Smart Agriculture: Driving Innovation in Rural America

NTIA Webinar Series

You must dial in to hear the webinar!
Conference Line: 800-593-7190 Passcode: 984-4951#

September 16, 2020

Participants

Moderators

- Jean Rice, Senior Broadband Specialist, BroadbandUSA, NTIA
- Karen Archer Perry, Senior Policy Analyst, BroadbandUSA, NTIA

Presenters

- Dennis Buckmaster, Dean's Fellow for Digital Agriculture, Professor of Agricultural and Biological Engineering, Purdue University; Co-chair, GCTC Smart Agriculture and Rural SuperCluster
- Megan Nelson, Economic Analyst, American Farm Bureau Federation
- Chad Rupe, Administrator, Rural Utility Service, U.S. Department of Agriculture

Helpful Information

Questions

- Please type questions in the Q&A box on the right hand side of the screen. Questions will be taken after the final presenter.

Presentation

- The presentation along with a transcript and recording will be available on the BroadbandUSA website within 7 days of this webinar under Events/past events.
- https://broadbandusa.ntia.doc.gov/past-event

Technical Assistance

- Guides, products, publications, and other tools are available to assist you with the planning, funding and implementation of your broadband project.
- https://broadbandusa.ntia.doc.gov

**Please dial-in to hear the webinar: Conference Line: 800-593-7190 Passcode: 984-4951#*

Global Cities Team Challenge

- GCTC brings together
  - industry
  - universities
  - nonprofits
  - local and state government

  to work on projects to share knowledge and best practices on smart community technologies

- National Institute of Standards and Technology leads GCTC, in partnership with NTIA, Dept. of Homeland Security, National Science Foundation, International Trade Administration, and others

GCTC Ag & Rural Supercluster – Objectives

Farmers & Ranchers

Help farmers and ranchers improve water efficiency, produce higher quality crops and raise healthier livestock, while making it easier to meet federal and state reporting requirements.

Rural Communities

Focus on projects to bridge the digital divide and close the homework gap, improve healthcare and the ability to age in place, improve economic development and spur innovation.

Results

Set of best practices and a replicable blueprint for other communities and partners to use.

Smart Agriculture and Rural SuperCluster blueprint
https://pages.nist.gov/GCTC/uploads/blueprints/2019-Ag-Rura-Blueprint.pdf

Ag & Rural Supercluster – Action Clusters

Agriculture

Looking at ways to streamline food sheds (supply chain, i.e., farm to table) and increase smart ag (crops, livestock).

Rural Communities

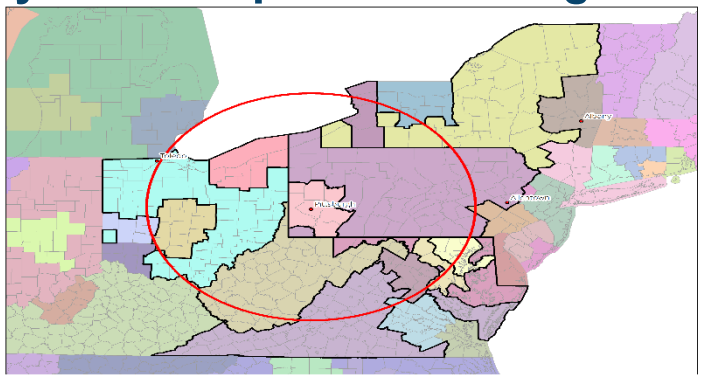
Potential collaborations to streamline and improve government services, education, workforce development and deploy regional approaches.

HealthCare

Collaborating on telehealth projects (wearables, data analytics, remote monitoring), telemedicine (physical and mental), blockchain, and cybersecurity.

Food Shed and Freight Analysis Zones

Pennsylvania Department of Agriculture



- Eliminate deficit of local food in Pittsburgh food shed
- Increase number of people/farms involved in agriculture by 25%
- Increase amount of output of farm product in food shed by 25%

Impacts

- More locally-produced food at a fair price
  - Higher income for farmers
  - Fresher, healthier food for consumers
  - Increased accessibility to food resources
- New opportunities for younger farmers
- More land in production, increasing tax base of communities

Smart Agriculture: Driving Innovation in Rural America

Welcome Dennis Buckmaster!

SMART, DATA-DRIVEN AGRICULTURE

Dennis Buckmaster

Professor & Dean's Fellow for Digital Agriculture

Agricultural & Biological Engineering, Purdue University

PURDUE UNIVERSITY | College of Agriculture

GCTC SUPERCLUSTER – AG/RURAL

- *Smart Agriculture*
- *Farm Field Mapping*
- *Improving Rural Outcomes and Broadband Access*
- *Telehealth*

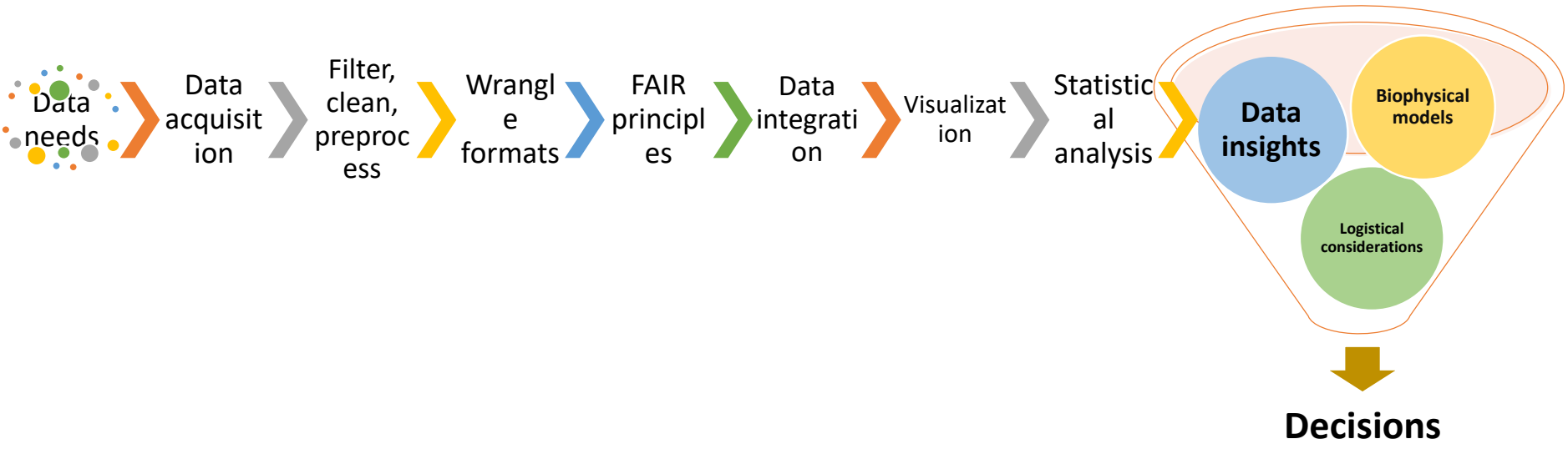
Leadership:

