
 - FCC should produce a map separate from National Broadband Map indicating where devices operating under TV White Space can be used. Notes National Broadband Map is for mass market technology while TV White Space is not yet at that stage while it operates under FCC part 15 rules
 - Validation and verification of map data recommendations:
 - Crowdsourcing is the current method, but there needs to be something more proactive for rural areas
 - Recommends the FCC establish an independent, on-the-ground sampling approach to verify mobile map accuracy that is sustainable over the long term
 - Should use propagation models that are open-source and widely peer reviewed

- Recommends FCC and USDA should encourage and advocate for further research directed towards mobile mapping efforts over agricultural lands for improved accuracy.
- Challenge Process recommendations:
 - FCC should develop a mobile challenge process suitable for sparsely populated agricultural and tribal lands as crowdsourcing is not suitable.
 - Current challenge process only gives the submitter a confirmation of receipt of user's submission data. The FCC should inform the challenger about the next steps and timeline of the challenge and potential map updates.
 - Submitting a challenge is essentially filing a complaint, the challenge should be responded to with suggestions for how the challenger might proceed to make the challenge "cognizable" (e.g. test other locations to bolster the data in the challenge).
 - Currently the theoretical minimum number of challenges to reach cognizability is 8 where 5 must completely fail.
 - FCC should ensure network operators do not inappropriately prioritize speed test traffic over ordinary network traffic
 - FCC should collaborate with all mobile phone manufacturers to make low-level data (e.g. RSRP, frequency and Cell ID) available on the official speedtest app.
 - Should do a similar outreach with agricultural equipment vendors and their mobile network equipment (e.g. cellular modems on tractors)
 - FCC should include the center of the H3 hex cell ID as the latitude and longitude when displaying or downloading pending and resolved mobile challenges.
- Sustainability recommendations:
 - Suggests that sustainability may be better addressed by a different working group.
 - FCC and Congress must ensure funding to sustain the mapping process on an ongoing basis.
- Awareness and outreach recommendations:
 - FCC should team up with precision agriculture equipment makers that rely on cellular connectivity to collect the data necessary to improve the maps while respecting end user privacy.
 - FCC must promote the National Broadband Map more widely especially among agricultural communities.
 - USDA and Land Grant partners must educate agricultural, rural, and tribal communities about the National Broadband Map and its application.

- Reality: GIS analysis at Penn State found that 96% of all crop land in the US is within 10 miles of existing fiber. This proximity provides a window of opportunity worth seizing as soon as possible.
- Recommends the FCC request NTIA to talk to State broadband offices to prioritize precision agriculture in decisions to grant funds.
- Based on August feedback, describes new latency requirement under 10 milliseconds as opposed to 0.5, which is unrealistic.
- Expresses excitement at the FCC Rural 5G Program, a \$9 billion fund with \$ 1 billion set aside for agriculture. Emphasizes that the symmetrical bandwidth of 100 Mbps. recommendation is key to get the full potential of precision agriculture. Notes that their research has shown this is the sweet spot to unleash the potential of precision agriculture.
- Focuses on the importance of spectrum:
 - Mentions Notice of Inquiry (NOI) on allocation and use of low-band spectrum that was issued in 2021 and asks someone to go back to investigating this possibility.
 - Highlights big problem regarding unused spectrum in rural areas and believes this problem exists because much of the necessary build out has never occurred.
 - It would be helpful to know where spectrum infrastructure has or has not been built.
 - Suggests that policy should incentivize or mandate buildout of spectrum infrastructure to increase availability
 - Proposes consideration of dedicated “Ag Band” but notes that this is a controversial proposal since companies have already started using different bands for their equipment. Suggests that AI-driven spectrum sharing could alleviate this issue.
 - Recommends that a dedicated percentage of spectrum be allocated specifically for agricultural use if the FCC auctions spectrum in the future.
 - Urges that license holders be mandated to build out currently unused spectrum in agricultural areas.
- Infrastructure:
 - Expresses concern about scope of recommendations. The core goal is Last Acre Wireless Coverage that provides an “umbrella-like ecosystem” around an entire farm or livestock operation.
 - Emphasizes excitement about the GIS analysis that suggests the ability to bring fiber to the farm. The data provides points on maps that allows us to target fiber. We are trying to get an idea of the cost for that last 10 miles of fiber. After this threshold we can move on to the 99.9% of crops within 25 miles of fiber.
 - Last Acre Coverage: wants to approach this initiative in a tech-neutral way not to suggest that the technology is all interchangeable, rather all the tools (e.g. towers, 5G and beyond, private on farm networks, etc.) are necessary.
 - Satellites: Low Earth Orbit satellites are a promising new technology and the FCC is considering providing spectrum to boost the throughput of these satellites, but only one provider has reached the critical mass to provide the necessary

