Precision Ag. Technology Update and Things to Consider Before Investing

Prepared for: 2023 Badger Crops and Soils Update Meetings
November 27 - 30, 2023

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Disclaimer

References to specific products within this presentation do not represent an endorsement by Dr. Brian Luck, the Badger Ag. Tech. Lab, the University of Wisconsin-Madison, nor the University of Wisconsin Division of Extension.

Overview

- Current State of Precision Agriculture:
  - 2022 CropLife Purdue Precision Agriculture Dealership Survey
- Interesting NEW Technologies
- Badger Ag. Tech. Research Overview/Update
- Summary

Precision Agriculture Dealership Survey
2022 Purdue CropLife

- Annual survey of Precision Agriculture Dealerships
  - Longest-running continuous measure of precision agriculture technology adoption.
- Focuses on:
  - Precision technology, variable rate technology, soil sampling, profitability, and data.
- Wonderful indicator of what technology is being sold in dealerships and potentially adopted by farmers.
- Citation: Erickson, B. and J. Lowenberg-DeBoer. 2022. 2022 Precision Agriculture Dealership Survey. Purdue University, West Lafayette, IN. Accessed 20 November, 2023. https://ag.purdue.edu/digitalag/precision-agriculture-dealer-survey.html

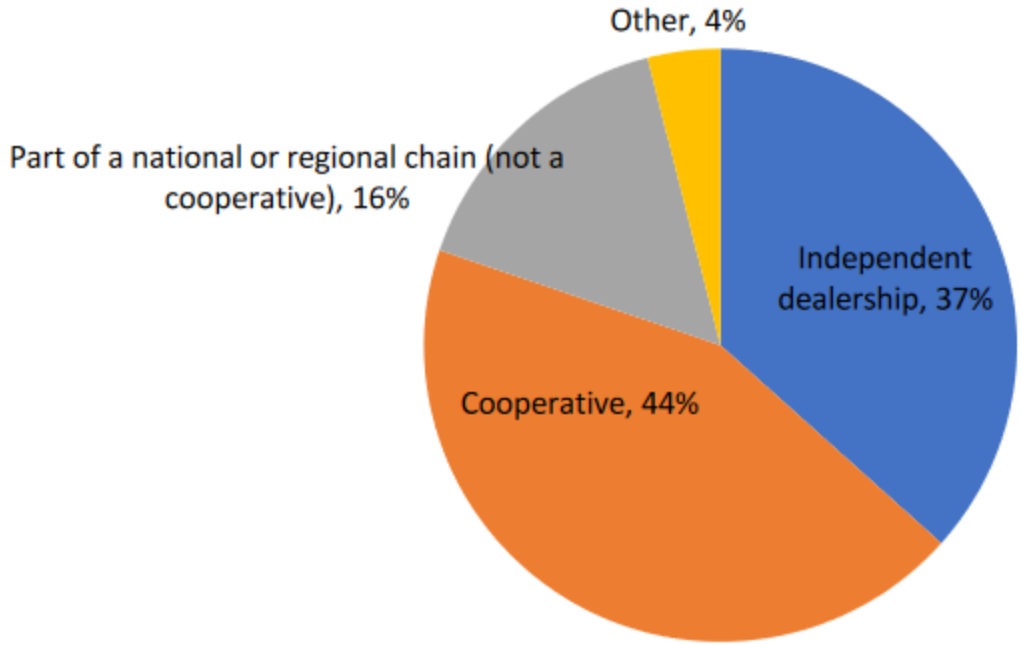
Respondent Location and Organization Type

Midwest 74%			
Illinois	13%	Kansas	3%
Iowa	13%	S Dakota	3%
Ohio	10%	Michigan	2%
Minnesota	7%	N Dakota	2%
Indiana	6%		
Wisconsin	6%		
Nebraska	5%		
Missouri	4%		

South 13%	
Texas	4%
Georgia	2%
Kentucky	2%
Tennessee	2%
Oklahoma	1%
Arkansas	1%
Louisiana	1%
N Carolina	1%