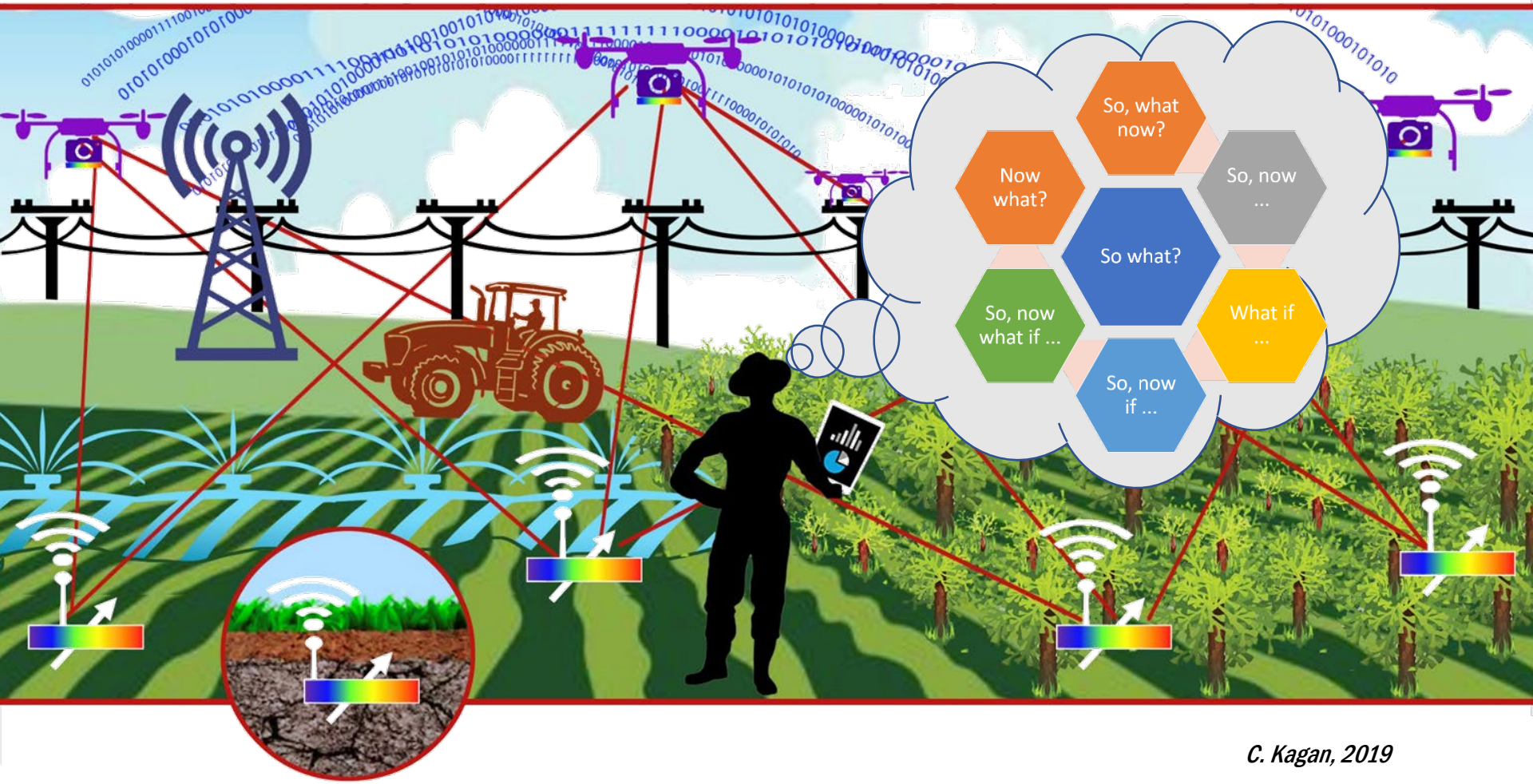
- **Mo Shakouri, Community Broadband – Joint Venture Silicon Valley**
- **Josh Seidemann, NTCA-The Rural Broadband Association**
- **Dennis Buckmaster, Purdue University**

PURDUE UNIVERSITY | College of Agriculture

The Data Pipeline

Actual Decision Making




So, what now?
Now what?
So, now ...
So what?
So, now what if ...
What if ...
So, now if ...

C. Kagan, 2019

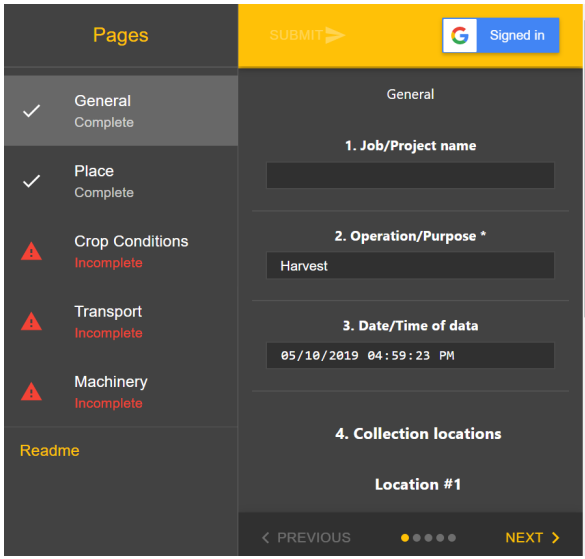
CONTxT App

con·text
/ˈkäntekst/

noun

1. Background, environment, framework, setting, or situation surrounding an event or occurrence.

the circumstances that form the setting for an event, statement, or idea, and in terms of which it can be fully understood and assessed.



Purpose of the app

The primary purpose of CONTxT is to provide metadata about other data layers which might be UAV images, as applied seed or chemical files, yield data files, etc. This context (the full backstory of what happened here this year - maybe even longer term) is critical for record keeping, model building, artificial intelligence, and machine learning. By streamlining the collection of this data, we hope to move quicker and farther toward achieving the promise of data in agriculture.