- connectivity and a competitive marketplace is an essential part of achieving sustainable connectivity.
- Sustainability
 - Sustainable connectivity: suggests that connectivity needs to be ubiquitous and redundant to handle potential interference.
 - Connectivity for sustainability: precision agriculture can create “smart farming” that reduces inputs and ensures the safety and reliability of the food supply chain.
 - FDA Food Traceability Rule (goes into effect Jan. 2026): connectivity will play a key role in helping farmers use technology to detect and stop disease outbreak or infestation before produce goes into distribution.
 - Throughput and Latency Requirements
 - Describes graph showing that core farming practices may be possible at lower throughput levels, but the transmission and analysis of collected data will require higher throughput to be actionable in real time.
 - Recommends having demonstration farms use specific farming tools to produce data about the exact bandwidth requirements for any individual operation.
 - Questions:
 - HHK: Does your team or anyone on the task force know of policies being considered, or should be considered, to make that fiber accessible?
 - Answer: The issue is the gap between existing fiber and the croplands. Our recommendation is that this information should be given to the States to factor into decision-making process for the distribution of BEAD funds
 - Follow-up question: I understood you to say part of the fiber within 10 miles was dark fiber. How do we make sure that fiber gets used.
 - Answer: That was not my understanding. I understand there is a gap between the fiber and the croplands.
 - JC: 25 years ago Canada had regulations allowing higher powered transmission on unlicensed devices in rural areas than urban areas. Have you thought about something like that or were you focused on public networks?
 - Answer: We have thought about it, and it does need to be included. There are pros and cons like everything else. There are tons of ancillary solutions, and we advocate for all of them because any of them may be effective depending on the case. There are so many factors that can boost connectivity, so we consider all methods valid.
 - JC: Should we have the National Broadband Map include a higher data rate? Currently, the Map for fixed service does not include a data rate at all, just what is advertised. For mobile service, it shows actual rates (e.g. for LTE the rate 5mbs down and 1mbs up). Do you think there should be a higher tier map showing something to the order of 100mbps?
 - Answer: We are advocating that become the standard.
 - JC: For cohesive Task Force recommendations as opposed to independent working groups, it might make more sense to include it. Discussion with autonomy people suggests they are more concerned with data upload rather than download due to analysis from AI systems, so upload will be of more concern for precision agriculture.

it's critical to make that happen to facilitate things like edge compute and private networks that all farms can use.

Accelerating Broadband Deployment on Unserved Agricultural Lands

- Presenter: HHK
 - Highlights leading opportunities for accelerating deployment: license build-out obligations, funding and incentives, siting, informational resources, leveraging spectrum and underused infrastructure.
 - License build-out obligations:
 - Explains no obvious changes from August but new recommendations related to underused infrastructure that potentially intersects with this section.
 - Changes or additions to funding and incentives section since August:
 - Describes suggestions that have not been traditionally used in unincorporated areas (i.e. agricultural lands) and most rural areas outside municipal boundaries.
 - Highlights the groups thinking on incentivizing private investment in addition to public funding and how to allocate funds already set aside.
 - Targeted subsidy program for precision agriculture.
 - Supports using part of 5G fund being used for this purpose and wants to update language in light of FCC's recently published notice to emphasize need to plan for 6G and beyond with scalable, evolving technologies.
 - Allowing funding from multiple sources.
 - Working group agrees that there are regional un- and underserved areas where local entities want to be involved.
 - Wants to develop language that opposes the creation of monopolies out of publicly funded grants and programs.
 - Allowing cooperatively owned telecommunications utilities to qualify for municipal bonds.
 - Proposes research on ways to incentivize investment by allowing co-ops to qualify for bonds.
 - Siting recommendations: no substantive changes from August.
 - Informational resources recommendations: no substantive changes from August.
 - Changes or additions to leveraging spectrum and underused infrastructure section since August:
 - Expanded this section to include leveraging underused infrastructure and the previous section that had recommendations related to other spectrum matters.
 - Working group members are creating explanatory language for each section to put them in context and describe the "what" and "how" of each section.
 - Incentivize buildout of cellular base stations.
 - Recommends policies should support sustainable competition and avoid barrier to market entry.
 - Wants to clarify language on unlicensed and licensed by rule spectrum and will coordinate with FCC staff to confirm.

- Described addition of sentence acknowledging the potential benefit of satellite direct to device.
 - Two areas they still want to discuss as a working group: Sub-1GHz and Universal Service Fund.
 - With recent court decisions the congressional working group will need to act, and we should weigh in on using the Universal Service Fund on behalf of precision agriculture in un- and underserved areas.
 - Anticipates discussion on this issue and formulating ideas by end of October.
 - Highlights anticipated work for September.
 - Introductory paragraphs to provide context of the significance of each area.
 - Prioritize recommendations.
 - Explore additional topics: Sub1 GHz and Universal Service Fund.
- Questions
 - Dr. Adelaine: You mention 5G and 6G, so for clarification do you think this will be the backbone of connectivity across agricultural lands with other pieces to fill the gaps?
 - Answer: Fiber will still be the backbone and prerequisite for both terrestrial and satellite wireless connectivity. Satellite wouldn't be the backbone but still is a key component. Notes that AI will be driven by dark fiber.
 - Follow-up question: Do you mean fiber to the home location or fiber to every field?
 - Answer: It makes sense to have fiber to anywhere where there is need to deploy more towers. Recognizes that even with satellite, there are many rural towers already overloaded and fiber will assist with that.

