

# A View From the Air: An Applicator's Perspective of How Drones Can Benefit Producers

Presenter: Brad Helser

Brad Helser Aerial Applications  
Powered by Agri-Spray Drones



# Topics to cover today

- About me
- How do ag spray drones fit into farming?
- What is an ag spray drone?
- How to setup and use a drone
- Regulations information
- More detailed information
- Q&A Session



# About me



- Entrepreneur from northeast Wisconsin
- Took over family farm and implemented new technologies
- Began using drones to spray my own crops when a tough crop year made it necessary
  - Also spray crops for other producers in my area
- Became a dealer with Agri-Spray after realizing how essential the technology is and running into issues with my own drone

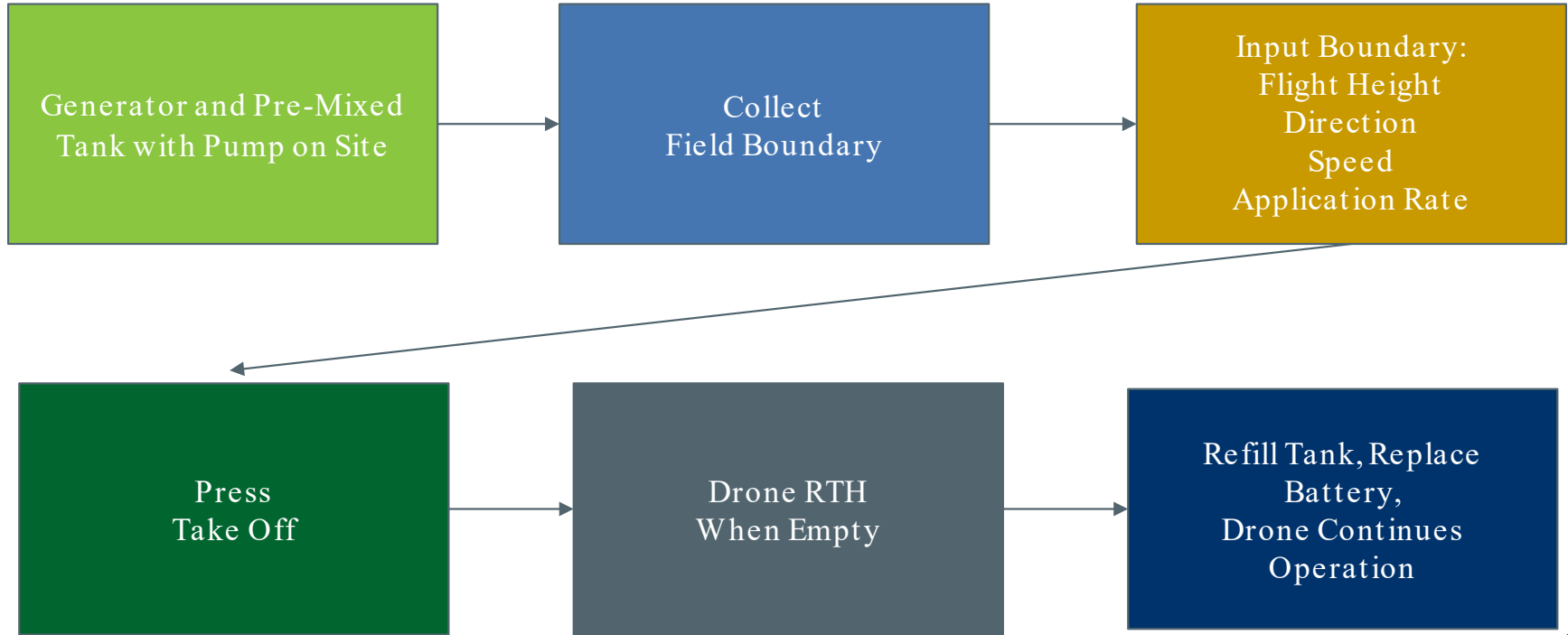


# What is an ag spray drone?

- Unmanned aircraft that can dispense liquid or dry product
- Spraying/spreading system
- GPS/navigation
- RC controller
  - Manual or autonomous flight options
  - Uses radio frequency to communicate with drone
- Software
  - On-demand mapping
  - Variable rating
  - Adjustable droplet size/speed
  - Diagnostics



