CASE STUDY

How Researchers in Upstate New York used Drones to Improve Hemp Farming

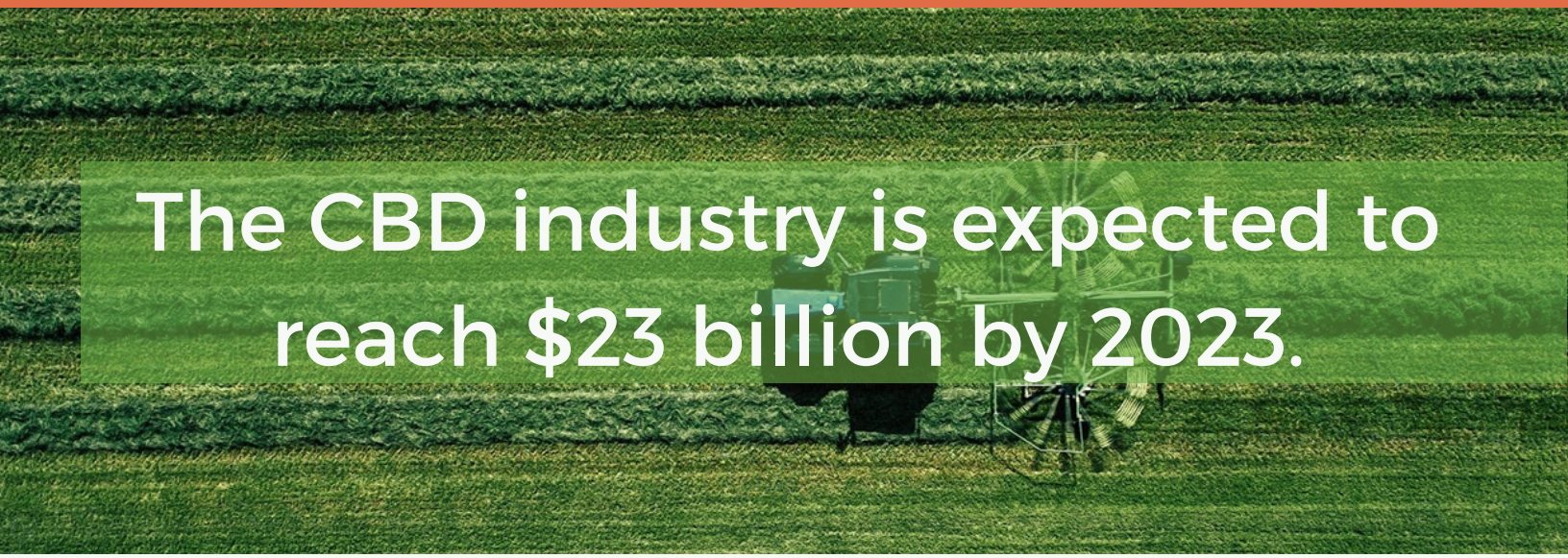
MTI
Sustainable Solutions for
Efficient Environments

KEY ACHIEVEMENTS SUMMARY

Decreased scouting time to 30 minutes

Correlated size to CBD content and gender

Optimized nutrition management



DRONES ARE TRANSFORMING HEMP RESEARCH

Across the United States, **drones are making hemp farming more accessible**. Since the 2018 Farm Bill federally legalized hemp production in the U.S., farming of the plant quadrupled. Increasingly, researchers are exploring ways to gather more data about varietal performance, cultivate hemp more efficiently, and maximize CBD hemp harvests. CBD is one of the main products that hemp farmers are interested in. The CBD industry is expected to reach $23 billion by 2023, **causing an acre of hemp to be worth up to $40K per acre**. But the budding industry is still learning about hemp-growing practices.

Earlier this year, Dr. Lesley Judd and Dr. James Hardin, researchers at The State University of New York (SUNY) Coblekskill, partnered with local drone company, MTI Drones, to get a better idea of how they could use drones and analytics to improve the quality and quantity of their hemp data. **Ultimately, they gained insights into the CBD content, gender identity, and challenges of cultivating their hemp crop.**

THE CHALLENGES OF GROWING HEMP

Dr. Judd is an Assistant Professor in Plant and Animal Science at Cobleskill with a unique interest in greenhouse production, nursery production, and soil science. Her research partner, Dr. James Hardin is an Ag Engineering faculty member who teaches students, among other things, how to turn drone data analytics into actions and results.

To begin their assessment of CBD hemp, Judd and her team planted a 5-acre field in June, divided among 30 rows, for a total of 10,000 plants.

5
acre field

30
rows

10,000
plants

They were mainly evaluating the cherry wine and abacus cultivars of CBD hemp. Like hundreds of others who tried growing hemp for the first time last spring, **Judd found the crop to be more difficult to grow than they expected.**

Some of the challenges they faced were:

HARVESTING

The CBD content of hemp varies throughout the growing cycle. For Judd and her team, their hemp matured at different times.

HEMP GENDER IDENTIFICATION

CBD is higher-content and more potent in female hemp plants. But the process of pollination reduces CBD potency, thereby threatening the profitability of the yield. Male hemp plants can pollinate female hemp plants from up to 20 miles away.

