

Understanding Precision Adoption through Two Decades of the CropLife Purdue Survey

*Bruce Erickson, Education and Distance Outreach Director,
Agronomy Department, Purdue University*

*James Lowenberg-DeBoer, Elizabeth Creak Professor of Agri-Tech Applied Economics,
Harper Adams University*

CropLife[®]

PURDUE
AGRICULTURE

Precision Dealer Survey Specs

- Conducted yearly 1997 to 2009, then every other year.
- Topics:
 - Precision technologies used by the retailers in their business
 - Precision products and services offered to customers
 - Retailers' estimation of farmer use of precision practices
 - Profitability, technology investment, constraints to adoption
 - Added more data questions in 2017
- Use U.S. CropLife magazine contact list
- Respondents include cooperatives, independents, multi-location regional companies

2017 DEALER SURVEY: Making the Turn Toward Decision Agriculture

Precision agriculture in the agricultural marketplace continues to evolve in new and sometimes unanticipated ways. For the 18th time, *CropLife* magazine has partnered with Purdue University to document and track these trends, with the findings presented here.

BY BRUCE ERICKSON and
JESS LOWENBERG-DEBOER

It has been a long road to fully implement the vision crafted two decades ago—where soil, nutrient, yield, EC, remote sensing, and other data would be transformed into knowledge to guide decisions of inputs and precise amounts of seeds, fertilizers, and pesticides applied across crop fields. All of which would substantially reduce input costs, increase productivity, reduce the environmental footprint, and transform crop production. Some of this has come to be, but much more has not.

But the 2017 precision dealer survey results show large upticks in adoption in not only the technologies to measure spatial and temporal variations within fields, but in the technology of addressing these via variable rate applications of fertilizers, lime, and seeds. For example, after a ten-year stretch where only around half of dealers were offering grid and zone soil sampling, this increased to 67% of dealers offering in 2015, to 75% now in 2017 (Figure 1). Dealers offering satellite imagery, a possible foundation for creating zones or guiding site-

specific decisions, increased from 48% in 2015 to 55% now, and UAV services from 19% to 30%. Variable rate technology (VRT), where an informed approach is used to address variability across fields, has correspondingly increased (Figure 2). Throughout

HOW THE SURVEY WAS CONDUCTED

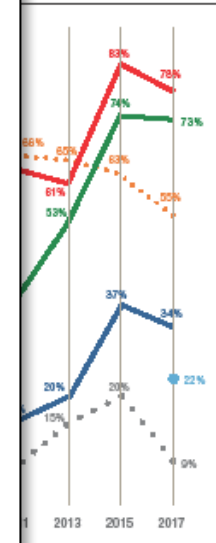
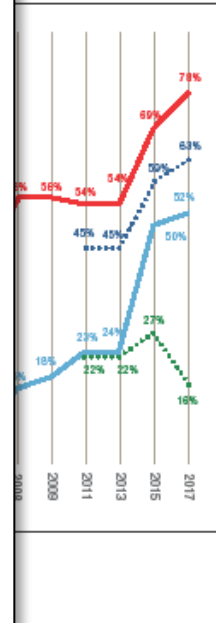
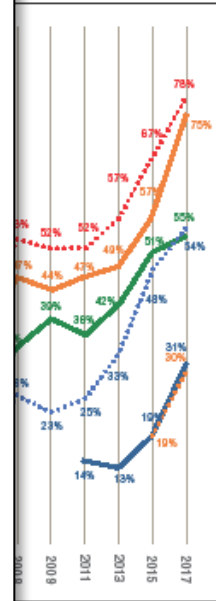
The *CropLife*/Purdue precision dealer services survey is the longest-running continuous survey of precision farming adoption. The 209 respondents included cooperatives (47%), independent retailers (37%), and retailers part of a regional or national chain (16%). 78% of the respondents were from the U.S. Midwest, 9% West, and 7% from the South.

A full report detailing all of the results will be posted online later this summer. The full report from the previous survey in 2015 can be accessed by visiting <http://agribusiness.purdue.edu/precision-ag-survey>.

the 2000's decade about half of dealers were offering VRT fertilizer applications, but this increased to 69% in 2015 and to 78% in 2017. Lime VRT was up as well, and VRT seeding recommendations made a huge jump, from 24% in 2013 to 50% in 2015, and in 2017 with 52% of dealers offering these services.

Looking at Crop Management

This site-specific side of crop management has been poised for its coming-out moment since grid and zone soil sampling, yield monitors, and variable rate technology first became commonplace in the mid 1990's. But a decade ago the initial excitement became bogged down in the details—in that field environments were more complicated than we had thought. We could see correlations among factors, but not always cause and effect. With rectangular grids or multiple acre management zones we may not have been capturing a resolution fine enough to characterize fields. And dealing with all of the data proved to be cumbersome with yesterday's computers and data portability, fumbling with data cards, CD's and flash drives.



2017 results signal a change. Technological capability: analytics are now common, which around large data sets after processing speeds and ease of what were available to site providers and their site-whom entered the market

use technologies that are a set of automated a field's agronomic size and shape and where precision systems were viewed entered the market in accurately steer a tractor at the economic benefits of allowing drivers to work to come back to row ously marked rows, and through the night proved

cate a maturing market, section controllers, used (Figure 3). Piggy-guided boom section/nozzle

way, as might be crop nutrient decisions siders said phosphorus decisions were at least nced by pooled data, ogen decisions were l, and 37% saying s were influenced. ns were second in indicated pooled t some influence for ariety placement and nfluencing variable y placement in fields. ate that pooled data ce on decisions related ction, overall seeding site-specific seeding ions related to cropping station. On another s than half of dealers their company had a privacy statement rms and conditions

many of us still enjoy a that comes from see- new way with imagery, ap, or interpolated soil s, in the end it all has Those bills can be paid s—through increased specific activity, but ducing the costs to the ight be the case with on controllers, or fleet ement. Or the indirect ping customer rela- viding a product or ser- le from a competitor. s were asked about he services they offer, mpling and VRT ferti- s stood out positively (Figure 5). Notable ble side were dealers services, where 53% of V indicated they were en or didn't know. UAV xiting, but it has been product or service that farmer.

agronomy e-Learning University. Jess r is Professor of mics at Purdue University. West Lafayette, IN.

- Highlights published in June *CropLife* magazine the year of survey
- Full reports posted online: <http://agribusiness.purdue.edu/precision-ag-survey>

