Enabling Solutions

RDO EQUIPMENT CO.

JOHN DEERE

RDO® EQUIPMENT CO.

Ron Offut purchased his first John Deere dealership in Casselton, ND in 1968

Today RDO owns and operate 83 dealerships in 11 states as well as partnerships in Russia, Ukraine, and Australia

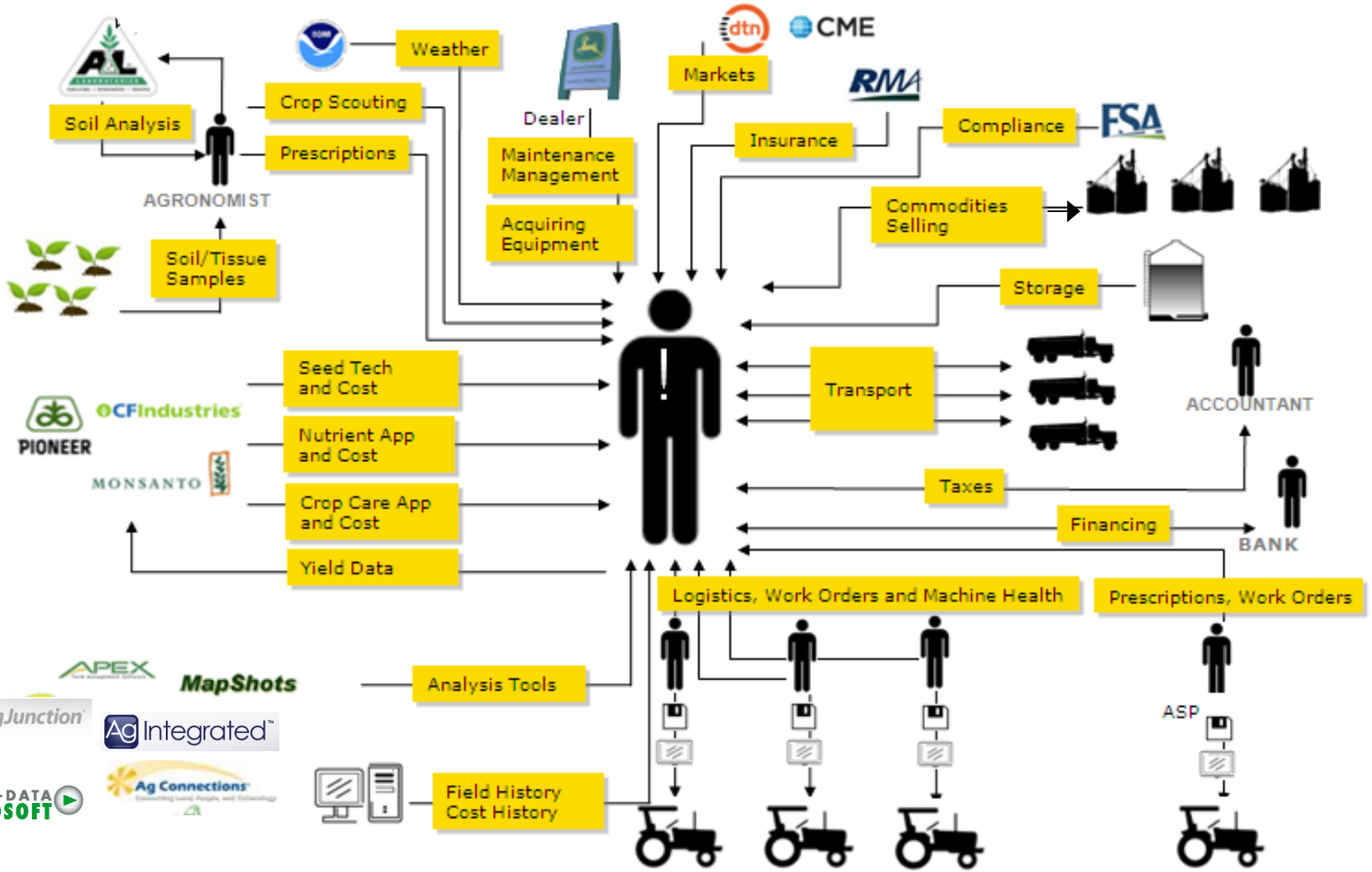
Today's issue's…

- 1970 – 2010: World population has doubled
- World population is 7.2 billion
- 1987 – 2010: 40% more corn, 30% more soybeans, 19% more wheat, 0% increase of land
- 1949: 1 farmer fed 19 people; 1970: 1 farmer fed 73 people; 2010: 1 farmer fed 155 people; 2018: 1 farmer feeds 165 people
- Top 10 "in demand" jobs in 2010 didn't exist in 2004

Tomorrow's Issues...

- Projected population in 2050: 9.7 billion increase of 2.5 billion
- By 2050, farmers will have to increase their production by 60% to feed everyone.
- Half of what a 4 year student learns in their 1st year will be outdated by the 3rd year.
- How do you prepare for jobs that don't exist, with technology not even developed, for an unknown problem?

Customer Challenges:
Simplify Complexity, Create New Insights



Precision Agriculture

Precision Farming – managing crop production inputs on a site-specific basis to increase profits, reduce waste and maintain environmental quality.

The 4R's of Stewardship

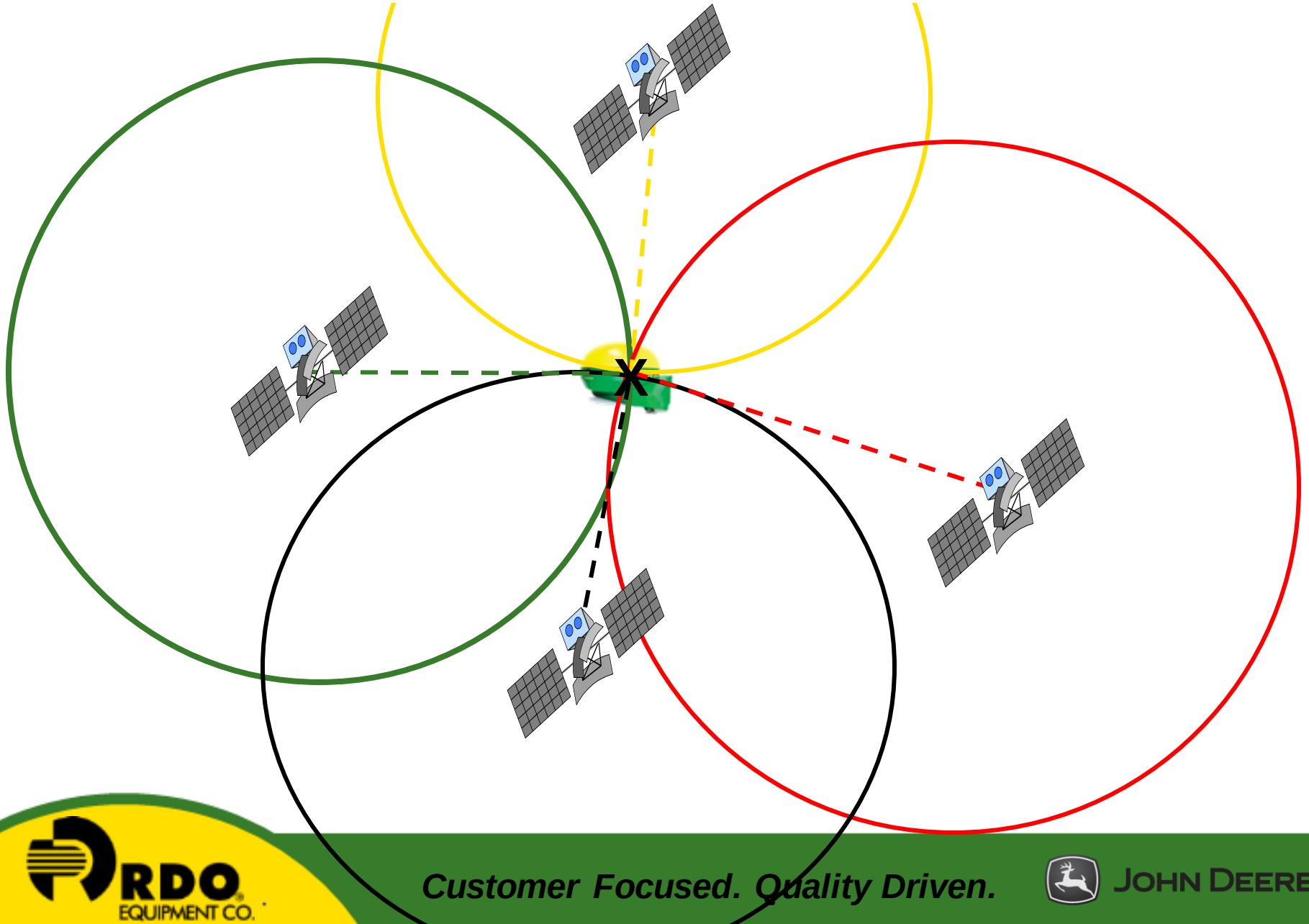
- Right Source – the right product for the job
- Right Rate – Matching application rate with crop requirements
- Right Time – Applying what it needs exactly when it needs it
- Right Place – Applying exactly where it is needed

Understanding GPS

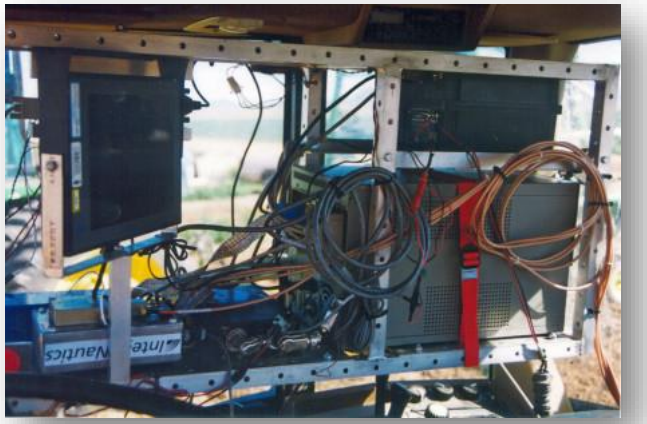
GPS (Global Positioning System) –

- A constellation of at least 24 satellites
- Orbit the earth on 6 evenly spaced planes
- Orbit at 12,550 miles above the earths surface
- Each satellite circles the earth twice a day
- 4 satellites are "visible" from any point at any time

How we use it to gain location on Equipment.
"Theory of Triangulation"



Steel Plow of the 20th Century



- **1992** – GPS was accurate to within a few feet
- **1994** – Deere develops the Precision Farming Group
- **1997** – A joint project between the Precision Farming Group, John Deere Product Engineering Center, and Stanford University produced a demonstration to Deere leadership showcasing a specially equipped tractor which created perfectly straight beds accurate to 1 inch, raised and lowered the implement, and turned all with no operator on board.
- **1999** – Stanford refined the system to be more compact and user-friendly. Used the system to plant 250 acres of corn and drill 250 acres of soybeans. Two weeks later, when it was time to cultivate the operator simply pressed the button and followed the same rows.
- **2002** – John Deere AutoTrac™ went into production.

Today 60 – 70% of crop acreage in North America is farmed using AutoTrac™ or similar systems. That number exceeds 90% in Australia.

Accuracy & Differential Correction Options

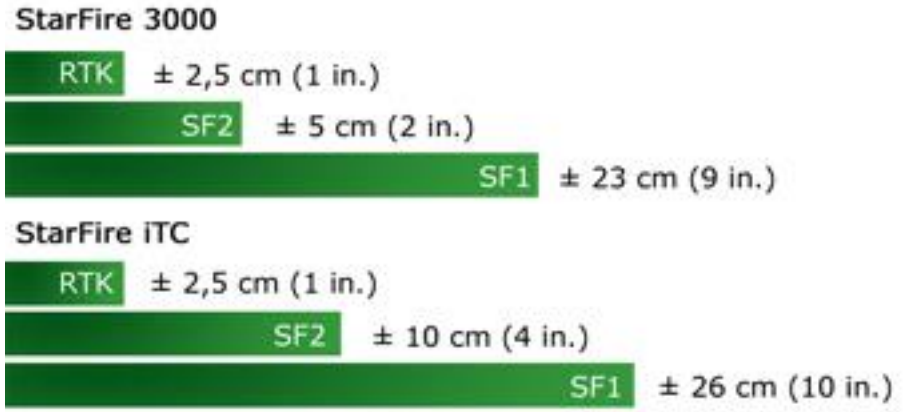
Provided Through the Starfire™ Network

WAAS (Wide Area Augmentation Signal)

- Only required to be within 25ft, 95% of the time
- On average in the continental US its around 3.5 feet

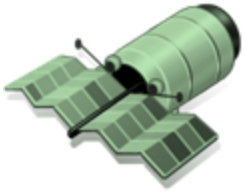
StarFire Network

- Position data is generated from GPS satellites
- StarFire Network provides differential corrections to improve accuracy
- StarFire Network is comprised of John Deere owned reference stations and processing hubs



How the Starfire™ Network Provides Differential Correction Options.

