

# Advances in Hort Sprayer Technology

*or "what have you done for me lately?"*

"Drift: a ground-breaking advancement in multi-row applications" 😊

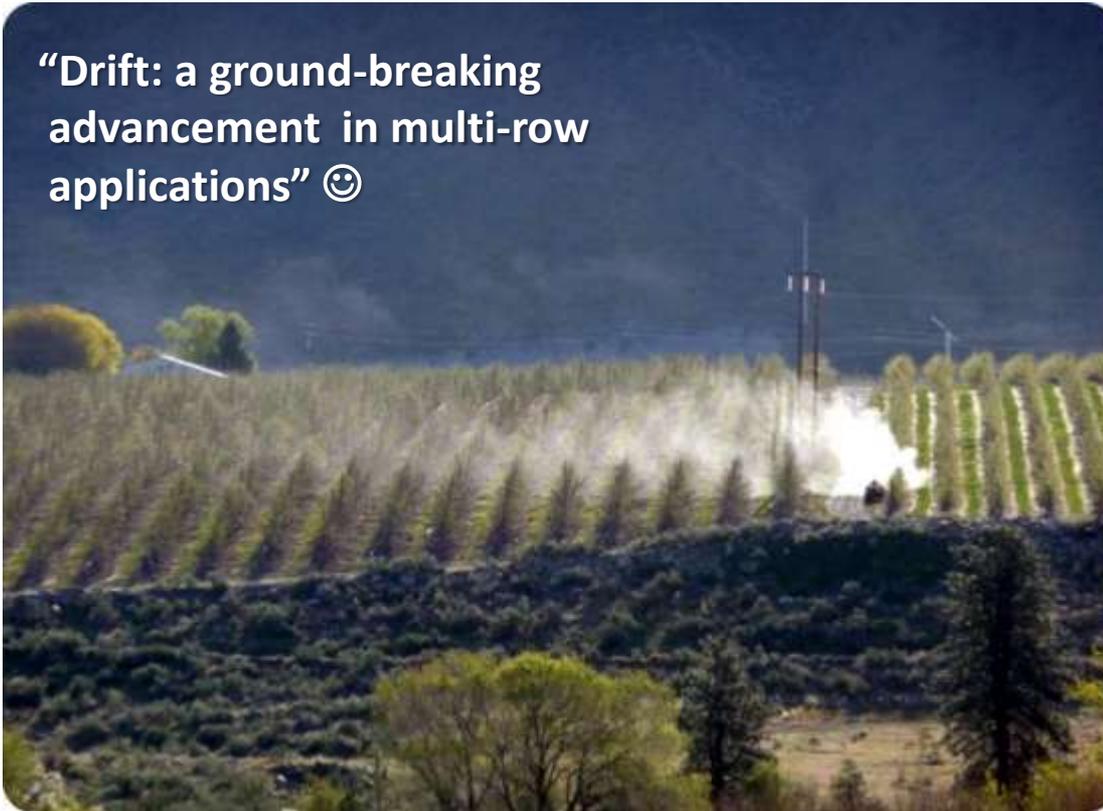


Photo courtesy of Gail Amos and David Zamora



**Dr. Jason Deveau**  
**Application Technology Specialist**  
**OMAFRA, Simcoe, 2014**



Shameless Promotional Slide



Jason Deveau  
@ spray\_guy



- Working to reduce pesticide wastage and off-target contamination
- Developing methods to spray crops consistently
- Developing educational resources for sprayer operators



# defining sprayer advancements

**Technologies:** Equipment or chemistries that make spraying safer, easier, more efficient or more effective

**Methods:** Techniques to improve a spray application (*or a sprayer operator*)

**Regulations:** Company, municipal or federal rules that positively impact spray applications

**So, sprayer advancements are not *just* nifty gadgets.**

**..but they're fun,  
so I'll show  
you a lot  
of them!**



# Pentair HyPro's Dual Reflex

- **The dual body has a manual turret, but the operator can switch between the two tips from the cab**
- **e.g. from fertilizer to fungicide, from conventional flat fan to air induced or to dual asymmetrical fans**



# Pattern-Master brushes

- **Brushes mounted in front of the nozzle cut apparent windspeed, retaining many of the small droplets lost to wind and preserving the finer portion of the spray pattern**

**Winner of the ASABE  
AE50 Award for 2015**

**Pattern Master Brushes  
on the boom  
- *photo by Dean Scott***



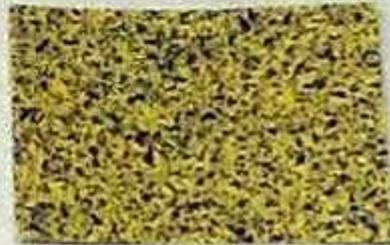
12.3 MPH

8006 Flat Fan Tips

15gPA

20gPA

Brush



Brush

No

Brush



no

Brush

**Pattern Master Brushes in action**  
*- by Dean Scott*

# “New” herbicides are coming...



- **Our old friends dicamba and 2,4-D are volatile actives now chelated to salts like a balloon to an anchor. Even if vapour drift has been addressed, particle drift is still a concern...**

**DICAMBA  
UNDILUTED**



# auto-level boom systems

- **How do you keep a 120 foot boom at 20 inches at 25 mph?**

- **Slow down, drive on level ground and use auto-adjust**



# Agritronics' LED-illuminated booms



- Drivers can see the boom clearly during transport and the operator can assess tip patterns in poor light

# Pentair HyPro Express end bodies

- **Faster shut-off valve operation, act as air aspirators and eliminate “dead zones” that retain pesticide during cleanout**



# Peek-A-Boom remote boom control

- **After-market remote control to turn boom sections on-or-off from outside the cab. Perform timed-output tests safely and with ease**
- **Deere and others offer similar systems to open and close boom sections**



# the SpotOn



- **This calibration tool from Innoquest Inc. is much better than the classic pitcher & stopwatch approach**
- **+/- 2% accuracy and it will gauge a hollow cone's output (US G/min, L/min or Oz/min) in ~15 sec**

# airblast sprayers evolved

- **We've come a long way since this c.1910 Ontario orchard crew**
- **BUT, there haven't been many advancements in Canada's airblast fleet until recently.**



...poor horse

# moulded tips on airblast

- **Moulded tips are bright, colour-coded, fool-proof and last longer than disc-core... but don't have high rates (I've asked TeeJet why)**
- **Air induction tips, for example, create coarser droplets that resist drift and move more reliably when spraying high up but be careful - they produce fewer droplets**



You *may* have to change nozzle bodies, and sometimes that's tough...