GROW – your own GDD tool

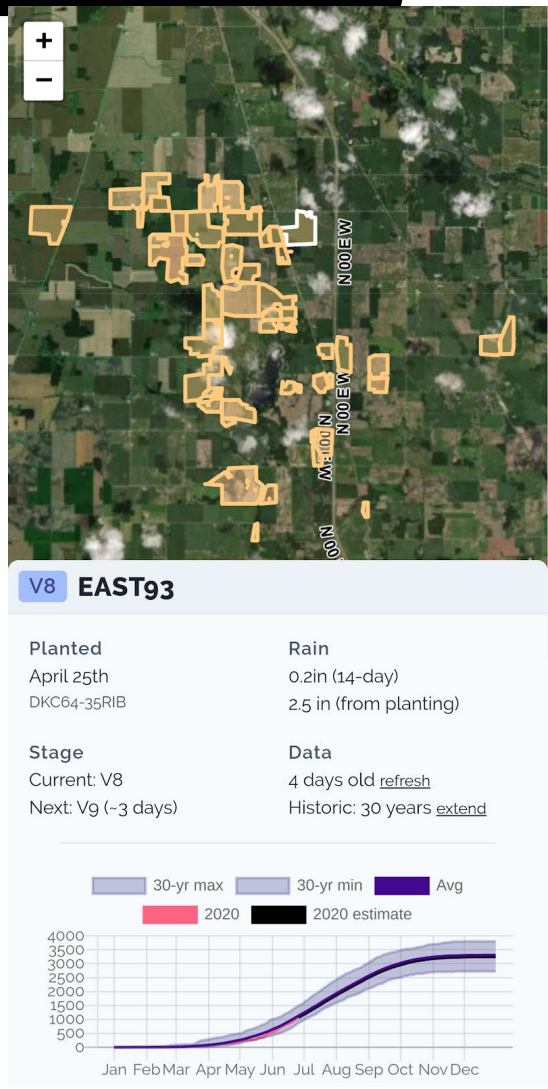
Google Sheets - grower specific data, such as:

- Field name
- Boundary
- Plant date
- Variety

Applied Climate Information System - NOAA Regional Climate Centers (RCC) with a web API for *free* gridded daily weather metrics.

Progressive Web App

- Can be installed to your device like a native program
- Offline first - automatically caches satellite imagery, field metadata, and relevant historical weather data, allowing for a complete and full offline experience.
- No backend - fetches, stores, and computes on field data locally (no server backend other than weather database)



PURDUE UNIVERSITY | College of Agriculture

Some commercial examples – just a sampling

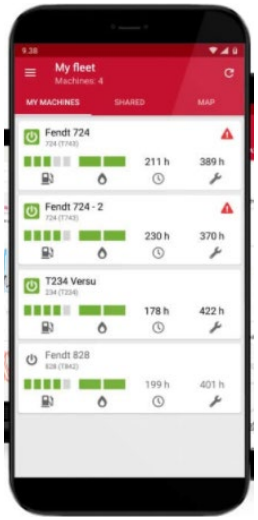
- Machine data – real-time harvest insights, timeline, playback, agronomic data
- Cropping systems management – stream real-time data, utilize various data layers (imagery, yield, as-applied inputs), create and apply prescriptions
- Sub-acre management with data integration and research-oriented processes to mitigate risk
- Machine connectivity for logistics and operations management, fleet maintenance, and tracking
- AI farm plan modeling, input selection and placement

FARMOBILE®

CLIMATE FIELDVIEW

ADVANCED AGRILYTICS

AGCO Connect



ARVA INTELLIGENCE

PURDUE UNIVERSITY | College of Agriculture

More commercial examples – just a sampling

- Integration of data from disparate systems to deliver insights – livestock realm
- Robotic, precision soil sampling
- Crop intelligence from frequent high-resolution imagery – collect, classify, analyze, visualize, alert
- Dairy calving predictions, health, heat detection, analytics, herd insights
- Smart and variable rate irrigation control – multiple depth soil moisture tracking

iYOTAH SOLUTIONS

ROGO

intelinair

ida

CropMetrics™ YIELD OPTIMIZATION TECHNOLOGY

Interoperability – still a challenge

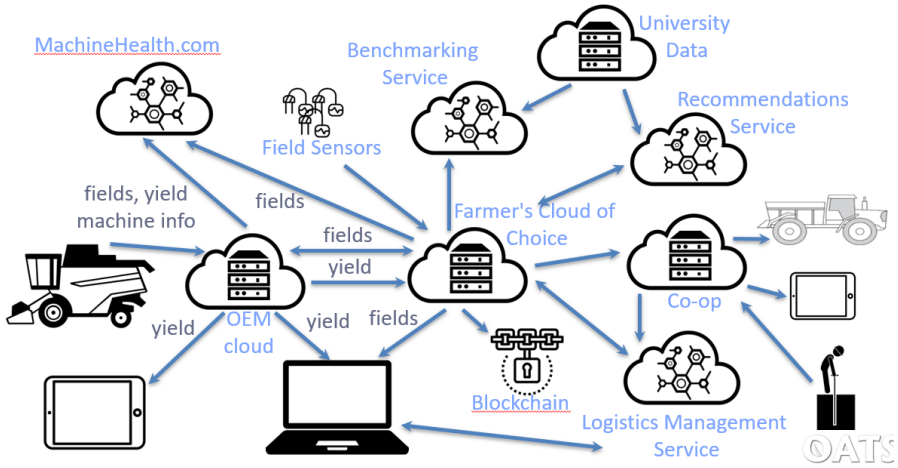
Requires cooperation amidst competition

Many stakeholders

Multiple platforms and systems each with a “piece of the pie”

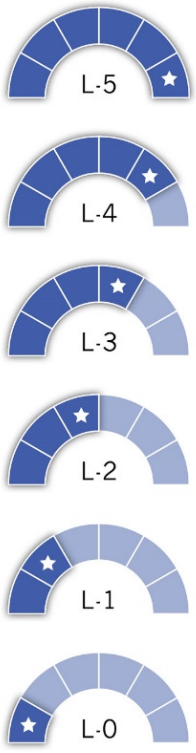
Can enable efficiency, sustainability, traceability

Connection-based Architecture for Automated Data



SIX LEVELS OF PRECISION AGRICULTURE ADOPTION

The *PrecisionAg*® Institute, administered by Meister Media Worldwide along with its Partner organizations, have proposed these six levels of precision adoption for row crop growers.



Source: PrecisionAg® Institute; PrecisionAg.com/Institute

PURDUE UNIVERSITY | College of Agriculture

Smart Agriculture: Driving Innovation in Rural America

Thank you, Dennis!

Smart Agriculture: Driving Innovation in Rural America

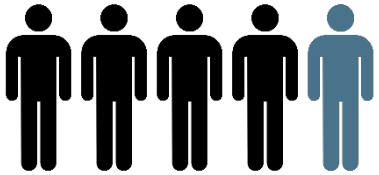
Welcome Megan Nelson!