GPS



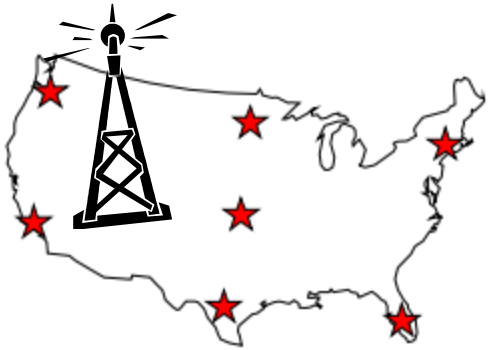
Inmarsat

Correction Signal

dGPS

GPS Position

Land Uplink Station



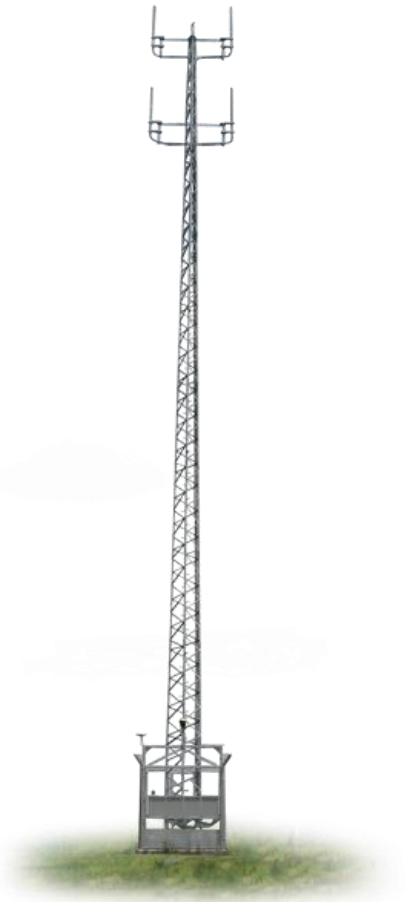
Network of Reference Stations

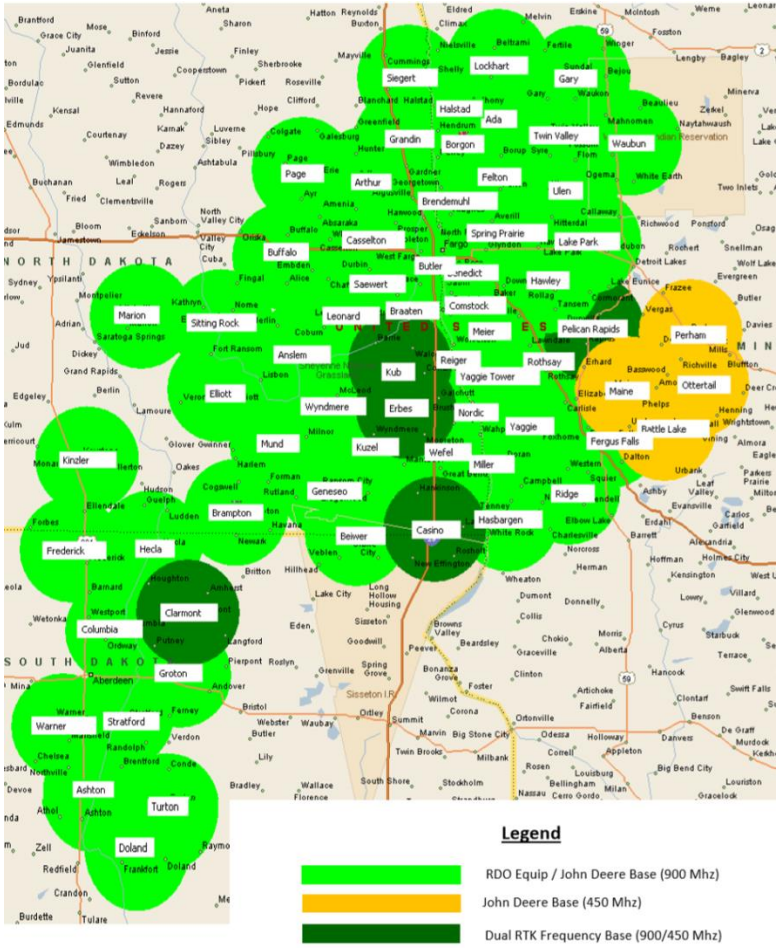
Processing Hub

How GPS Works

RTK – Real Time Kinematics

Utilizes Dealer or Customer Owned Receivers and Radios to create base stations within 12 miles





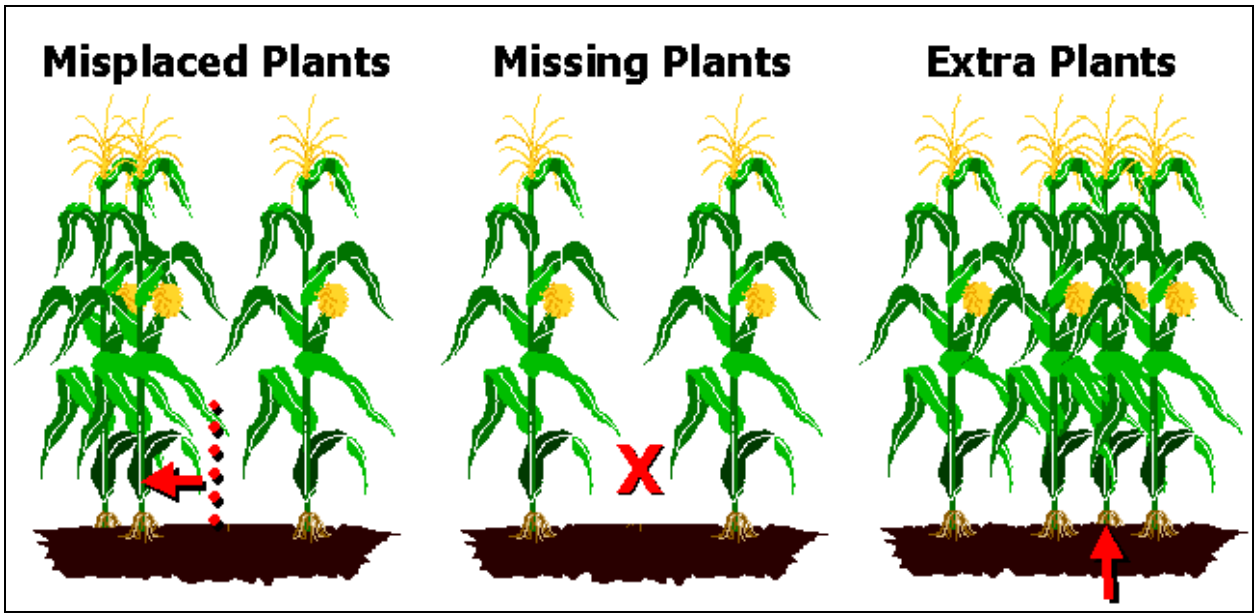
Corn Planter Technology

ExactEmerge Planter

Componants and facts

https://www.youtube.com/watch?v=BLuI118nhzc

How Important is Uniform Plant Spacing?



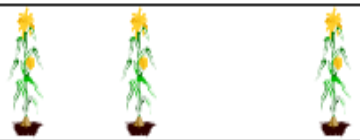
Sometimes bad | Always bad | Benign

Perfect spacing = Standard Deviation (S.D.) of 0”

Little yield impact at S.D. from 0-2.0”

Source: Pioneer Hi-Bred, Int’l. 2001

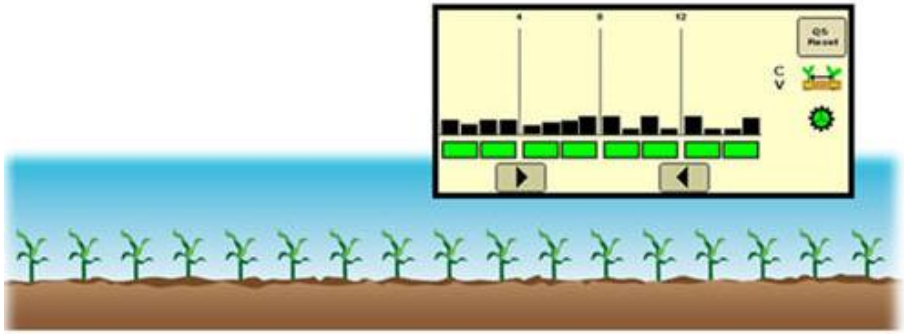
Spacing Affect on Yield

Planting Outcome	Plant Spacing	Average Yield Loss/Gain Lbs.
Perfect Spacing		0
% yield	100 100 100	
Skip		-0.25
% yield	112 112	
Double		+0.11
% yield	100 60 60 100	
¼ Misplaced		-0.02
% yield	92 98 102	
½ Misplaced		-0.05
% yield	84 93 106	
¾ Misplaced		-0.09
% yield	74 88 109	

% yield of individual plants compared to plants at perfect spacing

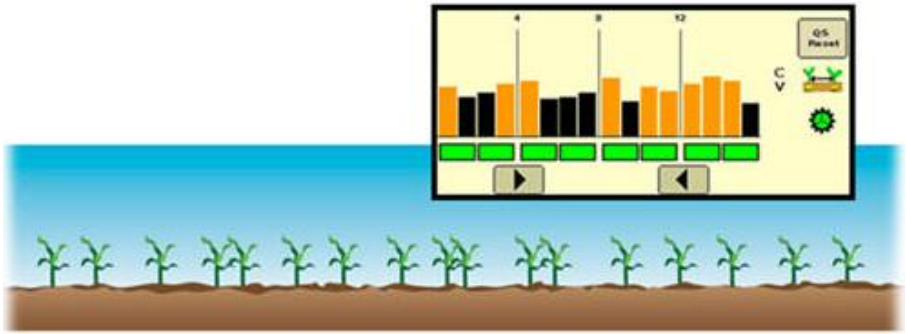
Source: DuPont™ Pioneer®

Coefficient of Variation (CV)=

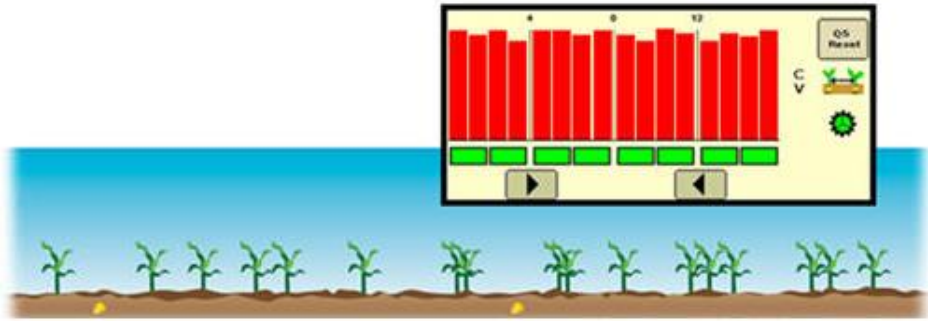


Standard deviation of seed spacing (variation between seeds)
average distance between seeds