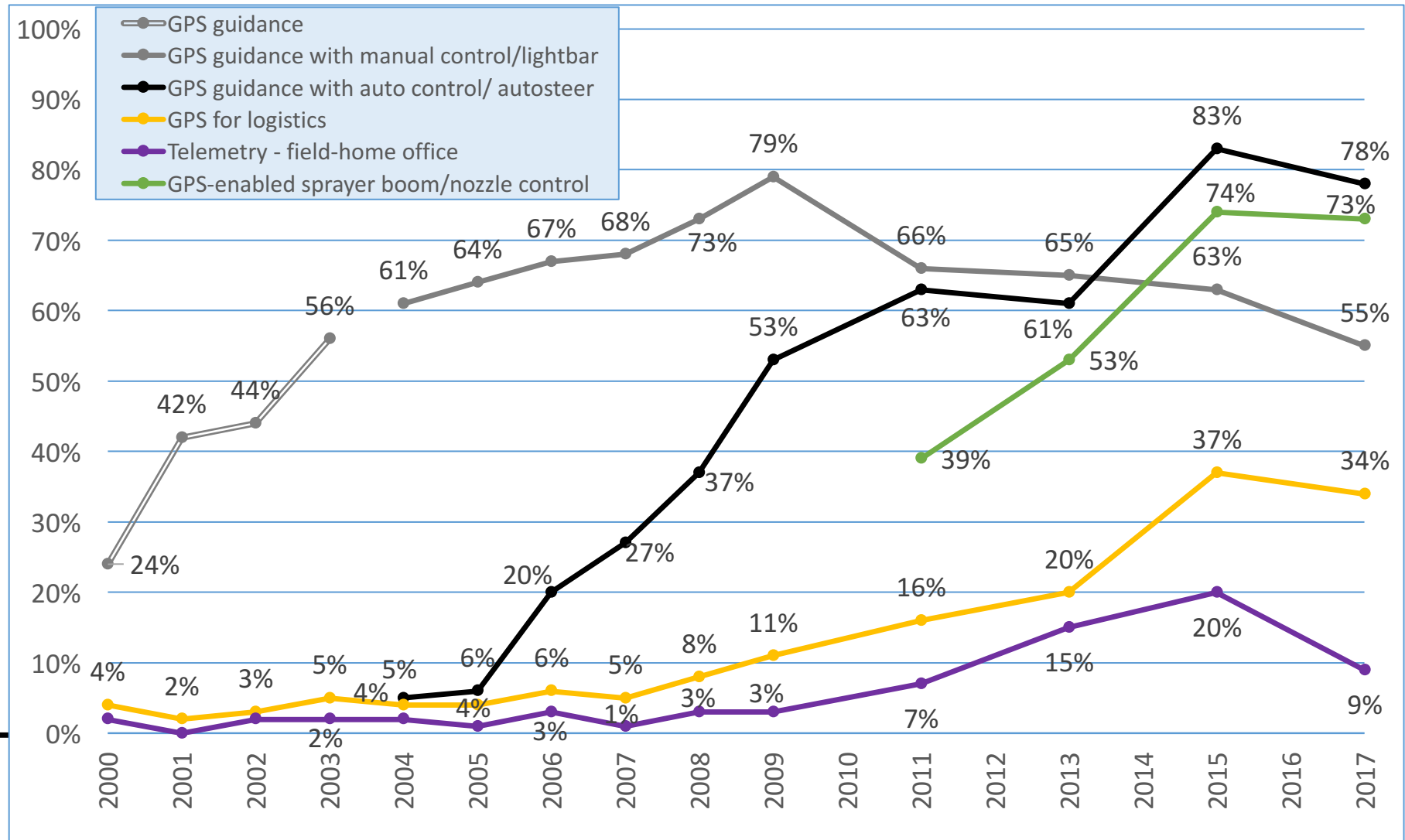
Retailer Use of Precision Technology in 2017

- GPS Guidance and sprayer section control is standard practice
- Satellite and aerial imagery used by about half for internal purposes.

GPS guidance systems with automatic control (autosteer) for fert/chem application	78%
Auto sprayer boom section or nozzle control	73%
GPS guidance systems with manual control (light bar) for fertilizer/chemical application	55%
Satellite/aerial imagery for internal dealership purposes	52%
Smart scouting using an app on a mobile device to record field situations and locations	44%
Field mapping with GIS to document work for billing/insurance/legal purposes	43%
UAV or drone for internal dealership purposes	34%
GPS to manage vehicle logistics, tracking locations of vehicles, and guiding vehicles to the next site	34%
Telematics to exchange information among applicators or to/from office locations	24%
Soil electrical conductivity (EC) mapping	22%
Sprayer turn compensation	22%
Other soil sensors for mapping, mounted on a pickup, applicator or tractor (example: pH sensor)	9%
Chlorophyll/greenness sensors mounted on a pickup, applicator or tractor (CropSpec, GreenSeeker, OptRx, etc.)	9%

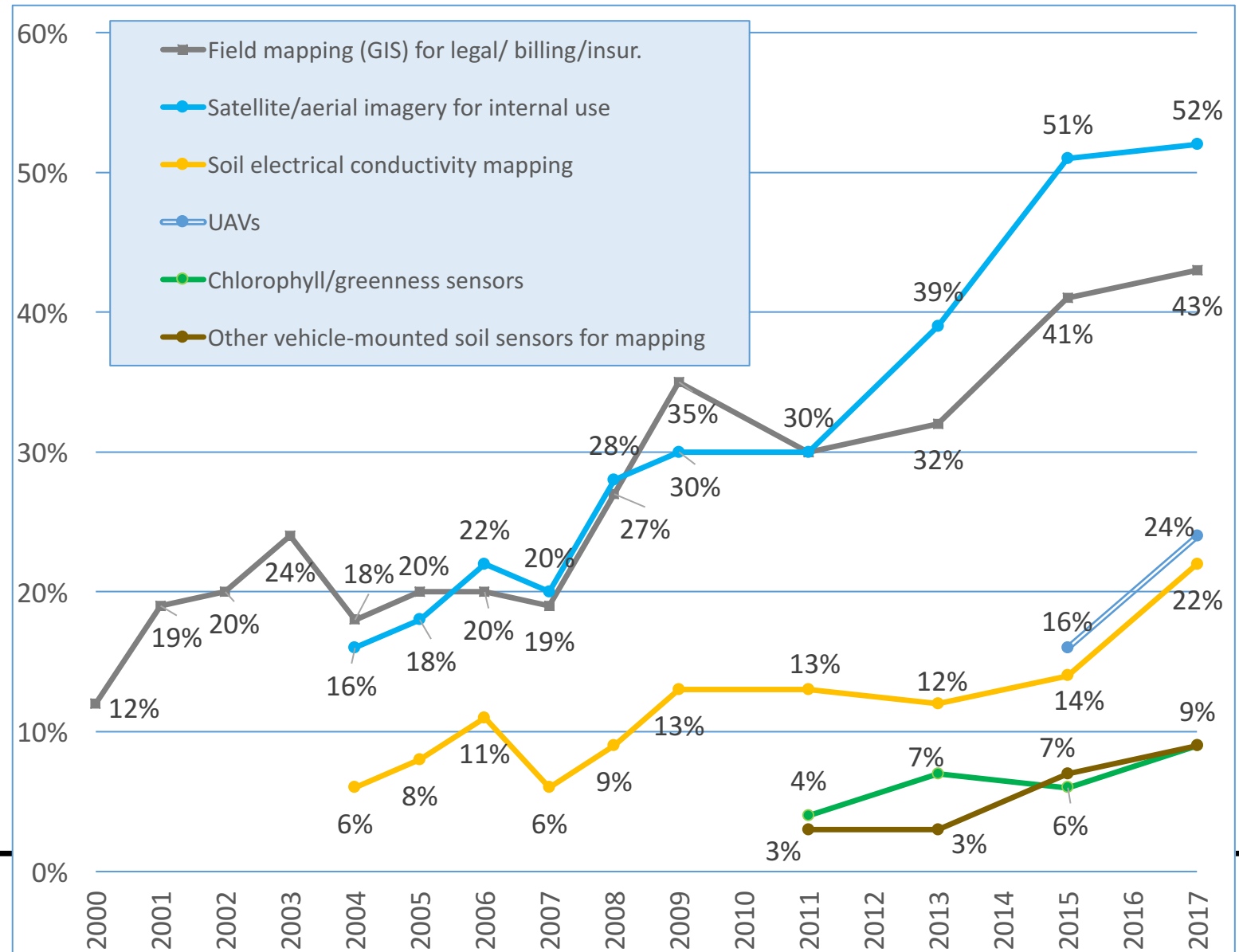
Retailers Adopted GPS Guidance Rapidly for Internal Business Use (% of Retailers)

- Lightbars rapidly adopted starting in late 1990s
- Autosteer rapidly adopted starting in about 2004
- Both are easy to use and have short run benefits