West 8%	
Washington	4%
Alaska	1%
Arizona	1%
Colorado	1%
Montana	1%
Oregon	1%

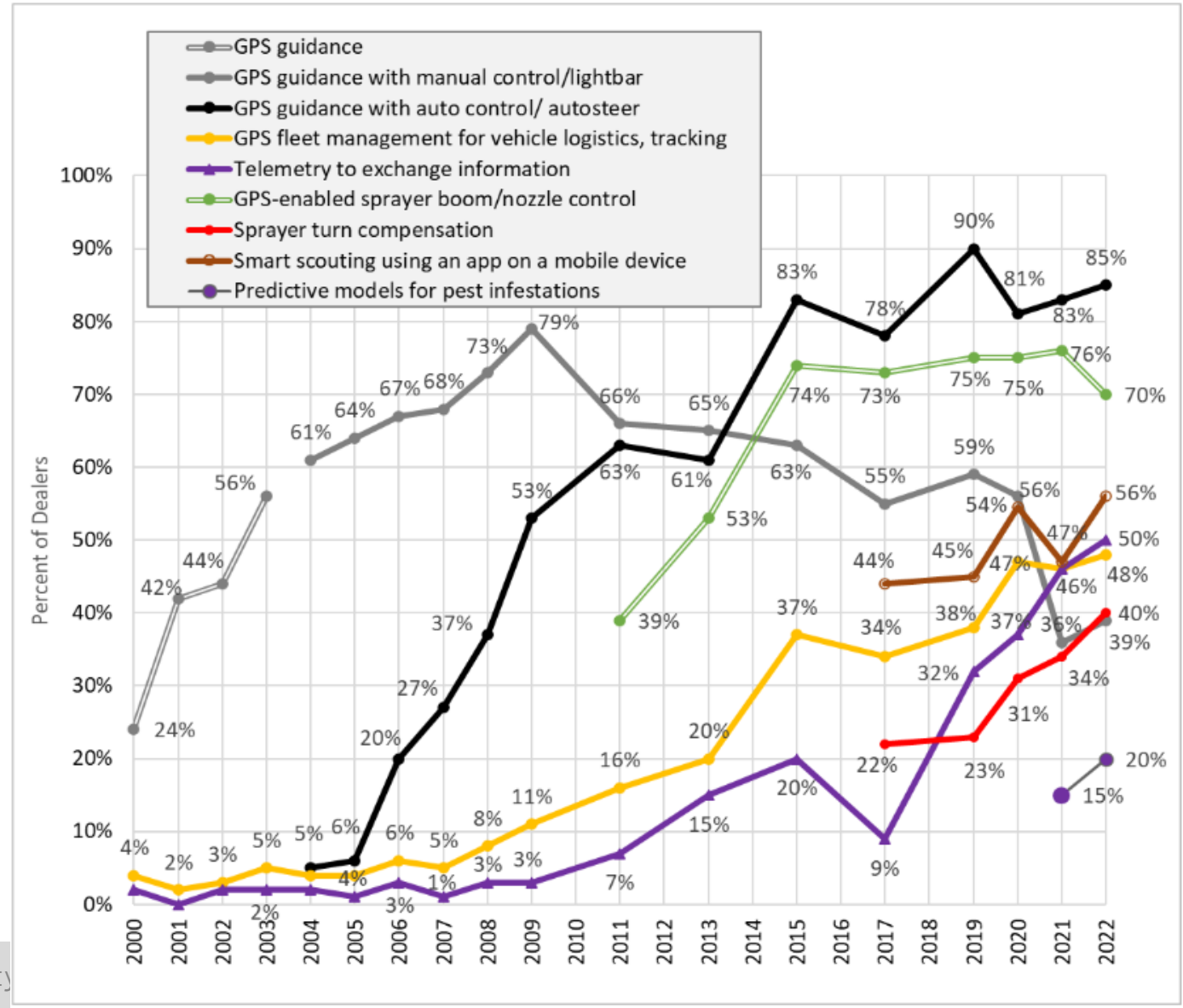
East 5%	
Pennsylvania	2%
Maryland	1%
New York	1%



https://ag.purdue.edu/digitalag/_media/croplife-report-2022.pdf

Retailer Use of Precision Technology

- Interesting Trends:
  - Manual guidance with lightbar on a steep decline
  - Automatic guidance increasing
  - Fleet management increasing
  - Telemetry increasing
  - Sprayer turn compensation increasing