# Operation/application setup



# Drone rigs & setup

- Truck mounted vs trailer type
- Fresh water tank, mix tank
- Pumps for agitation & dispensing
- Generator large enough for drone chargers, pumps, etc



# Regulations information



- Part 107
  - sUAS (small unmanned aircraft system)
    - Required when flying more than just recreational use
  - Allows operator to fly a drone up to 55 lbs
- 44807 Exemption
  - This allows operator to fly a drone over 55 lbs weight rule
- Part 137
  - 14 CFR Part 137
    - A Federal Aviation Regulation governing agricultural aircraft operations for dispensing substances like pesticides or fertilizers

# Regulations continued..




- N number
  - Unique identifier (like a license plate number)
  - Required for drones over 55 lbs used commercially or by public entities
- Flight & spray records need to be submitted monthly
  - Programs exist to help facilitate this
  - Agri-Spray OPS Center directly integrates with EA Vision remotes to remove manual entry
- With recent changes, FAA plans to audit everyone holding Part 137 within next 2 years

# Creating a spray pattern


- Creates droplets/spray atomization
  - Original technology vs new technology




**J100**  
EAVISION




MICRON TESTING



Small atomizer disc  
with bottom installed  
10 - 150  $\mu$



Small atomizer disc  
with bottom removed  
90 - 500  $\mu$



Large atomizer disc  
with bottom removed  
130 - 620  $\mu$

AGRI SPRAY  
DRONES



## FUNGICIDE STUDY

### DRONE ATOMIZERS VS. NOZZLES

Atomizers tend to produce smaller, more uniform droplet sizes, which makes them a good fit for low-volume applications such as drones. Our results in this first year of testing indicate a slight advantage to the atomizer in this on-farm study.

#### 2025 RESULTS - LEWISTOWN, IL

RT TREATMENTS	APPLICATION TYPE	PERCENT MOISTURE	BU./A.	BU./A. DIFFERENCE	RETURN ON INVESTMENT
Control: No Fungicide	--	13.8	243.6	--	--
14 oz. Atticus Aquila XL™	Atomizers (24% Speed)	14.8	267.7	+24.1	+\$100.50
	Nozzles (XR 11006 Flat Fans)	14.8	265.1	+21.5	+\$89.01

Corn \$4.42/Bu. Atticus Aquila XL™ \$55.00/gal. These results are based on the disclosed study parameters and participating sites.

Disease Pressure: Heavy (Southern Rust), Light (NCLB & Tar Spot)





Lower ← Drift Potential → Higher

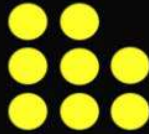
ASABE S572.1 Droplet Size Classification

Coarse



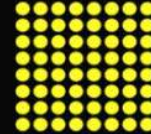
400 μm

Medium



250 μm

Fine



125 μm

Very Fine



≤80 μm

Number of droplets and their diameters of equal liquid volume



Weeds

Coarse sprays are used with systemic, residual and soil-applied herbicides. Better protection against drift.



Fungi, Pests & Weeds

Medium sprays are the most widely used. Systemic-acting fungicides, insecticides & herbicides



Fungi, Pests & Weeds

Fine sprays provide enhanced retention for directed spraying on the target incl. foliar-acting weed control, contact-acting fungicides & insecticides



As Required

Generally used as an exception due to high likelihood of drift\*

Typical Applications

# Ways to mitigate drift

- Selecting the correct adjuvant
  - Knowing the product you're spraying
- Specific time of day for application considering weather patterns
- Temperature inversions
- Using the right micron setting while still achieving coverage
- Direction in which you fly the drone



# Important aspects of setup

- Clear communication with farmer
- Knowing the product you're spraying
- Accurate map
  - Boundary lines
  - Waterways
  - Acreage



# JT50 DEMO



# Fungicide application

- Know your target pest
  - Some products do a better job on certain pests
- Read the product label and understand the effective rates
- If and or when adding micro-nutrients, know the mix compatibility
  - Some micros don't mix well
  - Avoid pre-mixing batches containing micros too far in advance







