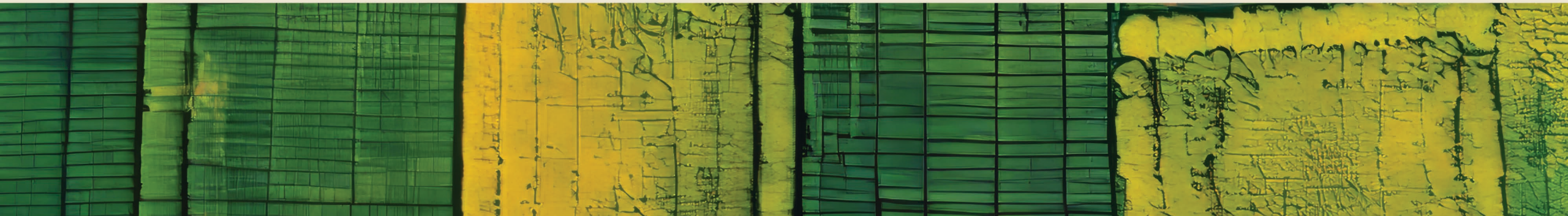




TASK FORCE FOR REVIEWING THE
CONNECTIVITY AND TECHNOLOGY
NEEDS OF **PRECISION AGRICULTURE**
IN THE **UNITED STATES**



Task Force for reviewing the
Connectivity and Technology
needs of **Precision Agriculture**
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.

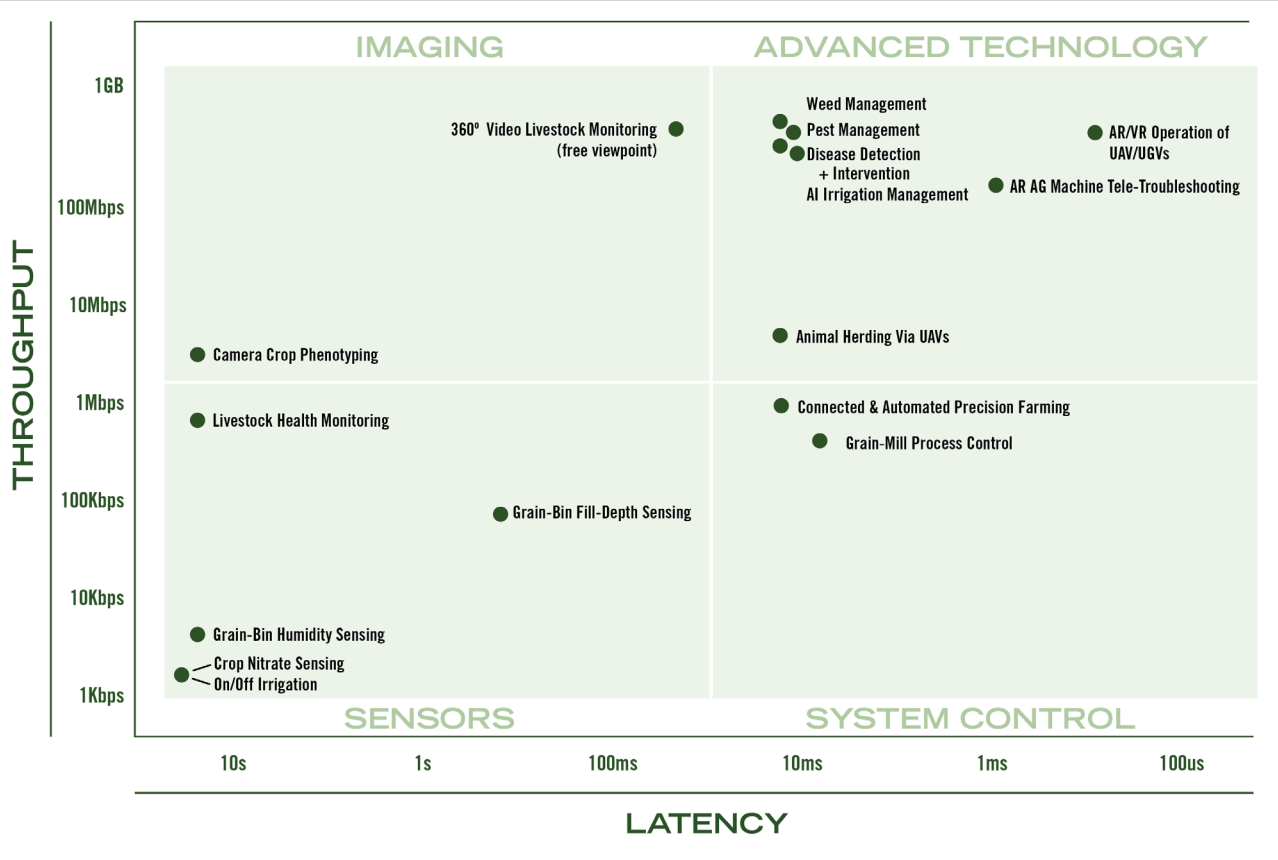
- **Spectrum**

- 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.



Initial Findings of the Accelerating Broadband Deployment on
Unserviced Agricultural Lands Working Group for Review and
Deliberation by the Precision Agriculture Connectivity Task
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