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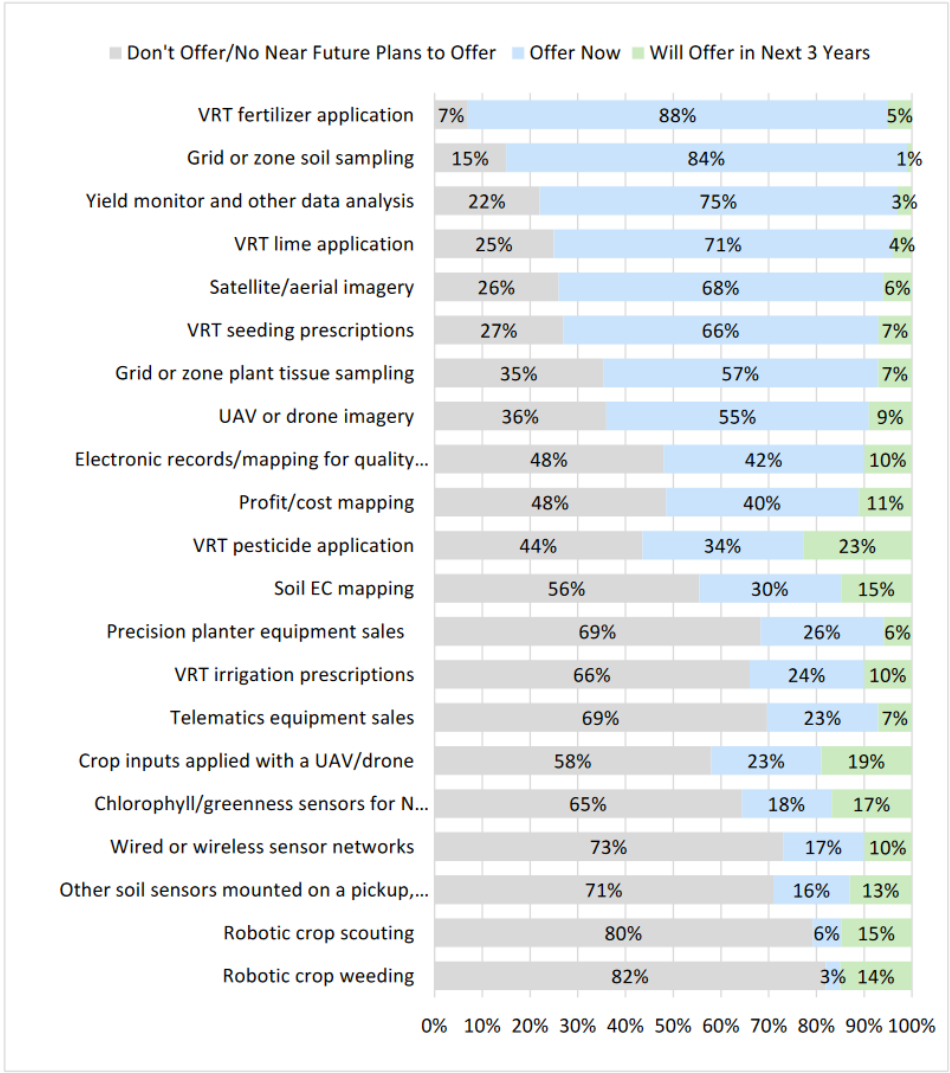
Dealer Precision Technology Service Offerings

- Responses center around mature technologies
  - Variable rate applications
    - Fertilizer and seeding
  - Soil and tissue sampling
  - Satellite/aerial/UAV imagery
  - Data analysis
- New technology offerings
  - UAV applications
  - Robotic crop scouting
  - Robotic crop weeding