# FUNGICIDE APPLICATION STUDY

## GROUND VS. DRONE

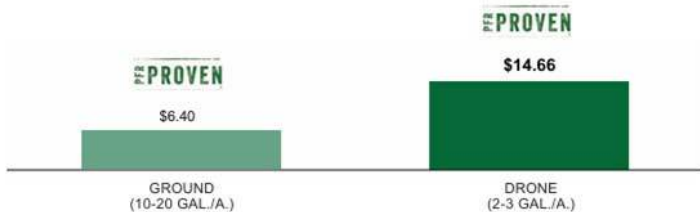
This was the first year we experienced heavy disease pressure in our on-farm spray trials, and we suspected that the drone might not perform as well under those conditions. The Central Illinois farms experienced heavy pressure, and the drone applications performed well. After three years of large-scale on-farm testing, our results lead us to conclude that if you have to make a foliar application, there are multiple good ways to do so, and a drone is one of those PFR Proven™ methods.

### 2025 MULTI-LOCATION RESULTS

RT TREATMENTS	APPLICATION METHOD & CARRIER RATE	PERCENT MOISTURE	Bu./A.	Bu./A. DIFFERENCE	RETURN ON INVESTMENT
Control: No Fungicide	--	21.4	227.3	--	--
Fungicide	Ground (10-20 gal./A.)	22.1	235.2	+7.9	+\$9.14
	Drone (2-3 gal./A.)	22.2	236.9	+9.6	+\$16.65

Corn \$4.42/Bu. Fungicide Cost \$25.78/A. These results are based on the disclosed study parameters and participating sites.

### 3-YEAR MULTI-LOCATION FUNGICIDE APPLICATION - GROUND VS. DRONE RETURN ON INVESTMENT



### 2025 DISEASE PRESSURE

	GREY LEAF SPOT	NORTHERN CORN LEAF BLIGHT	SOUTHERN RUST	TAR SPOT
INDIANA	Moderate	--	Moderate	--
C. ILLINOIS	Light	Light	Heavy	Heavy
OHIO	Light	Light	--	Light
ON-FARM	--	--	Heavy	Heavy

PARTICIPATING SITES



# 2024 PTI Results

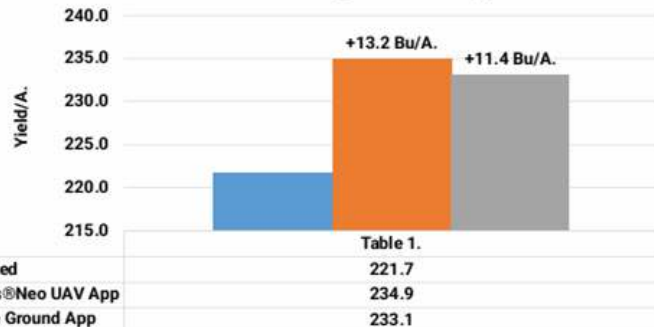
## Fungicide Ground vs. UAV Spray Application Study Continued

**Results:** Table 1. illustrates that VT foliar applications of Miravis®Neo resulted in yield gains of +11.4 to +13.2 Bu/A. The Hagie® high clearance sprayer and the T50 spray UAV yielding resulted in similar performance, with the UAV tallying higher yields of +1.8 Bu/A. and +\$7.34/A. additional return.

In our 4th year of evaluating spray UAV applications, it does appear that this technology is an effective method to apply crop protection products, in regard to control. In 2021, the spray UAV applications resulted in +4.5 Bu/A. yield gains with additional revenue of +\$22.50/A. and 2022 offered +1.3 Bu/A. yield gains and +\$7.20/A. additional revenue. (4-yr avg= +2.6 Bu/A., +\$12.05/A.)

Advantages to UAV technology include precise application due to downward propeller air movement, low carrier rates, the absence of ground or soil engagement, and the ability to spray in fields with topography challenges. Disadvantages include flight time duration, tank capacity, battery charge, and insurance/licensing. UAV supplied by Truss Services LLS. located in Bucyrus, OH.