# moulded tips on airblast



- TeeJet AITX



- TeeJet TXR  
low-profile  
cone



- Albuz 60  
degree cone



- Albuz low-  
Profile cone

# H.S.S. Hol sprayer



**Flexible ducts and a gantry comprise the tower**

# H.S.S. Hol sprayer



**Each duct is paired to a nozzle body,  
including the option woolly apple aphid attachment**

# H.S.S. Hol sprayer



**Adjustable, offset double axle distributes weight and reduces ruts**

# H.S.S. Hol sprayer



**Access port separate from fill basket (operator safety during inspection)**

# H.S.S. Hol sprayer



**150 L clean water tank supplies water to onboard tank rinse system**

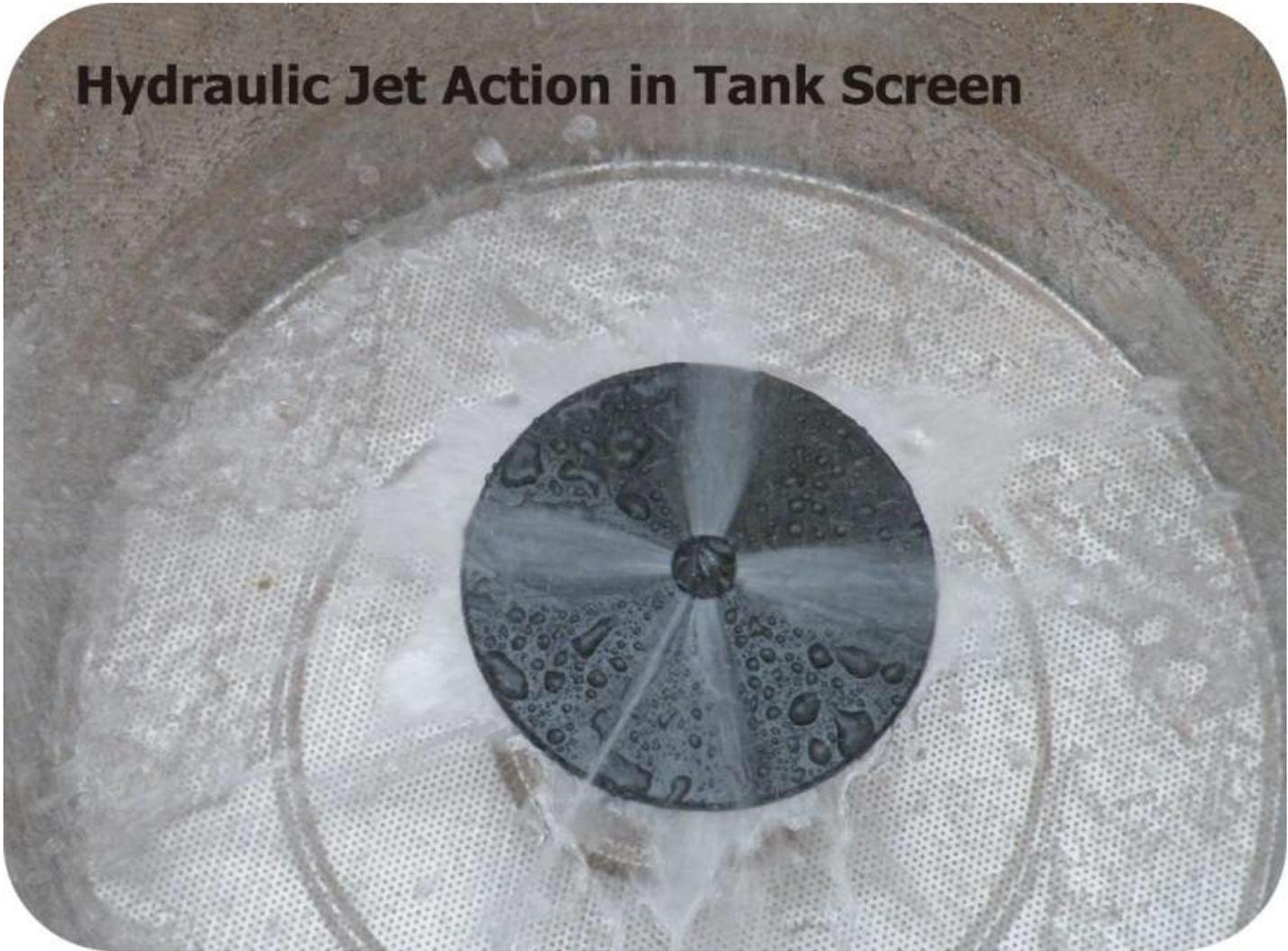
# H.S.S. Hol sprayer



**SS hydraulic tank screen and (optional) tank level sensor**

# H.S.S. Hol sprayer

**Hydraulic Jet Action in Tank Screen**



**Hydraulic jet breaks up pesticide without a slurry**

# H.S.S. Hol sprayer



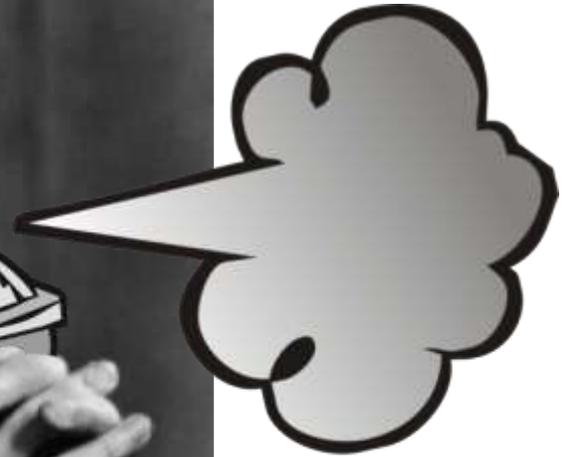
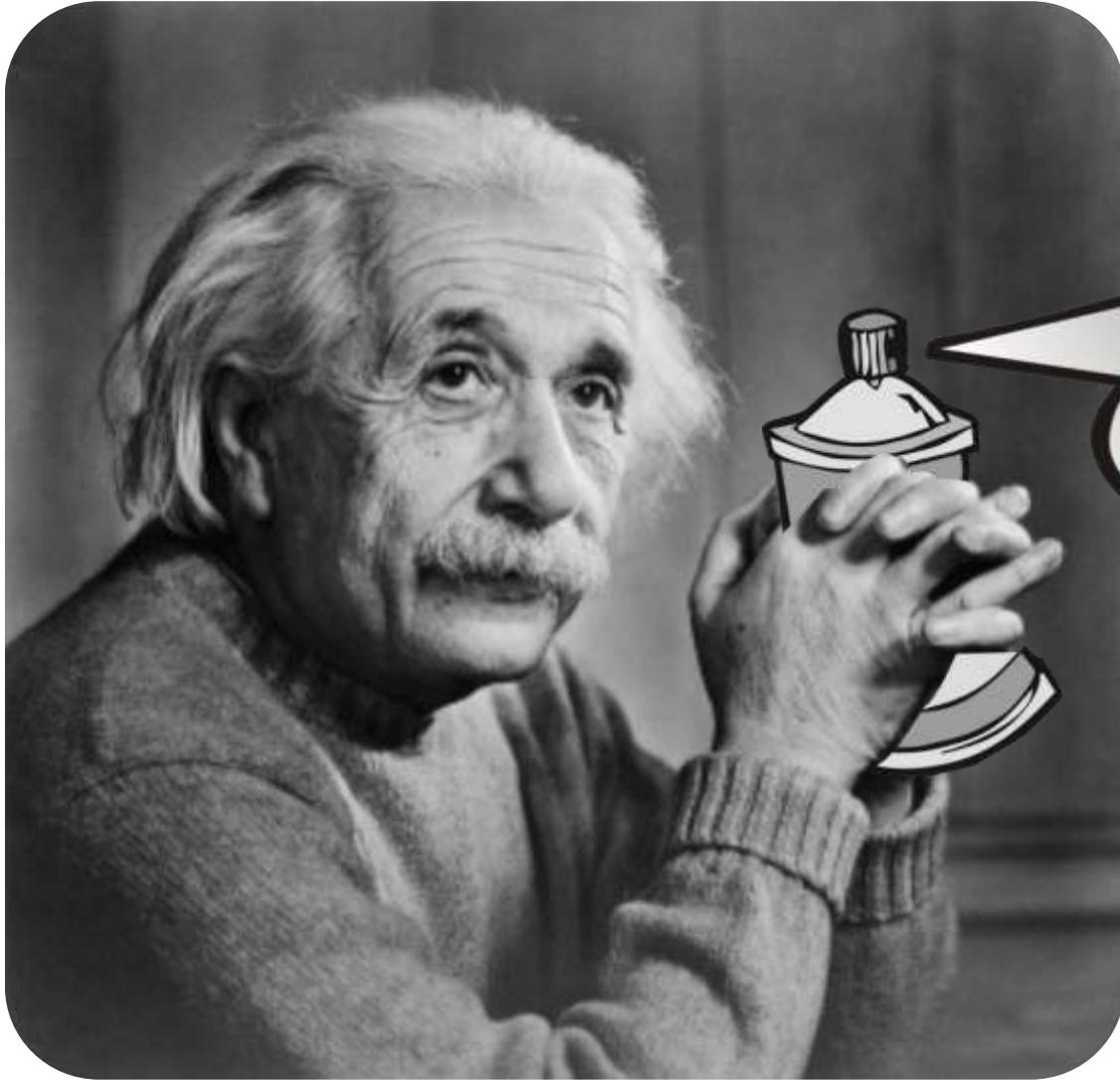
**Clean water source for handwash**

Stretch out with  
your feelings,  
young Padewan

The force is strong  
with this sprayer...