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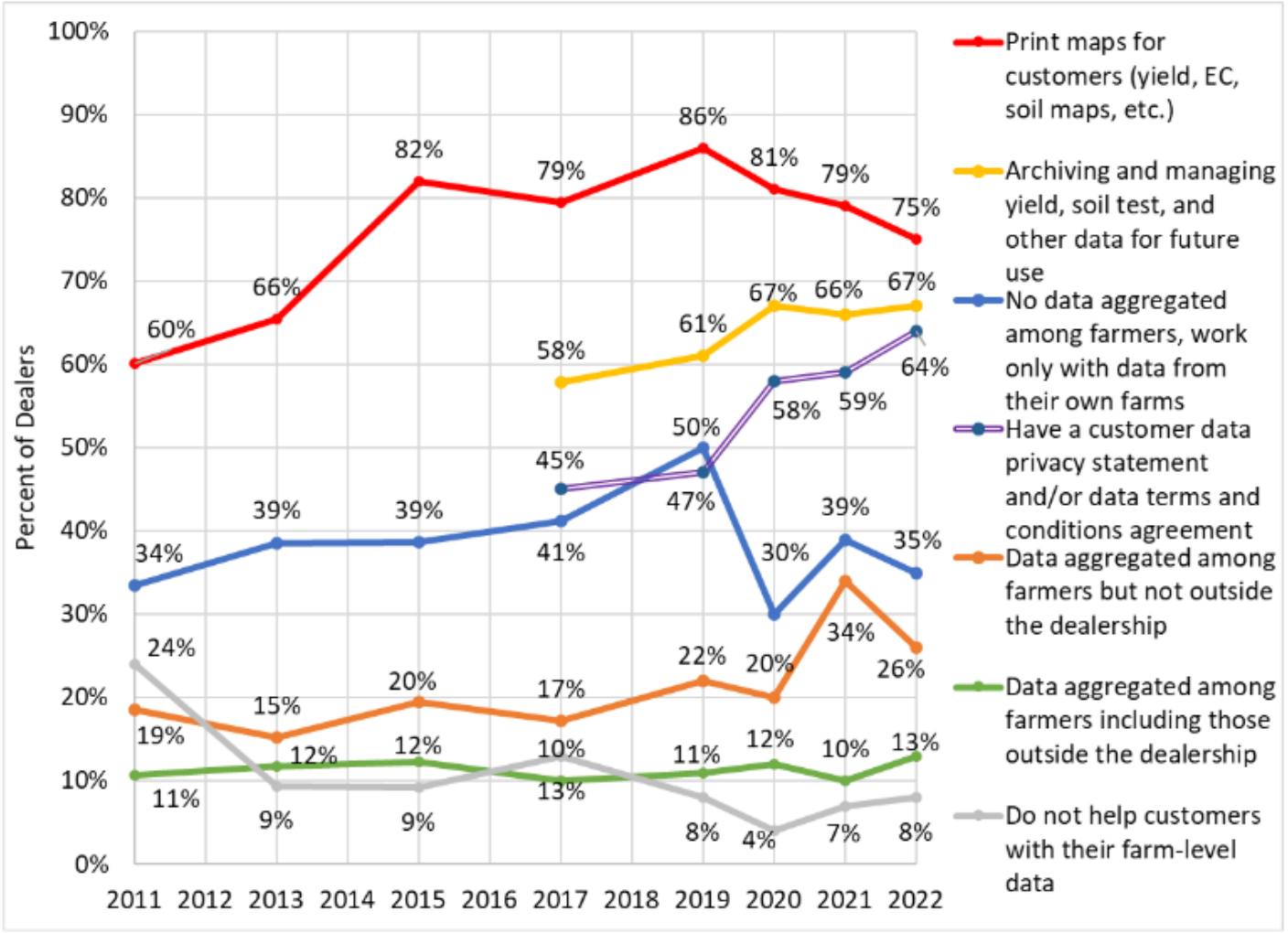
Dealership Management of Farm-Level Data

- Precision Agriculture Data is becoming more important
- Not just printing maps anymore
- 67% of dealers work with farmers to archive and manage data
- 39% of dealers aggregate data
- 64% of dealers have a data privacy agreement with customers/members.



