

Precision Application Technologies and Stakeholder Communication

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FRUIT PATHOLOGY LAB

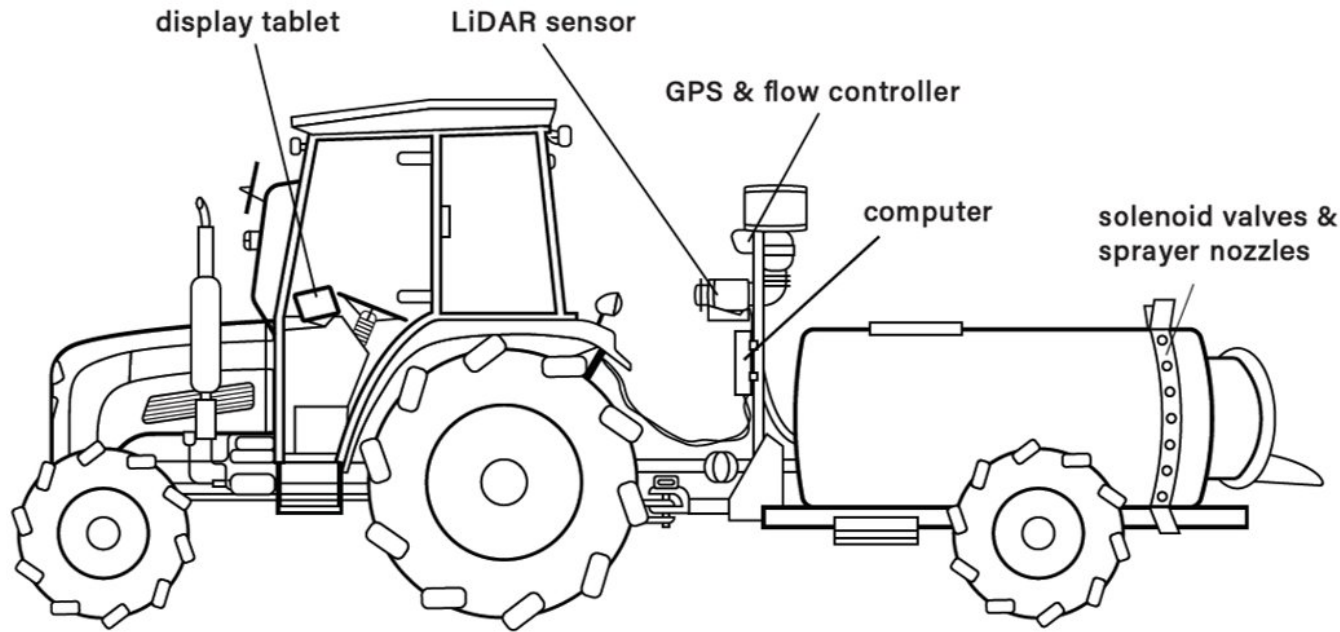
Supporting Healthy & Safe Fruit Production

Identify economical and sustainable strategies to control diseases of fruit, hop and nut crops –

- **Reduced reliance on pesticides**
- **Pesticide resistance mitigation**
- **Pesticide stewardship**

Laser Guided Intelligent Sprayer Technology

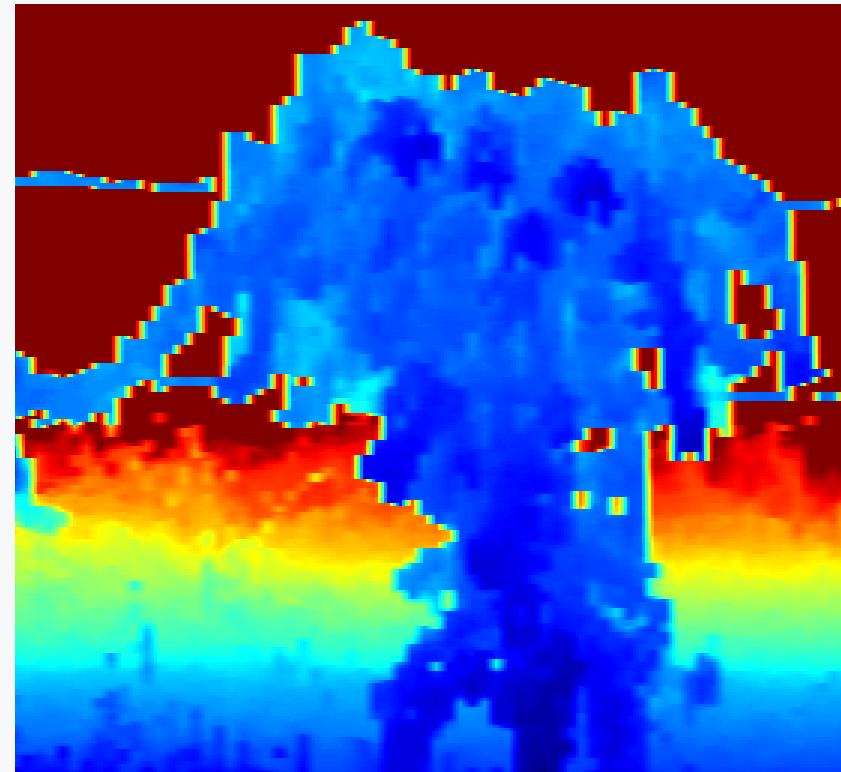
CFAES



- Air-assisted
- Detects tree architecture and canopy density
- Measures travel speed
- Variable spray rate (selects nozzles)
- Estimates volume required for coverage