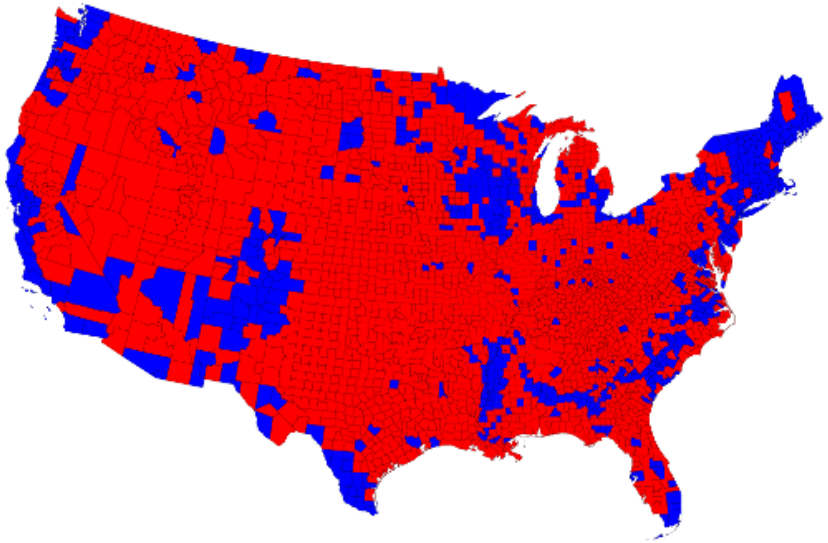
BENEFITS OF PRECISION AGRICULTURE AND HOW WE GET THERE

Megan Nelson
Economic Analyst
American Farm Bureau Federation

WHERE ARE WE TODAY?

Nearly 60 million people or 1 in 5 Americans live in rural areas.





FARM BUREAU®

Broadband is no longer a luxury, it's a NECESSITY

Agricultural Needs:

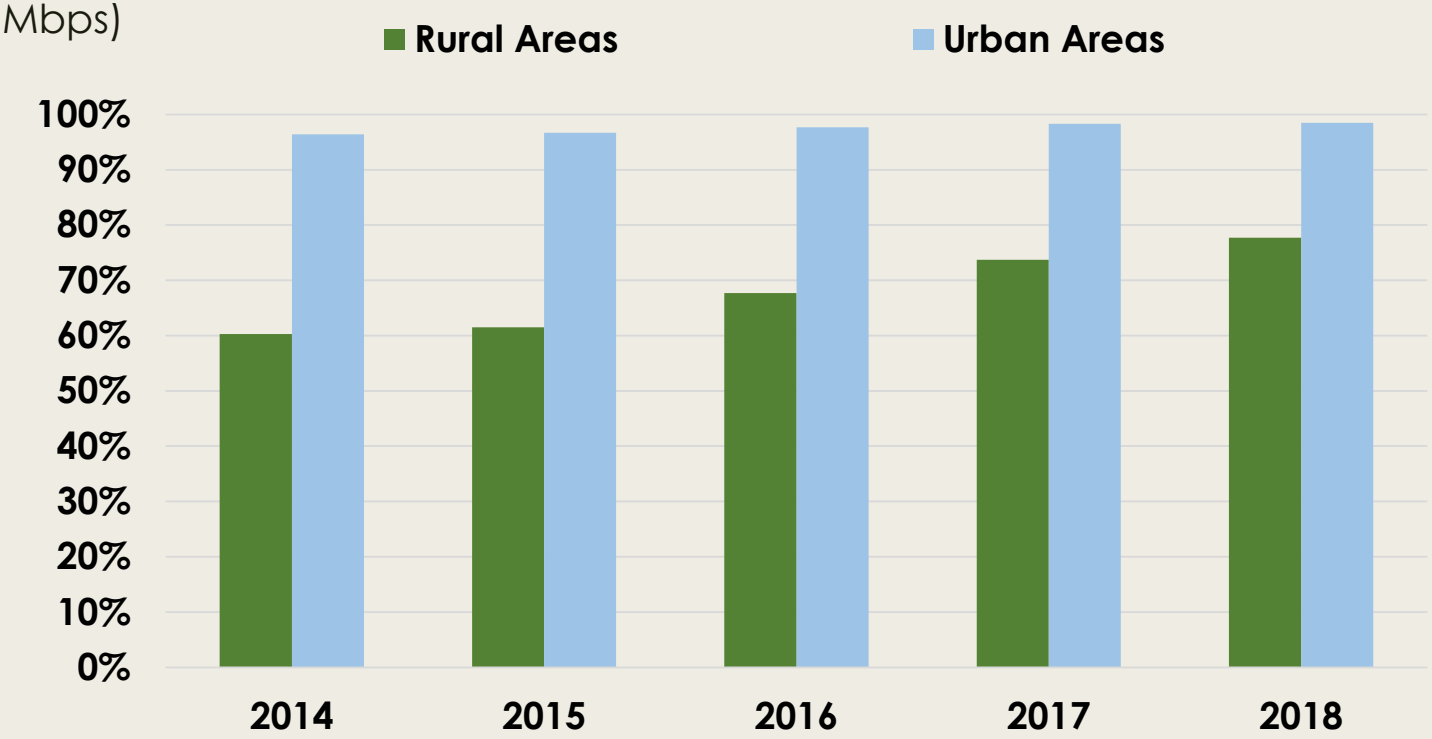
- Infrastructure
- Precision Agriculture
- Connecting with buyers and customers

Quality of Life:

- Health Care
- Education
- Entrepreneurship
- Leisure

FARM BUREAU®

Percentage of Americans with Access to Wired Broadband (min. 25 Mbps/3 Mbps)



FARM BUREAU®

Source: FCC, 2020 Broadband Deployment Report

WHY IS THIS SO IMPORTANT?

