WHAT'S THE BEST SPRAYING SYSTEM FOR YOUR TREE FARM?

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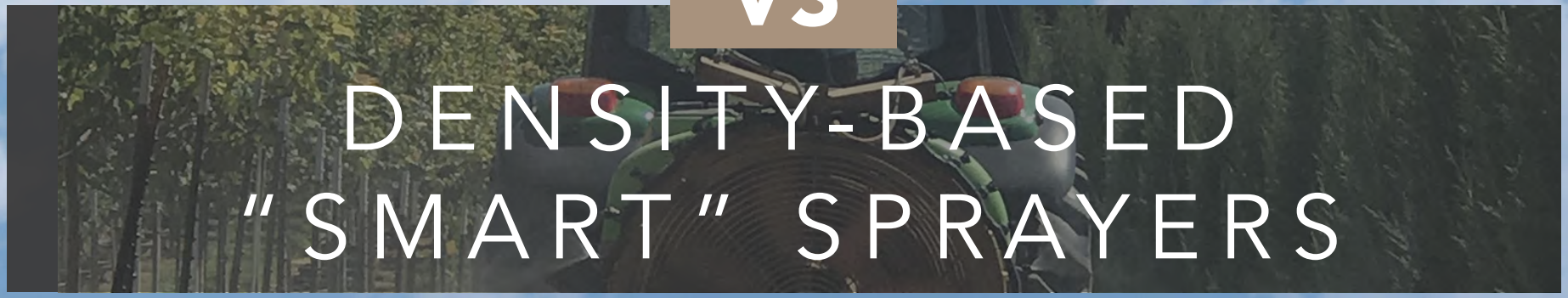

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INTRODUCTION

Sometimes you can get so deep in the weeds that you literally can't see the forest for the trees. And sometimes, you just really need to focus on the trees.

In today's lean market and volatile growing climate, every penny counts, and saving money on chemicals can really add up. However, when it comes to protecting your crop, such as fruist or nuts, you can't take any chances. So, your choice of spraying system really matters. Perhaps it's time to assess your current spraying system and decide if it's really the best option for your trees, your land, and the overall growth of your business.

When it comes to choosing the best spraying system for your organization, ask yourself these questions:

1. Are you happy with your current protection, chemical expense and yield?
2. Would you like to realize a greater profit than you currently are?
3. Are chemical drift and groundwater contamination a concern for you?
4. Are you concerned that overspraying might harm crop roots and adversely impact the health of your plants and the overall sustainability of your orchards or grove?
5. Are you and your crew open to exploring innovation and new technology?

INTRODUCTION

As you consider the spraying systems available on the market today, you have three options:

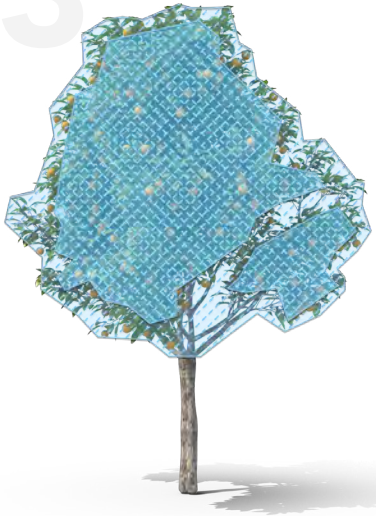
01

CONVENTIONAL AIR BLAST SPRAYERS

02

ULTRASONIC SPRAYERS

03



“SMART” DENSITY-BASED SPRAYERS.

There’s no single best choice for every operation, but your answers to these questions will help you determine which system is best for you.

In this guide, we’ll explore the features and benefits of all three, so you can make an informed decision about which type of spraying system is best for your organization.