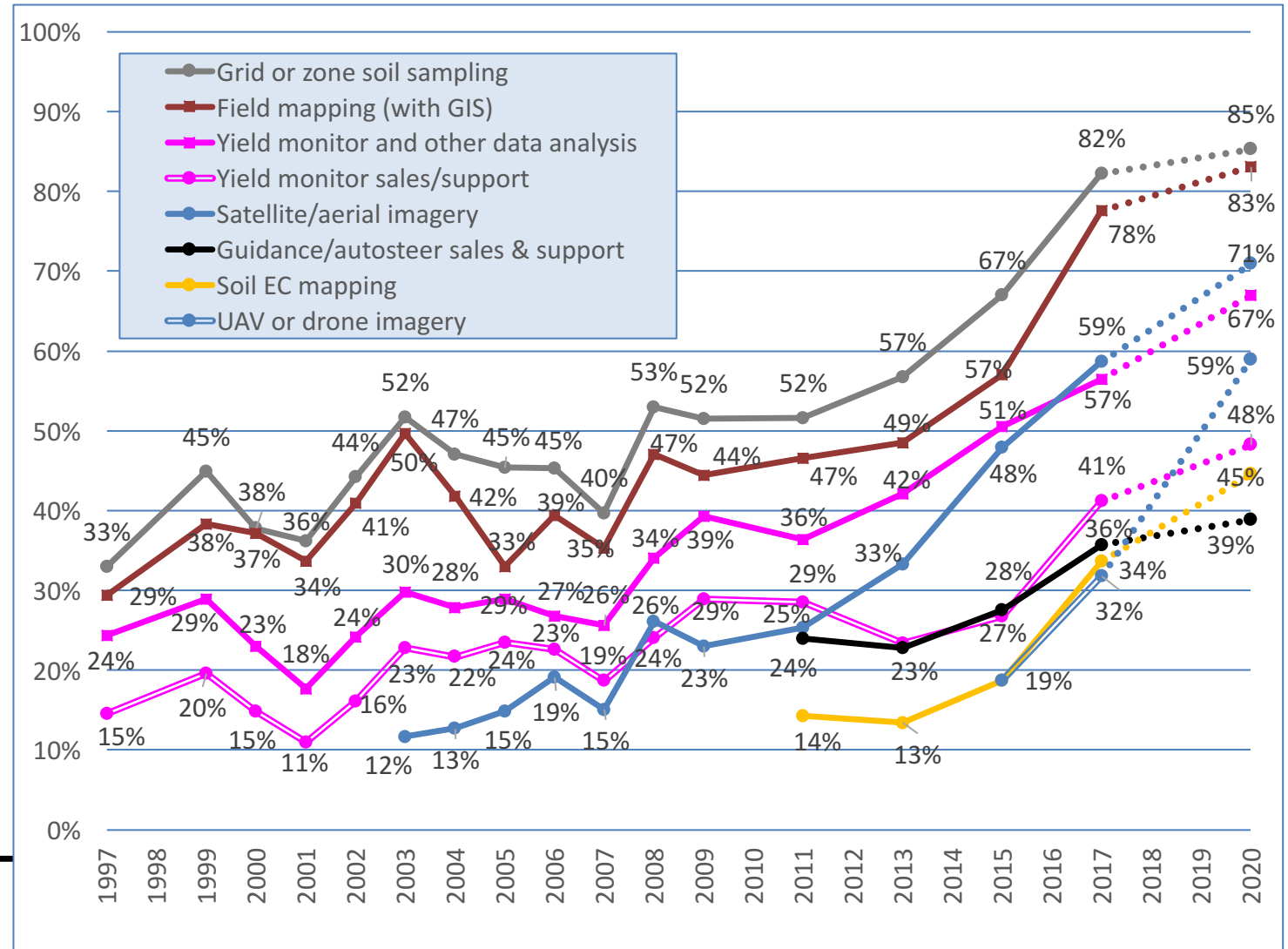
Retailers Slower to Adopt Sensing Technologies

- Return for sensing technologies more complicated—no return until data is turned into a decision
- Percent of retailers - Note % scale compared to previous slide



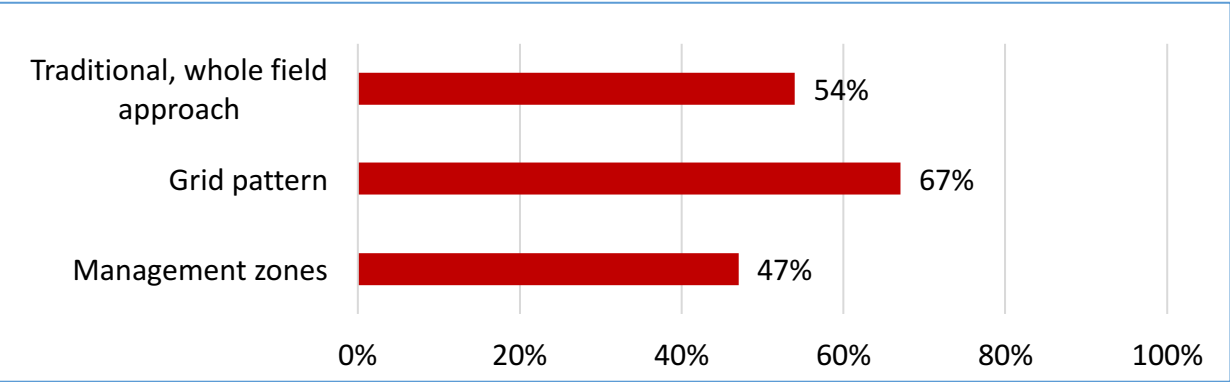
Ag Retailers Slower to Offer Data Gathering Technologies to Customers (% of Retailers)

- Data collection technologies are foundation of data-driven farming
- Intensive soil sampling services have become almost standard practice.
- After many years over 50% offer satellite imagery
- 2020 numbers are their projections

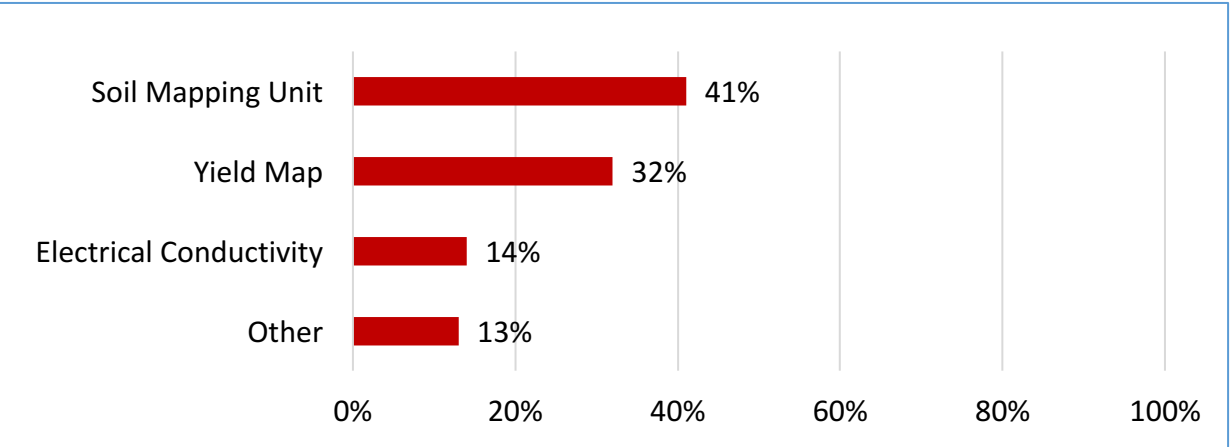


Soil Sampling

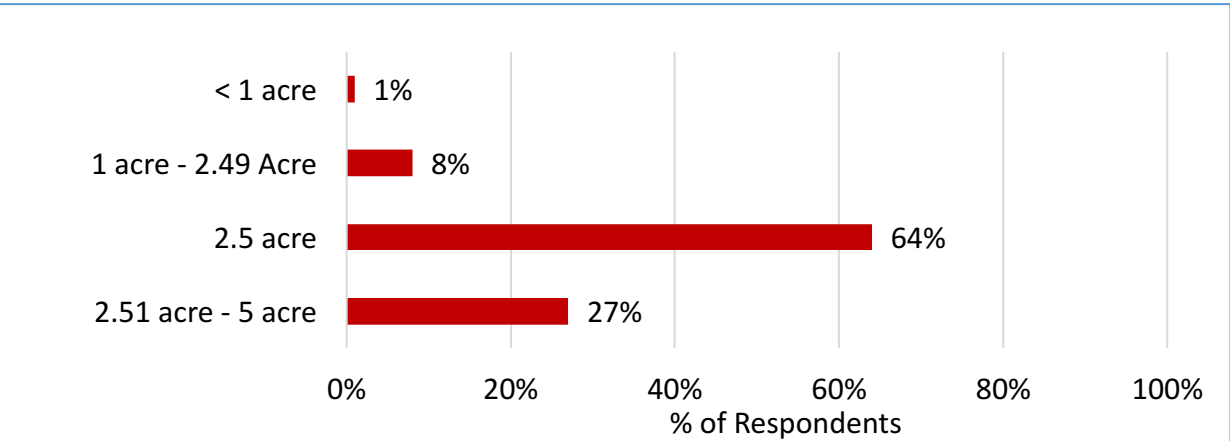
← More dealers sample in grids than zones



