

Examining Current & Future Connectivity Demand for Precision Agriculture

Interim Working Group Report

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Working Group Members:

Dan Leibfried*

Blake Hurst

Catherine Moyer*

Andy Bater*

Peter Brent*

Chris Chinn*

Dr. Ranveer Chandra

Valerie Connelly

Jennifer Manner

Aeric Reilly

Brian Scarpelli

Steven Strickland

Lucas Turpin

George Woodward

James Kinter

Omar Carrillo

Ron Miller

Steven Piccirillo (USDA

Liaison)

John Visclosky (FCC

Liaison)

Monica DeLong (FCC

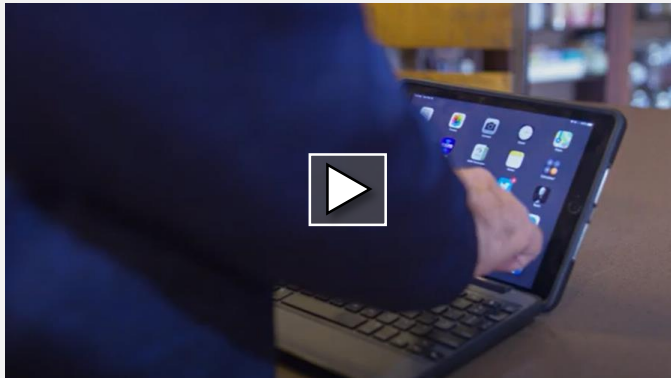
Liaison)

WORKING GROUP OPENING STATEMENTS

Food Security - Environmental Sustainability - Economic Viability of the Producers

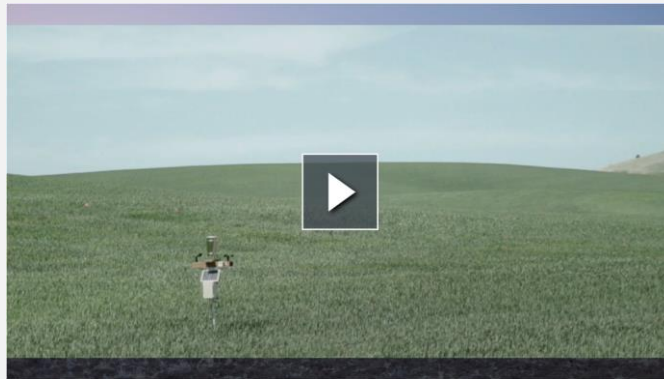
1. Food Security (Quality, Quantity, & Affordability) along with Environmental Sustainability and the Economic Viability of the Producers are critical factors to solve for simultaneously as we face the challenges of a growing population with limited resources.
2. The past approach of addressing the interconnected challenges through piece meal efforts across numerous programs has made progress but fallen significantly short in many key areas.
3. A comprehensive approach must ultimately be addressed by a single purpose program specifically focused on implementing Technology, Agriculture Infrastructure, Agriculture Applications and Precision Agricultural Best Practices.
4. More than technology solving the food shortage, this is an opportunity to establish true leadership while we;
 - Eliminate the Digital Divide
 - Establish Global Leadership in 5G
 - Further US leadership in Cloud Computing
 - Cement our position as the Global Technology Powerhouse

Precision Agriculture – Today and Tomorrow



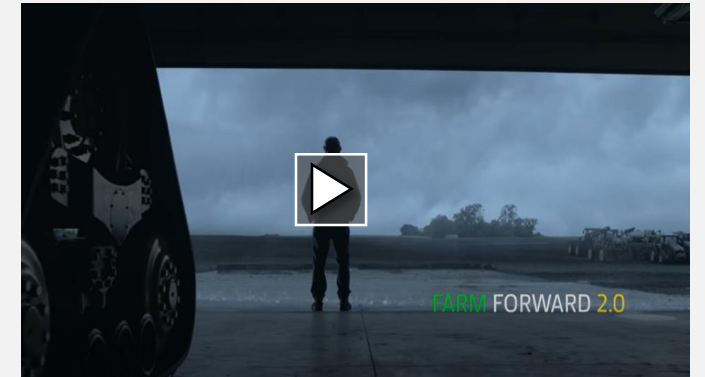
Broadband's Importance

Courtesy of HughesNet



Farming W/IOT

Courtesy of Azure Farm Beats



A vision of our Future 3

Courtesy of John Deere

Compelling, but all reliant upon Infrastructure, 5G Wireless Connectivity and Agriculture Apps to make possible!