Encouraging Adoption of Precision Agriculture and Availability of High-Quality Jobs on Connected Farms

- Presenter: Alex Thomasson in place of JS
 - Notes that statements reflect developments from August rather than official recommendations.
 - Per acre incentives statements:
 - Work group members consulted with State agriculture departments and university extensions on whether per acre incentives could be implemented.
 - ROI will be difficult for small farmers. Cultivating enthusiasm for small and strong dealer support for small farmers may play a role in assisting adoption.
 - Partnerships statements:
 - Extension services can work with farmers to develop economic evidence to assist advocacy for adopting agriculture technology.
 - Work on digital literacy, skill and adoption can promote agriculture technology as a necessary and natural component in the current digital economy.
 - Technical colleges can play a key role partnering with high schools.
 - Education statements:
 - Post-secondary hardware demonstration classes can prove difficult regarding timing (e.g. whether the classes conflict with planting or harvesting)

- Suggestion to use small equipment as representative examples for exhibitions so it can be located closer to schools since weather and travel to farm sites can be prohibitive.
 - Podcasts and other instructional tools are useful but not a substitute for hands-on instruction.
 - Suggestion to promote Future Farmers of America agriculture technology programming and their partnerships with high schools.
 - Land grant universities, through their extension programs, are leading youth programs related to drones (Purdue extension drones) and robots (Mississippi state extension youth robots).
 - Future technology to ensure best food:
 - Focus on sustainability and carbon footprint reduction will be an important sell for some communities.
 - AI and robotics can help farmers harvest at peak ripeness.
 - Camera-based systems can increase yield at the farm and reduce food waste in transit, warehouses, and production/retail facilities.
 - Automation shows potential for multiple passes through same area for selective harvesting.
- Questions
 - Dr. Adelaine: Did your group discuss cybersecurity concerns for farmers and ranchers and educational opportunities around this topic?
 - Answer: The group did discuss this and it's an area of significant concern, but I will take this back to the group for further discussion.

Open Discussion

- AB: Question that connects two working groups. There is concern that there may be soon be spectrum limitations and in particular that lower band spectrum may be most beneficial for agricultural products buried in the soil or in forests. How does the FCC and NTIA catalogue exactly how much is being used as well as where and how, and what the impact would be on allocating new spectrum? I think this is going to be needed to facilitate IoT devices.
 - HHK: I was wondering if the mapping recommendations is at least on the cusp of this notion
 - JC: I have seen some academic research on using software-defined radios to map out utilization of all sorts of different spectrum. That is not part of the National Broadband Map today. We have been focused on the near-term blocking and tackling of getting internet to rural areas. The point Andy raises is really important but longer-term perspective on the issue. I could see it being ripe for academic research. I don't think it belongs in the National Broadband Map because the Map is aimed at mass market availability and discussion of spectrum is upstream from that. This is close to the discussion about TV White Space in that TV White Space is one particular example of a number of related things.
- Joy: There are so many unknowns that we want to bring light to. For example, my point on the fiber "gap" (whether there is no fiber or dark fiber), we need to know. Also need to know for the

utilization or buildout of spectrum. I don't know if this is something nobody has addressed or if it's proprietary information for different providers that we haven't seen yet.

- DW: We discovered in Nebraska that there's fiber all over the state due to public power, railroads, etc. but there is reluctance to share data for several reasons. For example, how was it paid for? If there is dark fiber originally put in for railroads or the power industry at the expense of customers, then there might be political considerations as to who that fiber should belong to. He expresses potential issues with making that fiber usable for the intended purpose.
 - Joy: There are political issues here, but we should get to the bottom of it, so what is it we need to do to get to the answer?
- AB: We are seeing a lot of concern about the use of farm equipment produced offshore. He wonders whether we have addressed those concerns in discussions about security. Are any of the newest concerns worthy of digging by this Task Force?
 - Dr. Adelaine: It could be added as a thought from the Task Force. The Task Force could say that this issue is worthy of further discussion and investigation going forward if desired. Thoughts from other task force members?
 - HHK: Agrees but isn't sure where the expertise comes from.
 - Dr. Adelaine: The task force could make a general statement that there is a line inquiry that needs to happen related to security in equipment assembled or built outside the US and what are the implications of the equipment being built there. We will put this as an item to raise again in October if we want to pursue it as we go forward.
- HHK: Multiple items for open discussion.
 - Raises potential recommendation that the FCC or NTIA reach out to States about using BEAD or other state-guided federal funds for precision agriculture.
 - Dr. Adelaine: Steps in to solicit feedback from the rest of the Task Force on this item.
 - DW: Says that if this is not in our report it should be.
 - DW: Asks whether we are asking the FCC to advocate to NTIA since NTIA manages the BEAD program.
 - HHK: Yes
 - DW: Reminds the Task Force that BEAD funds have complicated conditions that may prevent free use for these purposes. Suggests changing the statute to make use easiest in case the statute does not yet allow it.
 - Suggests advising the FCC to request a communications market report to determine market coverage. Look at rural coverage and broadband availability for wireline, wireless, and satellite.
 - Recommends the Broadband Data Act be amended to include mapping voice services since voice is especially important and especially difficult for agriculture.
 - JC: Confirms that the Broadband Data Act does not include voice calls. Voice has a lower upload requirement than broadband as defined in the Act, so voice coverage is necessarily larger.
 - HHK: Doesn't want people to get hung up on the difference between voice and data rather than the purpose of the mapping.