← If zones, soil mapping units or yield maps most common method for delineation

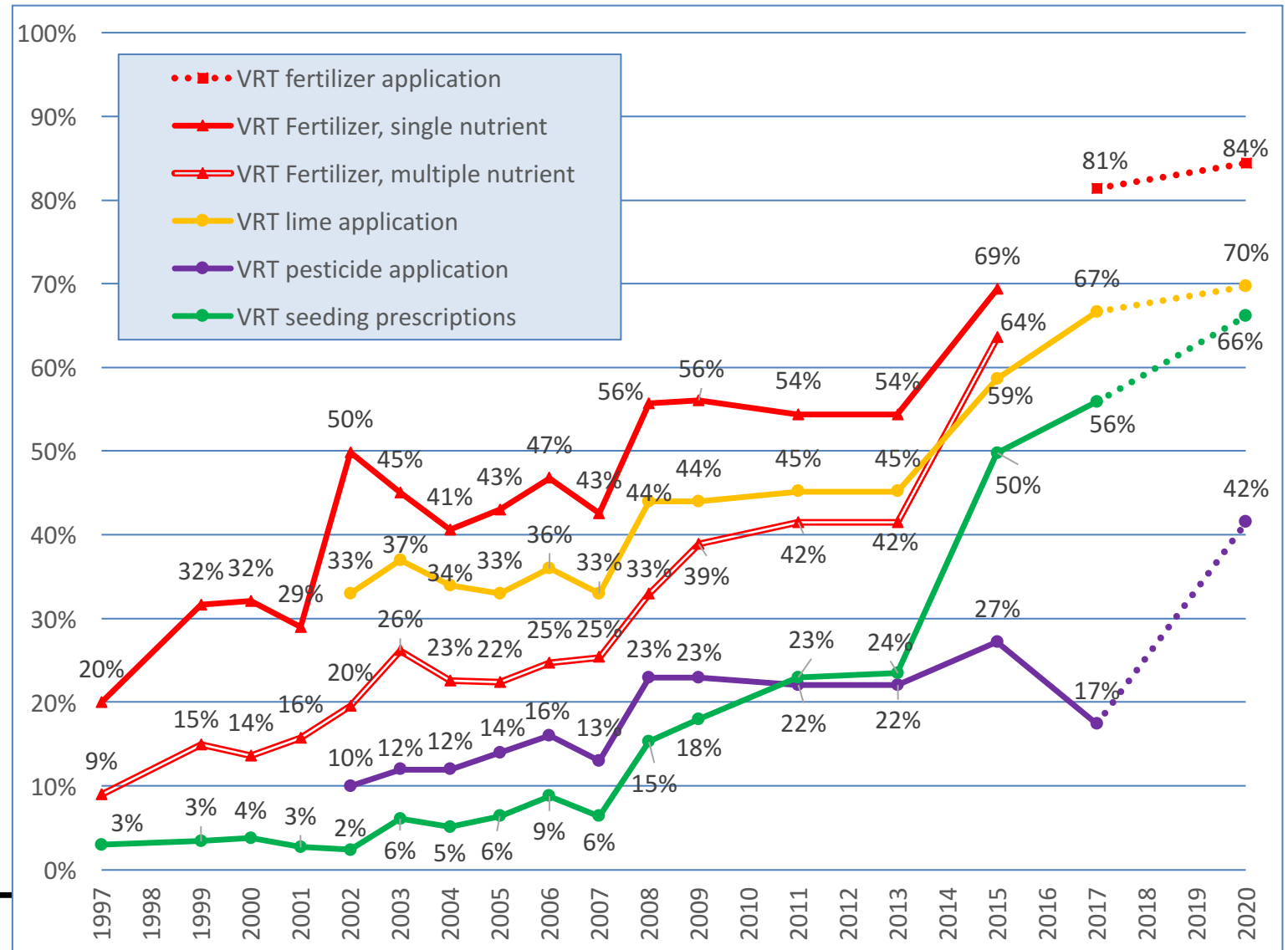


← If grids, 2.5 acres most common size



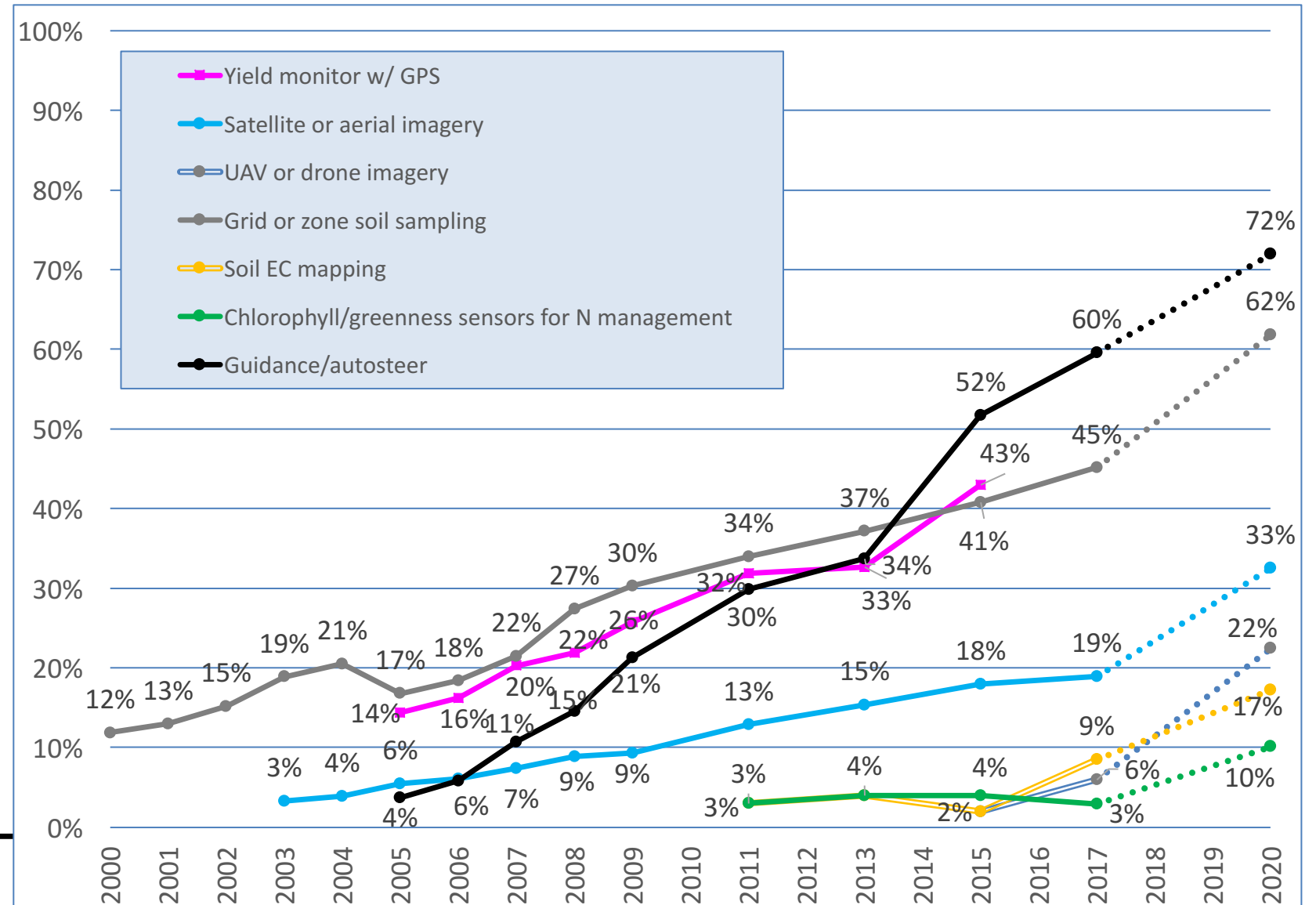
Dealer Offerings of Variable Rate Technologies