# the Intelligent Sprayer



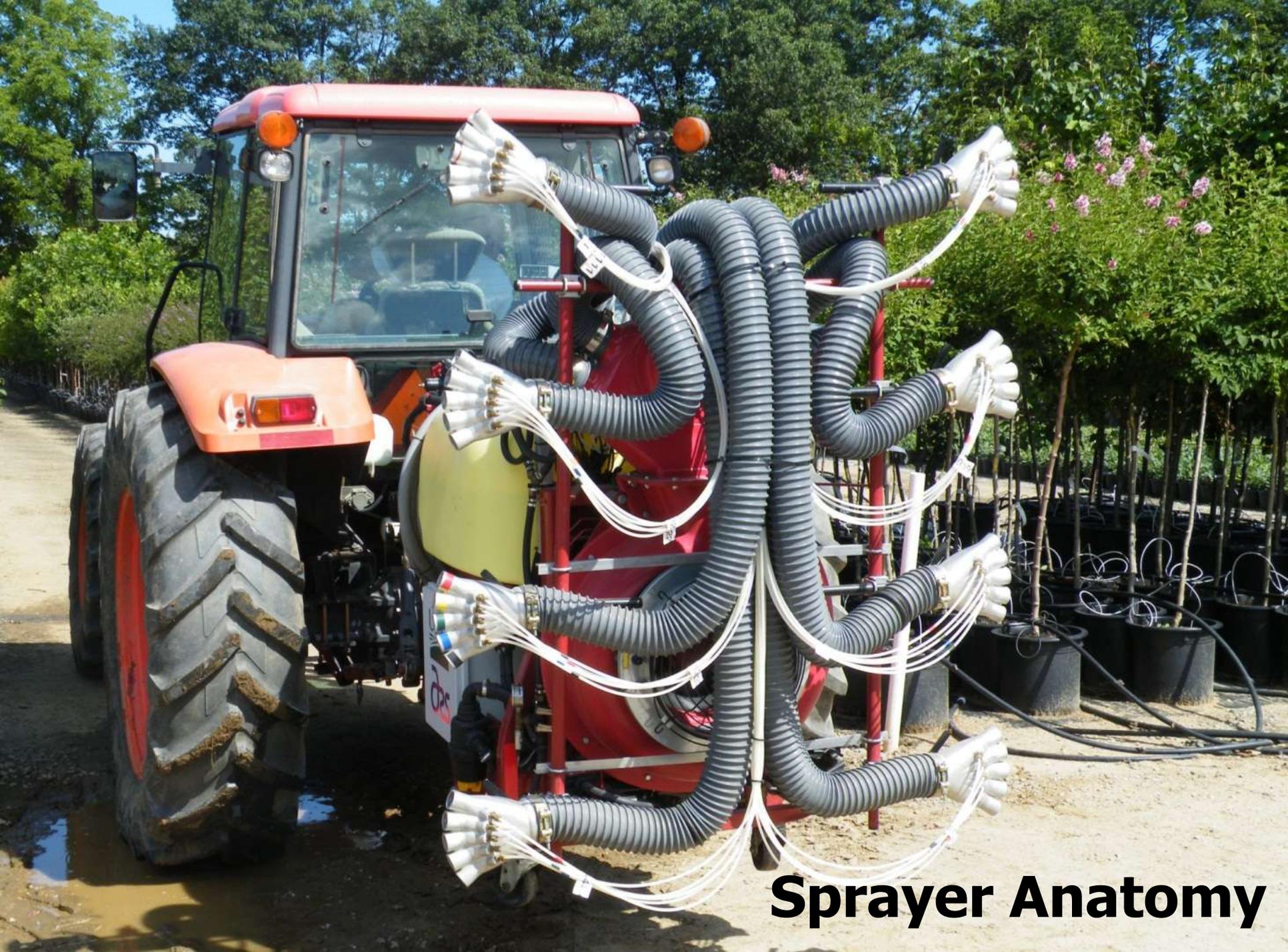
**The *real*  
Intelligent  
Sprayer...**



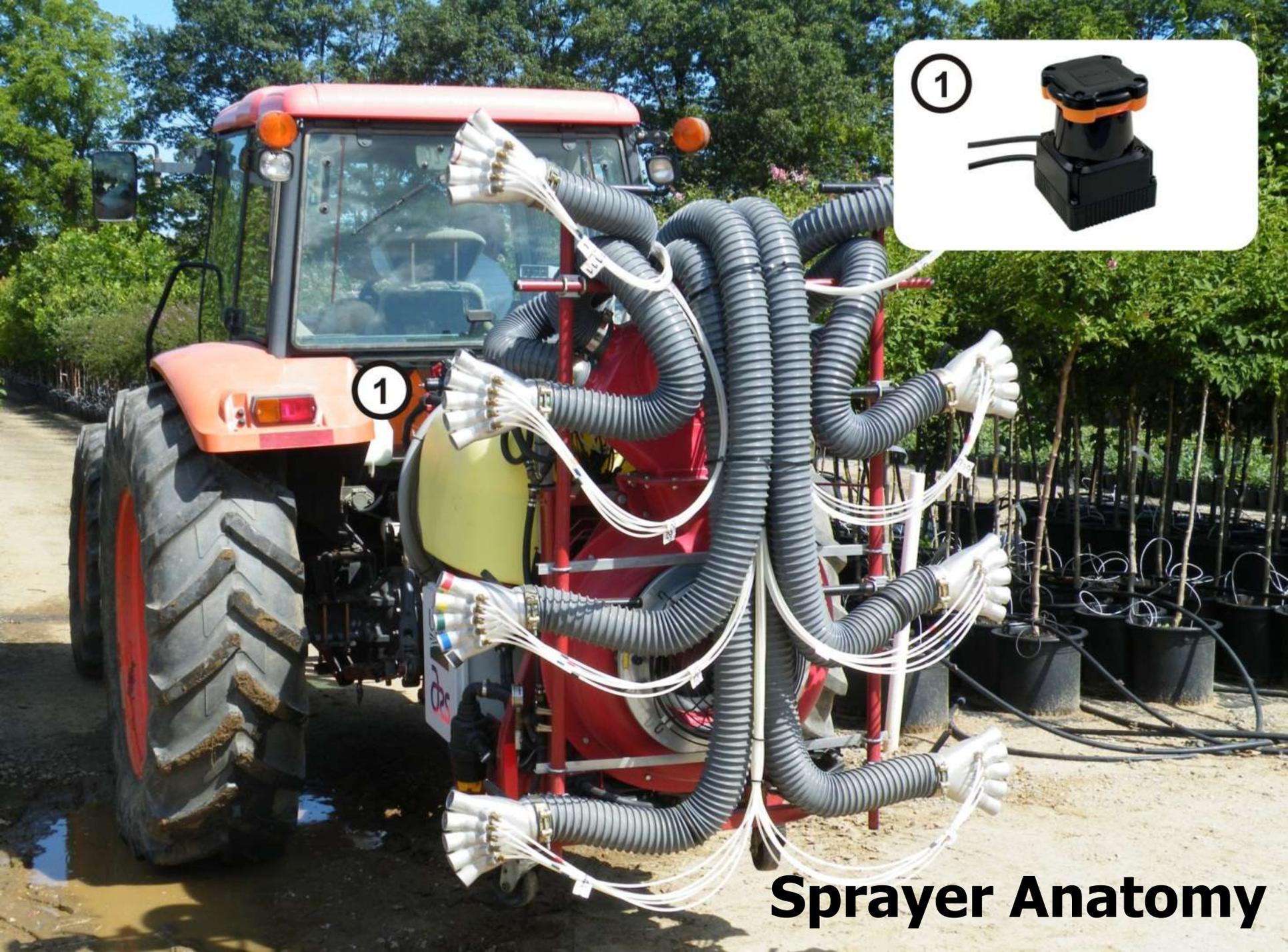
**Fact:** Optimum spray coverage saves money and maintains or improves efficacy