USDA's estimates potential benefits that broadband technology and infrastructure could bring to rural areas at

$64.5 billion

annually

Figure 1. Annual Potential Gross Economic Benefits of Precision Agriculture Technologies Derived From Broadband

	Row Crops	Specialty Crops	Livestock	Total
Annual Value of the U.S. Market Studied *	**$110.6 B**	**$30.1 B**	**$113 B**	**$254 B**
Precision Ag in Planning	$4.2 B	$1.3 B	$2.4 B	$7.9 B
Precision Ag in Production	$6.7 B	$3.5 B	$15.8	$25.9 B
Precision Ag in Market Coordination	$2.2 B	$8.5 B	$2.4	$13.1 B
Next Generation Precision Ag Potential Gross Economic Benefits Annually, For the Market Studied	$13.1 B	$13.3 B	$20.6	$46.9 B
Annual Value of Total U.S. Market Production *	**$142.6 B**	**$45.3 B**	**$151.9**	**$340 B**
Next Generation Precision Ag Potential Gross Economic Benefits Annually, Extrapolated to Total Market	$16.8 B	$19.9 B	$27.7	$64.5 B
Next Generation Precision Ag Potential Gross Economic Benefits as a Percent of Total U.S. Production	12%	44%	18%	18%
Average Percent of Next Generation Precision Ag Benefits that Depend on Broadband	35%	43%	38%	36%
Potential Gross Economic Benefits of Ubiquitous Broadband Infrastructure and Next Generation Precision Agriculture Adoption:	**$4.6 *to* $5.9 B *or 4%***	**$5.7 B *to* $8.6 B *or 19%***	**$7.8 B *to* $10.5 B *or 7%***	**$18 B *to* $23 B *or 7%***

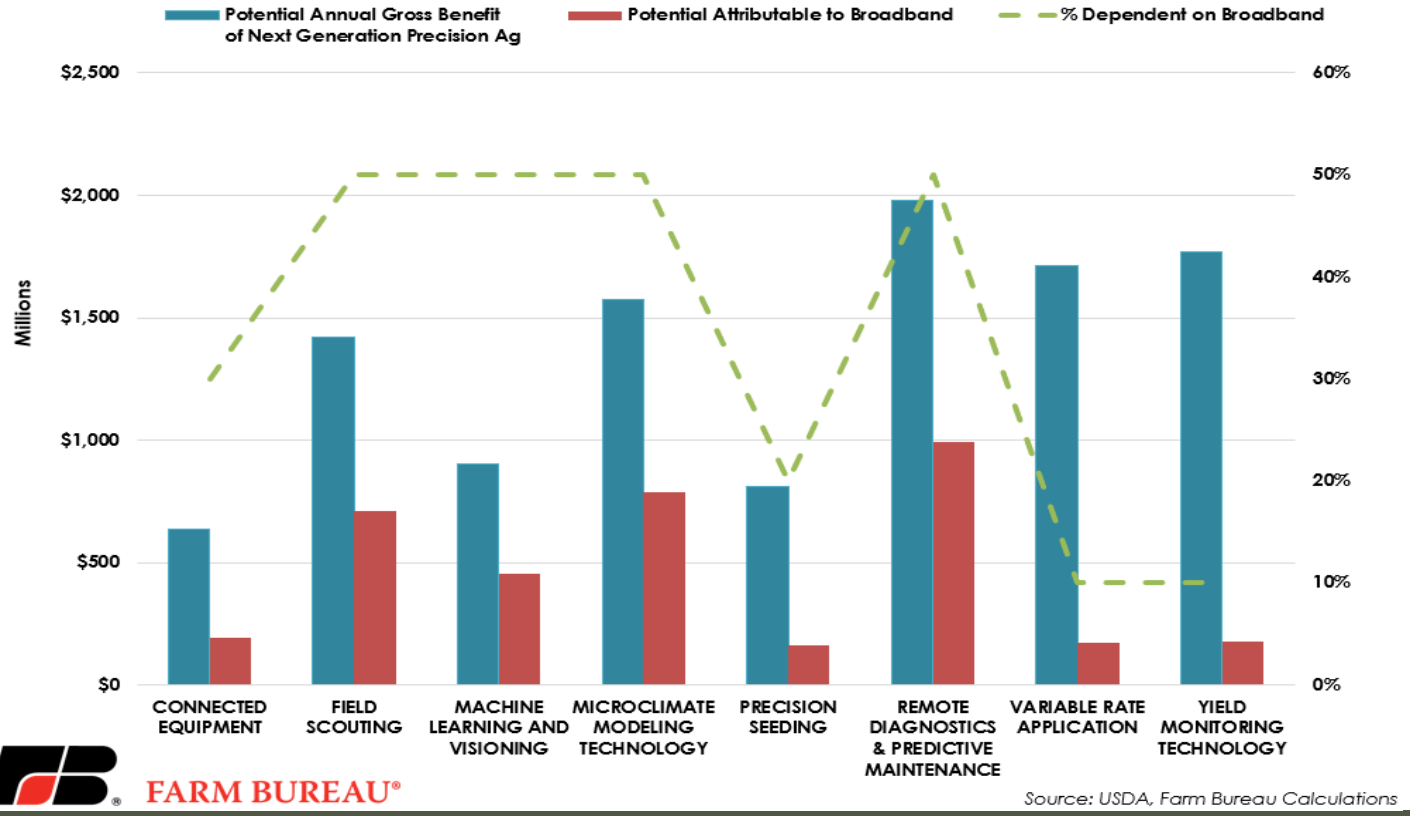
of the total market

** Source: 2017 Production Values per 2019 reports of USDA National Agricultural Statistics Service and Animal and Plant Health Inspection Service.*

FARM BUREAU®

Source: USDA

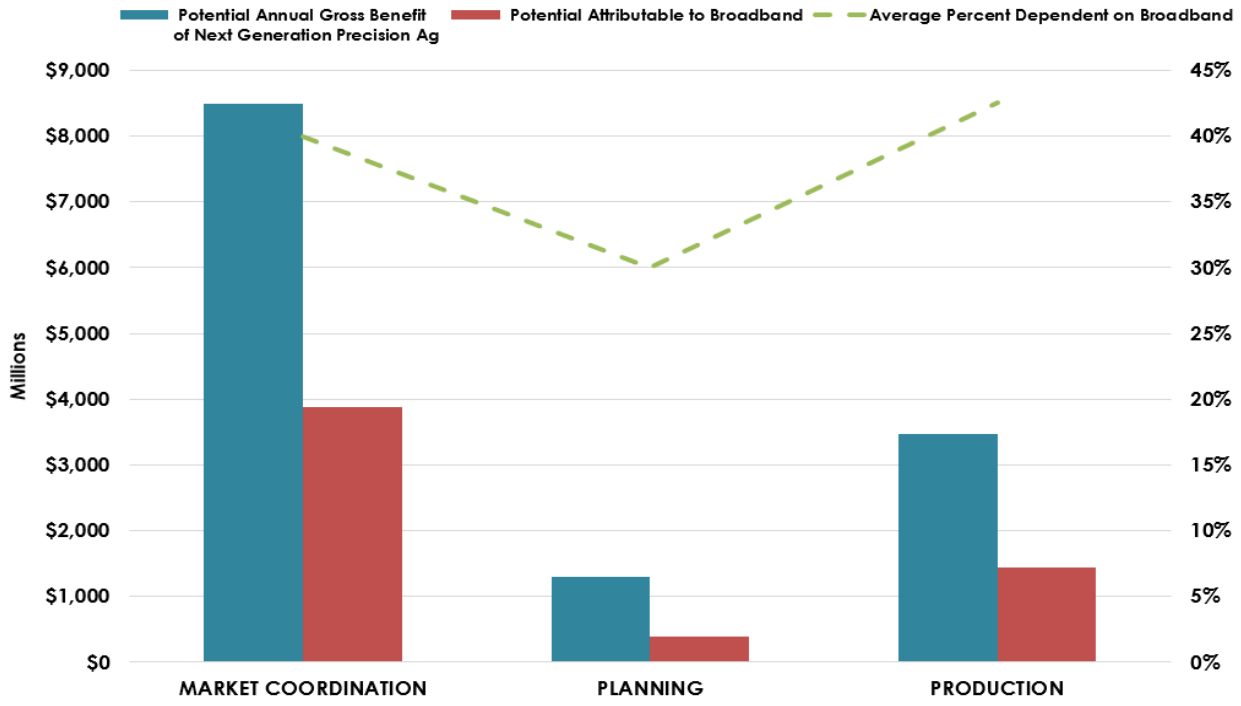
Figure 1. Potential Benefits for Row Crops by Digital Techonology Type