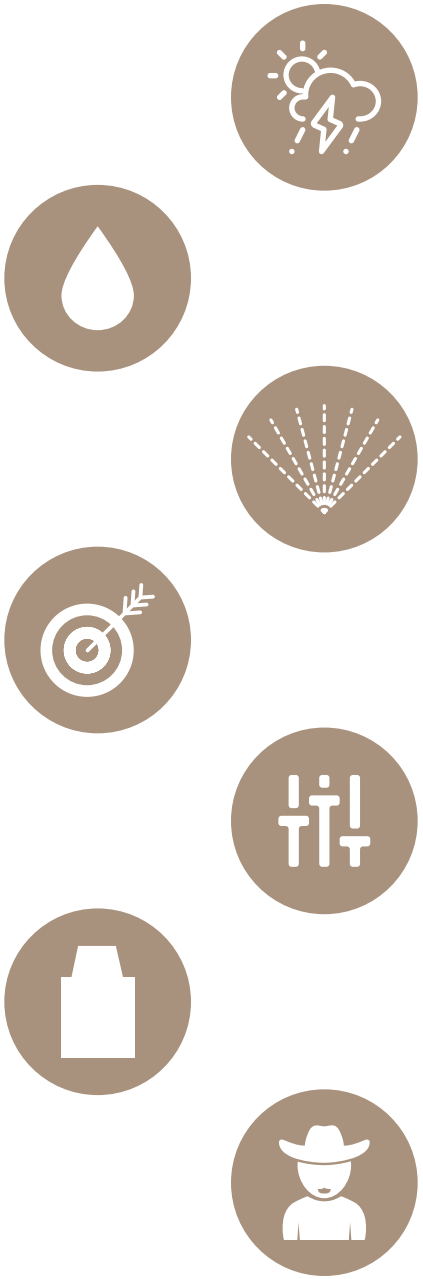
Let’s dig in.

01 CONVENTIONAL AIR BLAST SPRAYERS

Conventional air blast sprayers have been around for a long time, and lots of growers use them. They get the job done. However, conventional air blast sprayers create chemical waste and contribute to overspray. They have two settings: on or off. They are manually controlled and will continue to spray whether there are trees present or not. And while they are fairly simple to operate, they're not necessarily low-maintenance.

01 CONVENTIONAL AIR BLAST SPRAYERS

When you're calibrating a conventional air blast sprayer, you need to consider these variables:

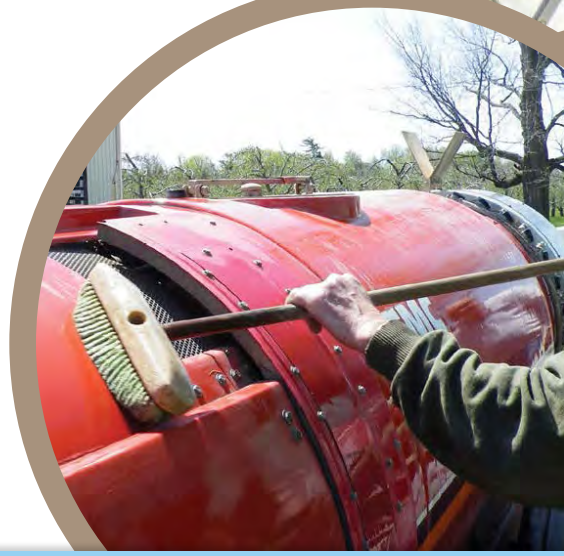


- **The weather.** Weather can have a dramatic effect on the efficacy of your application. Factors to consider include wind speed and direction, as well as the temperature and humidity.
- **The product you're using.** You'll need to factor the recommended application rate, carrier volume and timing.
- **The application method.** Most operators employ the alternate row-middle spray technique. As you're making the spray calculations for this, you'll also need to consider the rate and ground speed of application.
- **Your target.** Your target factors include the time of year, size of your orchard and spacing of your trees. You'll also need to consider your tree canopy height, to determine spray nozzle positions.
- **Equipment settings.** You'll also have to consider the direction, volume and speed of the air-assist, as well as your nozzle orientation, droplet size and intended spray pattern.
- **Spray nozzles.** You'll need to check the spray nozzles to make sure they are not worn, using the proper nozzle size and pressure to develop the proper droplet size and intended spray pattern.
- **The operator.** It's important to note that the best-laid plans with all of the above can still result in a less-than-effective spray if the operator is not properly trained, or is not giving the job his or her full attention.