$$CV = \frac{.5''}{6''} = .08$$

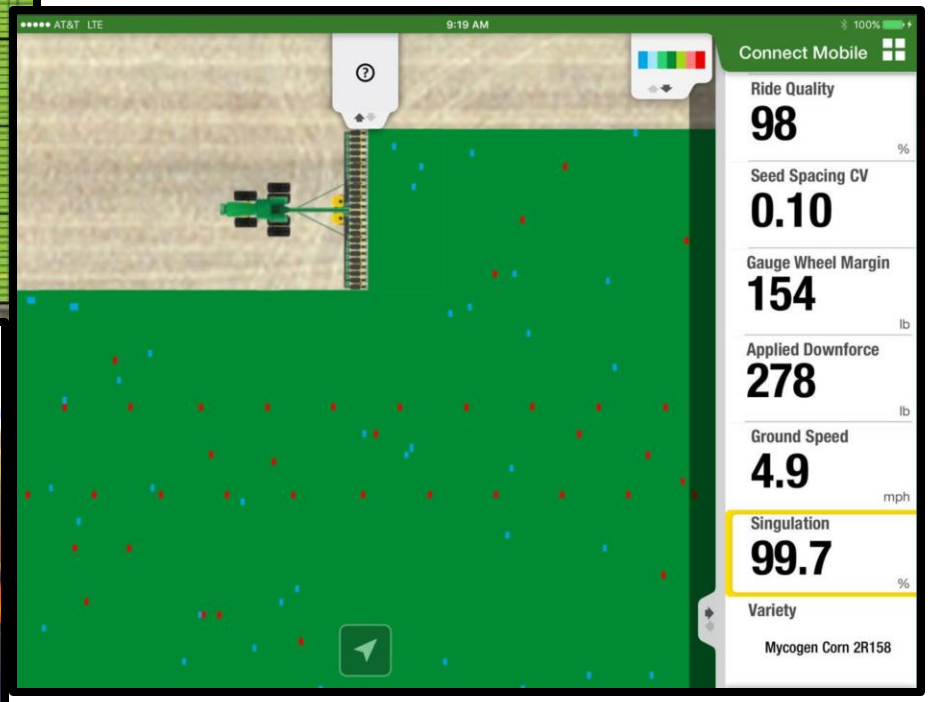


$$CV = \frac{2''}{6''} = .33$$



$$CV = \frac{4''}{6''} = .67$$

SeedStar Mobile



24 row 30 inch planter = 60 feet

5 mph x 5280 feet = 26,400 feet/hr

60 feet x 26,400 feet/hr = 1,584,000 sqft/hr

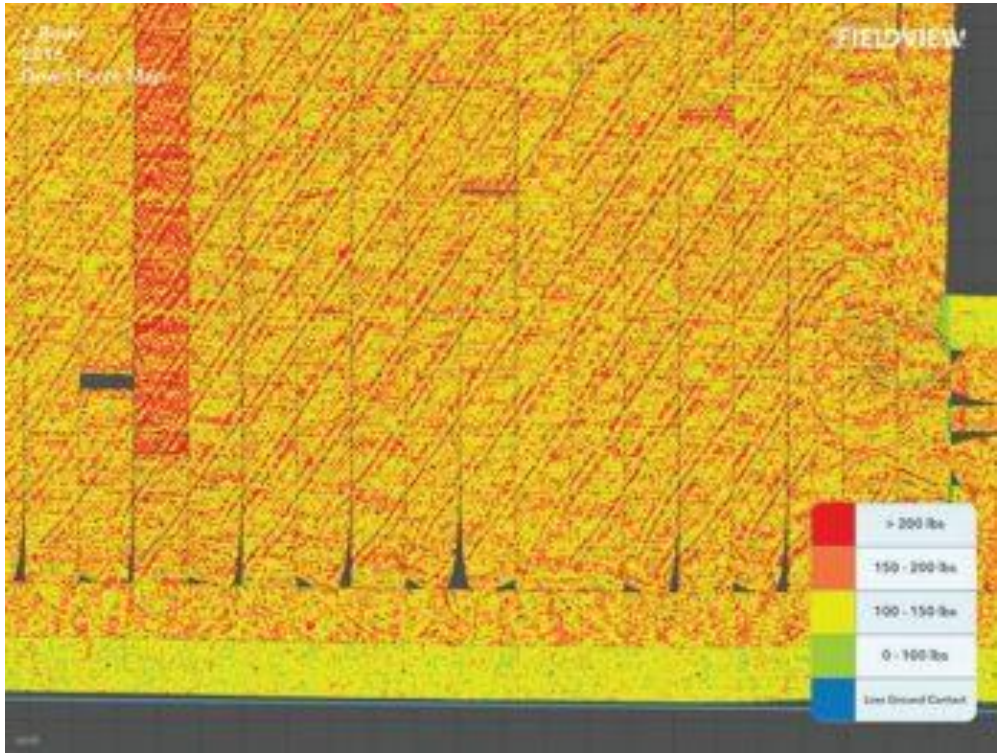
1,584,000 sqft/hr / 43,560 sqft/acre = 36.36 ac/hr

36.36ac/hr x 25,000 seeds/ac = **909,090 seeds per hour**

Hydraulic Down Force

5 adjustments per second

100 lb adjustment per second



5 mph x 5280 feet = 26,400 feet/hr

26,400 feet/hr / 60 minutes / 60 seconds = 7.3ft/sec

7.3ft/sec / 5 adjustments/sec = **1.46 feet per adjustment**

ExactEmerge Planter – Curve Compensation

Maintains accurate seed population and spacing on curves by slowing down the inner row units and speeding up the outer row units on curves

With ExactEmerge and the curve compensation feature, each row will receive an individual signal based on the speed the row-unit is moving, maintaining the correct population across the length of the planter. Without curve compensation, there could be as much as a 24 percent drop in population accuracy, which is equivalent to 8,600 seeds per acre when planting at 36,000 seeds per acre.

Precision Agriculture

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The 4R's of Stewardship

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- Right Rate – Matching application rate with crop requirements
- Right Time – Applying what it needs exactly when it needs it
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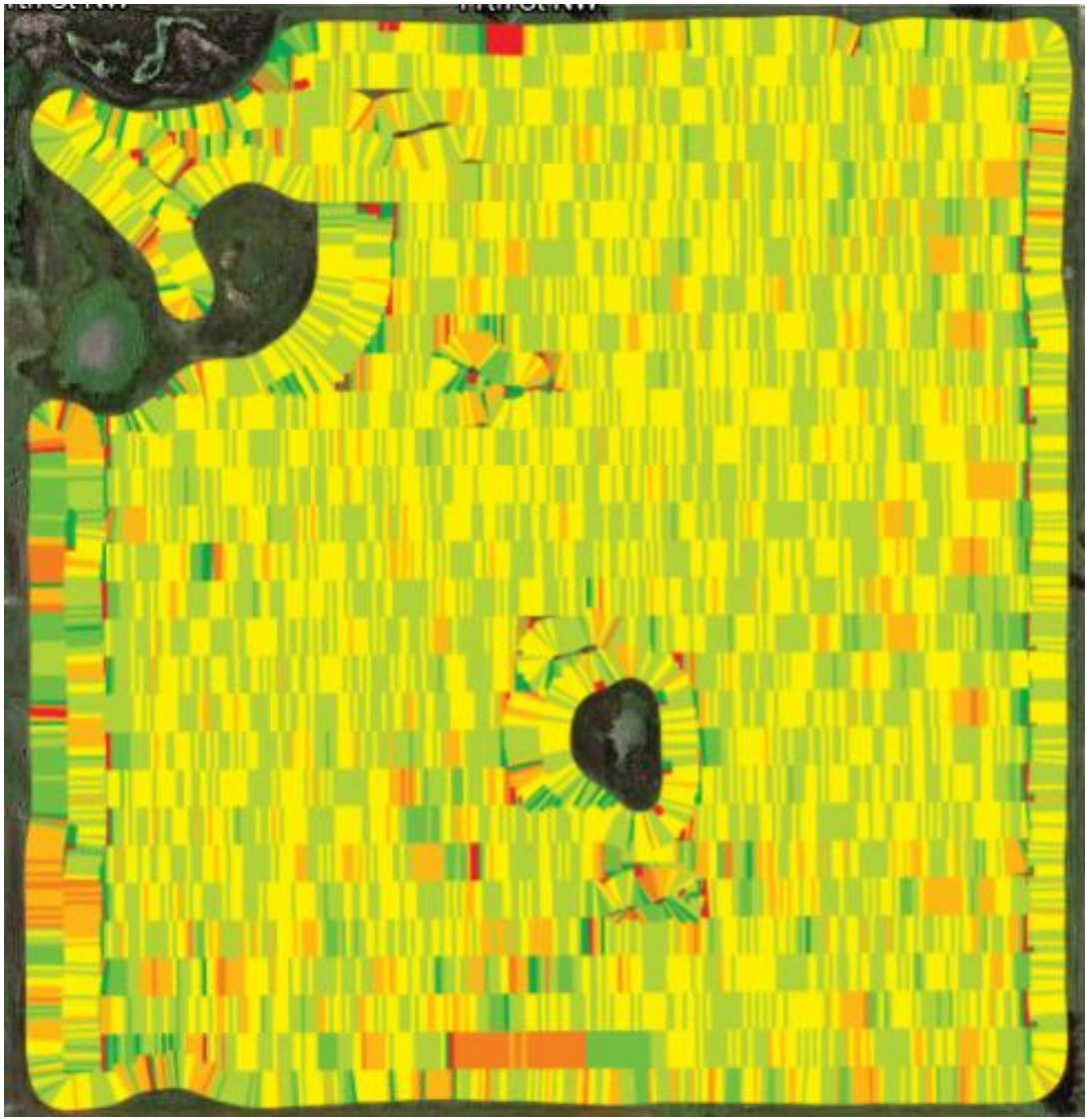
Section Control

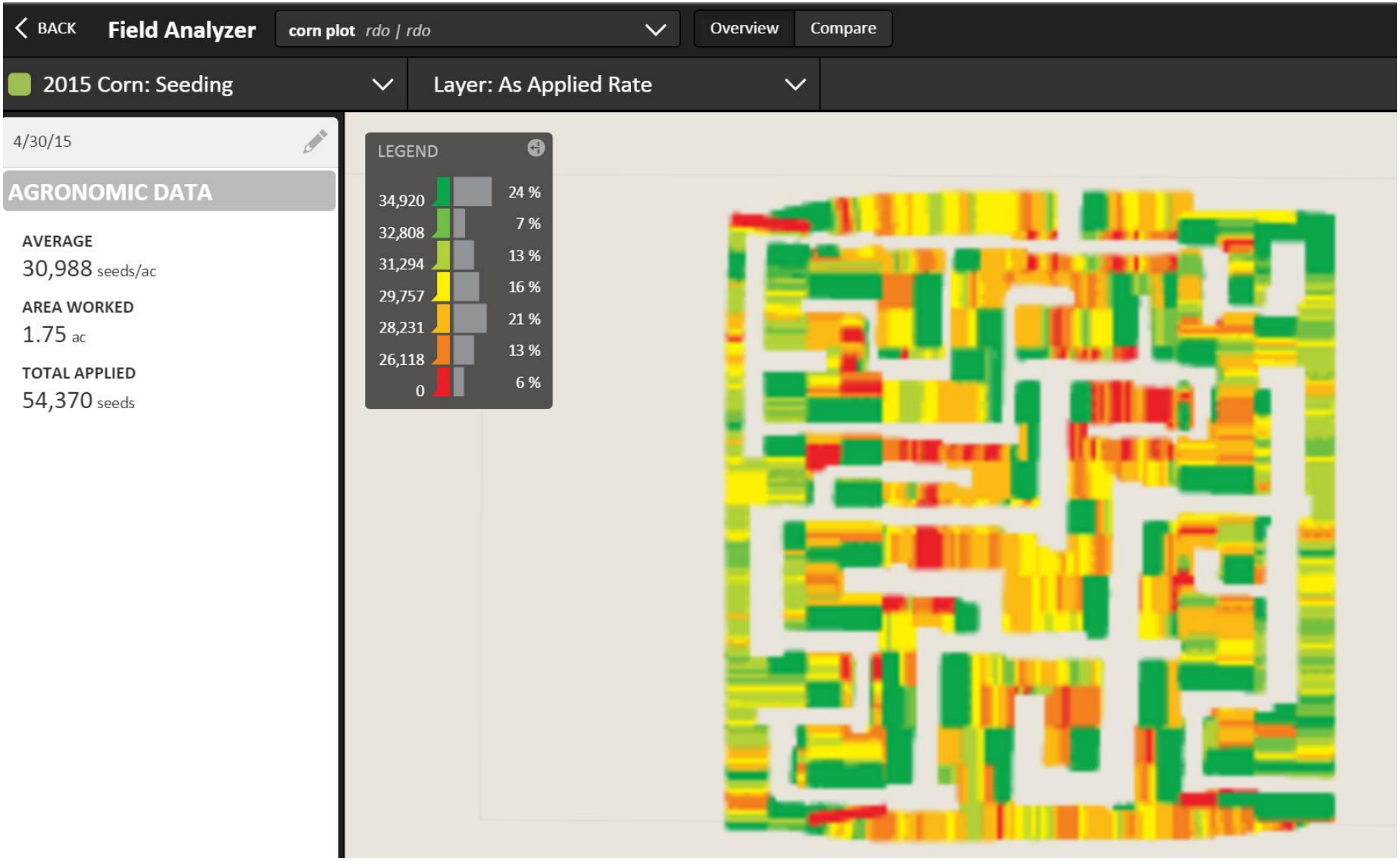
No Swath Control

Swath Control

Section Control



Section Control



SectionCommand

- SectionCommand is an integrated solution that manages seed and fertilizer application by minimizing overlaps and skips while seeding with the John Deere 1910 Air Cart.
- SectionCommand controls seed and fertilizer output by closing and opening gates on the bottom side of the meter.
- Meter stays full when gates are closed so that when they open there is immediate product delivery into the Primary hoses, once all gates are closed the meter stops turning

ExactApply

Spray Tip	Pressure (PSI)	Flow Rate (GPM)	Gallons per Acre 20-inch Nozzle Spacing MPH 4	5	6	7	8	10	12	14	16	18	20
01	15	0.06	4.5	3.6	3.0	2.5	2.2	1.8	1.5	1.3	1.1	1.0	0.9
	30	0.09	6.7	5.3	4.5	3.8	3.3	2.7	2.2	1.9	1.7	1.5	1.3
	40	**0.10**	7.4	5.9	5.0	4.2	3.7	3.0	2.5	2.1	1.9	1.7	1.5
	60	0.12	8.9	7.1	5.9	5.1	4.5	3.6	3.0	2.5	2.2	2.0	1.8
	80	0.14	10.4	8.3	6.9	5.9	5.2	4.2	3.5	3.0	2.6	2.3	2.1
	100	0.16	11.9	9.5	7.9	6.8	5.9	4.8	4.0	3.4	3.0	2.6	2.4
	115	0.17	12.6	10.1	8.4	7.2	6.3	5.0	4.2	3.6	3.2	2.8	2.5
015	15	0.09	6.7	5.3	4.5	3.8	3.3	2.7	2.2	1.9	1.7	1.5	1.3
	30	0.13	9.7	7.7	6.4	5.5	4.8	3.9	3.2	2.8	2.4	2.1	1.9
	40	**0.15**	11.1	8.9	7.4	6.4	5.6	4.5	3.7	3.2	2.8	2.5	2.2
	60	0.18	13.4	10.7	8.9	7.6	6.7	5.3	4.5	3.8	3.3	3.0	2.7
	80	0.21	15.6	12.5	10.4	8.9	7.8	6.2	5.2	4.5	3.9	3.5	3.1
	100	0.24	17.8	14.3	11.9	10.2	8.9	7.1	5.9	5.1	4.5	4.0	3.6
	115	0.25	18.6	14.9	12.4	10.6	9.3	7.4	6.2	5.3	4.6	4.1	3.7
02	15	0.12	8.9	7.1	5.9	5.1	4.5	3.6	3.0	2.5	2.2	2.0	1.8
	30	0.17	12.6	10.1	8.4	7.2	6.3	5.0	4.2	3.6	3.2	2.8	2.5
	40	**0.20**	14.9	11.9	9.9	8.5	7.4	5.9	5.0	4.2	3.7	3.3	3.0
	60	0.24	17.8	14.3	11.9	10.2	8.9	7.1	5.9	5.1	4.5	4.0	3.6
	80	0.28	20.8	16.6	13.9	11.9	10.4	8.3	6.9	5.9	5.2	4.6	4.2
	100	0.32	23.8	19.0	15.8	13.6	11.9	9.5	7.9	6.8	5.9	5.3	4.8
	115	0.34	25.2	20.2	16.8	14.4	12.6	10.1	8.4	7.2	6.3	5.6	5.0