### 2024 Ground vs UAV Corn Fungicide Study: Yield



# Chemical product compatibility

- Products should be labeled for aerial use
- Most drones utilize a mesh filter
  - Some products can cause plugging issues after being mixed with other products and solidifying
- All new recipes should undergo a jar test to ensure product compatibility



# Foliar feeding

- Drones are an excellent choice for mid year foliar feeding
- Low rate application
- Droplet sizing adjustable per product
- EAVision is capable of creating a variable rate map
  - This is done third party at the moment
  - In the future, VR recs can be made on EAVision CRM

# Water quality

- Check water pH before mixing chemical
- Chemicals half-life with poor water quality
- Know what chemicals you are spraying
  - Different chemicals require different pH values



# SPRAY TANK pH CAB CARD

## Crop Protection & Adjuvant Compatibility

Product / Mix	Target pH	Field Notes
Glyphosate	4.5 – 5.5	Improves uptake; reduces Ca/Mg tieup. AMS still required.
Glufosinate (Liberty)	5.5 – 6.5	Too acidic hurts activity. Avoid <5.0.
2,4-D (Amine)	6.0 – 7.0	Stable; heavy acidification provides no benefit.
2,4-D (Ester)	5.0 – 6.0	Slight acidity improves penetration.
Dicamba (Xtend)	5.0 – 6.0	Buffers only. Do NOT aggressively acidify.
Clethodim	4.0 – 5.0	Extremely pH sensitive. High pH rapidly degrades activity.
Most Fungicides	5.5 – 6.5	Prevents alkaline hydrolysis.
Most Insecticides	5.0 – 6.5	Pyrethroids & OPs degrade above pH 7.
Biologicals / Enzymes	6.0 – 7.0	Low pH can damage living organisms.

## CRITICAL MIX RULES

- Clethodim present? Target pH 4.5–5.0.
- Dicamba systems: buffers only; follow label language exactly.
- Glyphosate + Liberty: compromise pH ~5.5.
- Water pH >7.5 greatly reduces performance without conditioning.

## WATER CONDITIONING ORDER

- 1) AMS / Hardness Conditioner
- 2) Buffer or pH Manager
- 3) Herbicides
- 4) Fungicides / Insecticides
- 5) Adjuvants (NIS / MSO / Drift Agents)

## RULE OF THUMB

- Herbicide heavy load: pH 5.0–5.5
- Fungicide / insecticide load: pH ~6.0
- Dicamba: label defined buffer zone only

# High pH can reduce pesticide activity

NC State • Emily Mueller, Tom Bowman, Wayne Buhler

Pesticide Activity (Half-Life)			
Product	pH 5 Acidic	pH 7 Neutral	pH 9 Basic
Herbicide	16 days	17 hours	10 minutes
Fungicide	10 hours	3 hours	2 minutes
Insecticide	Stable	10 days	24 hours



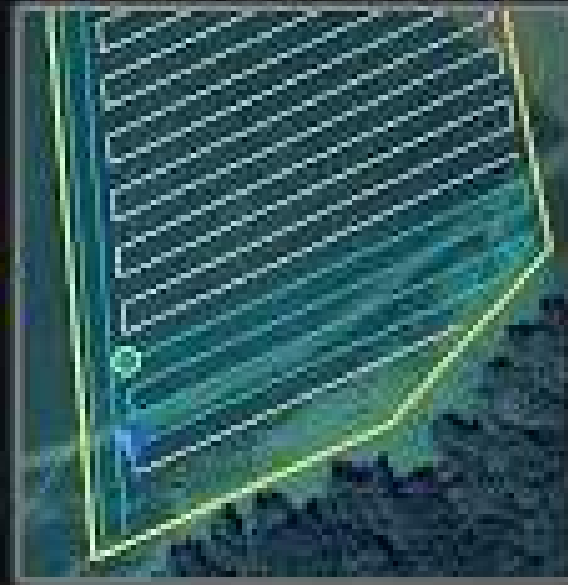
# Good vs Bad application

- A lot of factors in the initial setup determine a good or bad application outcome
- Knowledge of the chemical(s) being applied
- Type of drone being used
- The 4 Rs
  - Right droplet size
  - Right adjuvant used
  - Right canopy height
  - Right swath width for the drone
    - **This is key, each drone & chemical is different**