FARM BUREAU®

Source: USDA, Farm Bureau Calculations

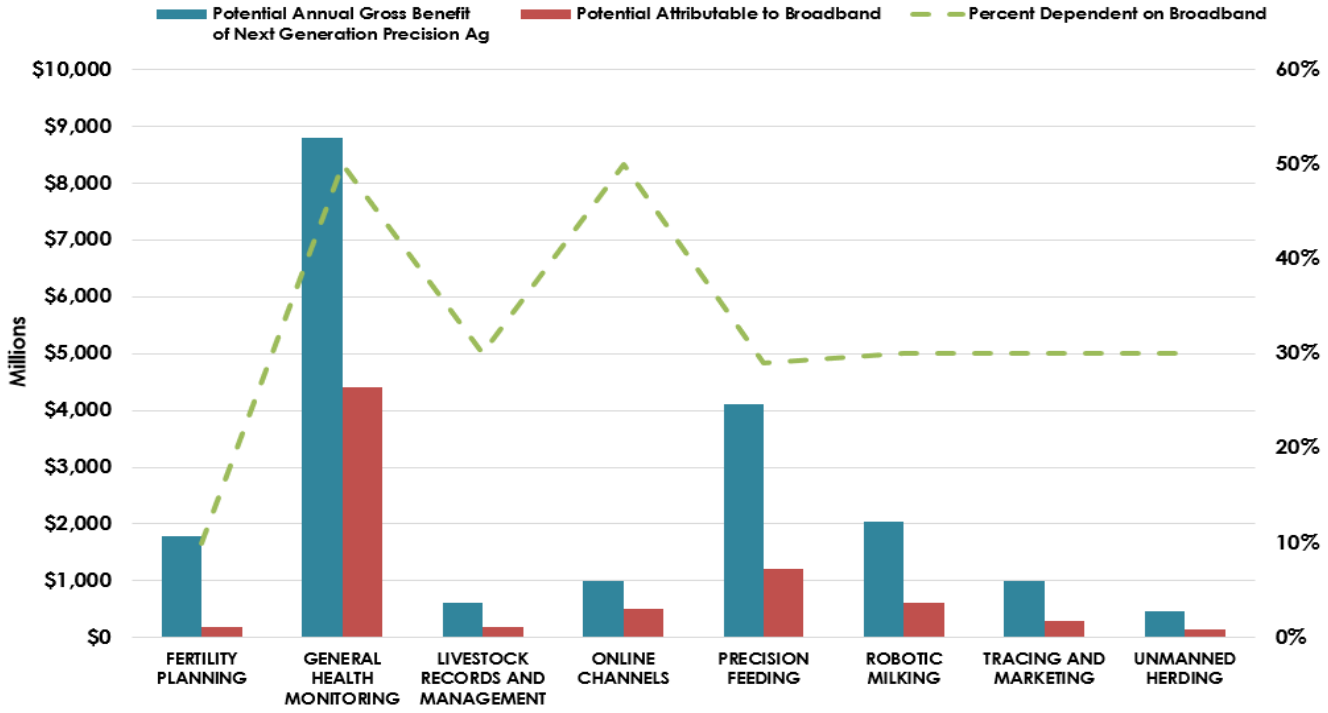
Figure 2. Potential Benefits in Specialty Crops from Digitial Techonology By Business Function