Droplet category droplet sizes

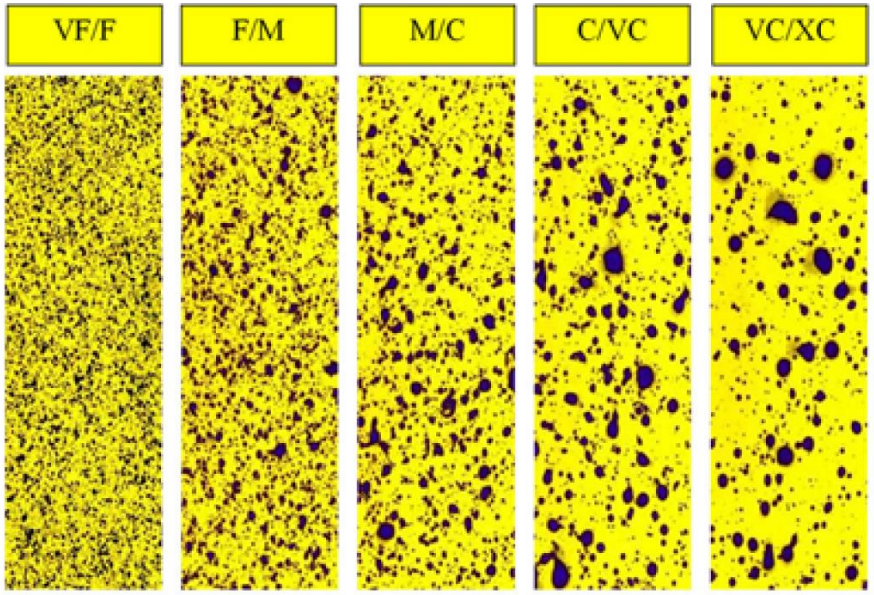
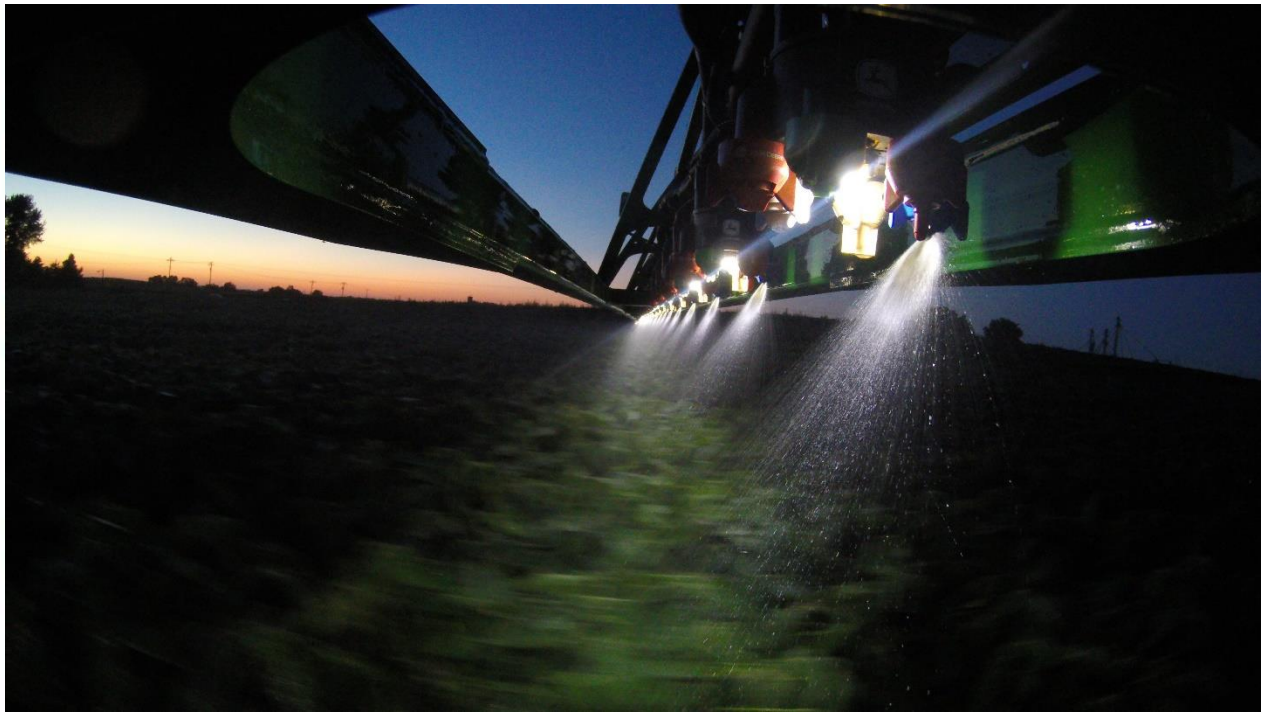


Image courtesy of Tom Wolf, Agriculture and Agri-Food Canada, Research Centre

ExactApply

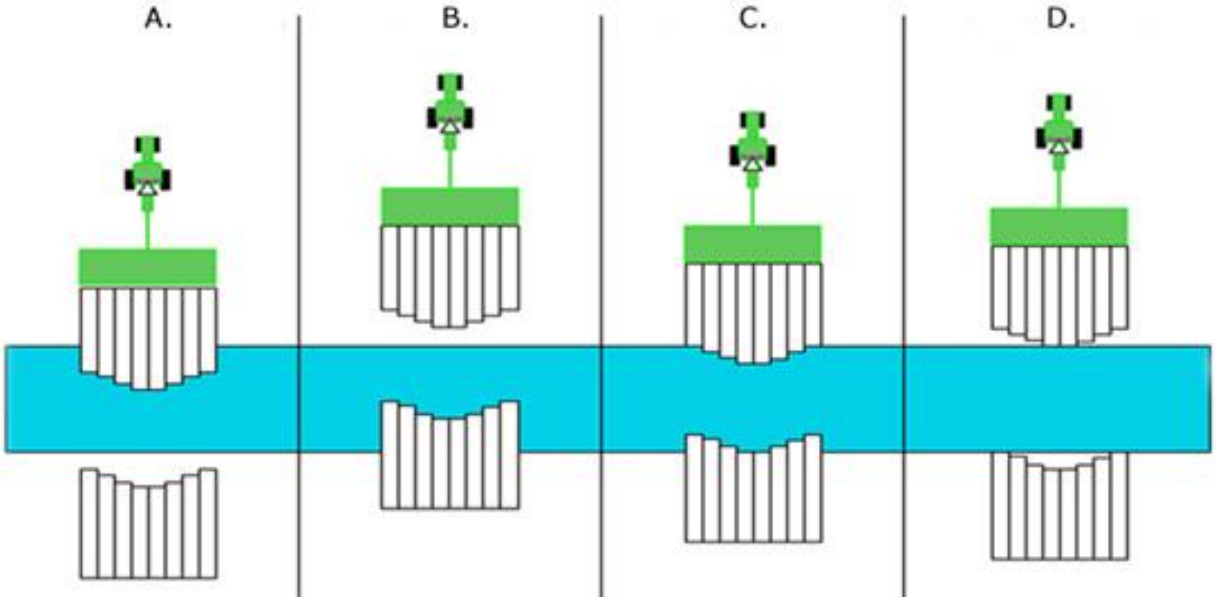
PWM = Pulse Width Modulation



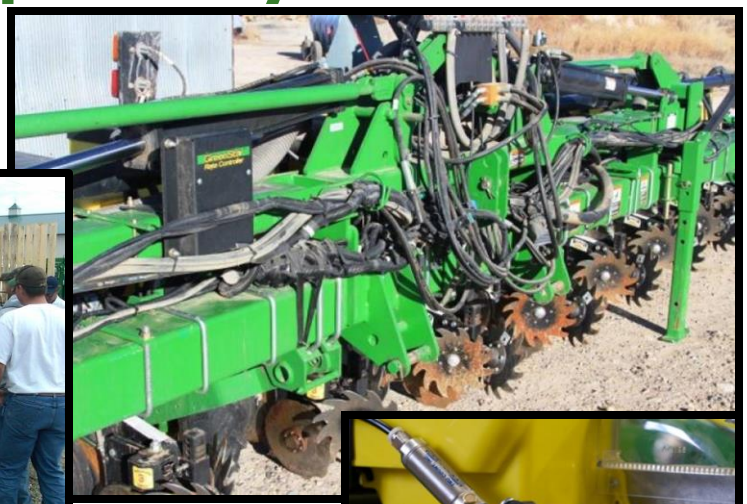
https://www.youtube.com/watch?v=FgBh2oF6llk

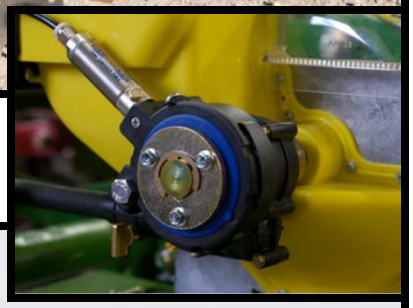
SectionCommand

Operations unique to air seeders: The illustration demonstrates how product will be dispersed from the air seeder. The time required for product to reach the center of the tool is less than it is to reach the wings of the tool, causing the application and emergence to resemble a chevron pattern. On/off times can be adjusted to minimize skips or overlaps



GreenStar Rate Controller Compatibility





Tractor-Baler Automation

Tractor-Baler Automation

Tractor-Baler Automation allows for easier operation and reduced operator fatigue after all-day operation. There are two levels of Tractor-Baler Automation.

Level 1: Selective control valve (SCV)

Net/twine

- Requires electronic SCVs
- Available for any tractor transmission
- Operator must stop tractor
- Gate automatically opens and closes
- Tractor speed must be at zero before gate will open

B-Wrap™ wrapping system

- Requires electronic SCV
- Available for any tractor transmission
- Operator must stop tractor
- Operator must back up the baler (can be done while the baler is wrapping)
- Power take-off (PTO) automatically turns off when proper bale orientation has been reached
- Gate opens after operator presses the Resume softkey
- PTO automatically turns back on and the gate closes once forward motion is detected

Tractor-Baler Automation

Level 2: SCV and machine-speed control

Net/twine

- Requires electronic SCV
- Requires an infinitly-variable transmission (IVT™) tractor
- Operator does not have to stop tractor; tractor is slowed and comes to a stop on its own
- Gate automatically opens and closes.