**Problem:** Sprayer operators have to make detailed changes to the sprayer for each significantly different crop

**Objective:** Develop an Intelligent Sprayer that makes the changes automatically



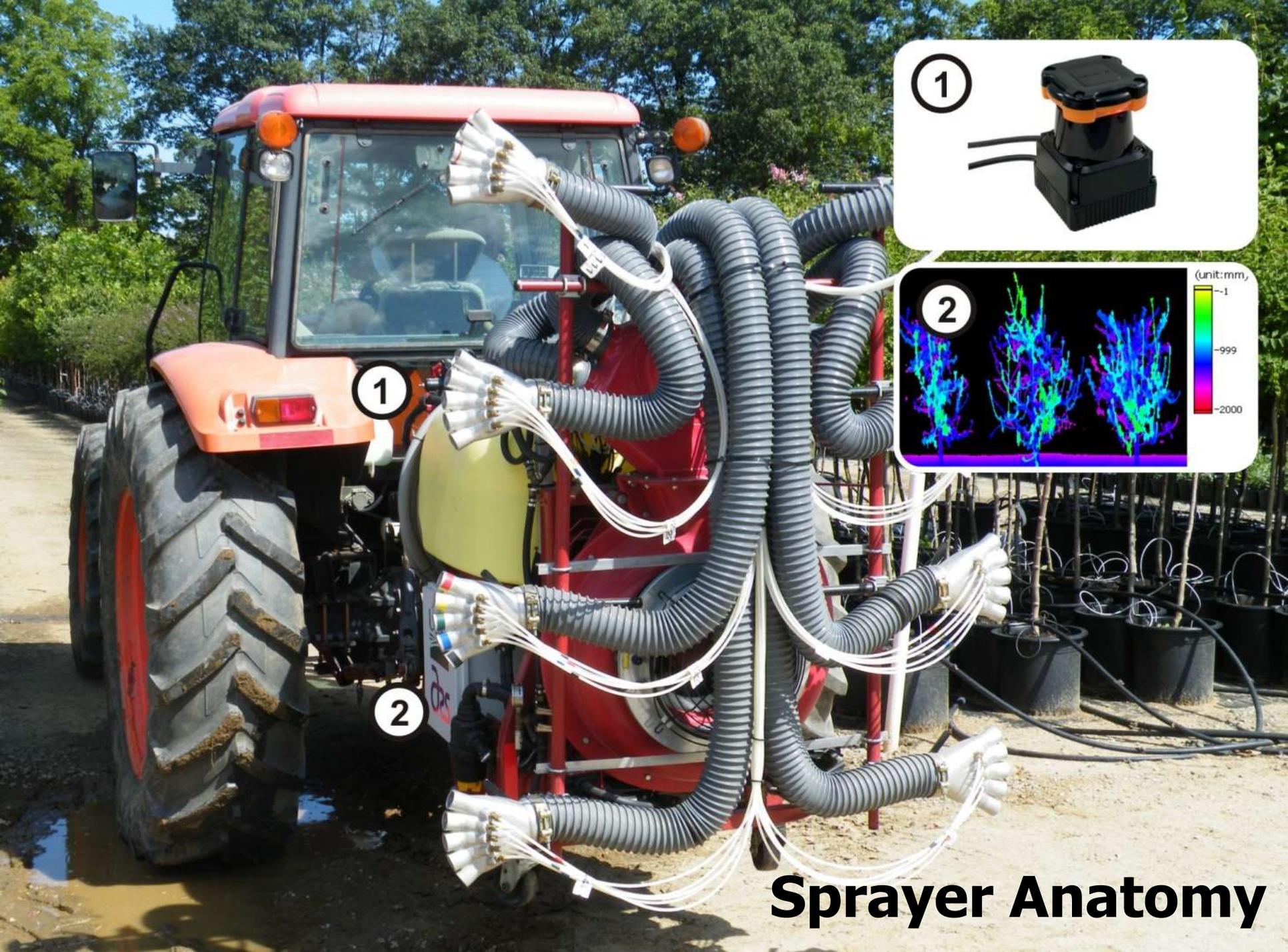
**Sprayer Anatomy**



1

1

# Sprayer Anatomy

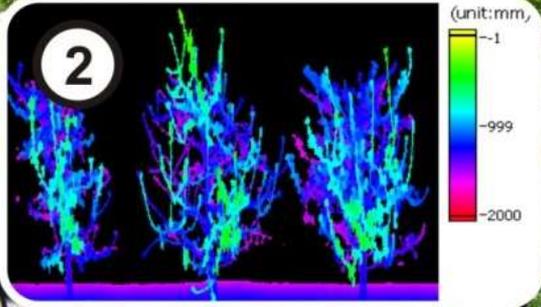


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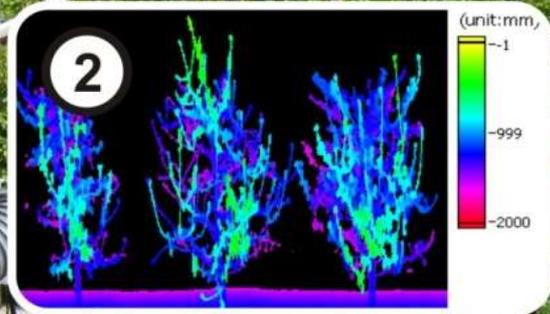
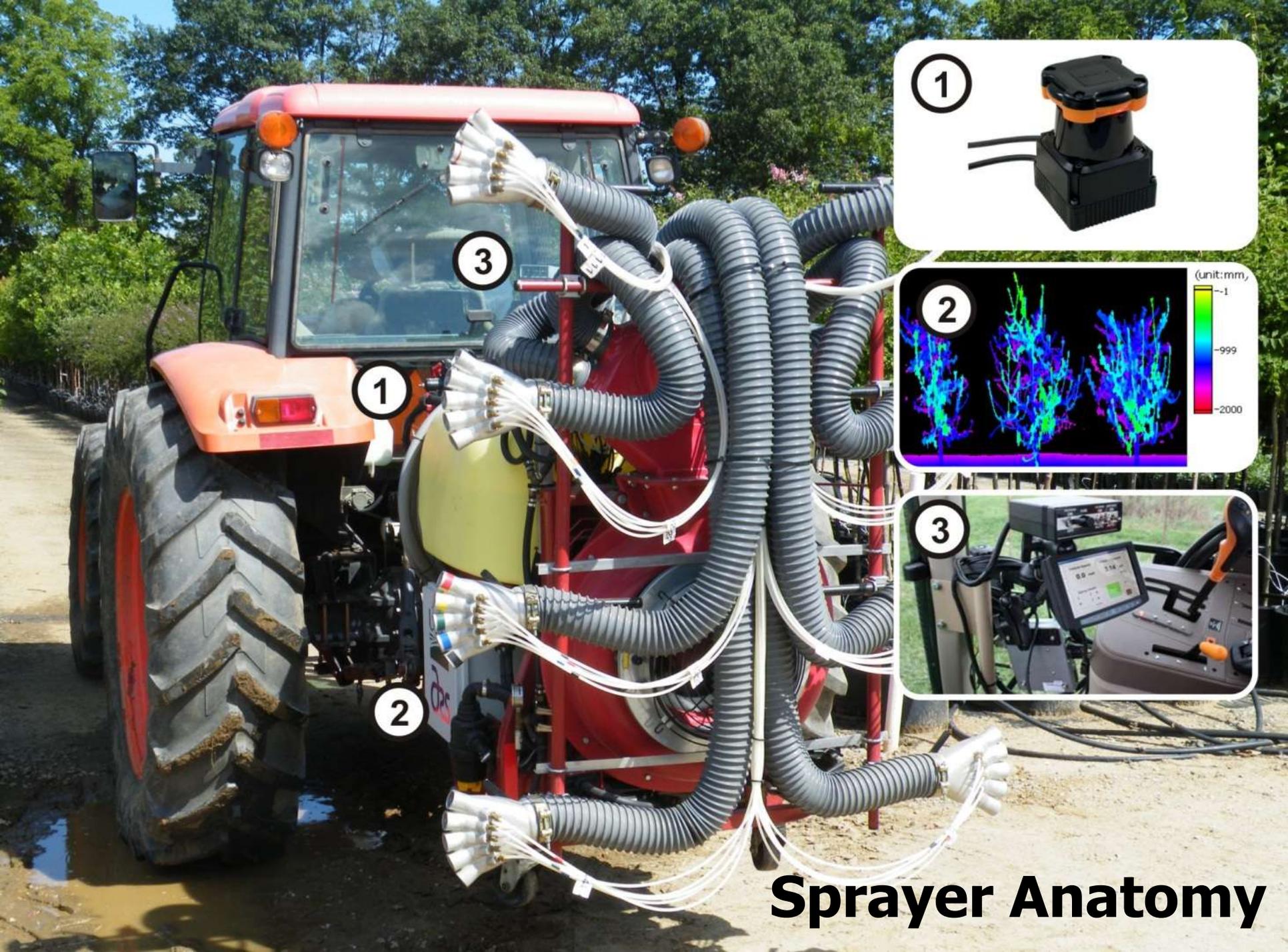
1