- % of Retailers
- VRT is the action side of data technologies for data-driven farming
- Most dealers offer VRT services.
- Farmer up take of VRT has been slower
- 2020 are projections



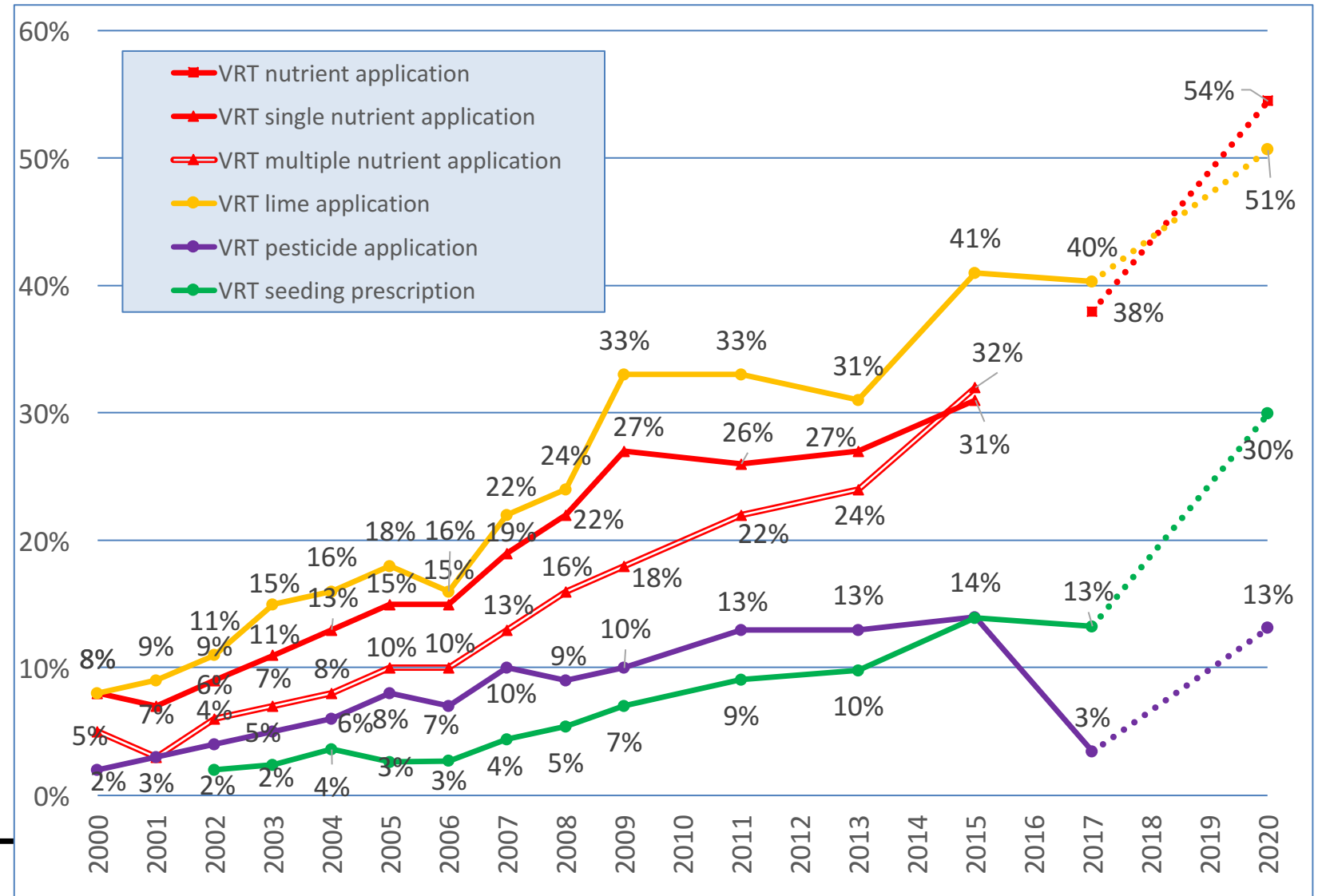
Farmer Adoption Estimated by Retailers in their Market

- % acres in the retailer's market area, not % farmers
- GPS guidance becoming standard
- For yield monitor data always a question of use
- 2020 are projections



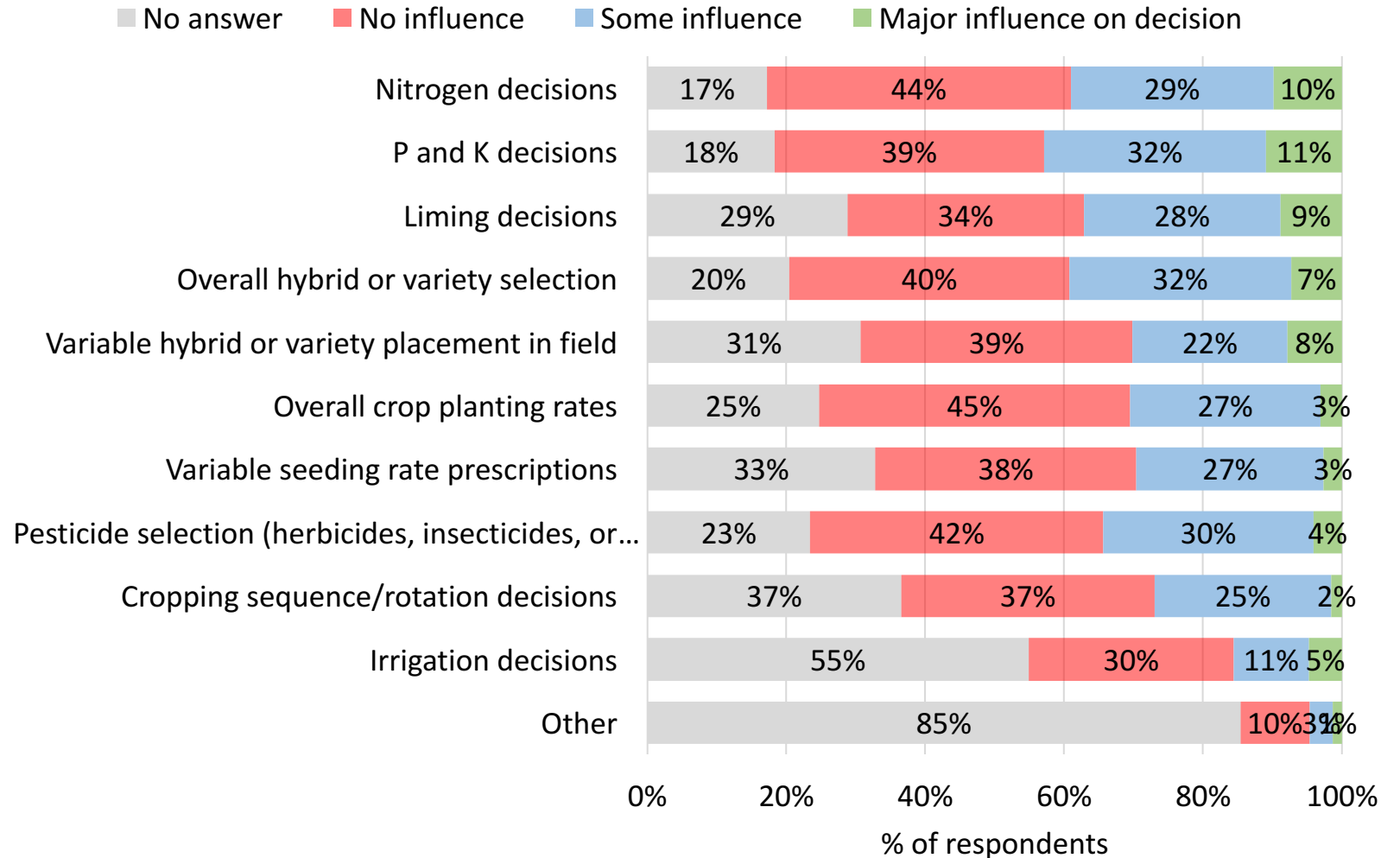
Farmer VRT Adoption Estimated by Retailers