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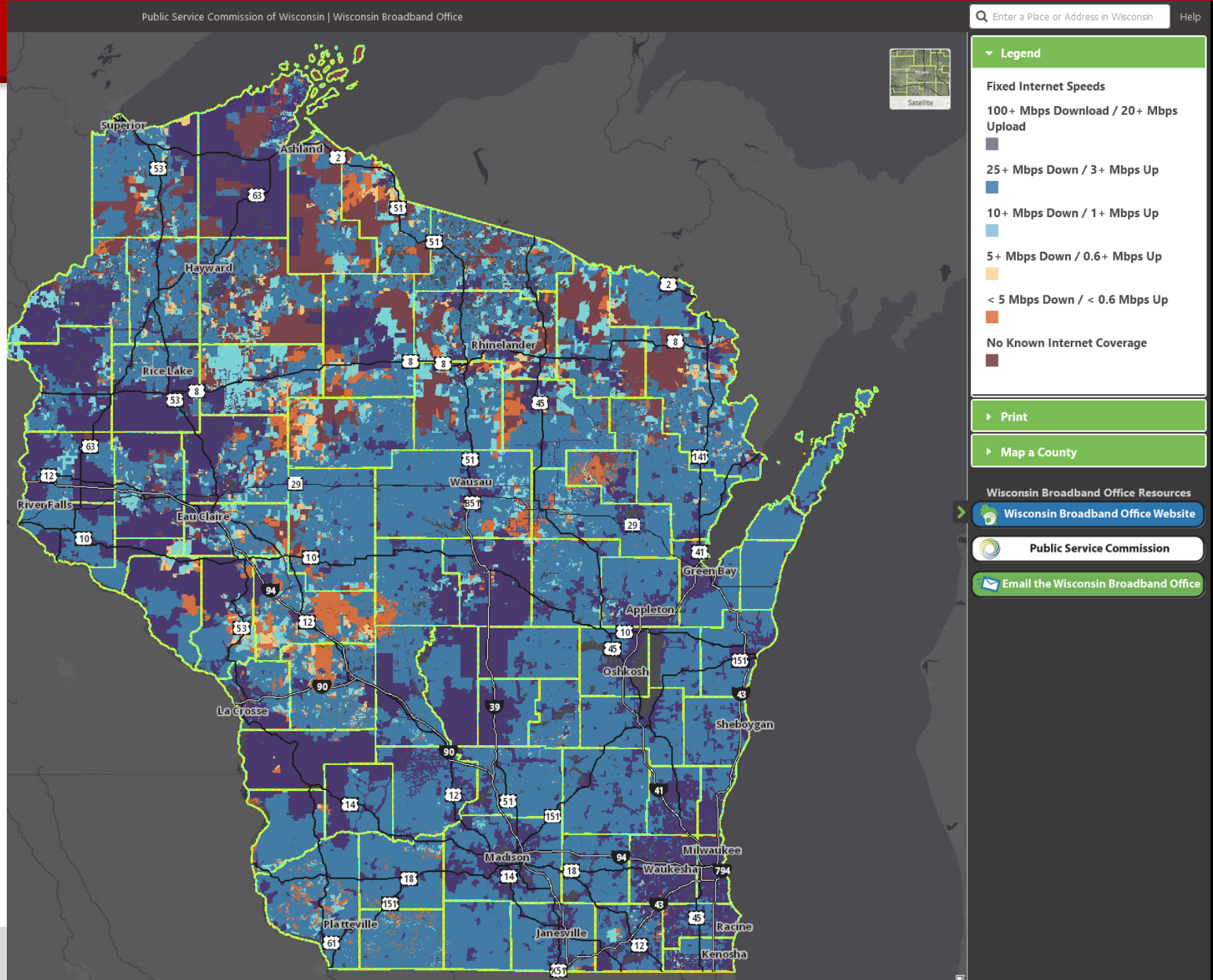
Wisconsin Technology Adoption Study

Drewry, J.L., J. M. Shutske, D. Trechter, B. D. Luck, and L. Pitman. 2019. Assessment of digital technology adoption and access barriers among crop, dairy, and livestock producers in Wisconsin. Computers and Electronics in Agriculture 165: 104960. https://doi.org/10.1016/j.compag.2019.104960

- Survey conducted in 2018 with 43% response rate (n = 1021)
- Asked about broadband internet access and internet speeds along with various technologies implemented on-farm
- Concerns with technology adoption centered around privacy, security, and keeping up with changes to technology.
- Most respondents happy with internet access and speed
  - Know no different?

Wisconsin Broadband Internet Coverage

- Urban areas high
- Rural areas 10 – 25 Mbps download



https://maps.psc.wi.gov/apps/WisconsinBroadbandMap/

New Precision Agriculture Technologies (I'm excited about)

- Spray/Spread Unmanned Aerial Vehicles (drones)
- Electric and semi-autonomous tractors
- Smart Seed Firmer
- TillMapper - EarthOptics

Spray/Spread Unmanned Aerial Vehicles (drones)

- High interest in 2023
- > 55 lb means additional FAA licensure and approval
- Advertised:
  - ~53 ac/hr work rate spraying
    - Closer to 40 ac/hr
  - Atomizer to distribute liquid (not typical nozzles)
  - ~30 ft swath width

Spray/Spread Unmanned Aerial Vehicles (drones)

- Conversations with users:
- ~$20/ac hired rate (n = 1)
- Down-time management is important during operation
  - Batteries need to cool before charging
  - Charging takes ~8 minutes
  - Route planning and “home” location are important for efficiency
  - Reload time is minimal with the correct setup.
- Good for irregularly shaped fields or small areas where it is not efficient for a spray rig to go.

