



Cost effective robots for smart precision spraying

# WHAT DATA CAN SENSORS PROVIDE USEFUL FOR VRT?

The importance of Variable Rate Technology (VRT) in precision agriculture, specifically in the context of applying plant protection products and fertilizers efficiently. VRT involves applying the right amount of product in the right place at the right time, using sensors and technology to achieve this precision.

## Sensors Used in Precision Agriculture:

- 1. Ultrasonic Sensors:** Basic sensors but with limitations in resolution and robustness for canopy perception.
- 2. LiDAR Sensors:** Provide detailed biometric data on tree canopies—height, width, volume, and leaf density.
- 3. Image Sensors:** Detect, classify, and count fruits, measure vegetation volume, and derive vegetation indices like NDVI, aiding in precise application.
- 4. GNSS Receivers:** Provide accurate machine location and speed data for precise mapping and control of product application.
- 5. Flowmeters and Pressure Sensors:** Monitor the volume being applied and ensure the correct pressure for optimal droplet size and coverage.

## Importance of VRT:



### Efficiency and Precision

VRT ensures precise application, optimizing the use of plant protection products and fertilizers.



### Economic Benefits

Increases farmer profitability by reducing waste and optimizing resource usage.



### Environmental Impact

Minimizes environmental impact by reducing unnecessary chemical usage.

## Data Obtained from Sensors and Benefits:

- 1. Biometric Canopy Indicators:** Height, width, volume, leaf density from LiDAR sensors.
- 2. Vegetation Data:** Fruit detection, vegetation volume, NDVI, and plant health from image sensors.
- 3. Location and Speed Data:** Utilized for accurate positioning, mapping, and control of product application.
- 4. Sprayer Performance Metrics:** Volume applied, pressure, ensuring precise and efficient spraying.

## Requirements for VRT Sprayer:

- **Robust Perception System:** Able to function effectively in adverse conditions.
- **Control System:** Enables uniform and precise application rate, adjusting in real time according to plant size/phenological state and prescription maps.
- **Adjustable Nozzles:** Fine-tuning spray nozzles for further precision in application rates.



## Conclusion

VRT, backed by various sensors and technology, facilitates precision agriculture, optimizing resource usage, reducing waste, and minimizing environmental impact. A VRT-enabled sprayer should integrate robust perception systems, precise control mechanisms, and adaptable nozzles to ensure efficient and accurate application.