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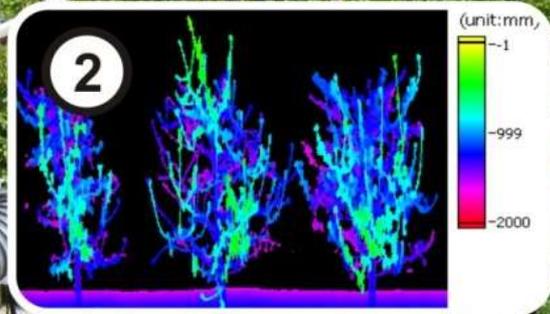


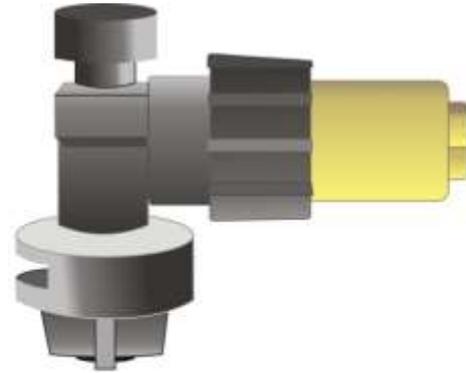
2

# Sprayer Anatomy

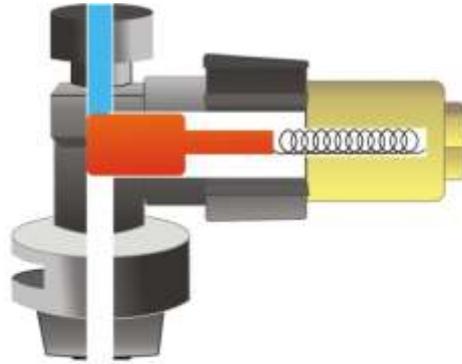


# Sprayer Anatomy





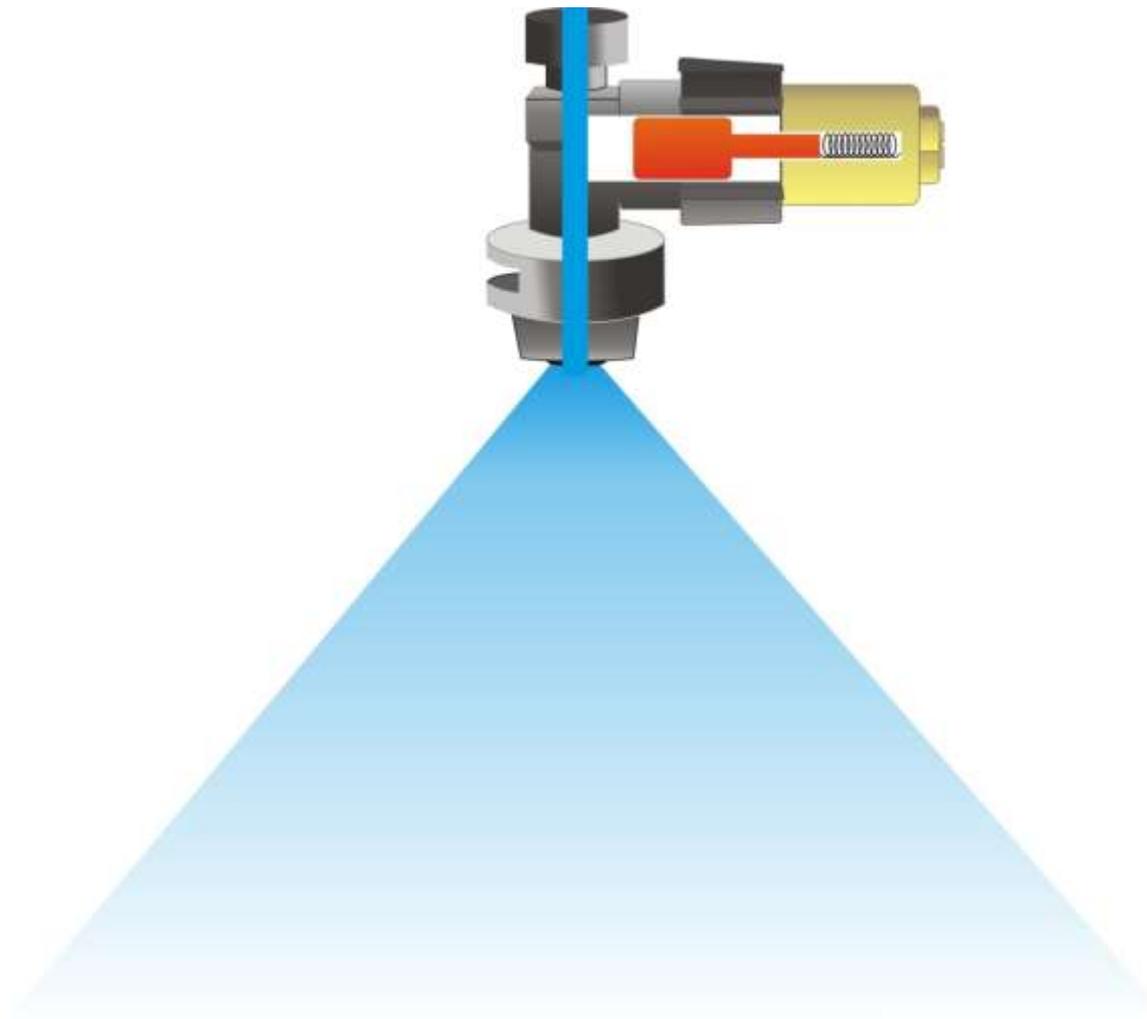
**what is pulse width modulation?**



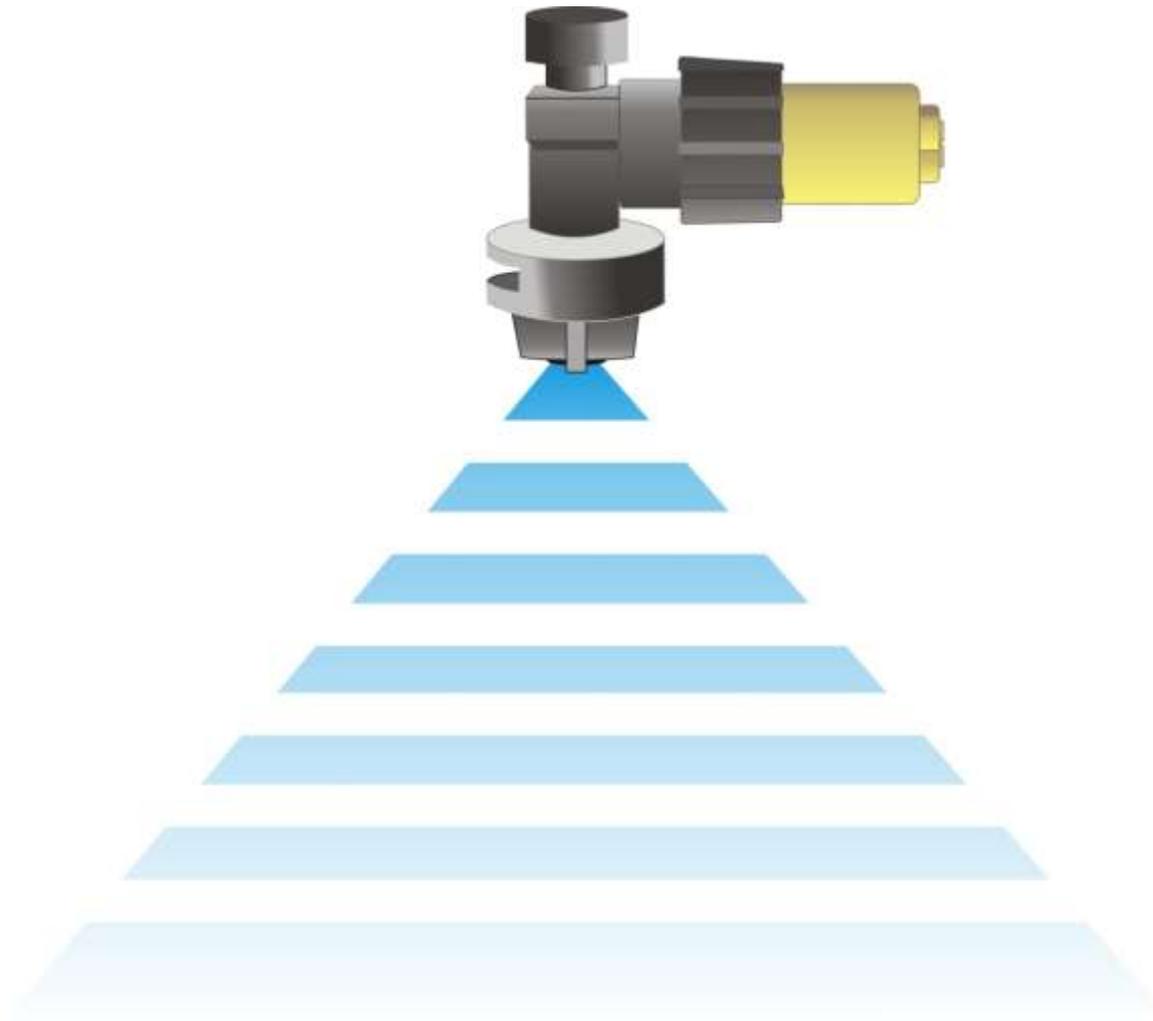
Open

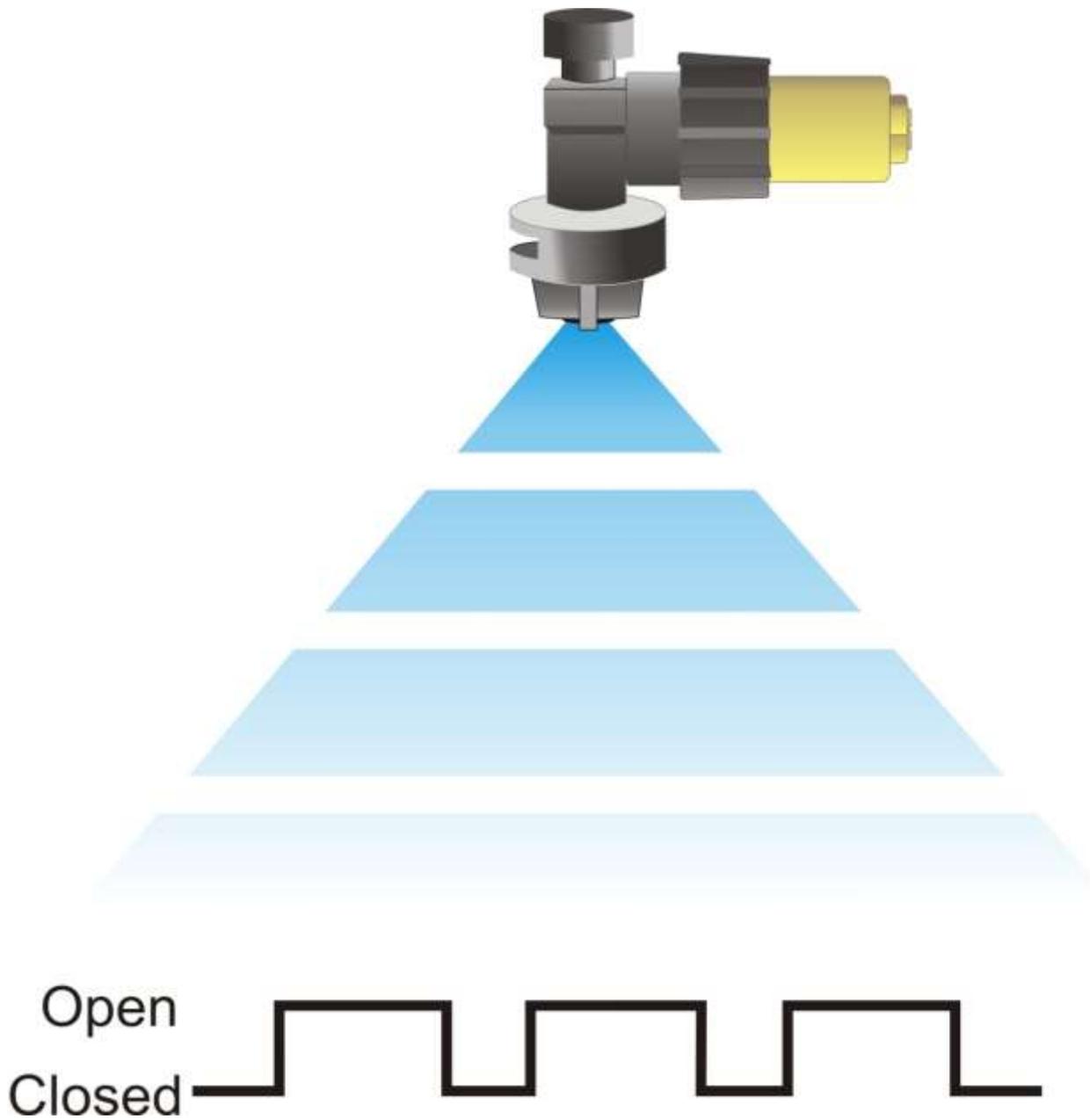
Closed





Open —————  
Closed





# demo day

J.C. Bakker and Sons Nursery

St. Catharines

August 14, 2013



# principle investigators

A group of five men standing outdoors in front of a red tractor and other agricultural machinery. The men are dressed in casual work attire, including hats, sunglasses, and collared shirts. The background shows a white container and a large piece of red machinery with a green tank.

Randy  
Zondag

Heping  
Zhu

Adam  
Clark

Richard Derksen  
Michael Reding  
Chris Ranger  
Charles Krause  
Jim Locke  
Erdal Ozkan  
Luis Canas  
Stan Ernst  
Amy Fulcher  
Robin Rosetta