Spray/Spread Unmanned Aerial Vehicles (drones)

Research Update:

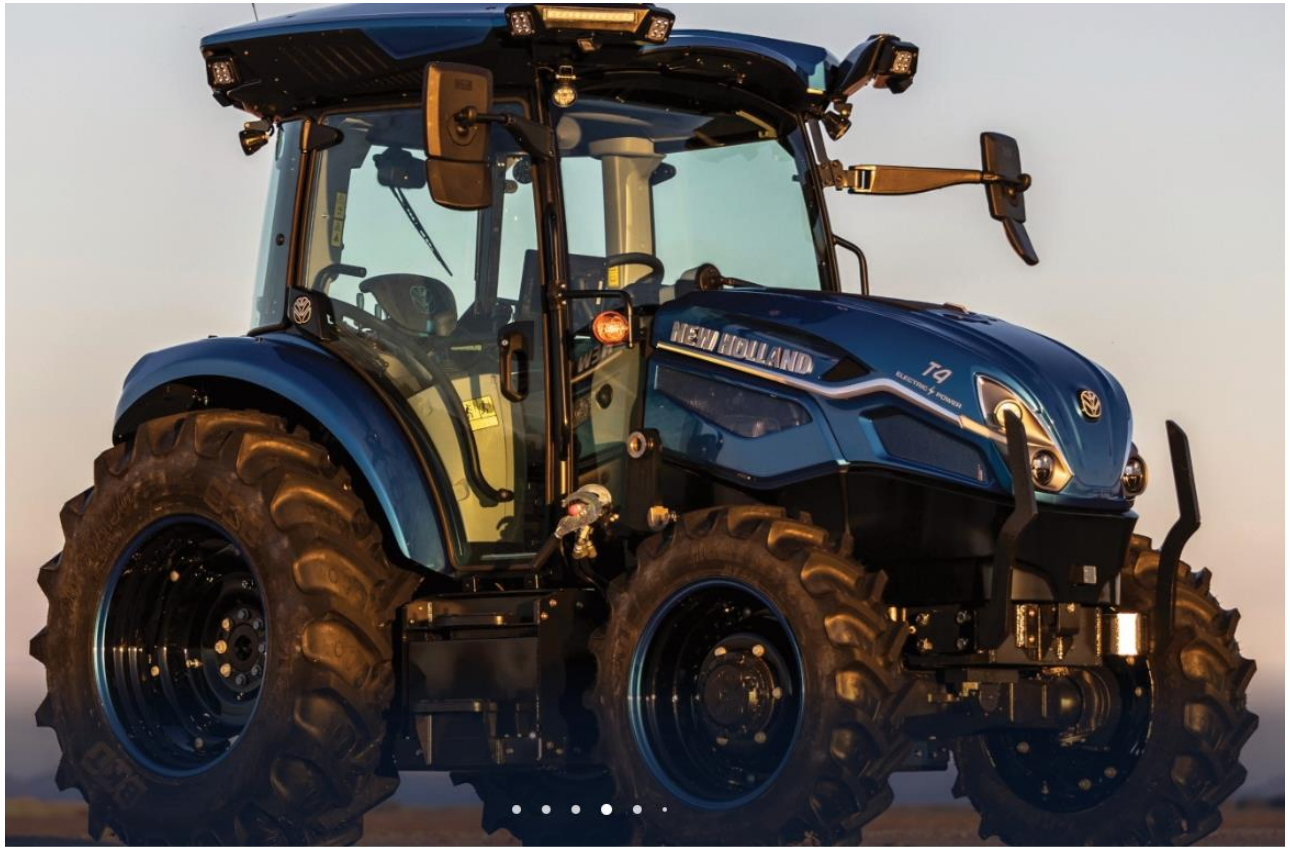
- Used to spray fungicides in soybeans in 2023
- Efficacy study completed
- 2024 Plans: Continue fungicide effort
  - Measure air velocity and direction within crop canopy
  - Use water sensitive paper to assess coverage and droplet size distribution
- Thanks to the Wisconsin Soybean and Corn Promotion Boards for funding

Photo Credit: Roger Schmidt

Electric and semi-autonomous tractors

New Holland T4 Electric Power

- Advertised 74 hp (65 pto hp)
- Major manufacturer first fully electric machine
- Advertised semi-autonomous and safety features:
  - 360° Camera view from console
  - Route mode (automatic guidance)
  - Follow-me mode
    - Gesture control from outside the cab (custom?)



https://agriculture.newholland.com/en-us/nar/products/tractors-telehandlers/t4-electric-power
https://www.agritechnica.com/en/awards/innovation-award/winners-2023#accordion-37933-4332