01 CONVENTIONAL AIR BLAST SPRAYERS

Other conventional air blast sprayer calibration, inspection and usage considerations:

- Calibration is key to proper spraying, and regular inspections of the spray nozzles are essential to avoid unexpected failure at a critical time in spraying.
- Calibrations must be performed for each different crop or block. Utilizing the same settings for crops of varying densities can result in over or under-spraying. Once you have determined the calibrations for various crops or blocks, they should be recorded for future use.
- For petaled trees, calibrations should be adjusted throughout the growing season to account for the target area density. This step is not necessary for nursery crops such as evergreens.
- Many air blast sprayer users attach heavy duty ribbon to each active nozzle position so they can visually inspect the direction of the spray flow. It may be necessary for the operator to have a "partner" following the spray rig to ensure that the direction and flow of the ribbons matches the desired spray pattern.
- In addition to calibration, you'll need to regularly test and inspect your pressure gauge, nozzles and sprayer output to ensure that they're still operating at the optimal settings.



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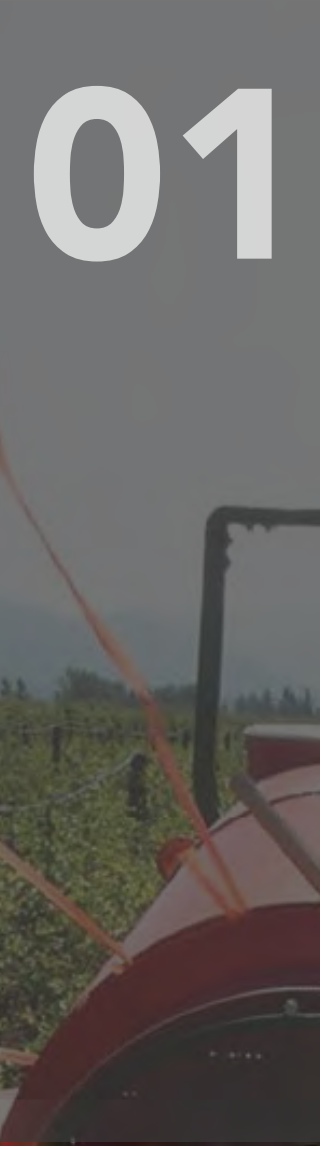


Summary:

As you can see, while conventional air blast sprayers might seem like a fairly simple piece of equipment at a glance, they do require a fair amount of attention and adjustments to operate as intended and ensure that your trees are protected.

Reference:

Sprayers 101

Reasons why a conventional air blast sprayer might be the best choice for you:

- You're a single-person operation with a small (less than 500 acres) farm.
- You have a very uniform and densely packed crop that wouldn't see a marked improvement with density-based spraying. (Vineyards can fall into this category.)