**THIS**



**THIS**



**WHILE FLYING**

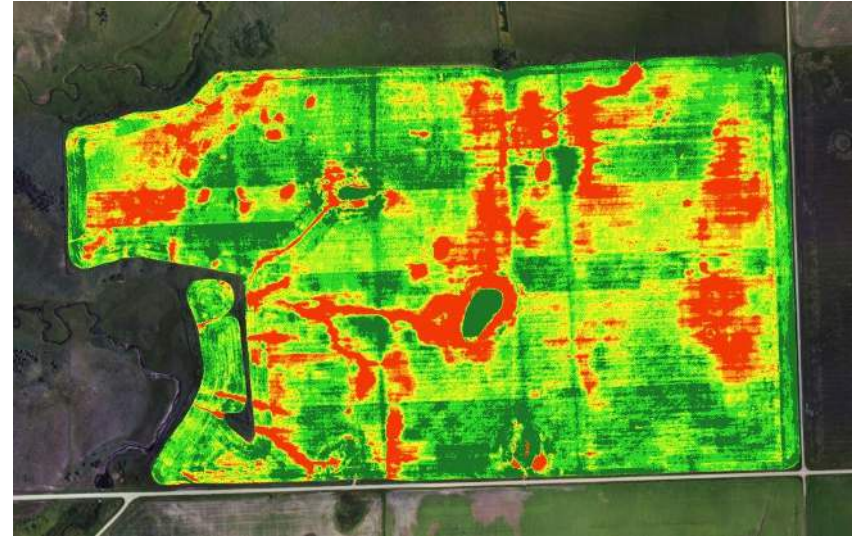
# Dry spreading

- Some drones have the capability of dry spreading
- Spray tank is removed and spreading system is installed
  - Hoses are detached, atomizers stay on the arms
  - Drone spreads product from center
- Typically utilized for:
  - Dry fertilizers
  - Cover crops
  - Anything granular



# Other uses for drones in agriculture

- Thermal drones
  - Drought assessment
  - Detailed land maps
  - Pest & disease management

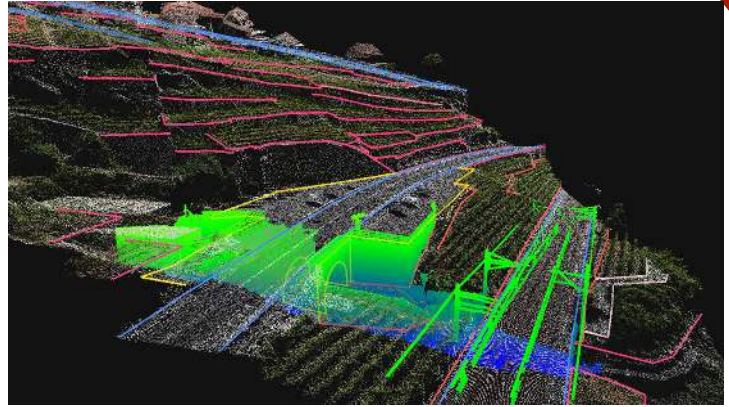


# Variable rating with a drone

- When would you use variable rating?
  - Micro-nutrient management
  - Dry spreading fertilizer
- EAVision is the first of it's kind to variable rate with a drone
- Achieved by creating a variable rate map
  - Consist of zones with low and high spray rates
  - As of now, this is done by a 3rd party company
  - EAVision is creating it's own VR program

# Drone efficiency

- J150 capable of 60 acres/hour
  - Flying at 30 mph
  - 35 foot swath
- Full terrain following
- Obstacle avoidance plays a big role in efficiency
  - J70 & J150 utilize lidar detection
  - Within the next year, drones will utilize AI for obstacle recognition
    - This will allow faster, more consistent flying on fields over time as the flights will be saved



# ROI

- Cost of owning a drone, is it worth it?
- Average drone application cost is \$17
- Application window and timing
- Loss of revenue due to bad timing
- Spraying at the right time of day





CUSTOM APPLICATION,  
DRONE SALES &  
SERVICE

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Local Agri-Spray dealer specializing in custom applying. Contact me for more info!

# Questions?

Thank you for  
your time!