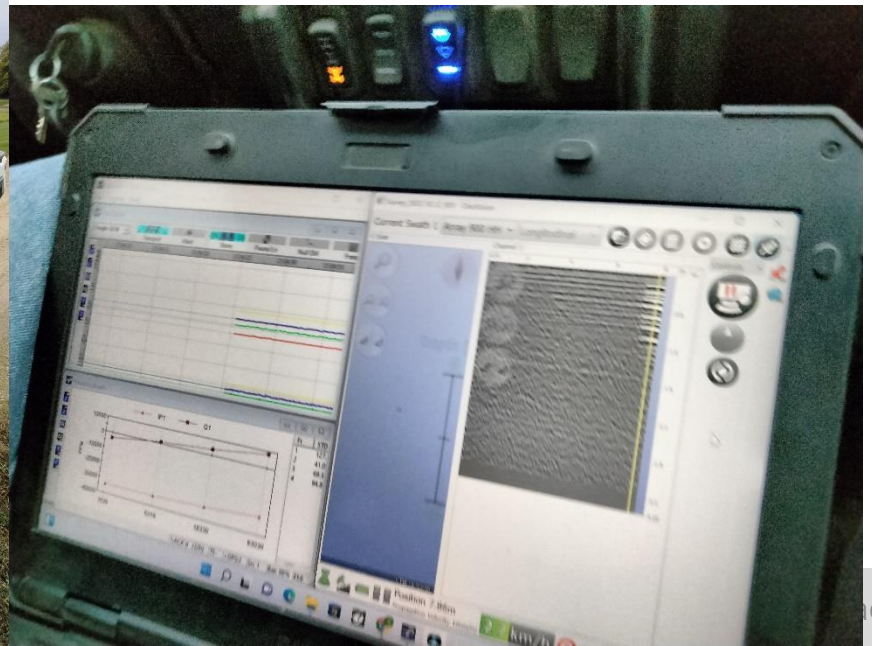
Smart Seed Firmer

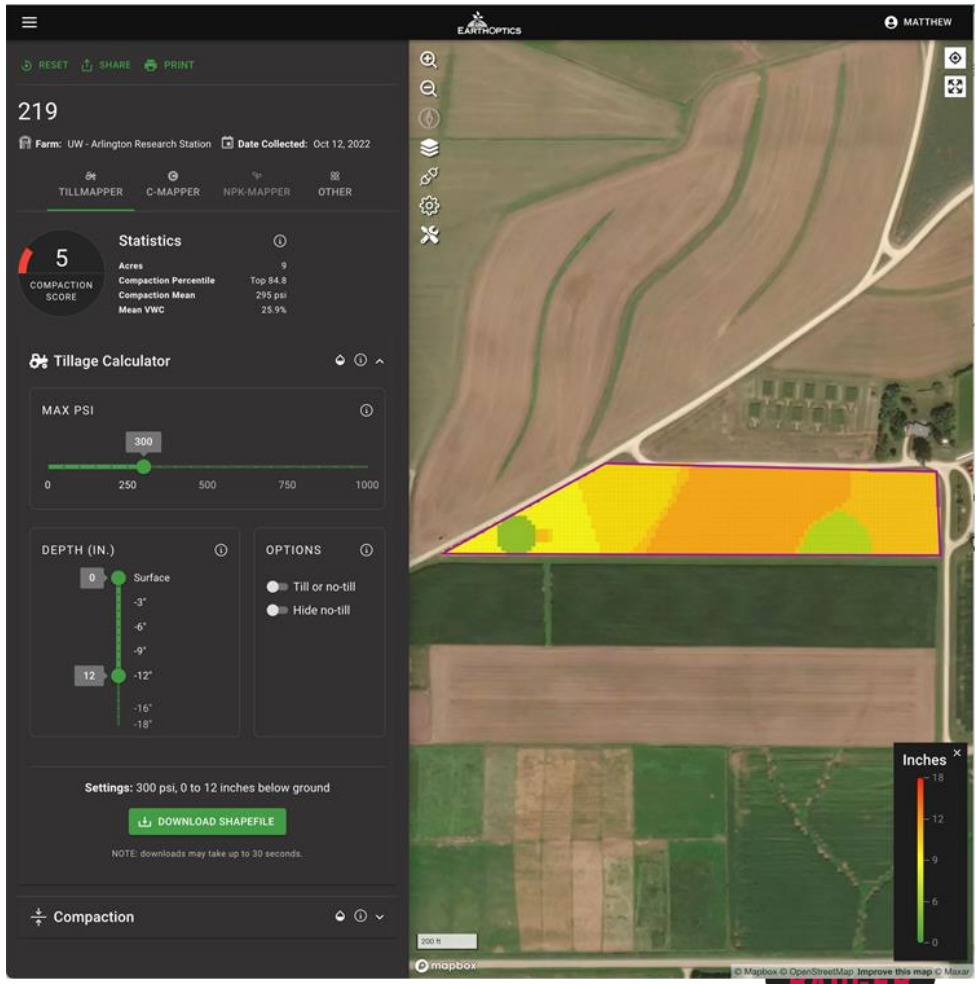
- Have heard comments in 2023 that this device helped with emergence during dry conditions
- Advertised to measure soil moisture, soil temperature, and organic matter
- Feedback data for planter down-pressure and seeding depth control
- Working toward potential research with this product to understand it better in Wisconsin soils.