- % acres, not % farmers, in the retailer's market area
- Substantially higher estimates than USDA and other sources
- Farmer interest in VRT seeding remarkable
- 2020 are projections



Nutrient Management and Hybrid/Variety Selection Dominate Decisions Based on Farm Data

- 58% of retailers manage and/or archive yield, soil test and other data for farmers.
- 17% pool that data within their customer base.
- 10% pool that data beyond their customers
- Only 13% of retailers do not help customers with farm data

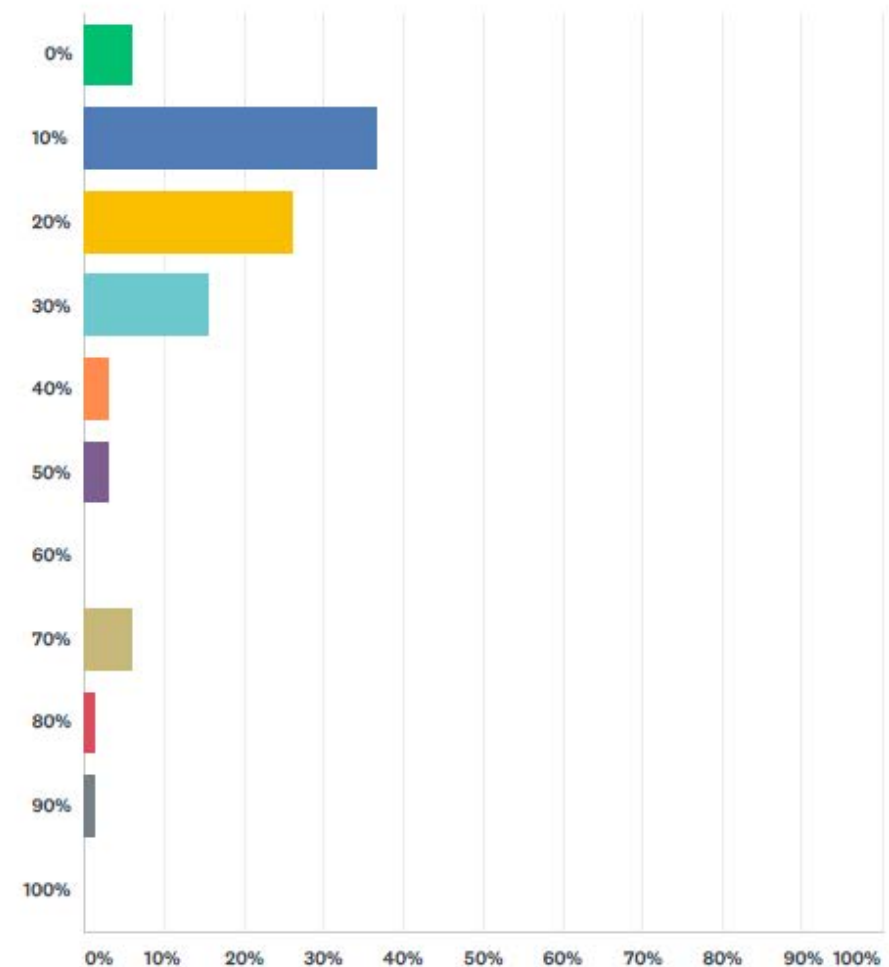


Retailer Survey: Cost Savings from Precision Ag

CropLife Precision Value Survey

Q7 What overall gains in efficiency have been realized in crop production by using precision farming tools such as guidance, section controllers, variable rate, yield monitors, etc? Answer question to nearest 10% DECREASE in overall inputs due to use of precision farming practices.