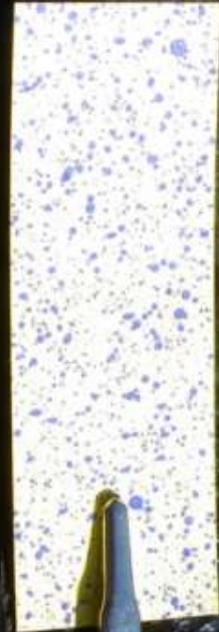
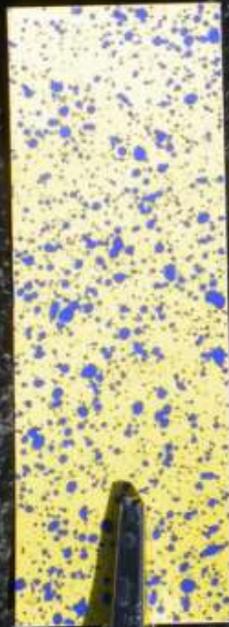
# demo day



# demo day



# Intelligent Sprayer coverage



- **In U.S. tests in 2013, the Intelligent Sprayer reduced spray loss up to **87%** and reduced spray volume by as much as **73%** - and efficacy was great**
- ***Wow...***

# (un)availability

- **Cost: \$21,000 USD (not including labour to assemble or profit). For future mass production, component costs should decrease dramatically**
- **So, you can't have one. What can you do to emulate it?**



# Crop-Adapted Spraying

- **Most pesticide label rates reflect the area of the planting (e.g. g/ha), not the area-density of the plant canopy**
- **A fixed, prescribed spray volume and/or rate is insufficient to match orchard variability**
- **An acre of corn is an acre of corn, but an acre of apple trees...**



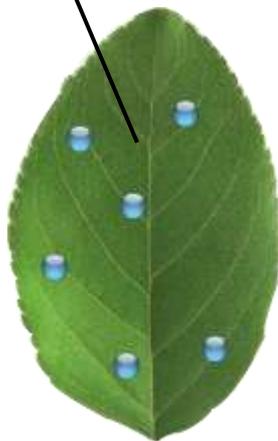
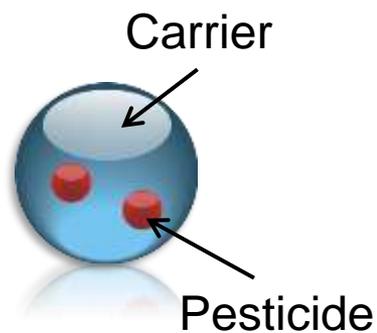
①



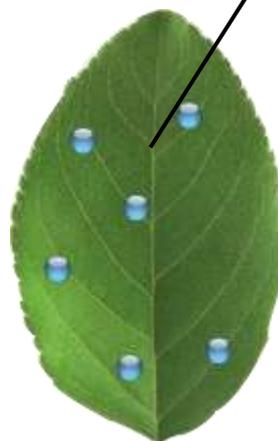
②



③



1,000 L spray mix /ha  
(1 g active / L)