https://cdn.bfldr.com/7M6SII1K/as/p7x89k4k56hs6nthvbph438w/SmartFirmer_furrowuniformity_1050x600?auto=webp&format=png&width=800

TillMapper - EarthOptics

Utilizes a ground penetrating radar to map soil compaction by depth on-the-go. First retail product supporting “Variable Rate” Tillage.





Badger Ag. Tech. Research Update

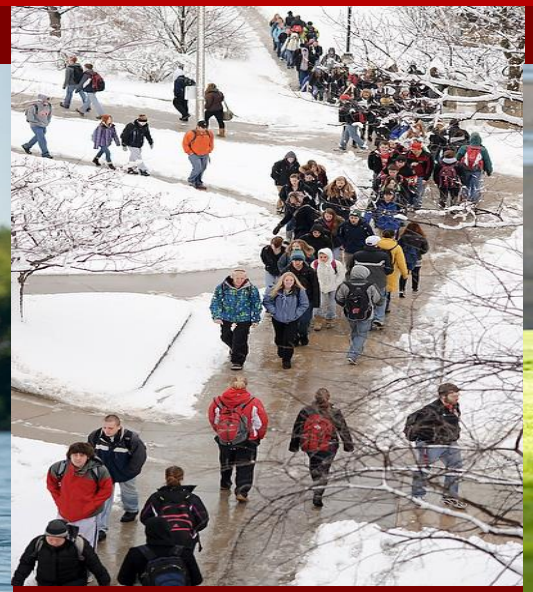
- Continuing work on Spray/Spread UAV's
  - Air velocity and direction measurement for down draft from the UAV
  - Water sensitive paper assessment for droplet size, deposition location, and coverage
- Finalizing year 3 of nozzle type and application method for fungicides in Soybeans
  - Year 1 & 1.5 (still analyzing yr 2 data) showed increased coverage and control of white mold by using a drop-type nozzle.
  - Potential implications for the type of fungicide used as well
  - Engineering design needed to make plastic drop nozzles more robust in closed soybean canopy

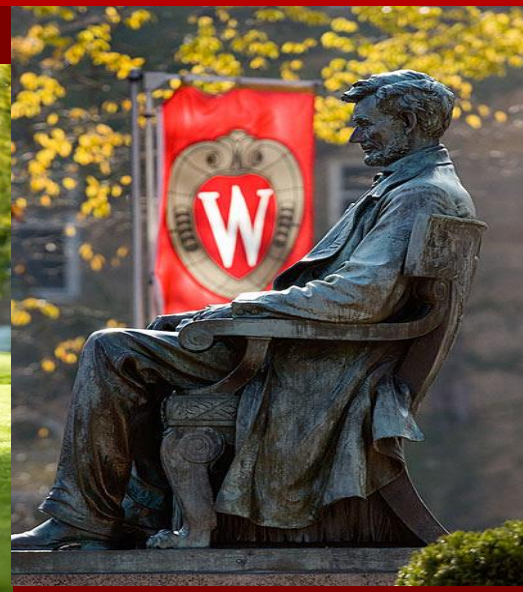
Summary (Take Home Message)

- Precision Ag. Technology has the potential to make farming easier, more efficient, and profitable.
- Adoption rates for mature (and some less mature) technologies are on the rise.
- Maintaining Precision Ag. Data on your farm is beginning to become a requirement if you want to use new tools and analysis software
- Getting involved with a trusted data service provider early will ensure data integrity is maintained

Summary (Take Home Message)

- Start Small
  - One GPS Receiver can be moved from one machine to another.
  - Same goes for field computer
  - Additional investment in cables
- Get trained on how to use (and bypass)
- Utilize local resources for help (neighbors/friends)
- The more practice you get the more proficient you will become
  - Install guidance on the lawnmower?
- You don't have to invest in certain technologies, VRT for instance, to benefit from them. Utilizing applicators that use these technologies and having them provide the as-applied data back to you is a great place to start.



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