Answered: 65 Skipped: 0

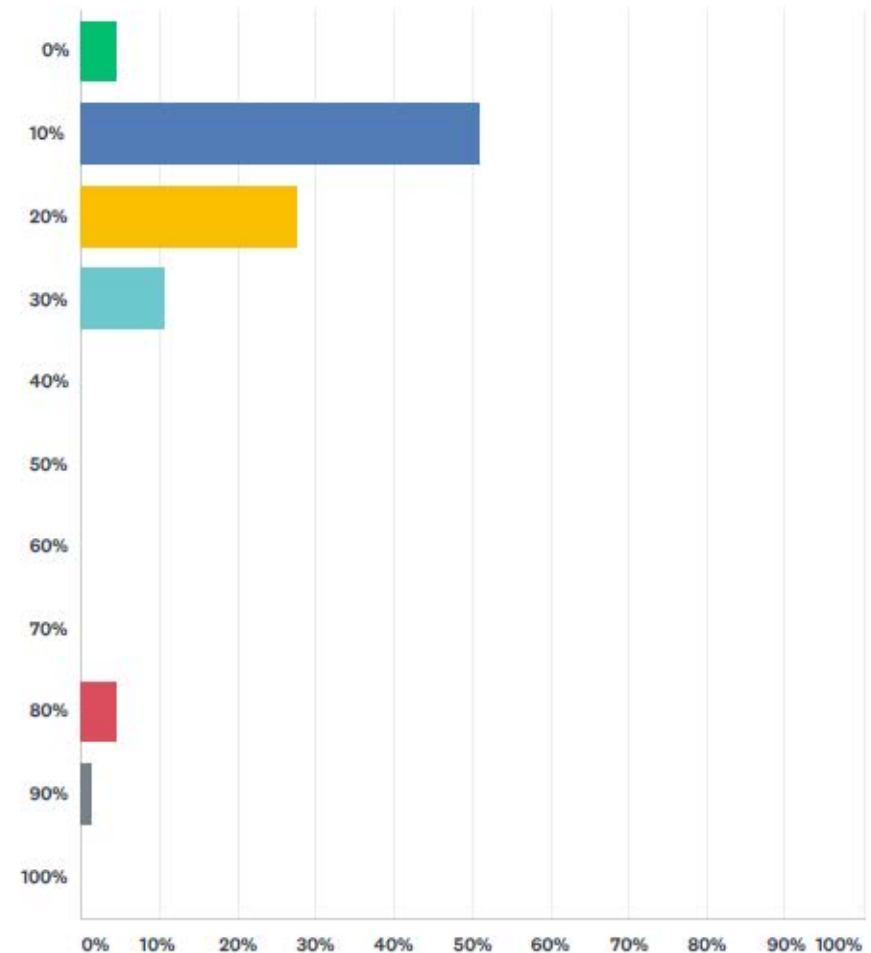


Retailer Survey: Yield Gains from Precision Agriculture

CropLife Precision Value Survey

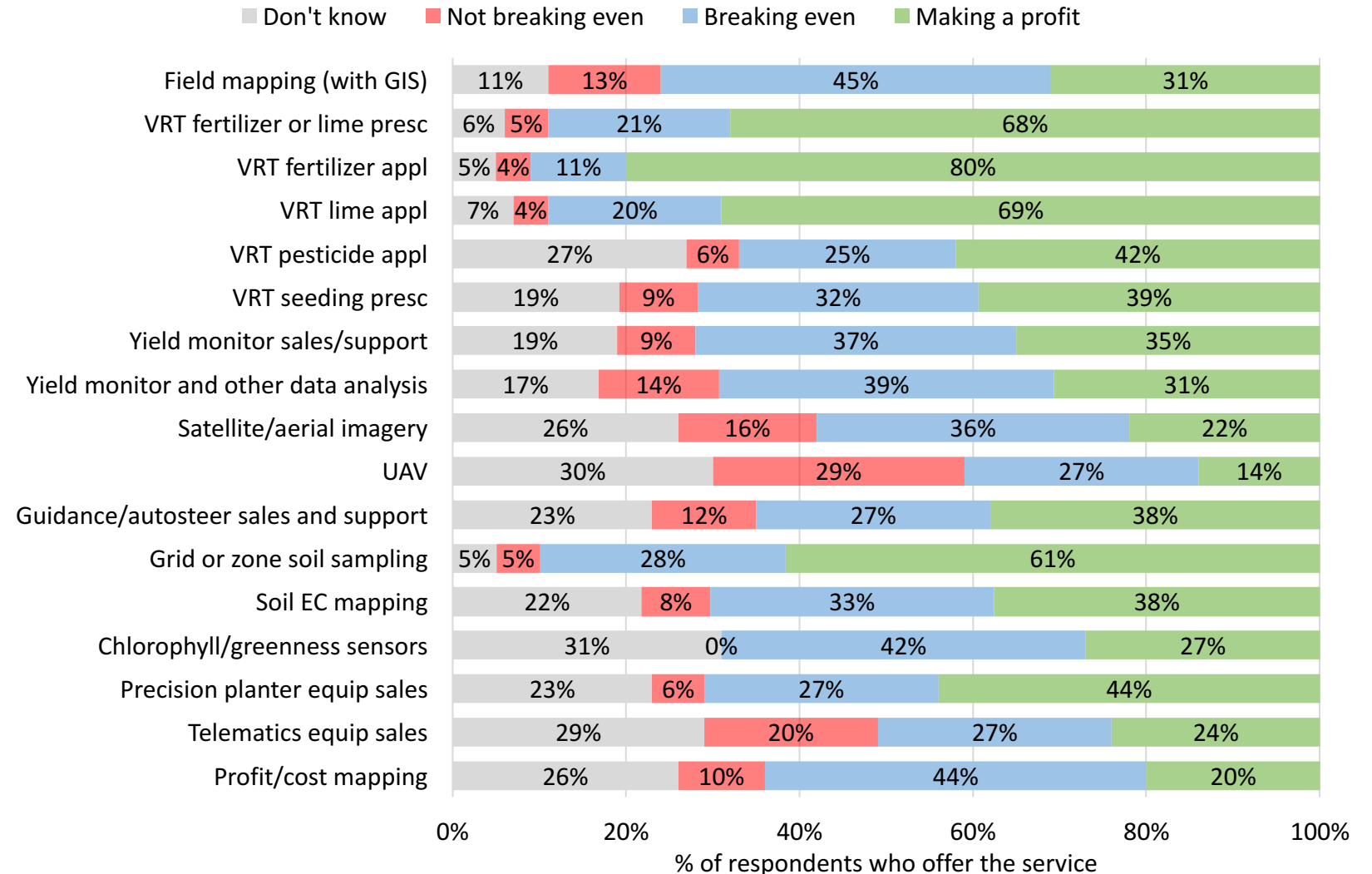
Q8 What gains in crop yields have been realized from using precision farming tools such as guidance, section controllers, variable rate, yield monitors, etc? Answer question to nearest 10% INCREASE in crop yields due to use of precision farming practices.

Answered: 65 Skipped: 0



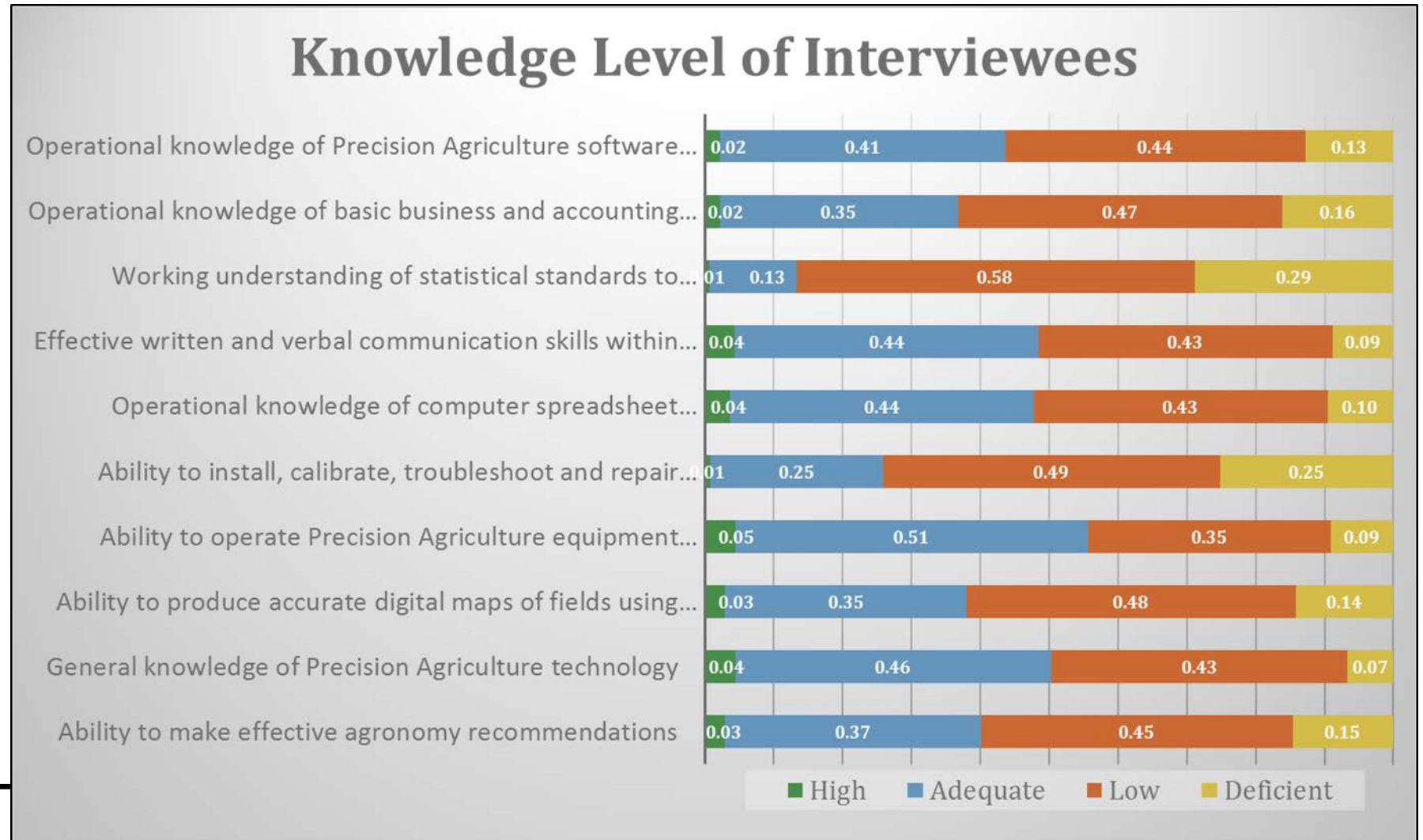
Profitability of Precision Service Offerings

- % of Retailers
- VRT fertilizer related services usually profitable
- Sensing services (e.g. UAV, satellite/aerial imagery, soil EC, chlorophyll sensors) less profitable