Harvest Solutions

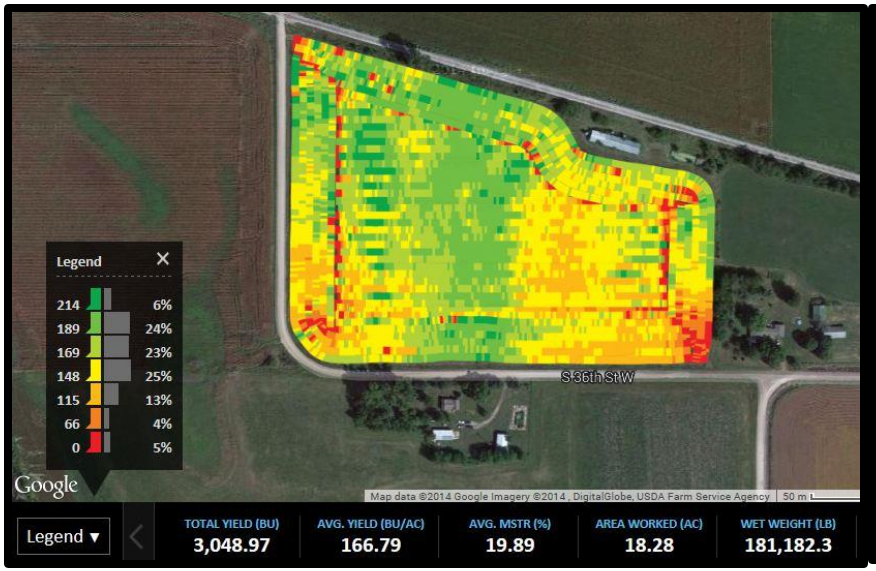
Machine Sync

- The grain cart and tractor are “synced” in speed and travel direction

-The combine operator has control of the grain cart to move them forward/backward and left/right while the tractor speed automatically matches the combine speed

ActiveYield™

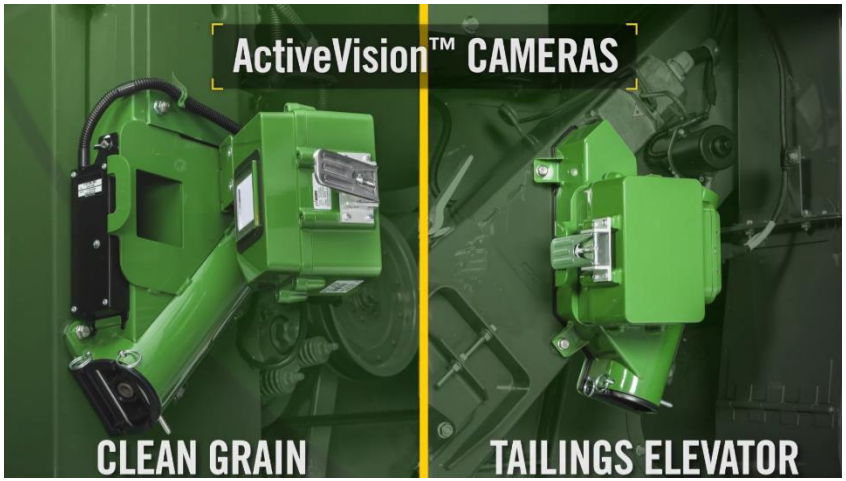
- Measures volume and mass of grain to build a 3D image.
- Eliminates manual yield monitor calibration
- Improves accuracy

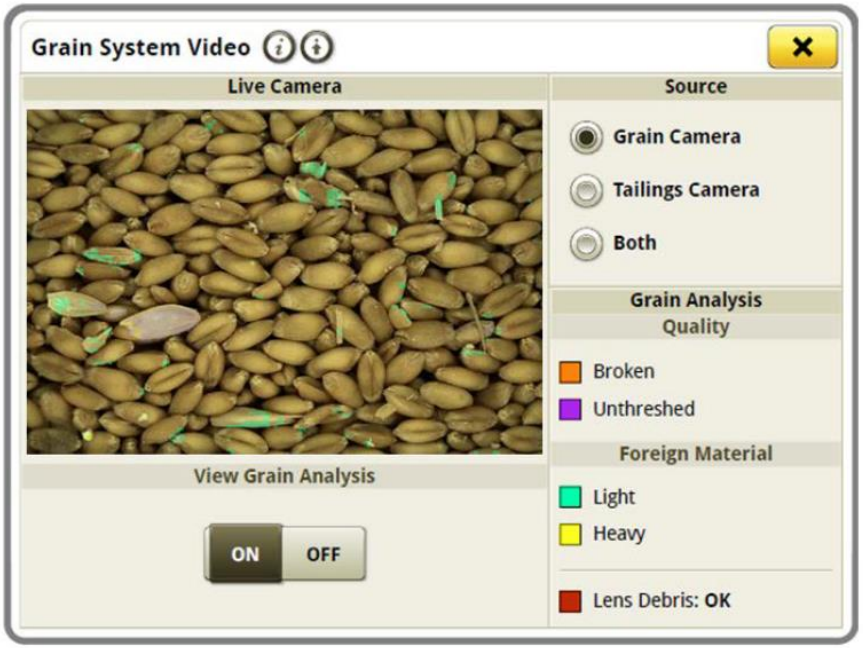


ActiveVision™ Cameras

Live views from the cab or cameras in the clean grain and tailings elevator

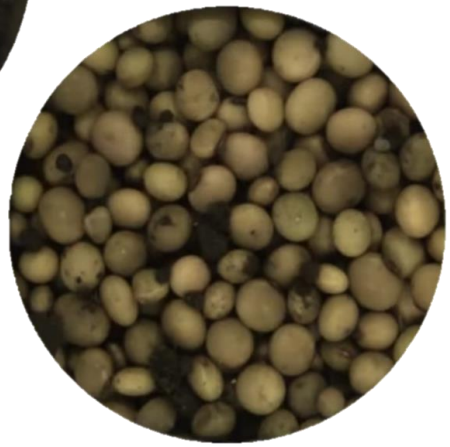
Detects broken or unthreshed grain and light or heavy foreign material





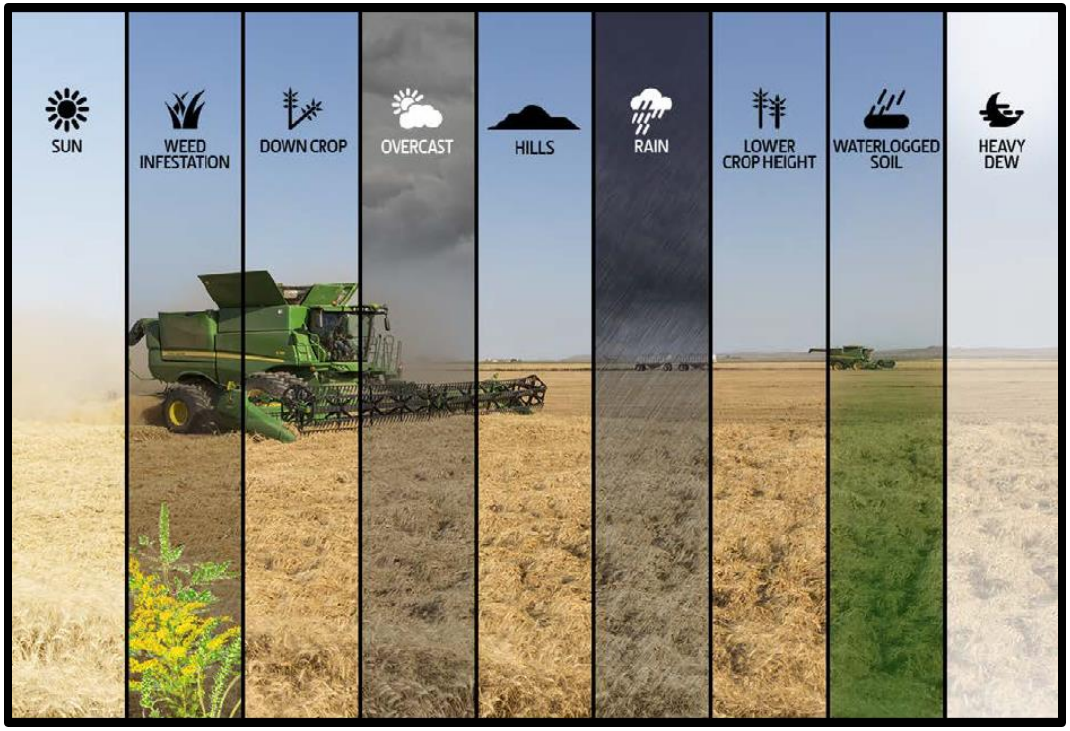
ActiveVision™ Cameras

- ActiveVision camera information feeds the Auto Maintain functionality
- Provides operator with live information on grain sample and tailings volume

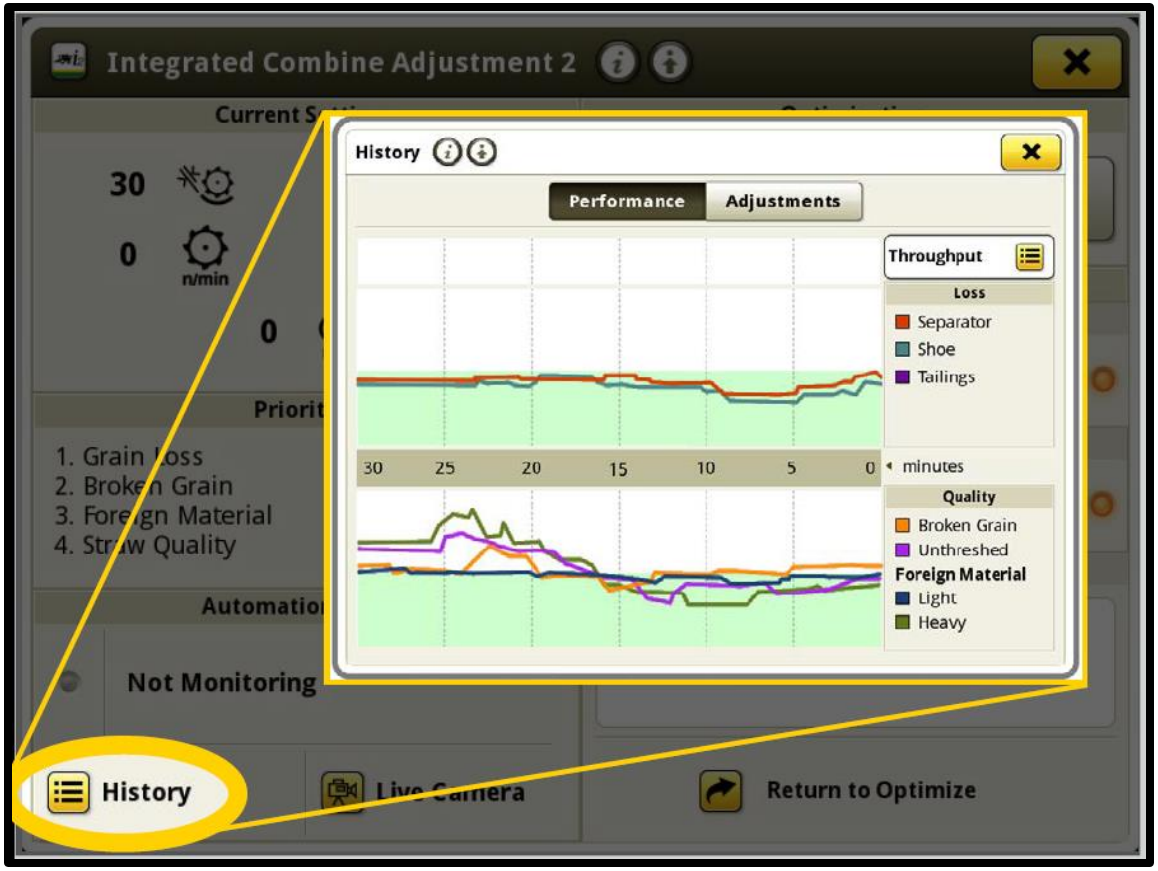


Auto Maintain

- Automatically adjusts settings as conditions change
- Performance maintained with sensing systems including ActiveVision™ Cameras



Auto Maintain

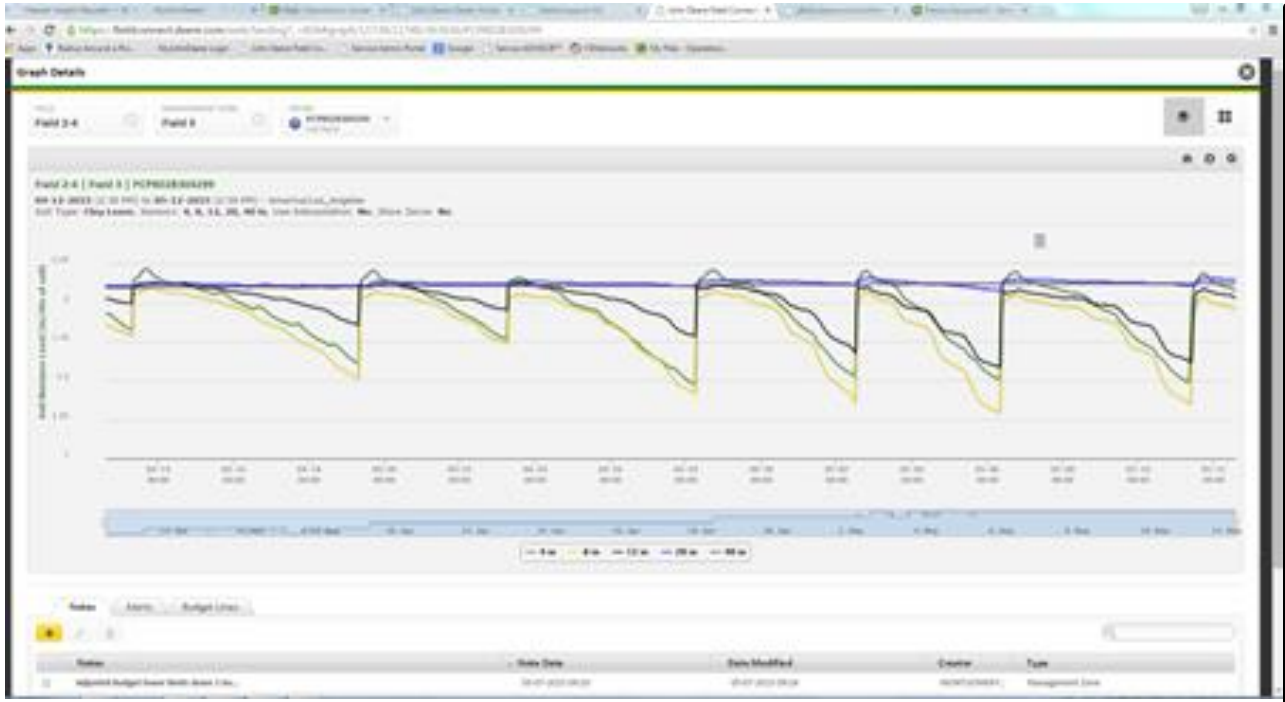


Field Connect

FieldConnect

Base station with sensors & 2 soil moisture probes

- Reduces input costs
- Gives data for water levels during key growing times
- Provides on site data in MyJohnDeere.com