FARM BUREAU®

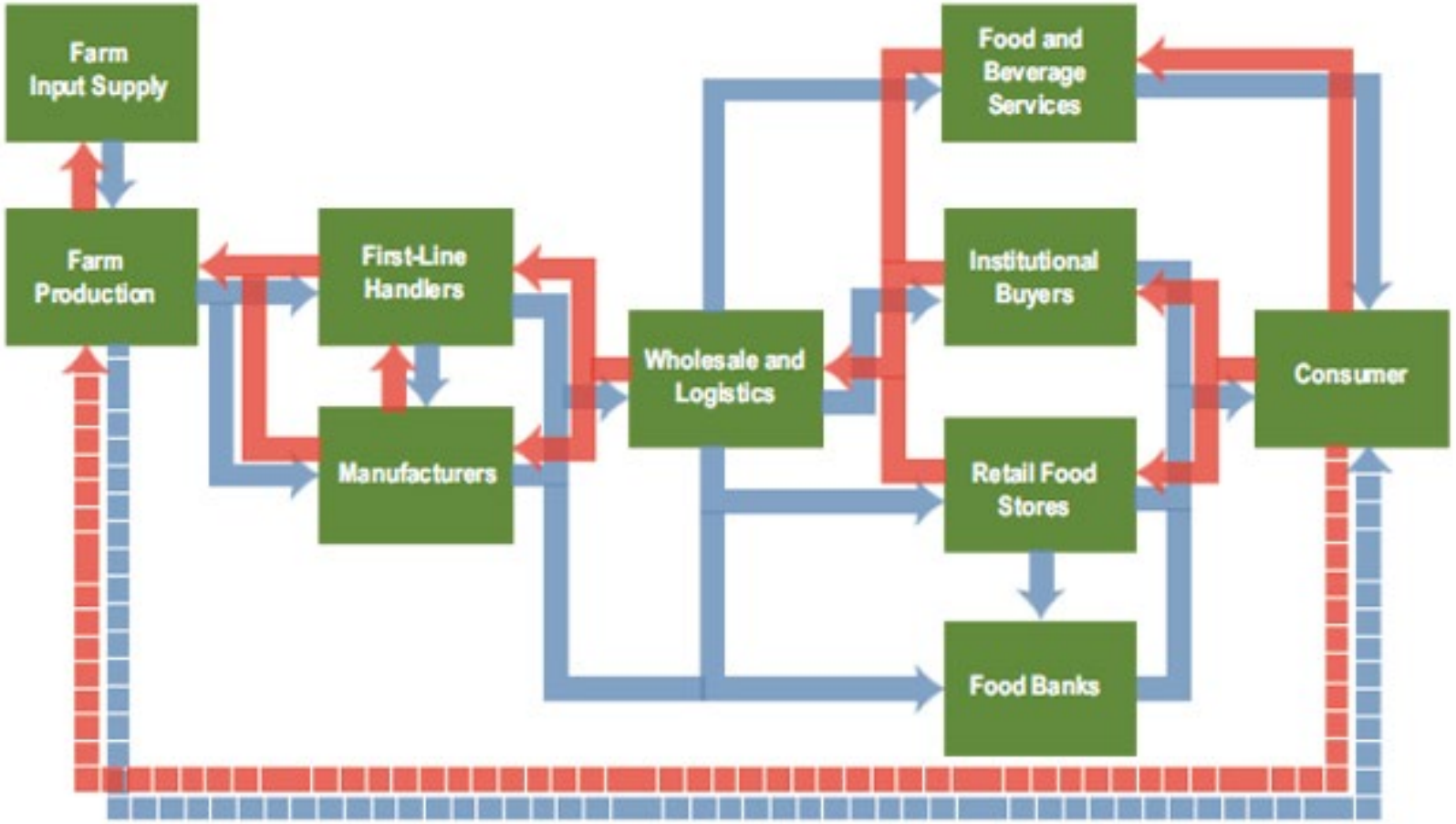
Source: USDA, Farm Bureau Calculations

Figure 3. Potential Benefits for Livestock and Dairy By Digital Techonology Type



FARM BUREAU®

Source: USDA, Farm Bureau Calculations



Source: A Framework for Assessing Effects of the Food System.

Excerpt from Blake Hurst's (President of Missouri Farm Bureau) Testimony to the House Agriculture Subcommittee on Rural Broadband

"I'm driving my combine, and the phone rings. It's my 84-year-old father, who is in our other combine. The conversation goes like this:

Dad: "I just got a call from John Deere."

Me: "Uh huh."

Dad: "They said I was running out of DEF!" (A diesel fuel additive)

Me: "Uh huh."

Dad: "They're watching us!"

Farming has changed.

We used to think that we just grew corn and soybeans. Now we also generate data. Trillions of bits, all containing information that can make us more efficient, economical and reduce our environmental impact. "

AFBF Advocacy

Accurate Broadband Maps

- Broadband DATA Act
- Broadband Deployment Accuracy and Technological Act

Precision Agriculture Connectivity

Continued funding assistance for connecting rural areas and bridging the digital divide

FARM BUREAU®

Questions?

Contact Information:

Megan Nelson

megann@fb.org

202-406-3629

MeganRNelson1

Smart Agriculture: Driving Innovation in Rural America

Thank you, Megan!

Smart Agriculture: Driving Innovation in Rural America

Welcome Chad Rupe!

Smart Agriculture: Driving Innovation in Rural America

USDA Rural Development

Presented by Chad Rupe, Rural Utilities Service Administrator

USDA Rural Development
U.S. DEPARTMENT OF AGRICULTURE

USDA Rural Development
U.S. DEPARTMENT OF AGRICULTURE

USDA Rural Development's Mission

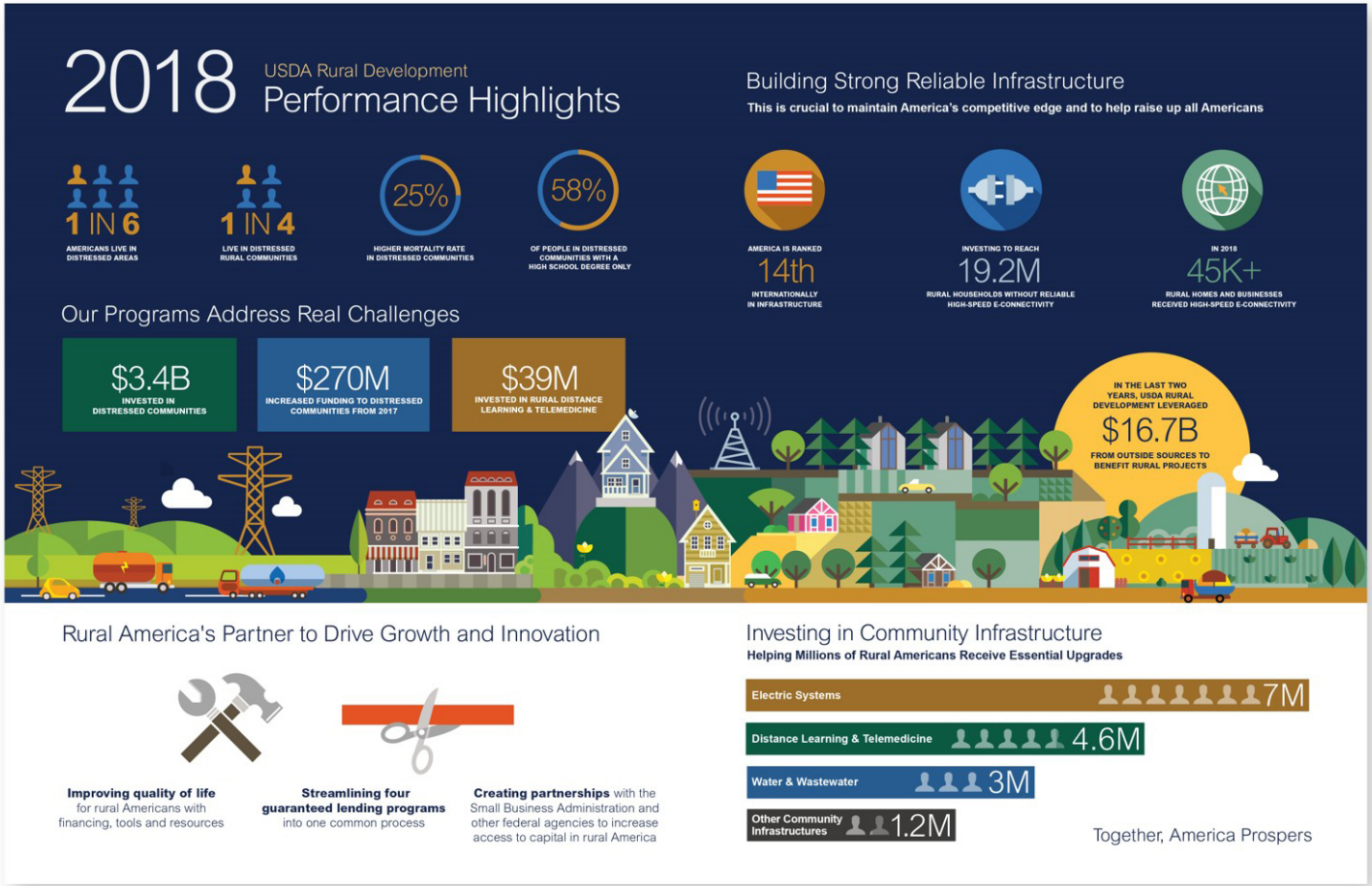
To assist rural communities in creating prosperity so they are self-sustaining and economically thriving through investments that create ladders of opportunity, build regional resilience and support the growth of emerging markets.