02

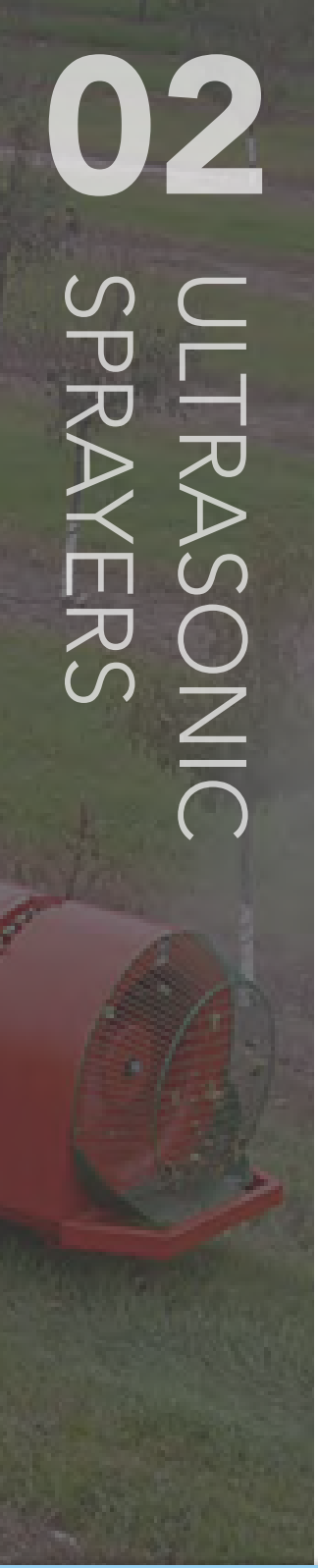
ULTRASONIC SPRAYERS

As you're researching improvements in sprayer technology, you'll likely discover ultrasonic sprayers. Ultrasonic sprayers are definitely an improvement over conventional sprayers as they do reduce spray between trees.

02 ULTRASONIC SPRAYERS

How it works and key features of an ultrasonic spray system:

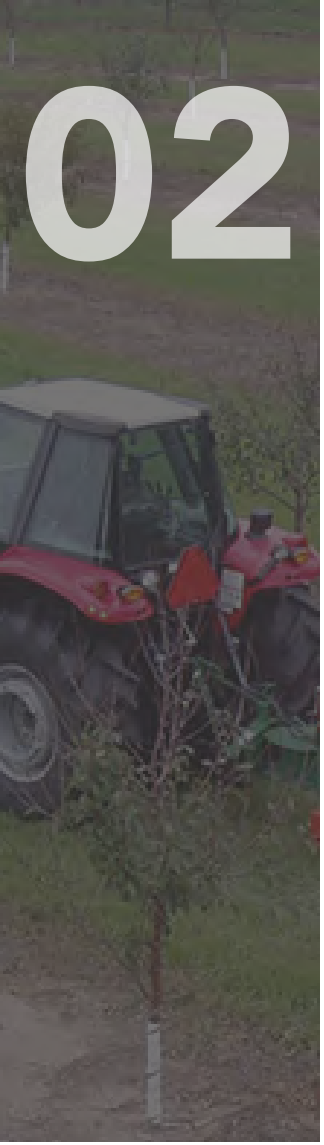
- The system is comprised of high speed, short interval ultrasonic sensors (usually around six) that locate trees as the sprayer rig moves down the alleys.
- When a tree is located, the sensors send a signal to a controller area network (CAN)-based microcontroller.
- The controller then sends a signal to turn off the sprayer whenever there is a gap between trees.
- The control panel shows the status of the sensors, valves, ground speed and diagnostics.
- Ultrasonic sprayers have proven to reduce chemical use and waste by 25% over conventional air blast sprayers. (Note that the percentage savings is dependent on your crop.)



02 ULTRASONIC SPRAYERS

Other ultrasonic sprayer considerations:

- While ultrasonic sprayers are clearly an improvement over conventional sprayers, there are limitations to what the sensors identify. They simply sense objects. So, when a tree is in the line of sight, the sensors will direct the sprayers to spray.
- Ultrasonic sprayers are not density-based sprayers. Most ultrasonic sprayers have three sonars on each side of the system, for a total of six zones. As the sonar detects an object in a zone, it turns on every nozzle in that zone. So, if an object is sensed, all of the nozzles in that zone are turned on full blast, whether there is a full tree canopy or merely a single limb.
- Sensor lenses become dirty with use and need regular cleaning, sometimes even during the course of a spray application, to continue to function properly. Ultrasonic sprayers typically have multiple lenses making cleaning a cumbersome task.



02 ULTRASONIC SPRAYERS

Summary:

Ultrasonic sprayers offer cost savings and chemical use reduction over conventional air blast sprayers. However, they do not sense variations in crop concentration; they simply sense objects and turn spray nozzles on and off accordingly.

Reference:

Oregon State University

Reasons why an ultrasonic spraying system might be the best choice for you:

- You're a medium-sized (1000+ acres)operation and are ready to upgrade from a conventional air blast sprayer.
- You have a fairly uniform orchard, grove or nursery with little variation in tree canopies.
- You would like to stop wasting spray between trees and save money.