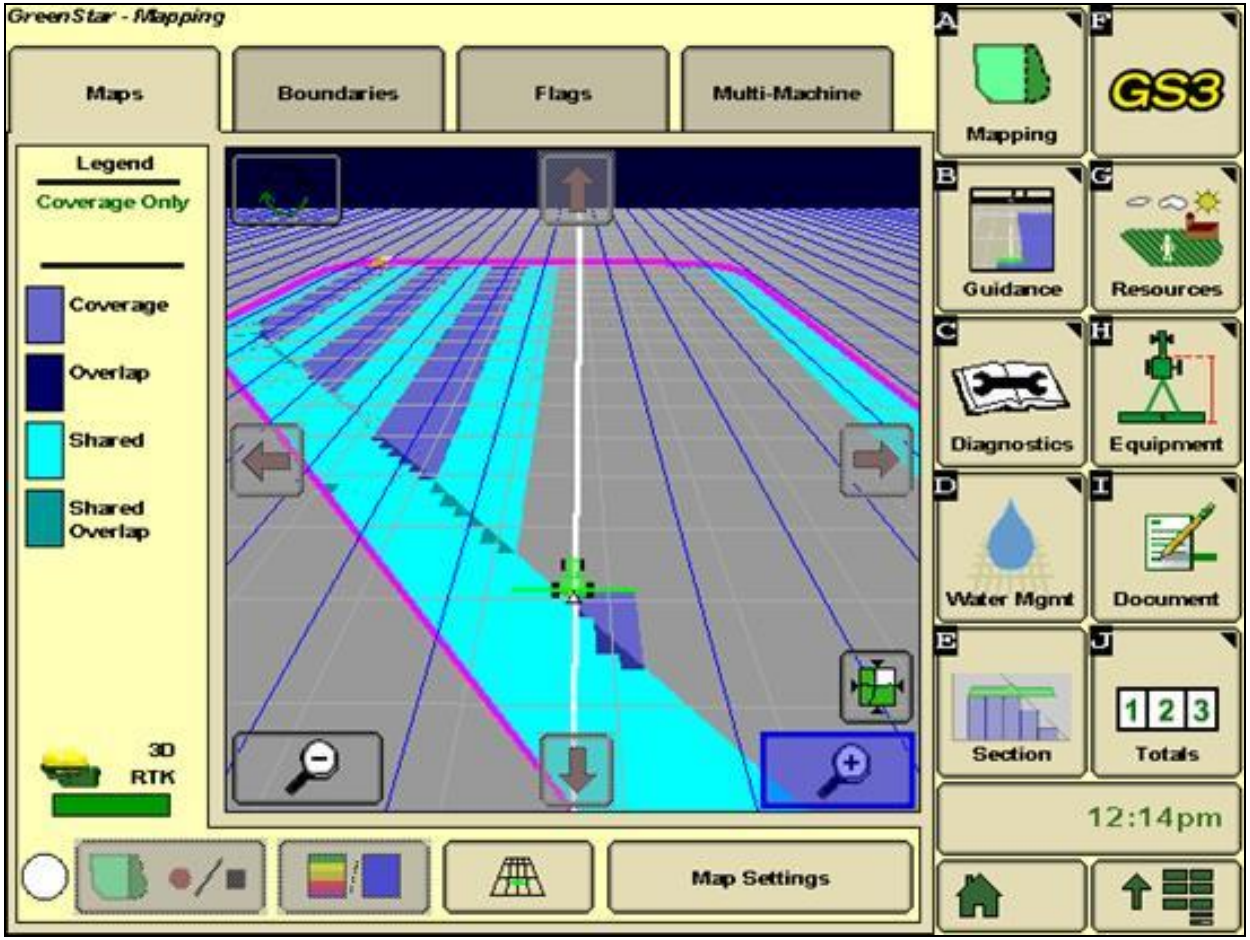


FieldConnect

Base station with sensors:

- Leaf Wetness Sensor: Determines length of moisture on a leaf that can lead to a higher risk of disease
- Temperature Probe: Alert to freezing air temperatures or can monitor soil temperature
- Pyranometer: Helps determine cloudy conditions based on solar radiation which impacts plant growth and development
- Rain Gauge: Besides collect rain data, can also help figure out how much moisture is lost in evaporation
- Weather Station: Collects air temperature, wind speed and direction, and also humidity data

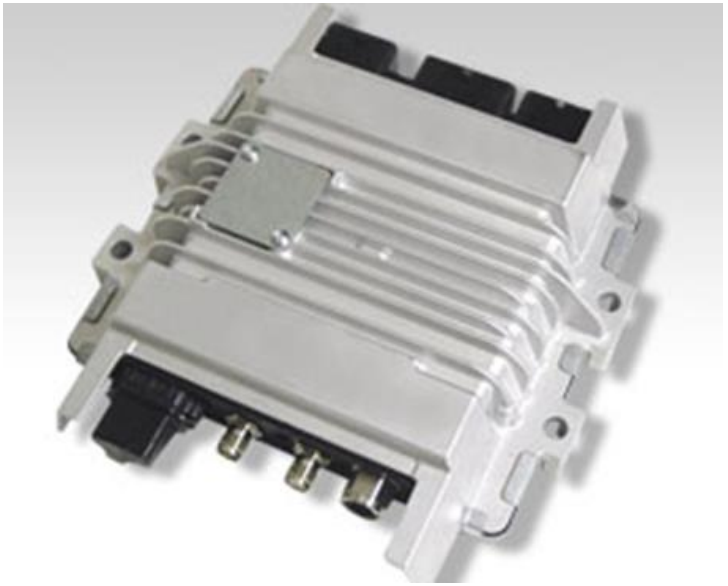
Shared Coverage and Guidance Lines



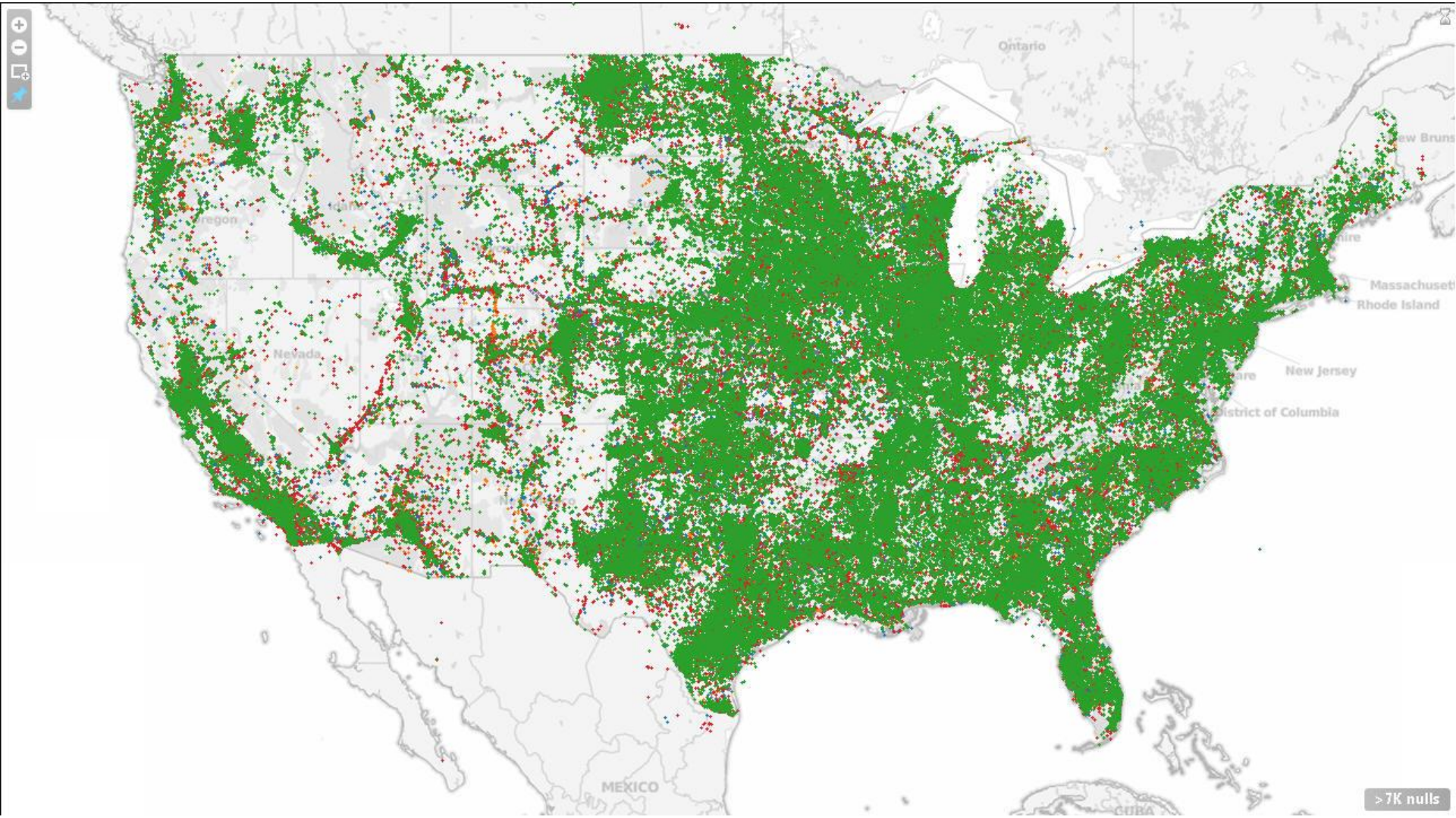
- In order to share coverage and guidance lines each display must be set up on the same:
  - Client
  - Farm
  - Field
  - Task

- To share guidance lines the operator needs to go into the Set Track 0 page and on the bottom of the page is a share guidance lines button
  - This must be done each time a track is shifted because it is not "live" sharing

JDLink Enabled Machines



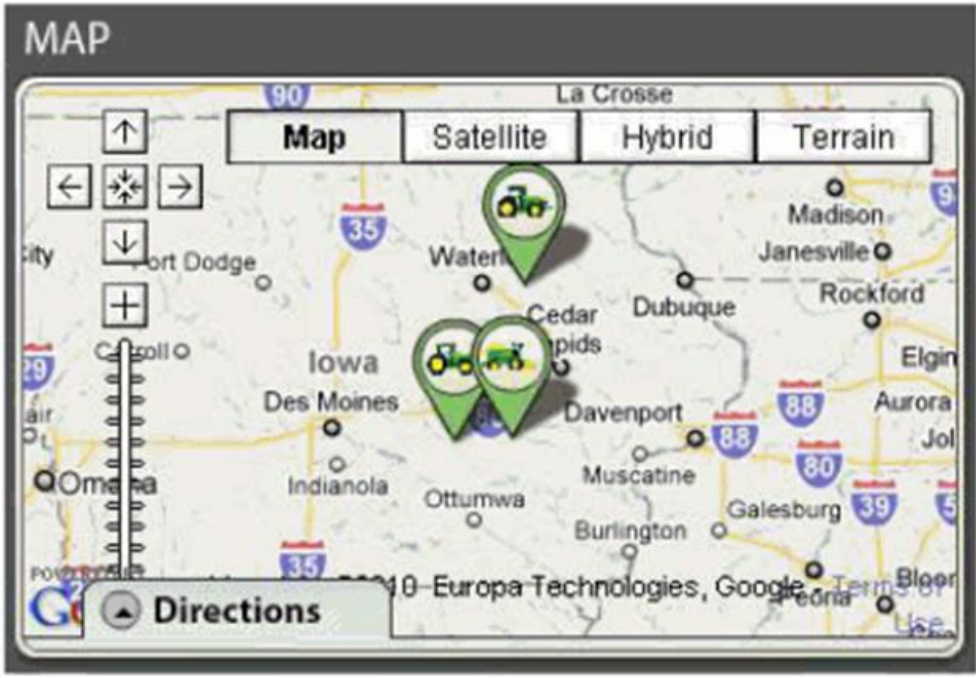
2012 Connected Machine Call-Ins – 100k+ Vehicles