Rural Utilities Service

- Investing in Rural Communities
  - Broadband Programs
  - ReConnect Round 1 Recap
  - Smart Grid and Middle Mile Buildout
- Interagency Coordination
  - FCC Precision Ag Task Force
  - American Broadband Initiative
- Additional Resources

USDA Rural Development
U.S. DEPARTMENT OF AGRICULTURE

Investing in Rural Communities


2018
USDA Rural Development
Performance Highlights
1 IN 6
AMERICANS LIVE IN DISTRESSED AREAS
1 IN 4
LIVE IN DISTRESSED RURAL COMMUNITIES
25%
HIGHER MORTALITY RATE IN DISTRESSED COMMUNITIES
58%
OF PEOPLE IN DISTRESSED COMMUNITIES WITH A HIGH SCHOOL DEGREE ONLY
Building Strong Reliable Infrastructure
This is crucial to maintain America's competitive edge and to help raise up all Americans
AMERICA IS RANKED
14th
INTERNATIONALLY IN INFRASTRUCTURE
INVESTING TO REACH
19.2M
RURAL HOUSEHOLDS WITHOUT RELIABLE HIGH-SPEED E-CONNECTIVITY
IN 2018
45K+
RURAL HOMES AND BUSINESSES RECEIVED HIGH-SPEED E-CONNECTIVITY
Our Programs Address Real Challenges
$3.4B
INVESTED IN DISTRESSED COMMUNITIES
$270M
INCREASED FUNDING TO DISTRESSED COMMUNITIES FROM 2017
$39M
INVESTED IN RURAL DISTANCE LEARNING & TELEMEDICINE
IN THE LAST TWO YEARS, USDA RURAL DEVELOPMENT LEVERAGED
$16.7B
FROM OUTSIDE SOURCES TO BENEFIT RURAL PROJECTS
Rural America's Partner to Drive Growth and Innovation
Improving quality of life for rural Americans with financing, tools and resources
Streamlining four guaranteed lending programs into one common process
Creating partnerships with the Small Business Administration and other federal agencies to increase access to capital in rural America
Investing in Community Infrastructure
Helping Millions of Rural Americans Receive Essential Upgrades
Electric Systems 7M
Distance Learning & Telemedicine 4.6M
Water & Wastewater 3M
Other Community Infrastructures 1.2M
Together, America Prospers

Broadband

- The last few months have highlighted the need for connectivity in rural communities
  - Distance learning, teleworking, telemedicine, etc.
- Broadband is of interest to our borrowers across all program areas
  - RUS Telecom Program
    - Ensuring that local service providers have access to affordable capital to deploy high speed networks
  - RUS Electric Program
    - Financing thousands of miles of fiber based smart grid
  - RUS Water and Environmental Program
    - Water utilities are making space on water towers for wireless communications

Broadband

- Distance Learning and Telemedicine (DLT)
  - Applications for Round 1 and 2 are currently under review.
  - In Round 1 (closed April 10), RUS received 253 applications requesting $143.2 M
  - In Round 2 (closed July 13), RUS received 534 applications requesting $252.1 M
  - Be on the lookout for award announcements in the coming months
- ReConnect
  - Round 2 Application Window Closed on April 15
  - 172 Applications were submitted for $1.57 Billion
  - We have invested over $86.7M in 7 states so far
  - Be on the lookout for more announcements in the coming weeks

USDA Rural Development
U.S. DEPARTMENT OF AGRICULTURE

Together, America Prospers

Broadband ReConnect Program

In round one of the ReConnect Program, USDA has invested $744 million into bringing high-speed broadband e-Connectivity to:

Smart Grid and Middle Mile Fiber

- In FY 19, the RUS Electric Program invested in over 9,586 middle mile fiber
- RUS will also consider a wide range of fire prevention and security measures for financing
  - Protecting the grid and other critical infrastructure from both cyber and physical threats

Interagency Coordination

- FCC Precision Ag Task Force
  - USDA provides support and expertise to the leadership team and working groups on the topics of
    - Jobs/Adoption
    - Connectivity
    - Mapping/Data
    - Deployment on Unserved Ag Lands
- American Broadband Initiative
  - Serve on ABI Executive Leadership team with NTIA and White House Office of Science and Technology Policy
  - Co-Chair ABI Federal Funding Workstream

We Are Ready To Partner with Your Rural Community

- We want to partner with your community by:
  - Investing in critical infrastructure for rural areas, spurring innovation in rural, agricultural, and farming communities
  - Supporting Broadband deployment to rural and remote areas
  - Encourage the growth of emerging markets

Additional Resources

www.rd.usda.gov

Chad Rupe
RUS Administrator
Chad.Rupe@usda.gov
202-720-9540

Smart Agriculture: Driving Innovation in Rural America

Thank you, Chad!

Smart Agriculture: Driving Innovation in Rural America

Questions and Comments

- Please type your questions in the Q&A box.

- The slides, transcript, and a recording will be posted on the BroadbandUSA website within 7 days of the webinar.

https://broadbandusa.ntia.doc.gov/past-event

BroadbandUSA

Thank you for attending.

Tune in for the next Practical Conversations Webinar

The Changing Landscape of Remote Learning

October 21, 2020

2:00 pm EST

Registration is required for each webinar:

https://broadbandusa.ntia.doc.gov/event

BroadbandUSA is available to help communities with their broadband access and digital inclusion efforts

For General Information:

202-482-2048

broadbandusa@ntia.doc.gov

https:broadbandusa.ntia.doc.gov/resources

To Request Technical Assistance (TA):

Broadband TA Request Form - https://broadbandusa.ntia.doc.gov/ntia-common-content/how-we-can-help

BBUSA Resources

- Implementing a Broadband Network Vision: A Toolkit for Local and Tribal Governments
- Community Broadband Roadmap Toolkit
- Guide to Federal Funding of Broadband Projects
- Using Partnerships to Power Smart Cities