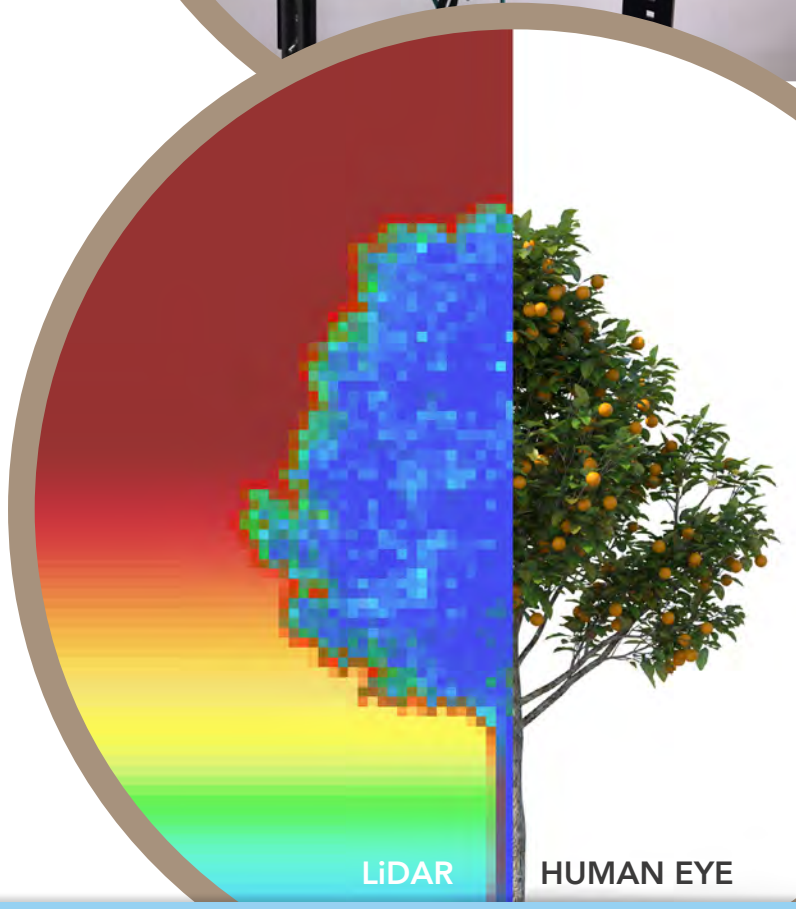
03 THE DENSITY-BASED "SMART" SPRAYER

Density-based "smart" sprayers are the most cutting-edge technology available on the market today. They're the next level up from ultrasonic sprayers because they not only sense the presence of a tree, but also the specific architecture of each tree. And they adjust the amount of spray instantly to apply the appropriate amount of chemicals. In other words, they don't just detect the tree, but the specific location of surface foliage and its concentration. In other words, they see every single leaf on the tree.

03 THE DENSITY-BASED "SMART" SPRAYER

How it works and key features of the density-based spraying system:

- The system is based on LiDAR (Light Detection and Ranging) technology, which is a remote sensing method that uses light in the form of a pulsed laser to measure ranges.
- The LiDAR works in tandem with a GPS to determine ground speed and position in the field.
- During the set-up and calibration process, the system determines algorithms for calculating spray volume based on crop density and location.
- Each nozzle has an individual solenoid to turn the spray on and off. The solenoid is also pulsed at a variable frequency using Pulse Width Modulation (PWM) to change the rate of application dependent on crop density, and measured by the LiDAR for that spray nozzle zone.
- All of these components interface with an Android tablet and app that allow the operator to easily gauge spray coverage.
- Density-based spraying systems have an override switch to easily revert to manual spraying as needed.