What is JDLink

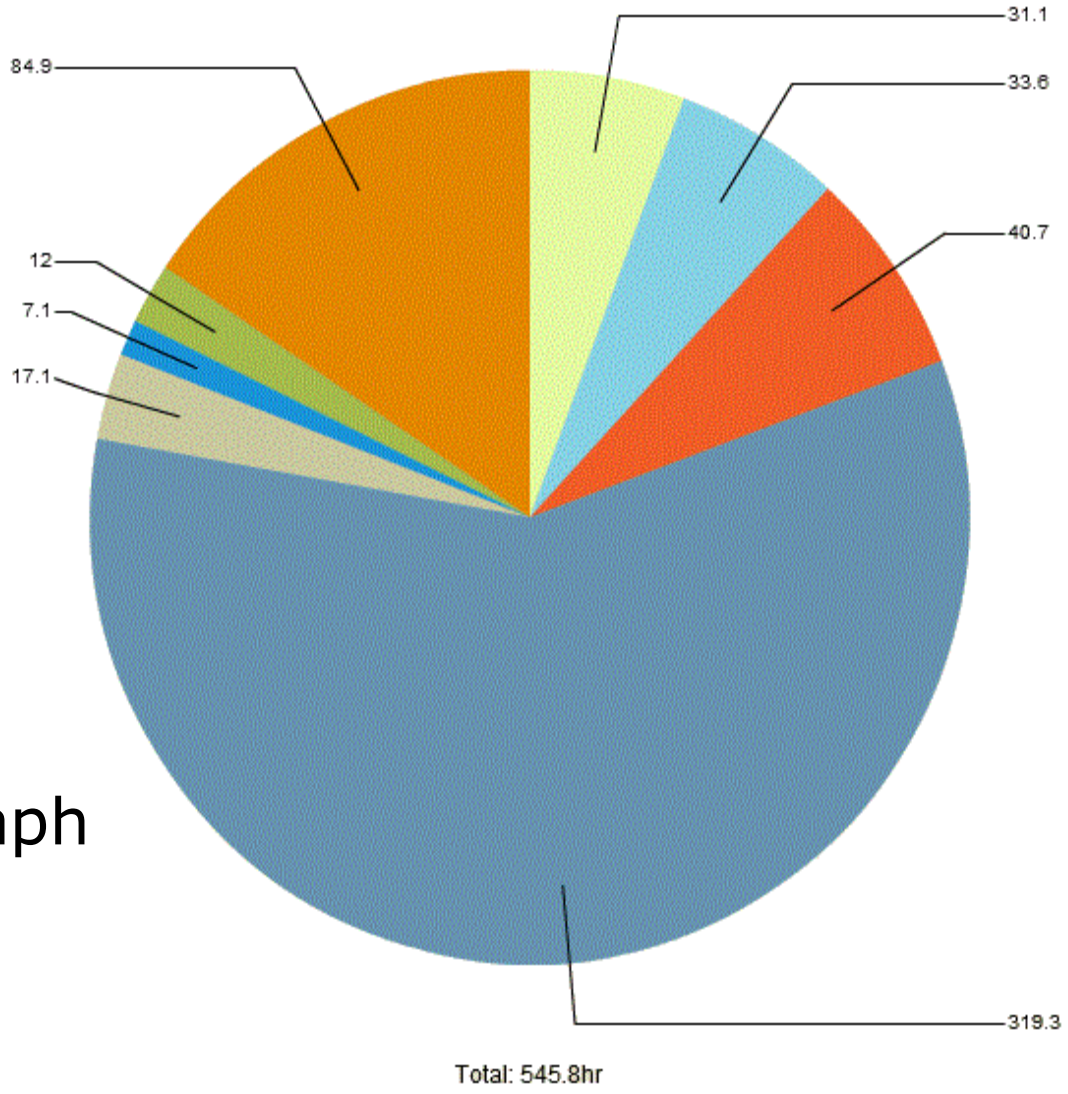
With JDLink, we can monitor Fleet Logistics like:

- Location
- Machine Utilization
- Maintenance Status
- Operator Alerts
- Diagnostic Trouble Codes
- Security
- Current Machine Hours



What is JDLink?

JDLink allows us to:



With a few different graph styles.

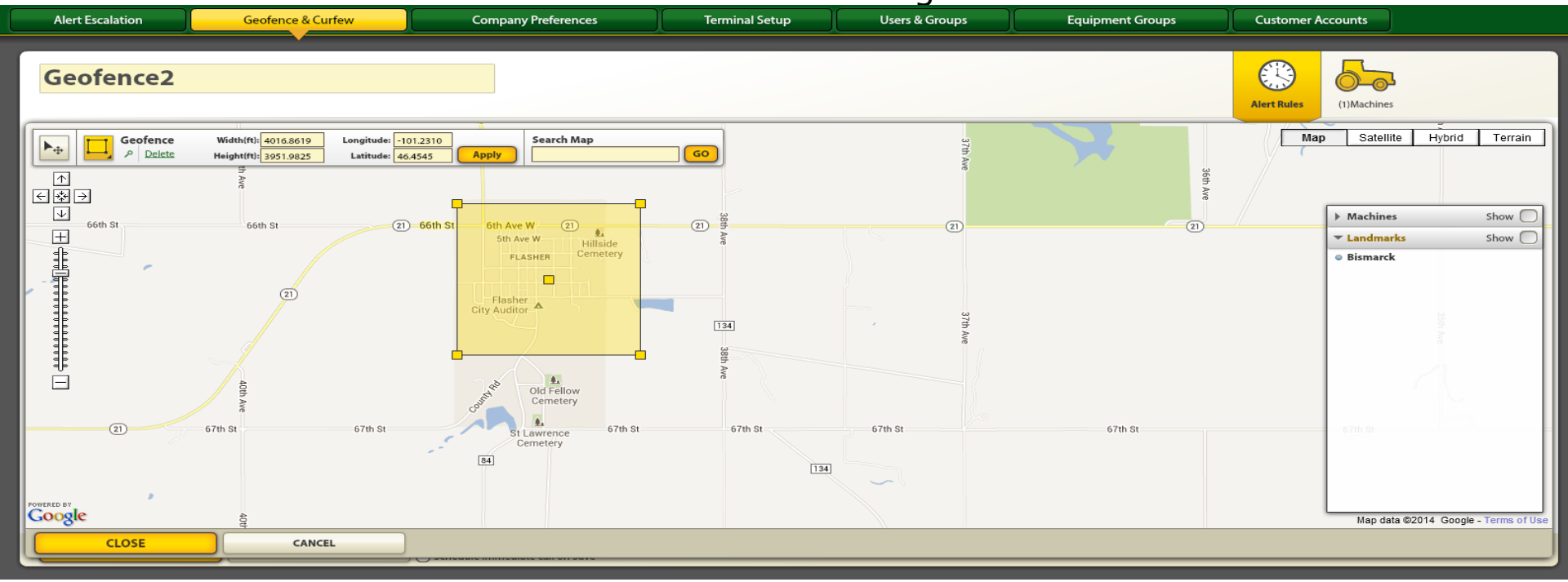
Geofences and Curfews

Geofence

This allows the user to create a virtual boundary. Any time a unit enters or exits the Geofenced area, an alert is sent via text messages or email, whichever is preferred.

Curfew

This can be set for after normal working hours. Alerts can be triggered if a machine is started outside of its normal working hours.



Service ADVISOR Remote

With Service ADVISOR Remote, a technician can:

- Retrieve, clear, and refresh Diagnostic Trouble Codes
- View and start recordings and capture Snapshots
- Record machine data points and set up triggers.
- Remotely Reprogram certified controllers**

Service ADVISOR Remote

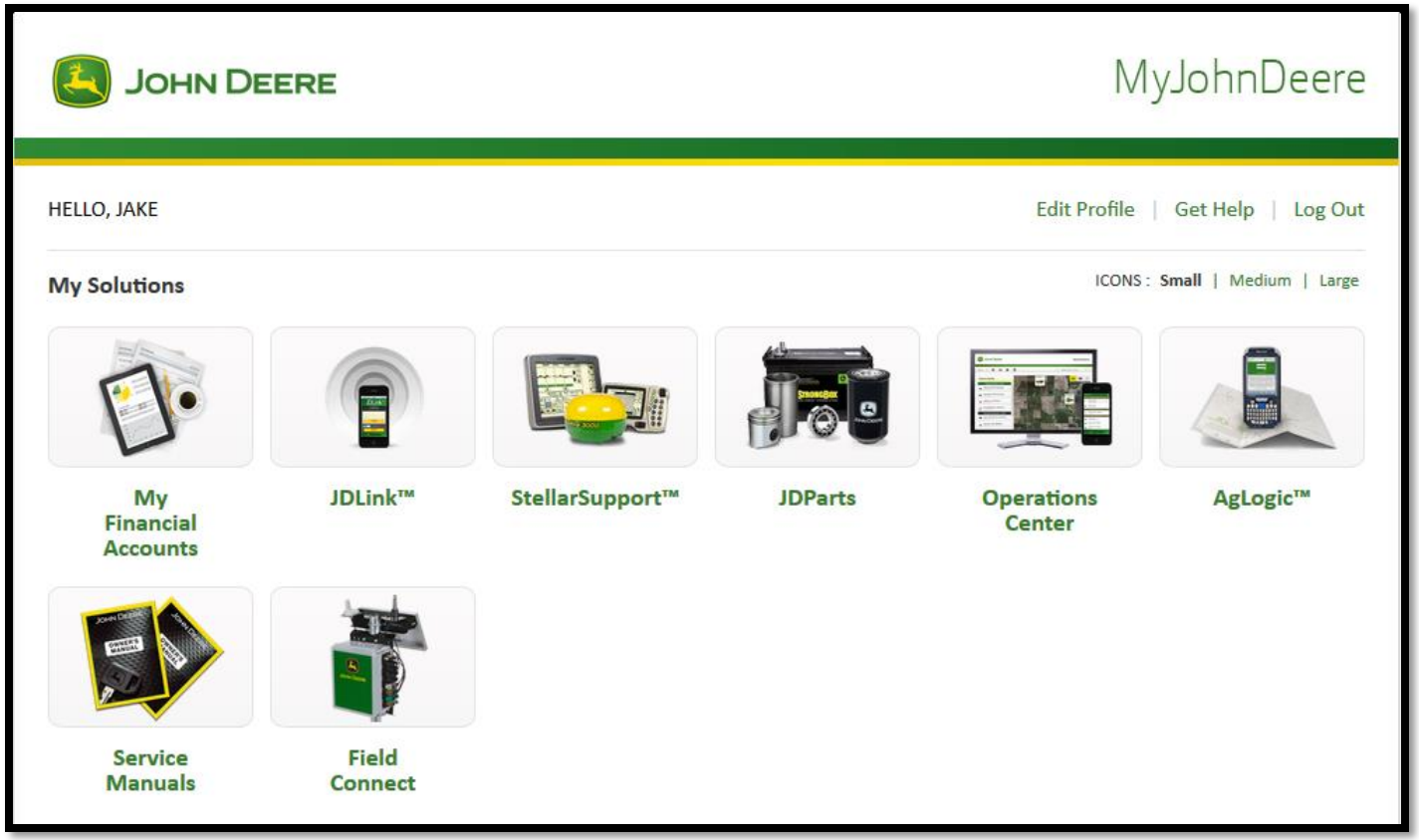
The Potential Benefits of Service ADVISOR Remote include:

- Reducing the need for initial diagnostic trips to the machine
- Helps technicians better predict what tools and parts to take with us on service calls to make us more efficient
- Eliminating Some Reprogramming Service Calls

Mobile Data Transfer

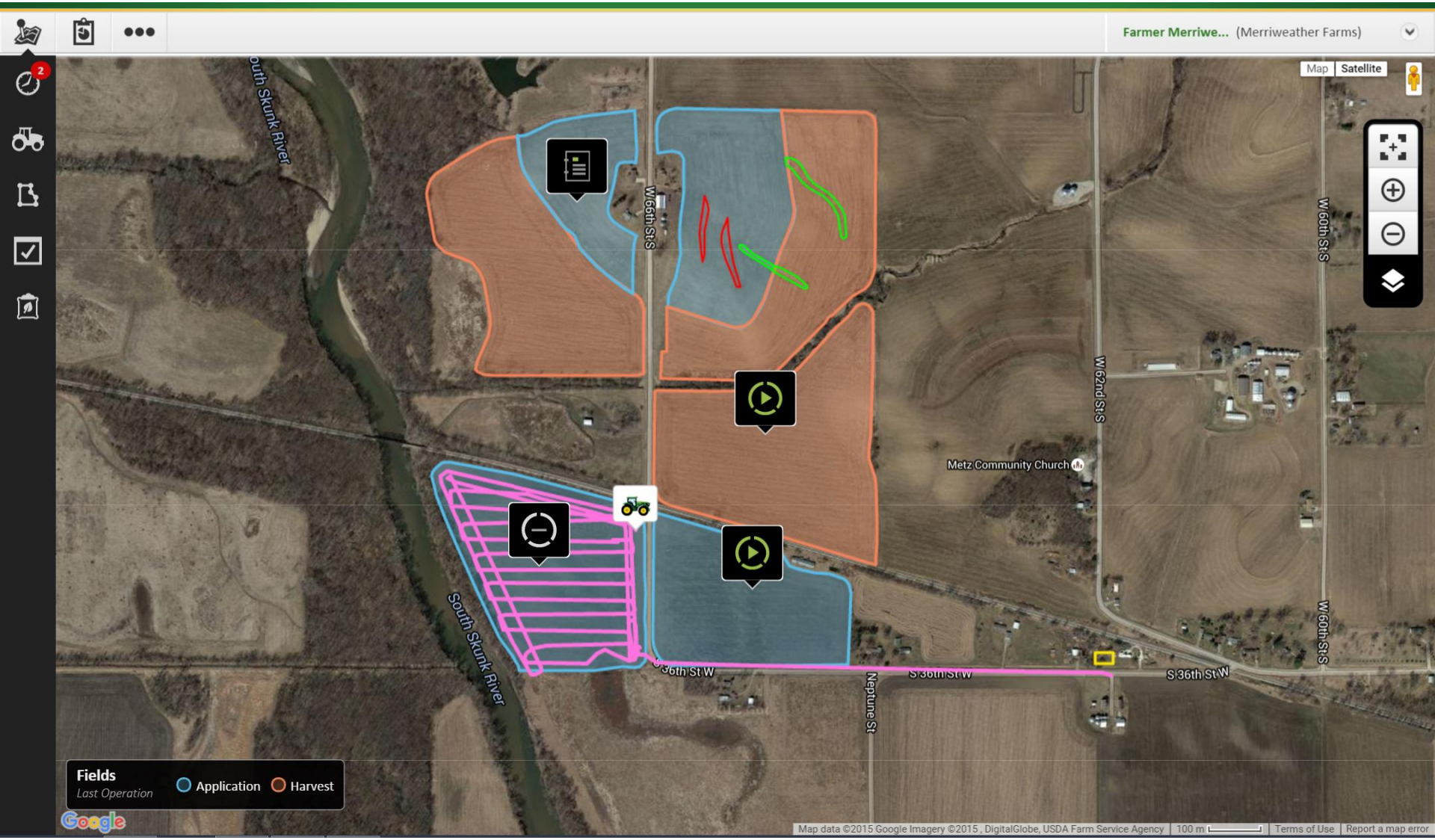
My Transfer App

MyJohnDeere.com



MyJohnDeere.com is the central platform for products and services that will help improve machine uptime, logistics management, and agronomic decisions.