Laser Guided Intelligent Sprayer Technology

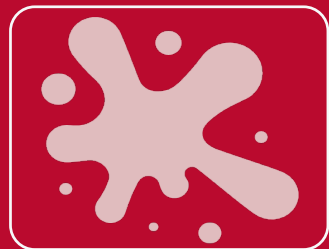
CFAES



Images courtesy of H. Zhu, USDA-ARS



Validation Criteria



Provides adequate coverage for pest control



Provides equivalent pest control



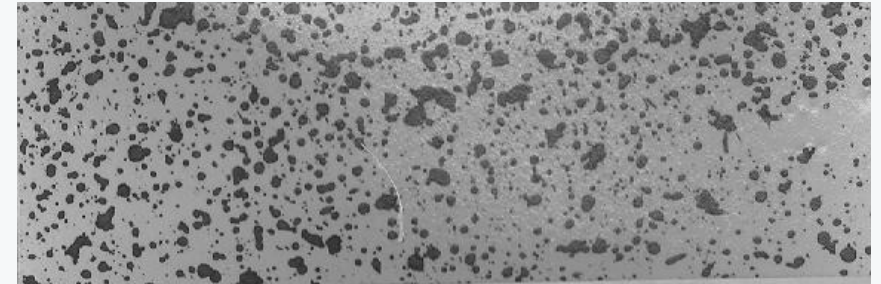
Economical and environmentally sustainable



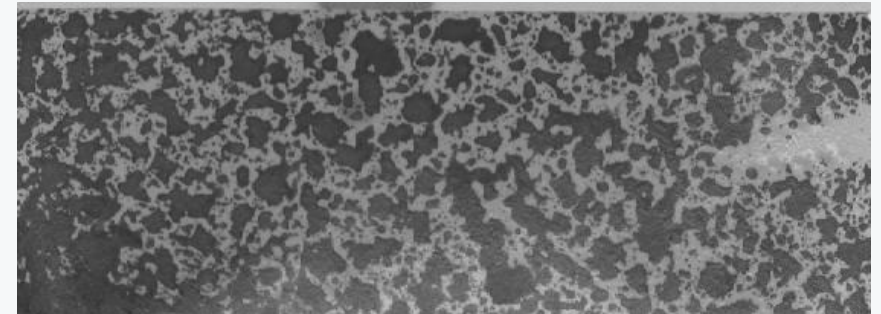
L. Wodzicki, MS 2022

Spray Coverage

- 25-30% = optimal
- < 25% = inadequate
- > 50% = excessive



Intelligent

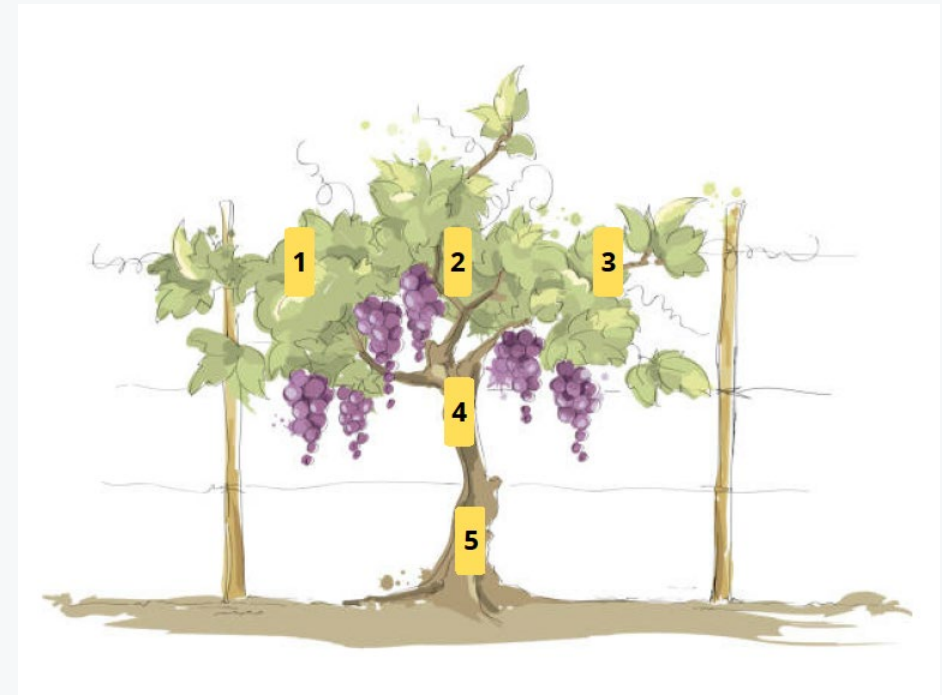


Airblast

Percent Pesticide Coverage Measured Using Water Sensitive Paper (WSP)