03 THE DENSITY-BASED "SMART" SPRAYER

Other density-based spraying system considerations:

- While ultrasonic sprayers typically yield a chemical savings of around 25%, growers who switch to a density-based spraying system without using the pulse will see additional savings of up to 37% more over ultrasonic systems, yielding a net chemical cost savings of up to 70% over conventional air blast sprayers.
- The density-based spraying system takes in 120,000 points per second. They can have up to 18 nozzles per side, and EACH NOZZLE has an individual zone that is managed by the control system. The system only turns on the nozzles needed to cover the canopy map in its path.
- Most density-based sprayers can be easily retrofitted to any conventional air blast sprayer.
- Density-based spraying systems have a single, well-protected lens, and filtered air is blown over the lens to create a pressure barrier to help keep it clean. At times when the lens becomes dirty (such as when the system is not in use) it's easy to clean. The control system also creates a warning on the tablet to make the operator aware of the need to clean the lenses.
- Because the density-based systems target the tree canopy so precisely, there is little to no overspray, resulting in significantly reduced drift, groundwater contamination and tree root damage.

03 THE DENSITY-BASED "SMART" SPRAYER

Summary:

Density-based, smart sprayers are the most cost-effective, time-saving and environmentally friendly option available today for tree farmers.

Reference:

Farm Progress

Reasons why a density-based spraying system might be the best choice for you:

- You're a large (2000+ acres) operation, currently using multiple air blast sprayers.
- You have an orchard, grove or nursery with crops of varied heights and canopy density.
- You want to reduce chemical use and see a dramatic increase in profitability in your organization.
- Sustainability and environmentally friendly growing practices are a high priority for you.
- You and your team are ready to leverage technological advances that provide proven ROI.
- You're experiencing a great deal of drift and/or chemical waste and you'd like to improve your spraying technique.
- Your operation is not realizing the profit margin you're hoping for.
- You have trees that are failing, and you suspect that either under or over-spraying is the culprit.
- You would like your operation to be more environmentally friendly and/or sustainable, with less groundwater contamination.

CONCLUSION

THE MORE YOU KNOW, THE MORE YOU CAN GROW

Density-based “smart” sprayers are the most cutting-edge technology available on the market today. They’re the next level up from ultrasonic sprayers because they not only sense the presence of a tree, but also the specific architecture of each tree. And they adjust the amount of spray instantly to apply the appropriate amount of chemicals. In other words, they don’t just detect the tree, but the specific location of surface foliage and its concentration. In other words, they see every single leaf on the tree.

SPRAY SYSTEMS AT A GLANCE

	IDEAL FOR:	ADAPTATION OF CONVENTIONAL SPRAYER	CHEMICAL COST SAVINGS	REDUCTION IN SPRAY LOSS BEYOND TREE CANOPIES	REDUCTION IN SPRAY LOSS ON THE GROUND	REDUCTION IN AIRBORNE DRIFT
CONVENTIONAL	**<$35,000** ANNUAL CHEMICAL BUDGET	N/A	N/A	N/A	N/A	N/A
ULTRASONIC	**>$50,000** ANNUAL CHEMICAL BUDGET	**DIFFICULT** TO INSTALL	**25%**	?	**UP TO 70%**	?
DENSITY-BASED	**$65,000+** ANNUAL CHEMICAL BUDGET	**EASY** TO INSTALL	**UP TO 73%**	**UP TO 87%**	**UP TO 93%**	**UP TO 87%**

ABOUT SMART GUIDED SYSTEMS™

Smart Guided Systems is the manufacturer chosen by the USDA to commercialize the “intelligent spray” technology that is the result of nearly a decade of development, field-testing and research at the USDA National Institute of Food and Agriculture. Our density-based spraying system is called the Smart-Apply Intelligent Sprayer™

BA Pumps & Sprayers have partnered exclusively with Smart Guided Systems to introduce the spray and crop mapping technology to the New Zealand market. With a dedicated team throughout the country, BA Pumps & Sprayers are committed to helping growers to realize dramatic chemical cost savings, improved sustainability through healthier trees and plants, cleaner and safer groundwater and greater overall yields with an easy-to-use, reliable system based on cutting-edge technology.

Contact BA Pumps & Sprayers today to learn more about the BA Smart Sprayer powered by Smart Guided Systems. To book a demo or to speak with us regarding the sprayer:

Visit **basmartspray.com** to get more information or schedule a demo.

Call: 0800 833 538 to talk to a Smart Apply expert today.

BA PUMPS & SPRAYERS