- JC: Not sure about recommending changing the Act since that would require an act of Congress. But the FCC has latitude to modify the map itself.
 - Dr. Adelaine: Recommends changing the suggestion to have the mapping working group to look at modifying the National Broadband Data Map.
 - JC: Will take this issue back to the mapping working group.
 - Recommends publishing Task Force reports for public comment and review.
 - AB: Previously we published interim reports but have not done so in this term.
 - HHK: This recommendation could encourage the FCC to seek and feedback rather than just publishing reports.
 - AB: From experience, it has been difficult to gather the experts, so fully supports any recommendation that will help us get the feedback of experts
 - Dr. Adelaine: They are publishing reports and not seeking public review, but he is not sure whether that is common practice.
 - Recommends directing the FCC to work with USDA and other agencies involved in the oversight, measurement, and delivery of internet connectivity to rural and agricultural areas.
 - Dr. Adelaine: This is a good one that can continue going forward.
 - Recommends an ongoing survey of precision agriculture industry providers, equipment manufacturers, farmers, and mapping efforts to document service levels and anticipated needs.
 - Dr. Adelaine: On previous task forces, he chaired the mapping working groups and had this language written into the working group’s section of the report
 - HHK: Wonders whether some of these items need to be elevated from an “ongoing” nature to recommend institutional steps
 - JC: This looks similar to the mapping working group’s sustainability points.
- Dr. Adelaine: HHK has given good food for thought. A few of the working groups can look at the suggestions and he likes the idea of elevating the items. Wants task force members to think about these issues deeper and bring it back to discussion in the October meeting.
 - Task force members agree.
- HHK: Requests Dr. Adelaine to work through the timeline

Closing Announcements and Next Meeting Date

Emily Caditz: Thanks the working group and task force members for all the progress they made. Emily and Dr. Adelaine will reach out with expectations around what goes to the FCC and what goes to the rest of the task force leadership. The next meeting will be a virtual meeting on October 15 fully virtual. We will discuss updates from the groups and the executive summary. The last full meeting will be December 5, and there we will vote on the task force comprehensive report as required. The FCC will need 30 days to review the report before getting the report back to the task force before the meeting. Thanks other staff for help in managing the process.

Dr. Adelaine: Requests members to have their thoughts in recommendation form by the next meeting. He is working on the executive summary, so he invites all information including draft recommendations. This is to help him visualize elevating certain elements to the task force level to make suggestions for the future.

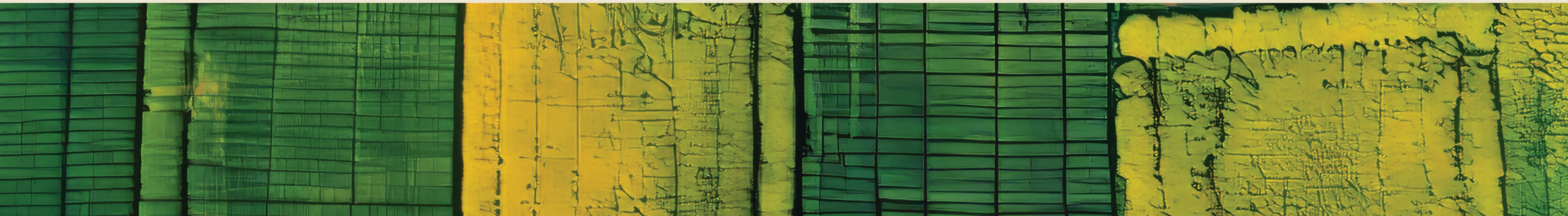
- Joy: What does recommendation form mean?
- Dr. Adelaine: He wants it to clearly state that the task force is recommending the item so that it's clear to FCC staff. The recommendations can be in bullet point form.

Next Meeting Date: October 15, 2024
December 5, 2024

- Dr. Adelaine: Adjourned the September 18 meeting.