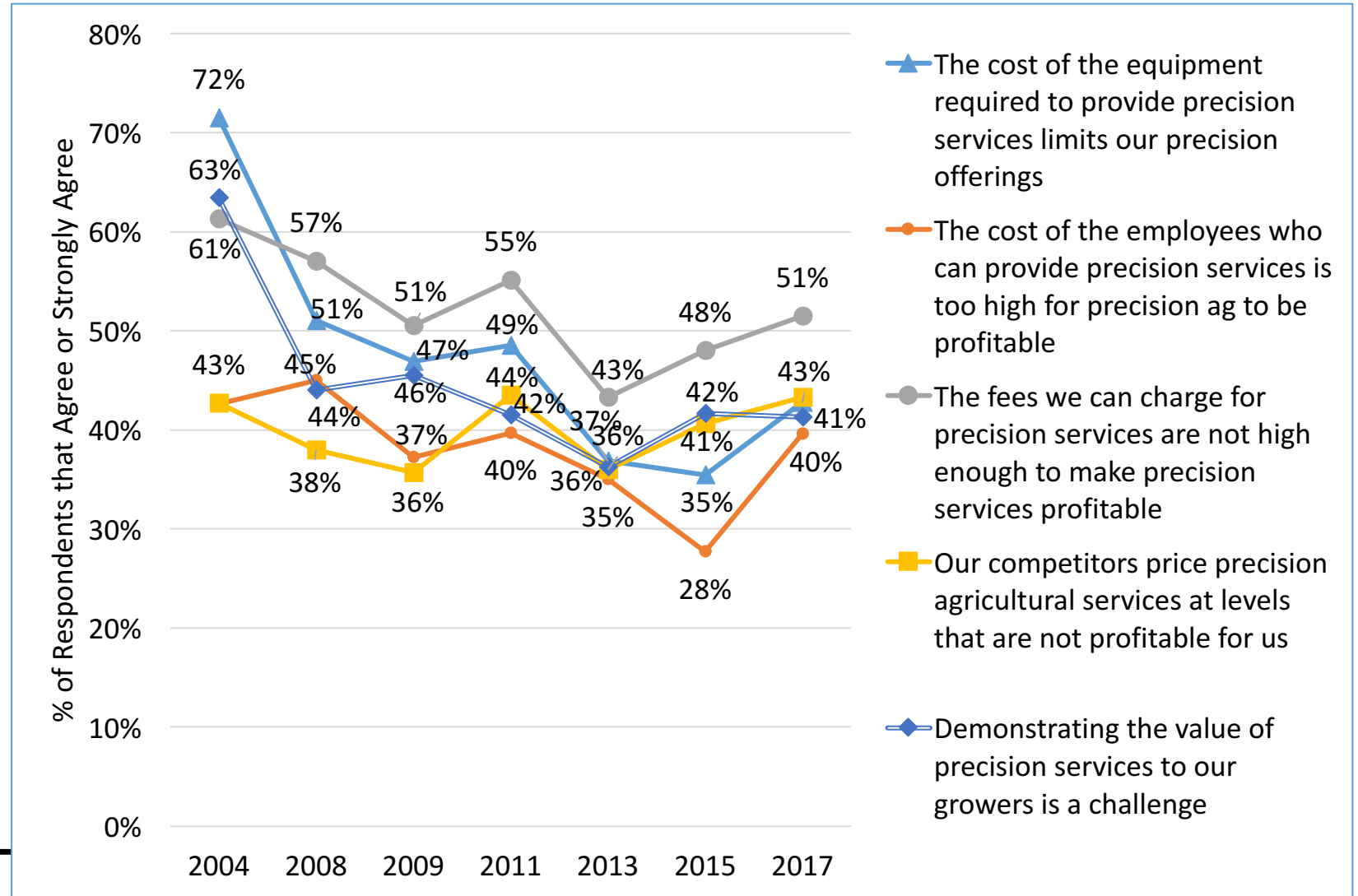
Informing the Precision Work Force

- Interviewees showed low levels of knowledge in many critical areas



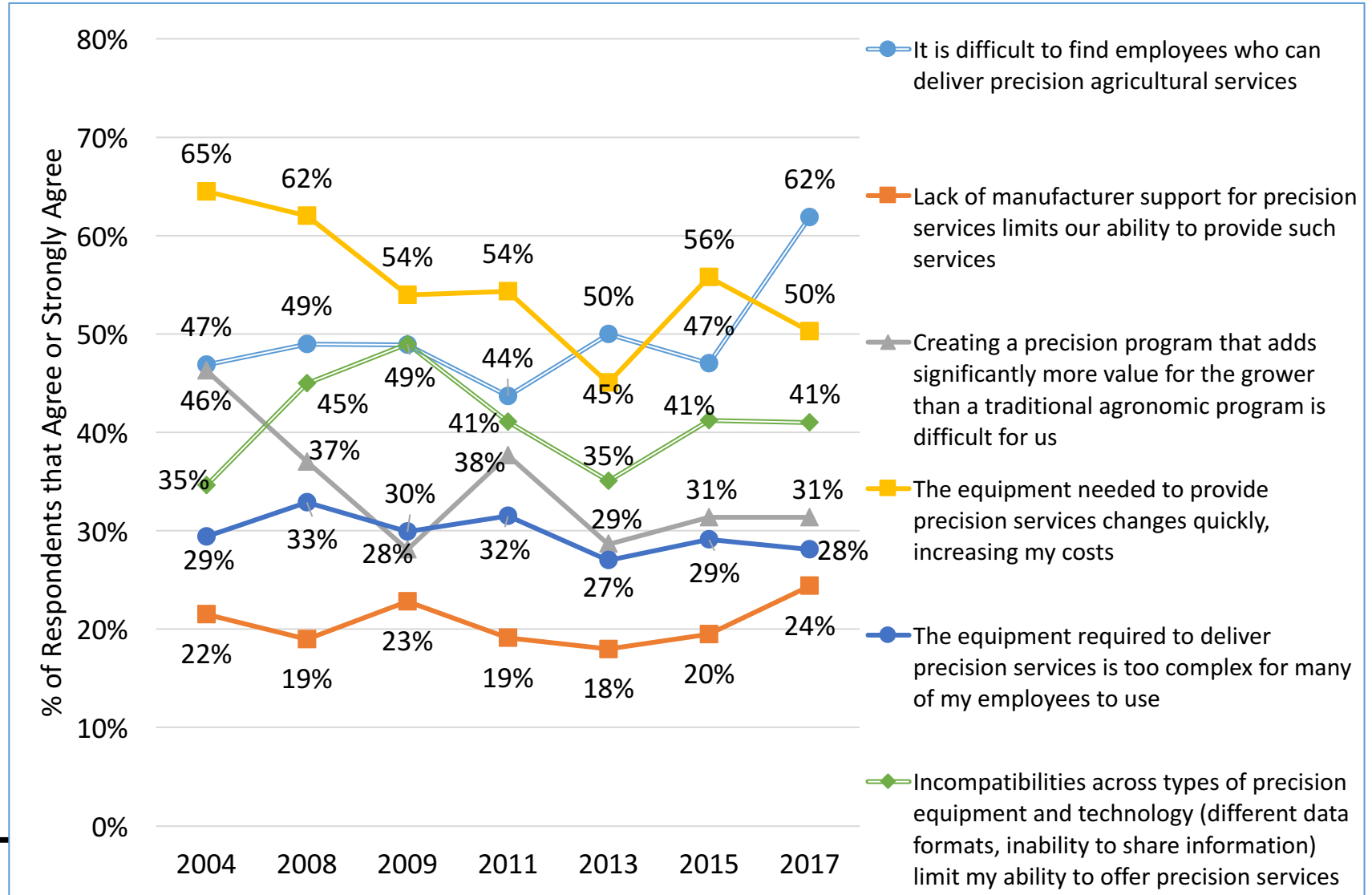
Dealer Barriers to Adoption

- General downward trend
- Biggest drops in cost of equipment and demonstrating value



Dealer Barriers to Adoption

- Uptick in difficulty to find employees



CropLife-Purdue Survey Summary:

- GPS guidance technologies have been adopted rapidly by retailers
- Information-intensive technologies more complicated, adoption is slower
- Many ag retailers offering farm data management & archiving
- Few ag retailers offer farm data analysis
- Creating a profitable data driven ag input supply business is challenge for retailers