500 L spray mix/ha  
(1 g active / L)

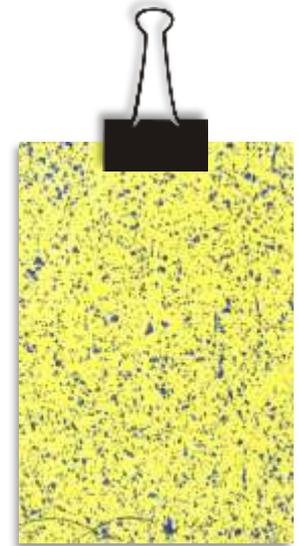


250 L spray mix /ha  
(1 g active / L)

1 g active / L

## research goals

- **Our Crop-Adapted Spraying (CAS) model is based on the work of many other people. It adapts the amount of active ingredient per unit ground area such that the amount of active ingredient per unit target area (usually the leaf area) remains constant for canopies of varying shape and density.**
- **When this is achieved with sufficient accuracy, the pesticide efficacy is maintained**





**Jason Deveau**

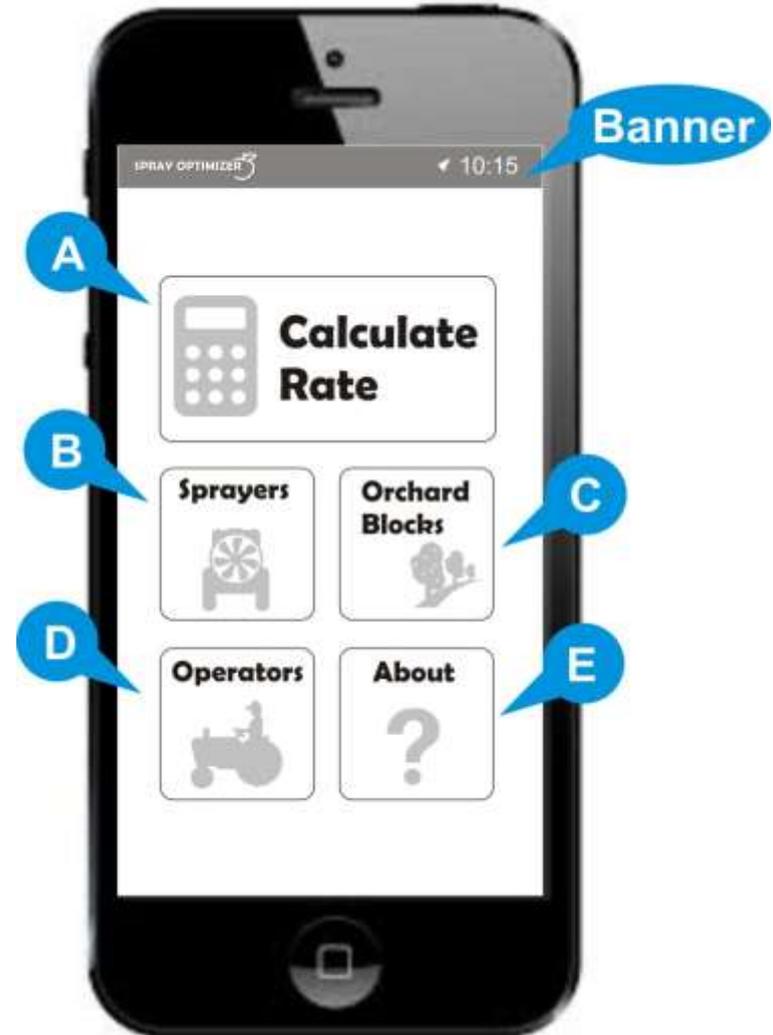
**Tara Wiedeman**

**Kristy Grigg-McGuffin**

## results to date

- **Two years of testing in four orchards has demonstrated rates can be dropped by  $\sim 30\%$  and there is no significant difference in pest activity or damage.**
- **Next year will be the third optimized rate spray program for 2 of the orchards – we are not expecting any issues related to prolonged use of reduced rates.**

# app is in development – free in 2015



# airblast air



*Dr. Bernard Panneton, Ag Canada, QC*



- **Using LiDAR in apples, Bernard found more surface area was exposed when using just enough air to rustle leaves versus no air at all**
- **He also found that too much air (too fast, really) reduced surface area versus no air at all**