TASK FORCE FOR REVIEWING THE
CONNECTIVITY AND TECHNOLOGY
NEEDS OF **PRECISION AGRICULTURE**
IN THE **UNITED STATES**



Task Force for reviewing the
Connectivity and Technology
needs of **Precision Agriculture**
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Initial Findings of the Mapping and Analyzing Connectivity on
Agricultural Lands Working Group for Review and Deliberation
by the Precision Agriculture Connectivity Task Force

1

MAPPING AND ANALYZING CONNECTIVITY ON AGRICULTURAL LANDS

Recommendation Categories

1. Presentation of the Map
2. Validation and Verification of the Map's Accuracy
3. The Public Challenge Process
4. Sustainability of the Map
5. Awareness of the National Broadband Map and Outreach

Presentation of the Map

The working group recommends:

- The mobile map reflect performance consumers may typically expect, considering both RF coverage and actual (typical) network load.
- The mobile map include a clear legend explaining, in terms an ordinary citizen can understand, how the map is to be interpreted.
- By default, the satellite view be enabled when the mobile map is being viewed.
- Mobile Satellite Services be added to the National Broadband Map.
- USDA NASS produce a map layer that includes mobile coverage over agricultural land.
- The FCC produce a map (separate from the National Broadband Map) indicating where devices operating under TVWS rules can be used.

Validation & Verification of the Map Data

The working group recommends:

- FCC establish an independent, on-the-ground sampling approach to verify Mobile Map accuracy that is sustainable over the long term.
- FCC maps should use propagation models that are open-source and widely peer reviewed.
- FCC and USDA encourage and advocate for further research directed towards mobile mapping efforts over agricultural lands for improved accuracy.

The Challenge Process

The working group recommends:

- FCC develop a mobile challenge process that is suitable for sparsely populated agricultural and tribal lands; crowdsourcing is not suitable.
- When a challenge is submitted, the FCC inform the challenger of additional testing required in order for the challenge to be recognized and acted upon.
- The FCC ensure that network operators do not inappropriately prioritize speed test traffic over ordinary network traffic.
- FCC collaborate with all mobile phone manufacturers to make low-level data such as RSRP, frequency and Cell ID available on the official speedtest app.
- For transparency, the location of pending and resolved mobile challenges in download data files should include latitude and longitude; currently these locations are identified only by H3 hex cell ID.

Sustainability

Congress and FCC must ensure adequate funding to sustain the mapping process on an ongoing basis, including:

- Independent, on-the-ground testing to verify network performance.
- Maintain the FCC speedtest app.
- Adequate funding for NASS to perform finer granularity census and surveys.
- Fund further Federal research to make the map more accurate and less labor intensive to maintain, especially over agricultural and tribal lands.

Awareness and Outreach

- The working group recommends the FCC team with precision agriculture equipment makers that rely on cellular connectivity to collect the data that is necessary to improve the maps, while respecting the privacy of end users.
- FCC must promote more widely the National Broadband Map and the challenge process, especially among agricultural communities.
- USDA and its Land Grant partners must educate agricultural, rural and tribal communities in awareness of the National Broadband Map and its application.
- USDA and its Land Grant partners support these same communities to actively participate in the verification and challenge process.



2

EXAMINING CURRENT AND FUTURE CONNECTIVITY DEMAND

Initial Findings of the Examining Current and Future
Connectivity Demand Working Group for Review and
Deliberation by the Precision Agriculture Connectivity Task
Force

September Updates

Summary Paragraph:

Our Working Group urgently advocates for the swift implementation of "Last Acre" initiatives, policies, and incentives, emphasizing the need for high-capacity broadband with symmetrical 100 Mbps speeds and low latency (ideally below 10 milliseconds) to fully leverage Precision Agriculture technologies, as essential to bolster food security and ensure sustainable water management. While fiber-to-the-farm remains the optimal solution for enabling advanced connectivity like 5G, 6G, and beyond, a multifaceted approach is essential, utilizing a diverse array of technologies from soil sensors to secure cloud/edge computing. The technology exists; the challenge lies in securing timely government support and incentives specifically targeted for agriculture to offset the high costs of rural broadband deployment, focusing on geographic build-out vs population-based build-out.

Topic Headings:

At the August 15 DC Meeting, Dr. Adelaine suggested working groups start our presentations with a list of headings or titles for our recommendations. Our list includes:

- **Last Acre:** Focus on extending high-speed internet to cover croplands and livestock operations, addressing the challenges of deploying infrastructure in sparsely populated and hard-to-reach rural areas.
- **Connectivity Requirements:** The objective is to achieve symmetrical bandwidth of 100 Mbps and latency targets below **10 milliseconds**.

Higher throughput is essential for uploading data to the Cloud for analysis, while lower latency is critical for enabling real-time decision-making, response, and execution. Specifically, low latency is safety-critical for autonomous trucks, with 1 millisecond being ideal for real-time decisions under optimal conditions. 5G networks typically achieve latencies of 10 to 20 milliseconds. A 10-millisecond latency would allow trucks to communicate with each other effectively in real time.

This adjustment reflects valid pushback on the initial recommendation of 0.5 milliseconds as unrealistic.