PRECISION AGRICULTURE requires PRECISION TECHNOLOGY

Technology – Applications – Automation

PRECISION TECHNOLOGY requires:

- Cloud Analytics
 - Software
- Artificial Intelligence
 - Machine Learning
- World-class Agricultural Software Applications
 - Created Globally – Run Domestically
- Must Support Sustainability
- Collectively – Automation

APPLICATIONS & AUTOMATION requires:

- Millions of Sensors
 - Big Data
- Cameras & Machine Vision
 - Identify and Act
- Controls & Devices
 - The World of Connected Everything
- Monitors and More
- Collectively – Devices

PRECISION AGRICULTURE requires PRECISION TECHNOLOGY

Devices – Connectivity – Infrastructure

DEVICES require CONNECTIVITY

- To the Cloud
 - Massive Applications
- To Each Other
 - Gig Speed Interaction
 - Low Speed as well
- Real-time and Batch Communications
- High Latency, Low Latency, No Latency
 - Terrestrial & Satellite
 - LoRaWAN/WiFi
 - TV White Space
- Wired and Wireless
- Collectively – **Connectivity**

PRECISION Ag INFRASTRUCTURE requires

- Gig-Speed Broadband
 - Cloud to the Farm
 - Fiber – Terrestrial – Satellite
- Edge Compute Systems
 - Cloud at the Farm
 - On-Site Compute & Storage
 - On-Site Precision Ag Applications
 - Capable of Offline Operations
- Cloud at the Farm – Ownership Options
 - Grower Owned & Operated
 - Telco Owned & Supported
 - Cloud Owned & Managed
 - Hybrid Model mixing all above
- Collectively – **Ag Infrastructure**

5G WIRELESS CONNECTIVITY

- Private Wireless Networks at every Farm/Ag Operation
 - Large & Small Growers alike
 - 4G & 5G OpenRAN Today
 - 6G and beyond
- Public Wireless Network Coverage across all Fields & Pasturelands
 - Rural Operator Incentives
 - 4G Immediately
 - 5G when practical
- Fully Integrated Public and Private Networks
 - Mandated Interoperability
- Collectively – **Ag Infrastructure**

PRECISION AGRICULTURE requires PRECISION TECHNOLOGY

Summary – Conclusions

SUMMARY

- Precision Agriculture requires Precision Technology
- Precision Technology requires Infrastructure at the Farm – Large and Small
- Farming Infrastructure requires
 - Edge Compute and Private 5G Networks
- Public 4G & 5G Networks Must Cover the Farm Fields & Pasturelands

CONCLUSIONS

- Broadband to the Farm is a Bridge Halfway!
- Action to address challenges is time sensitive
- Requires Herculean Effort
 - Manhattan Project
 - Landing Man on the Moon
 - COVID-19 Response
- Needs an Integrated Implementation Plan

PRECISION AGRICULTURE requires PRECISION TECHNOLOGY



Recommendations

- Include Agriculture Infrastructure in Every Existing Rural Program
 - FCC 5G Fund, USF
 - USDA Reconnect, RUS
 - Immediately
- Set New Standards for Connectivity
 - Gig Speed
 - Accelerate uplink speed to match/exceed downlink standard
- Include Farm Field & Pastureland Coverage Incentives
 - All Existing & New Rural Network Operator Programs
- Immediately Allocate \$500M to Pilot Programs
 - For Edge Compute Systems On-Site at the Farm
 - For Private 4G/5G Open RAN Networks at the Farm
 - For Precision Ag Application Creation and Adoption
 - For Training, Support and On-Going Operational Assistance

Working Group -Next Steps



Actions

- Further validate and garner consensus from Agencies, Industry and Academia on our findings & conclusions
- Rally support for adoption and implementation of our recommendations
- Assess potential gaps in mandate and depth of analysis to ensure completeness
- Assess findings across all segments; large & small, row crops, broadacre crops, specialty & livestock
- Establishment of cross working group objectives for synthesized finding with the other Task Force WG's
- Work on email survey to validate and educate
- Build a cohesive strategy & tactics for connectivity deployments by geographic region
- Provide education and support to ensure market readiness

With the FCC's leadership...

...to deploy 5G and other high speed connectivity focused on agricultural lands and producers, the US will be able lead the world in

- Food Security
- Sustainability
- Economic Viability of Producers

...we can

- Eliminate the urban/rural digital divide
- Support the leadership and adoption of Precision Ag technologies