# airblast air

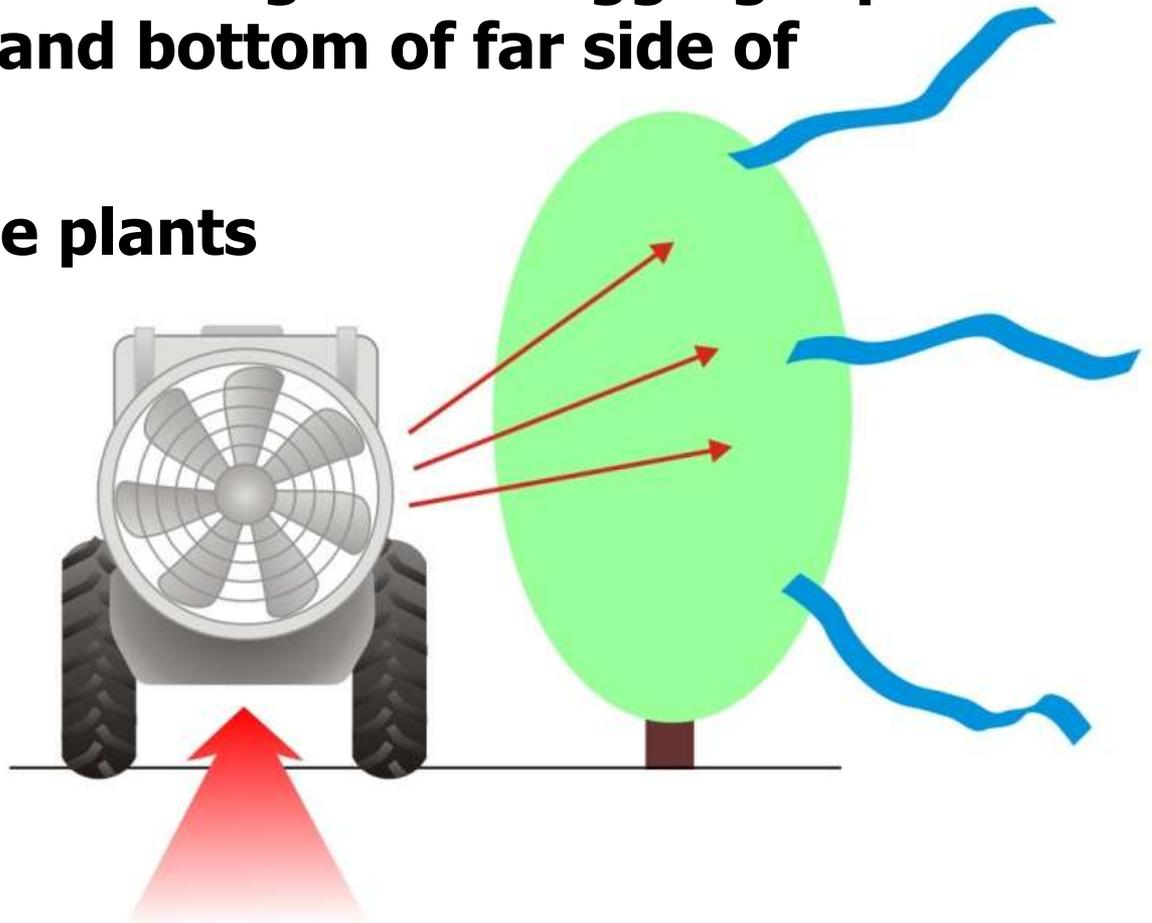


# airblast air



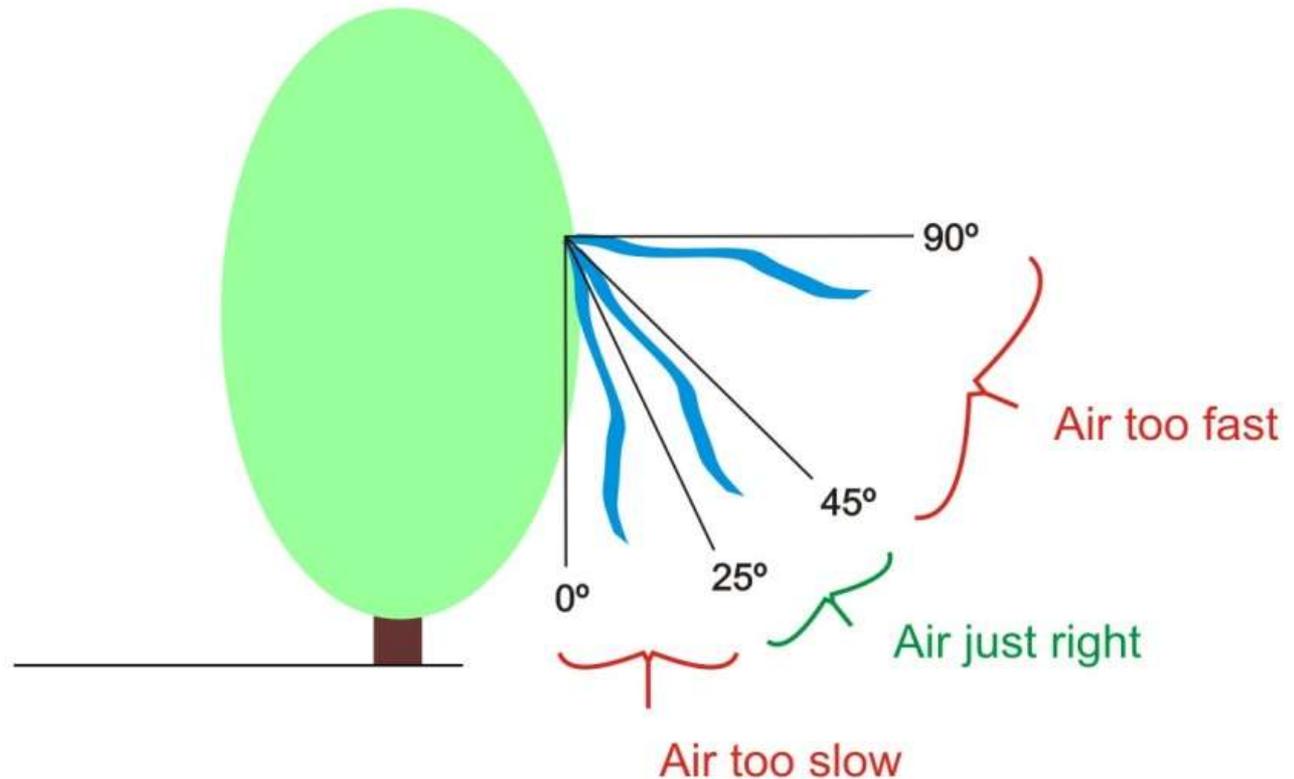
# adjusting airblast air

- **Set deflectors, fan gear, tractor rpm's and ground speed**
- **Attach three 25 cm lengths of flagging tape at top, middle and bottom of far side of canopy**
- **Do this to three plants**



# adjusting airblast air

- **Have a partner observe the tape as the sprayer drives by**
- **If air is too fast, increase ground speed, reduce rpm's or lower fan gear**



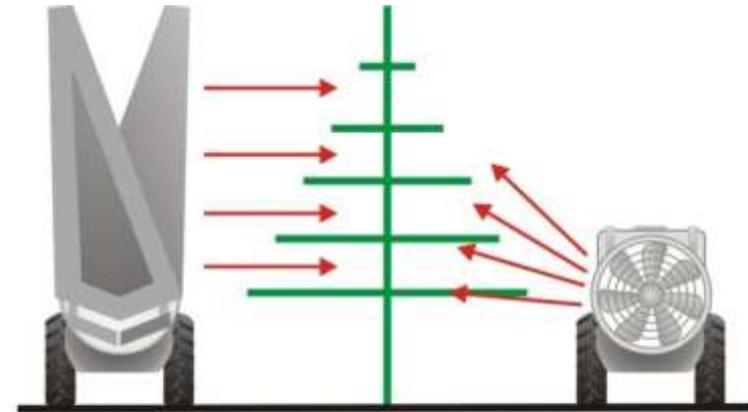
# canopy management

- **This is a large tree – 20 feet in diameter**
- **However, it is an easy spray target because it is not the size of the box, it's what's in the box that matters**
- **A good trick is to look at the tree's shadow. Then you'll know if it's open to spray**



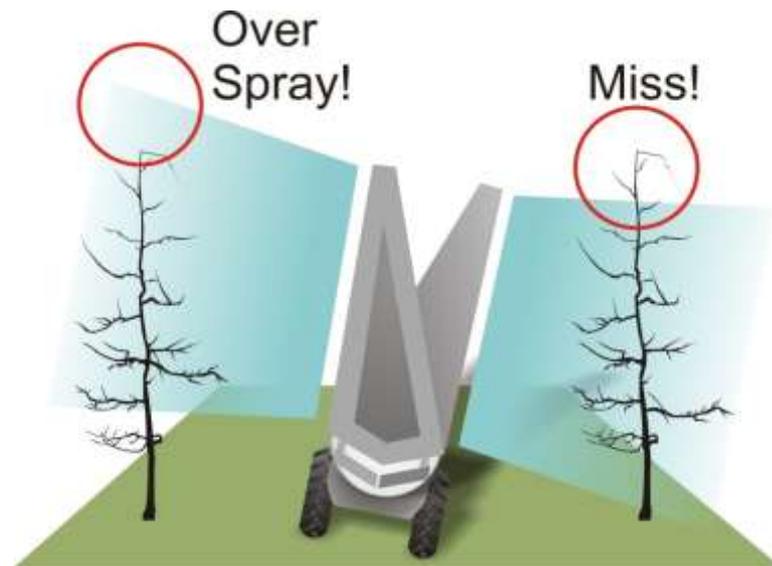
# tower power

- Towers bring nozzles closer to the target
- Towers have the potential to improve spray penetration and reduce required output
- Towers reduce drift



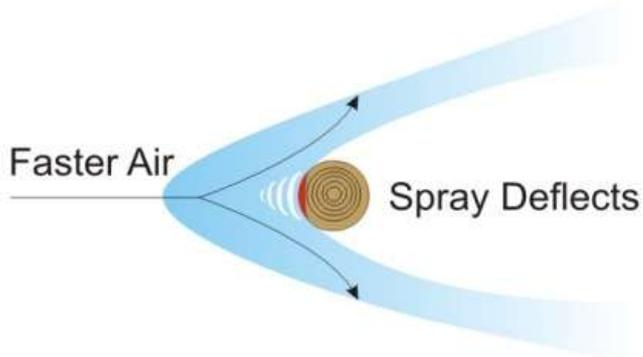
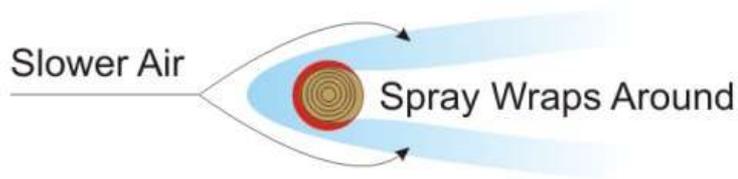
Tower can spray between branches

Radial must spray through branches

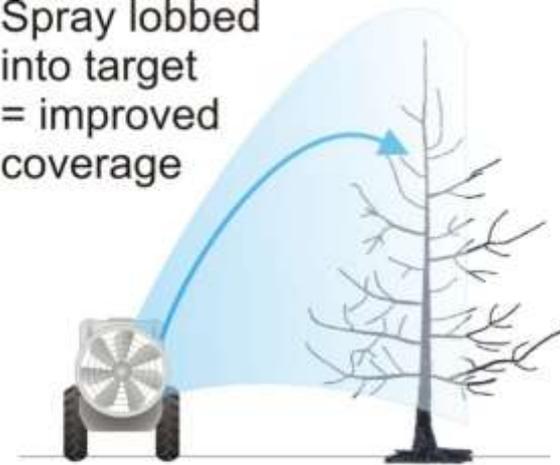


# Gear Up, Throttle Down

- **Who says 540 rpm's is the only way to go? As long as your tractor doesn't lug, and you're using a positive-displacement pump, you can try this**



Spray lobbed  
into target  
= improved  
coverage



Spray blasted  
through target  
= wasted spray



and so much more...

- This was too much, too quickly, but hopefully it inspires you to find out more. For more information, go to:



@ spray\_guy