- **Funding:**

- As the FCC Rural 5G Program moves forward, we urge emphasis on enhancing connectivity across our vital agricultural lands. Call it the **“Last Acre Program”** to ensure that robust 5G connectivity is ubiquitous across working lands, enabling IoT and robotic technologies. **This adjustment reflects recent FCC decision to move forward.**
- Urge NTIA to engage with state broadband offices to ensure that agricultural needs are considered and integrated as a key piece of the puzzle in the final allocations of the Broadband Equity, Access, and Deployment (BEAD) program. Available funding should be used to extend fiber to on-farm Broadband Serviceable Locations (BSLs), supporting Precision Agriculture initiatives, as a crucial component of bridging the digital divide. This is critical to address the last 10 - 25 miles to the farm edge and time sensitive to take advantage of once in a generation funding opportunity.

- **Infrastructure:**

- **Fiber to the Farm:** Research at Penn State demonstrates that fiber-to-the-farm *is* achievable. 96.1% of all crops are located within 10 miles of existing fiber infrastructure and 99.9% within 25 miles. This proximity makes it feasible to establish a fiber junction box and power source at a suitable location on the farm, serving as a mini IoT hub. This setup would enable high-capacity wireless connectivity for Precision Agriculture applications and support Cloud/Edge computing for data-intensive processes. Additionally, fiber-to-the-field provides redundancy for wireless solutions, whether terrestrial or satellite, used to cover farm fields or ranches.
- **Last Acre Wireless Coverage:** Cellular infrastructure (towers, fixed wireless (FWA), 5G and beyond, private on farm cellular networks) that support robust, ubiquitous connectivity across farmlands to cloud/edge compute.
- **Satellites:** Low Earth Orbit (LEO) satellites with cellular interoperability are making significant advancements, potentially competing with towers, but they require the deployment of multitudes of satellites to achieve throughput requirements.