MyJohnDeere.com – Operations Center



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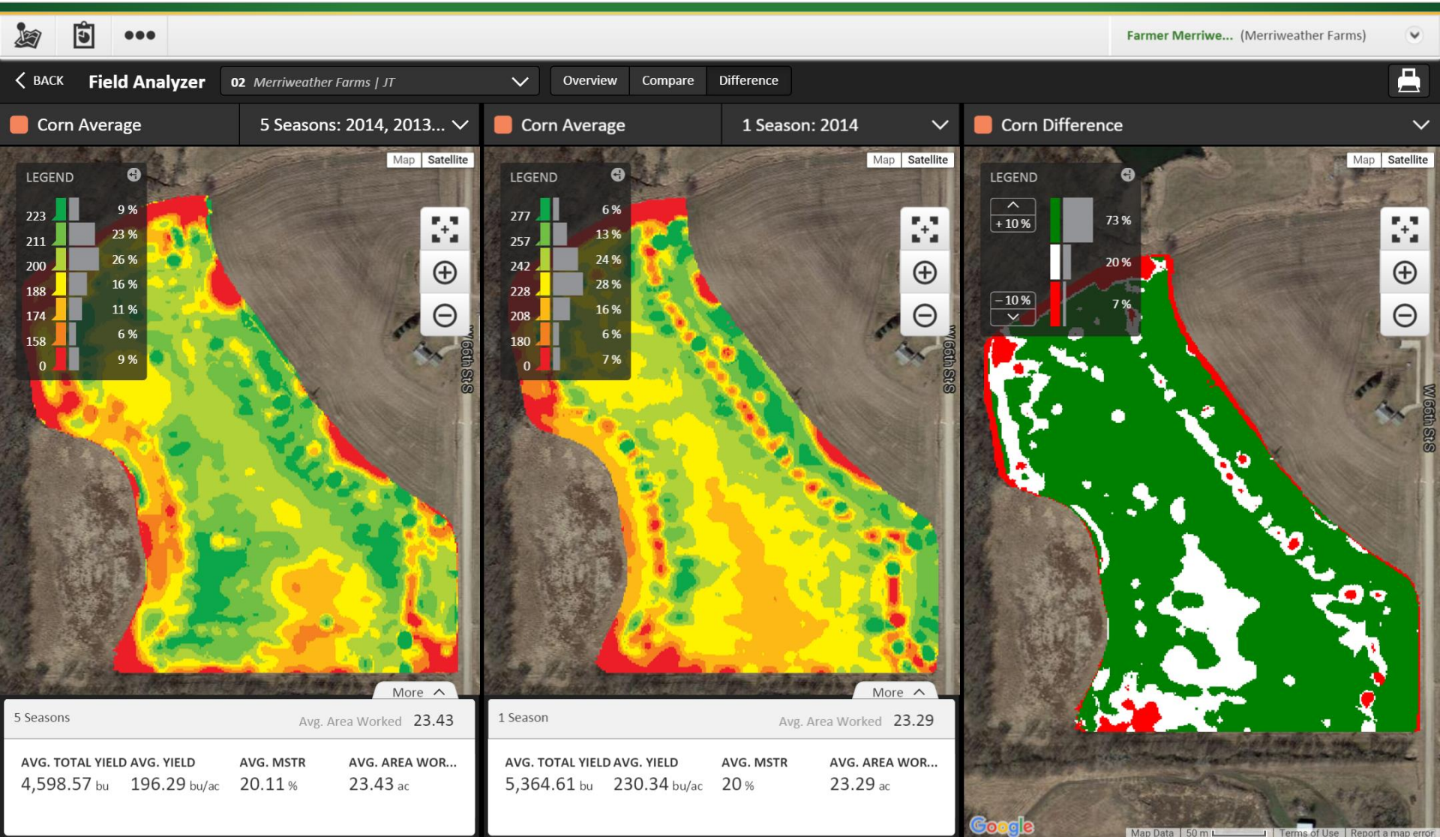

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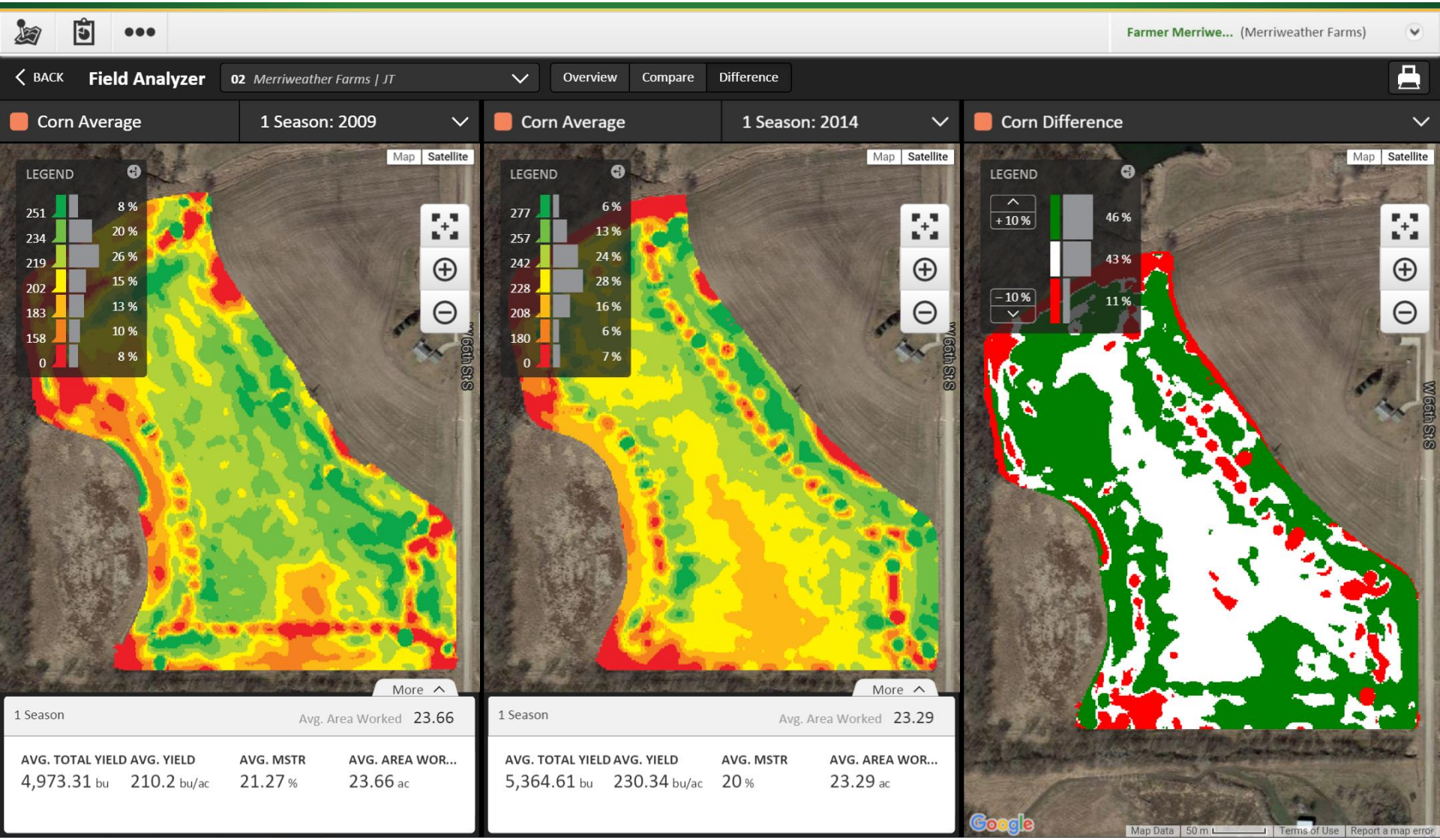

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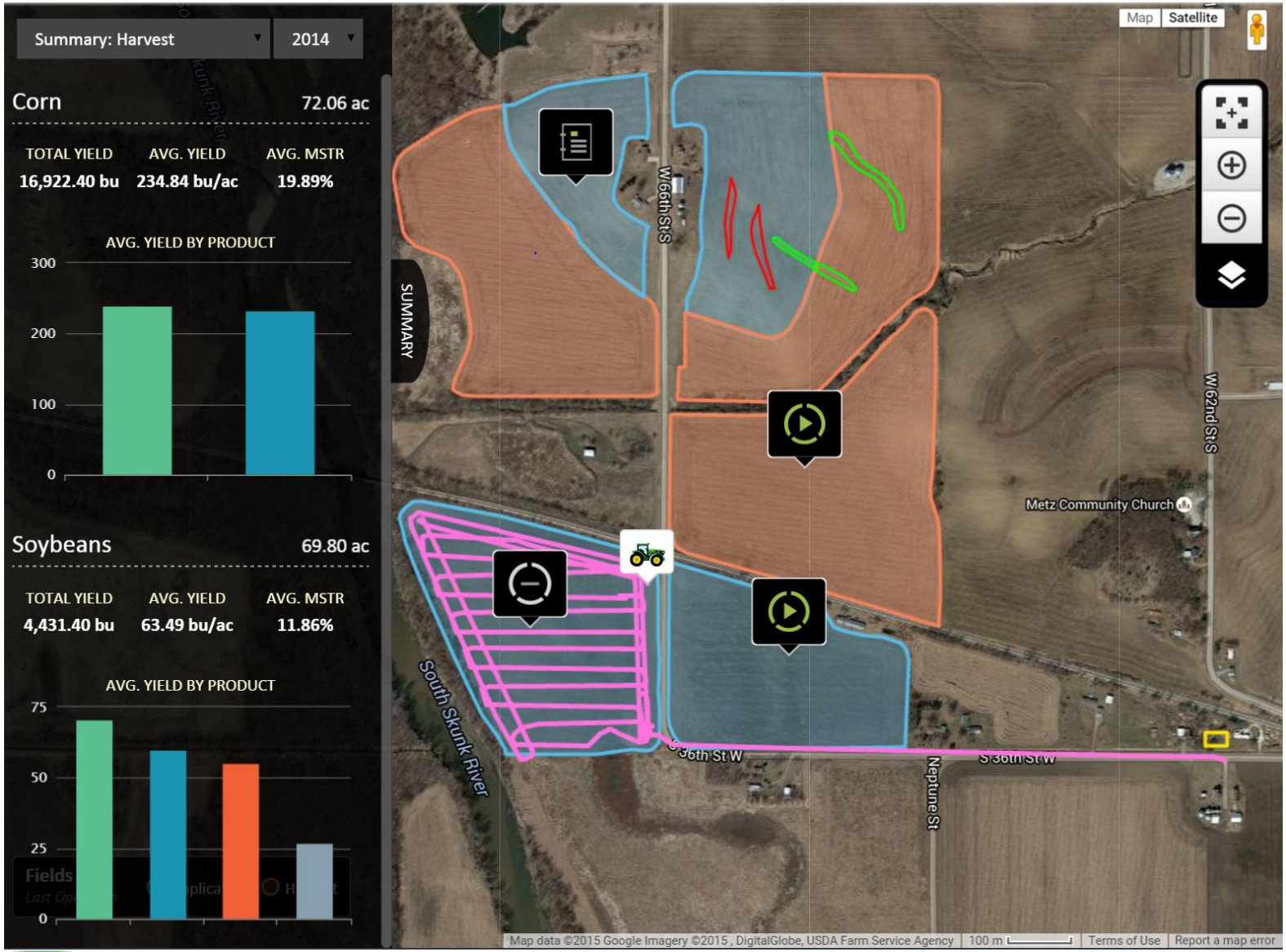

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Questions??

JOHN DEERE

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