CFAES

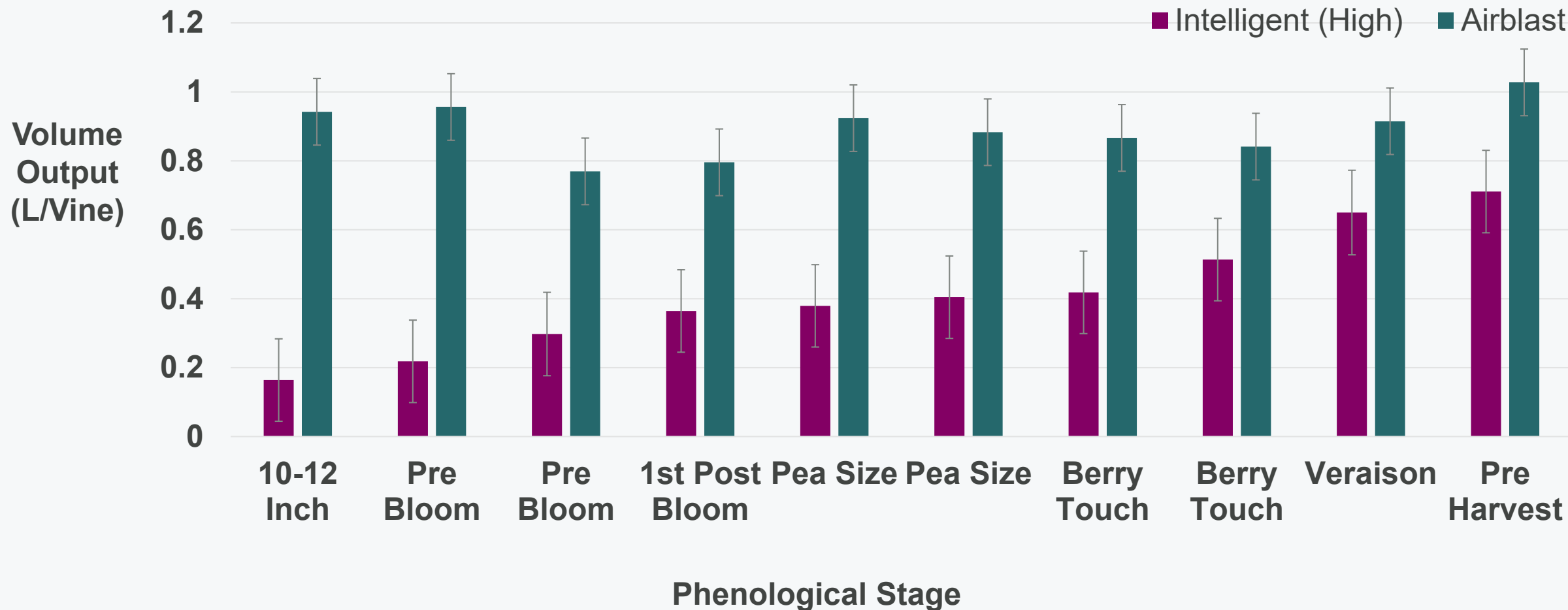
Placement of WSP	Percent Coverage	
	Intelligent	Airblast
1	49 D-F	79 D-F
2	54 C-E	61 C-E
3	48 D-G	74 D-G
4	56 B-E	73 B-E
5	42 E-H	63 E-H
Mean (P<0.0001)	50 ± 4.1 B	70 ± 4.4 A



Foliar Fungal Disease Severity and Progression **CFAES**

Sprayer Technology (Flow Rate)	Mean Percent Foliar Disease Severity	Mean Foliar disease progression (AUDPC)
Intelligent Technology (0.13 L/m ³)	40 B	340 B
Airblast Technology (75 gal/A)	33 B	342 B
Nontreated Control	89 A	278 A
P-value	<0.0001	<0.0001

Pesticide Volume Output



Pesticide Volume Output

**29 - 91%
reduction in
pesticide
and water
usage**

- Varies depending on phenological stage

**Pesticide
cost
\$469/Ha
less**

- Based on 2019 pesticide prices
- 3-year average

Economic Analysis

- Assumptions
 - 20 Ha (50 A) vinifera vineyard
 - Investment made in year 0
 - 3 years until productivity
 - 23 years productivity
 - Fixed and variable costs based on enterprise budget
 - Weather and grape costs excluded



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Economic Analysis

Technology	Cost of equipment	Additional costs per Ha	Net Present Value (\$)	Internal Rate of Return (%)	Payback (years)	Return-on-investment (\$)
New	+ \$70,000	+ \$3,459	49, 661	14.3	11.7	3.53
Retrofitted	+ \$36,000	+ \$1,779	51, 442	14.8	11.4	4.45

Environmental Sustainability

- Reduced pesticide into the environment
- Reduced water usage
- Targeted pesticide applications
- Reduced drift and ground drop-off





Acknowledgements

- USDA-ARS
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