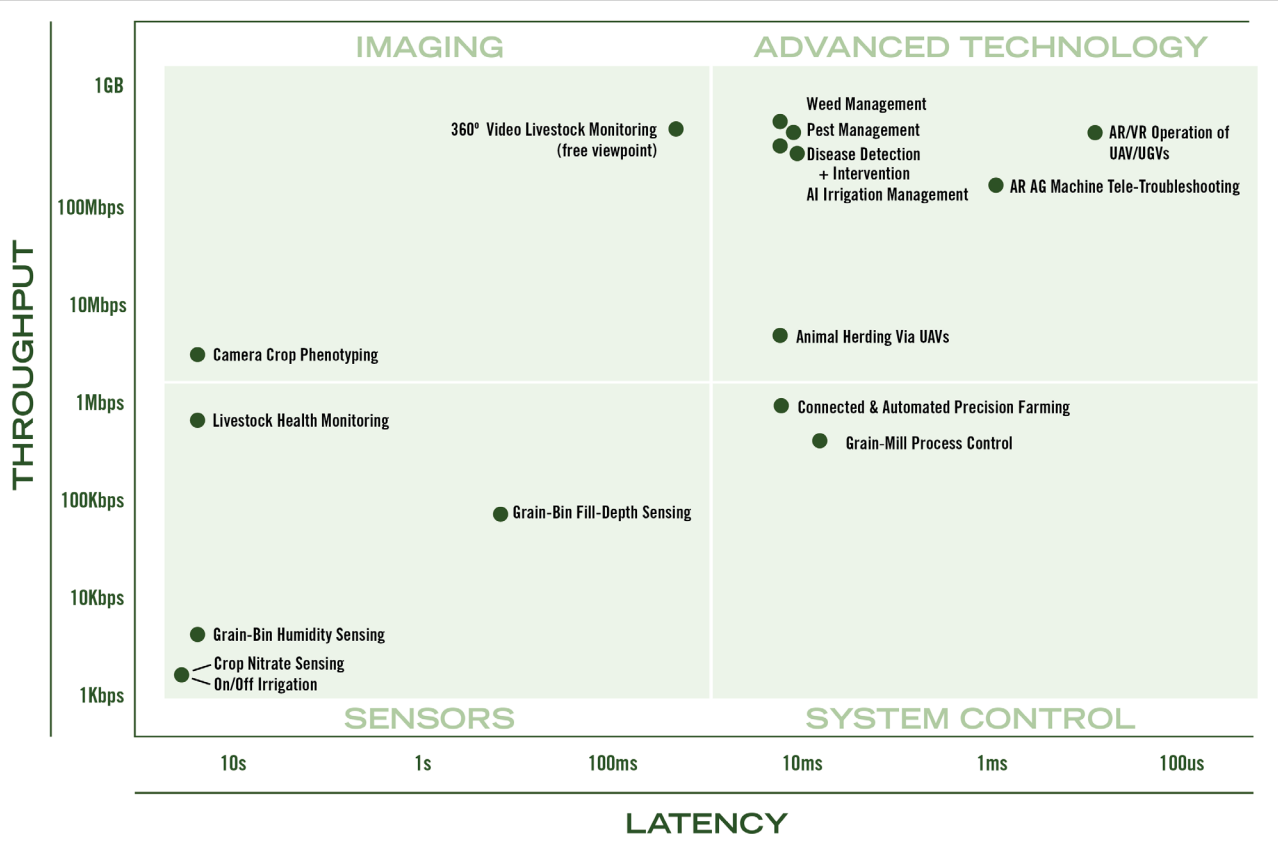
- **Spectrum**

- We advocate for agriculture to be given access to mid-band spectrum through AI-driven spectrum sharing, which can effectively manage and minimize interference. Common wisdom is that mid-band spectrum is best suited for 5G.
- We recommend that the FCC, in coordination with the NTIA, **review or continue action on a previously initiated** Notice of Inquiry (NOI) on the allocation and use of low-band spectrum (under 1 GHz) specifically for IoT devices essential to Precision Agriculture. **This adjustment reflects learning that a NOI was issued in 2021.**
- According to the IoT4Ag group, multiple networks may be required to effectively cover and manage a farm or ranch.
- We recommend that a dedicated percentage of spectrum be allocated specifically for agricultural use whenever spectrum is auctioned.
- We urge that license holders be mandated to build out currently unused spectrum in agricultural areas. This will ensure that these frequencies are actively used to improve connectivity, supporting essential agricultural operations and advancing precision farming technologies.
- We propose consideration of a dedicated Ag Band.

- **Sustainability:**

- Sustainable Connectivity - Robust, always on, ubiquitous, redundant and future proof. To quote Ryan Krogh, “We need as big a pipe as possible.” The surging increase in data requires a combination of more spectrum and more infrastructure. Redundancy is essential in case of any kind of interference.
- Connectivity for Sustainability - Provision farmers with the connectivity needed for “smart farming” practices - Precision Ag technologies/applications that create “sustainable value” like reducing inputs (water/fertilizer/pesticides) and implementing robust farm to fork traceability systems to ensure the safety and reliability of the food supply chain.
- FDA’s Food Traceability Rule, which comes into effect January 2026, requires lot codes on produce that capture key data elements for tracking from each individual farm field through packing, processing, distribution. The goal is to reduce the investigation time for say an E. coli outbreak from 35 days to just five. And ideally, the farmer will with technology be able to detect and stop any disease outbreak or infestation before the produce goes into distribution.

Throughput & Latency Requirements



While it appears the farm could operate on lower bandwidth within a bubble, this is an incomplete picture. Transmitting and analyzing collected data require higher throughput to be actionable in real time. Evolving technology and operations in the future will demand even more bandwidth.



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Force

3

ACCELERATING BROADBAND DEPLOYMENT ON UNSERVED AGRICULTURAL LANDS

Leading Opportunities for Accelerating Deployment

(AKA Sections of the Working Group Report)

- License Build-Out Obligations
- Funding and Incentives
- Siting
- Informational Resources
- Leveraging Spectrum and Underused Infrastructure

Changes or Additions to License Build-Out Obligations Section Since August 14, 2024

- No obvious changes recorded in this section

However, we have recommendations related to underused infrastructure that could potentially intersect with this section of our report.

Changes or Additions to Funding and Incentives Section Since

August 14, 2024

Numerous additions, in the form of potential programs or examples, to this category.

- **Investment Tax Credit**

Reviewing the model of renewable energy capital projects, recommending providing companies ability to claim up to 30% of their capital costs in a project.

- **Targeted Subsidy Program for Precision Agriculture**

We still collectively support part of the 5G fund being used for this purpose, however, we anticipate updating our language in light of FCC's recently published notice. We plan to emphasize the need to plan for 6G and beyond with scalable, evolving applications.

- **Allow Funding from Multiple Sources**

Our group compromised on this point by agreeing that regional unserved and underserved areas would benefit from multiple funding sources to afford initial buildout costs, while developing language that opposes creating monopolies out of publicly-funded grants and programs.

- **Allow Cooperatively-Owned Telecommunications Utilities to Qualify for Municipal Bonds**

Researching ways to amend existing bond cap and criteria to allow cooperatives to qualify for voice and data services.

- **Establish Opportunity Zones for Unserved and Underserved Areas**

Overlay poverty data and telecommunications service data to identify opportunity zones to incentivize investment.

- **Explore Tools: Tax Incremental Financing (TIF) Districts, Block Grant, Revolving Loan Funds**

Seek existing state models or recommend developing model in the 'playbook' for states and local gov to deploy.

Changes or Additions to Siting Section Since August 14, 2024

- There have been no substantive changes or additions in our Siting recommendations since August.

Changes or Additions to Informational Resources Section Since August 14, 2024

There have been no substantive changes or additions in our Siting recommendations since August.

Changes or Additions to Leveraging Spectrum and Underused Infrastructure Section Since August 14, 2024

We expanded the section to include “Leveraging Underused Infrastructure” and the previous section that had “Recommendations Related to Other Spectrum Matters”

- **Incentivize Buildout of Cellular Base Stations**

We are developing language to encourage taking inventory of, marketing, and incentivizing existing RTK and other towers that could be leased or operated by cellular providers to expand service quality and reliability to unserved and underserved areas.

- **Facilitate Emergence of Sustainable Competition**

The FCC and USDA policies should support emergence of sustainable competition over time and avoid erecting publicly funded barriers to market entry..

- **Clarified Language of Unlicensed and Licensed by Rule Spectrum**

We reference an NTIA 2023 report and state that these categories can complement exclusively held networks.

- **Accelerate Development of Direct to Device (D2D)**

We added a sentence acknowledging the benefit to consumers and precision ag. as well as the FCC’s March 24 vote.

Anticipated Work in September

- Write introductory paragraphs to provide context of the significance of each area with regard to accelerating deployment.

Working group members have volunteered to write statements that the group will review and edit together.

- **Prioritize our recommendations**

We plan to rank our recommendations by the impact they could have on accelerating deployment, using criteria of timeliness/urgency; scope/size of impact; and ease of implementation.

- **Explore additional topics**

Our group has identified potential opportunities for accelerating deployment to unserved and underserved areas through Sub1 GHz and the Universal Service Fund. We plan to discuss these areas and develop recommendations.



4

ENCOURAGING ADOPTION AND AVAILABILITY OF HIGH QUALITY JOBS

Initial Findings of the Encouraging Adoption and Availability of
High Quality Jobs Working Group for Review and Deliberation
by the Precision Agriculture Connectivity Task Force

Per acre incentives

- Barriers to adoption remain for small farmers who face difficulties achieving feasible ROI on ag tech
- Task Force leadership asked whether per acre incentives could be implemented
- Work Group members consulted with state ag departments and university extension services
- ROI for small farmers will be difficult; cultivating enthusiasm and strong dealer support for small farmers may play a positive role to assist adoption

Partnerships

- Extension services working with farmers can develop economic evidence to support championship and advocacy for ag tech
- Additional work on digital literacy, skills and adoption can help portray ag tech as necessary and as a natural component in the current digital economy
- Technical colleges can play a key role partnering with high schools

Education

- In the post-secondary world, hardware demo classes can be difficult from both a timing perspective (whether planting and/or harvesting conflicts with classes or breaks)
- Weather and travel to farm sites can also be factor, suggesting use of small equipment that can be located closer to school as representative examples for exhibitions
- Podcasts and similar “instructional” tools are useful but do not substitute for “kicking the tires”
- Future Farmers of America features ag tech focused programming whose partnership with high schools can be promoted
- Land grant universities, mostly their extension systems, are leading youth programs related to drones ([Purdue Extension Drones](#)) and robots ([Mississippi State Extension Youth Robots](#))

Future technology to ensure best food

- In some communities, a focus on sustainability and carbon footprint reduction will be an important sell
- AI and robotics can assist farmers harvest at peak ripeness
- Camera-based systems can increase yield at the farm and reduce food waste in transit, warehouses, and production/retail facilities
- Core technology exists and products based on it are being developed
- Automation may allow multiple passes through the same area for selective harvesting

Federal Communications Commission

MEETING OF THE TASK FORCE FOR REVIEWING THE CONNECTIVITY AND TECHNOLOGY NEEDS OF PRECISION AGRICULTURE IN THE UNITED STATES

September 18, 2024

AGENDA

3:00 PM ET	CALL TO ORDER AND WELCOME, ROLL CALL	Emily Caditz, Designated Federal Officer Dr. Michael Adelaine, Task Force Chair
3:05 PM	WORKING GROUP UPDATE	Mapping and Analyzing Connectivity on Agricultural Lands
3:25 PM	WORKING GROUP UPDATE	Examining Current and Future Connectivity Demand for Precision Agriculture
3:45 PM	WORKING GROUP UPDATE	Accelerating Broadband Deployment on Unserved Agricultural Lands
4:05 PM	WORKING GROUP UPDATE	Encouraging Adoption of Precision Agriculture and Availability of High-Quality Jobs on Connected Farms
4:25 PM	OPEN DISCUSSION	
5:00 PM	CLOSING ANNOUNCEMENTS AND NEXT MEETING DATE	Dr. Michael Adelaine, Task Force Chair Emily Caditz, Designated Federal Officer

Heather:

General recommendations to the Precision Ag Task Force as a Task Force member:

- Recommend the Commission reach out to states about using BEAD funds and other state-guided federal funds to support precision agriculture.
- Advise the FCC to request a Communications Market Report to determine rural coverage and broadband availability in rural areas and for precision agriculture across all three areas: wireless, wireline, satellite.
- Recommend modifying the National Broadband Map (replace: Broadband Data Act be amended) to include mapping voice services.
- Publish Task Force Reports for public review and comment.
- Direct the Commission to continue working with the US Department of Agriculture and other agencies involved in the oversight, measurement, and delivery of internet connectivity to rural and agricultural areas.
- Ongoing survey of precision agriculture industry providers, equipment manufacturers, farmers; and mapping efforts to document service levels and anticipated needs.

Note: there is no trade group for precision agriculture that is consistently commenting on Commission proceedings.