MANAGING WEEDS AND PESTS

Since the 2019 growing season was delayed due to an unusually wet spring, hemp was planted later, and therefore reached full canopy later in the season. This left many fields rife with weeds. Meanwhile, Dr. Judd's hemp field suffered from pests like corn borer and flea beetle.

LABOR INTENSIVE

All of the above reasons combine to make hemp a very sensitive, hands-on crop compared to crops like corn. That's why researchers like Dr. Lesley Judd are using drones to explore the optimal varieties and nutritional inputs for producing and harvesting CBD hemp.

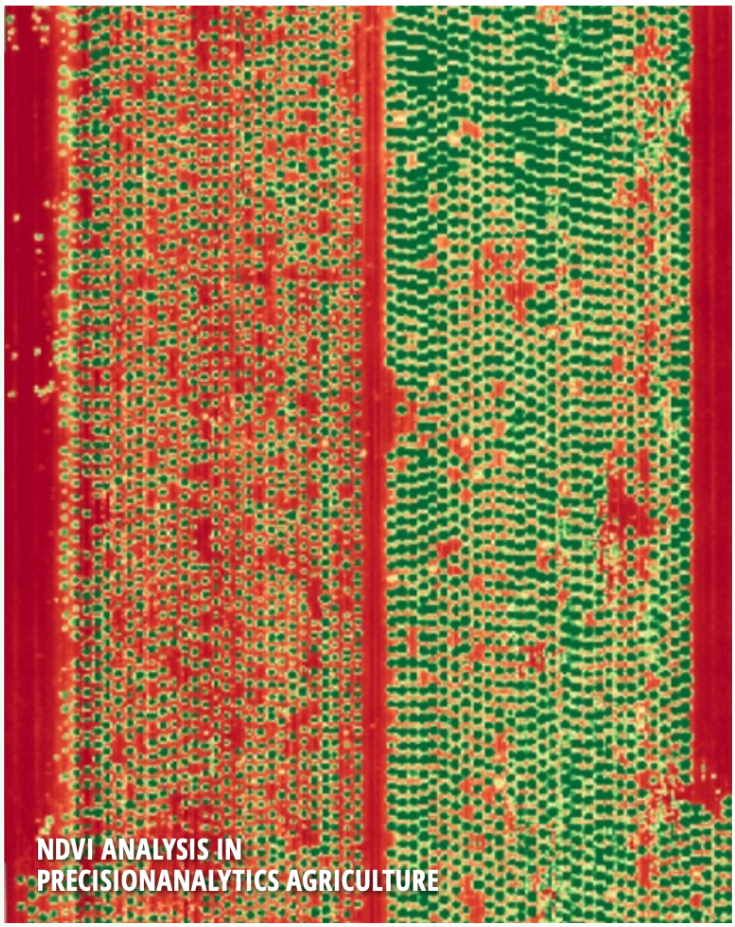
DRONES AS A SOLUTION TO ADVANCE HEMP RESEARCH

Instead of collecting the data themselves, Judd and Hardin partnered with a local drone service provider, MTI Drones. The MTI Drones' team collected data with a DJI Matrice 100 aircraft equipped with multispectral sensors, which they flew at 100 ft. in altitude bi-weekly. This enabled them to gather data that could track the hemp's growth throughout the four- month season.

After collecting the data, **MTI relied on PrecisionAnalytics Agriculture to process the data and precisely measure how various fertilizers and input methods impacted the plants' health and growth**. They found that PrecisionAnalytics Agriculture, provided deeper insights about crops, exceeding the requirements of Judd and Hardin who then used these insights to optimize their hemp crop management approach.

" I found it very easy to track what you are doing with your crops throughout the season with PrecisionAnalytics. When we were finished, we were able to say exactly why one half of the field grew better than the other half"

—Dr. Lesley Judd, Ph.D. SUNY Cobleskill



Here's how they used drones and PrecisionAnalytics Agriculture in their hemp crop research:

SCOUTING

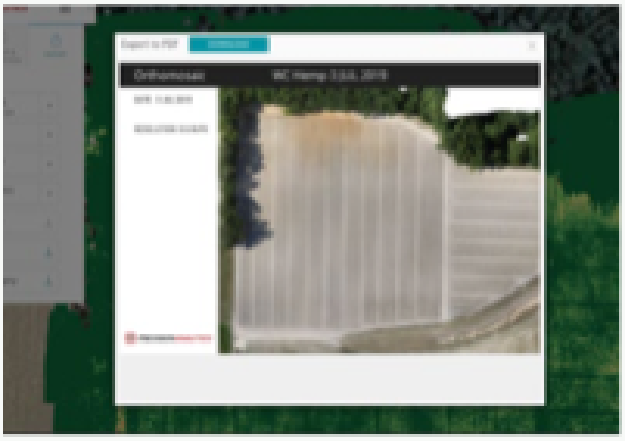
Prior to flying drones, it took Judd up to 16 hours per week, to walk up and down just five acres of hemp looking for signs of stress. **With drones, it took only 30 minutes to capture data** on the entire field.

16
hours per week

0.5
hours per week

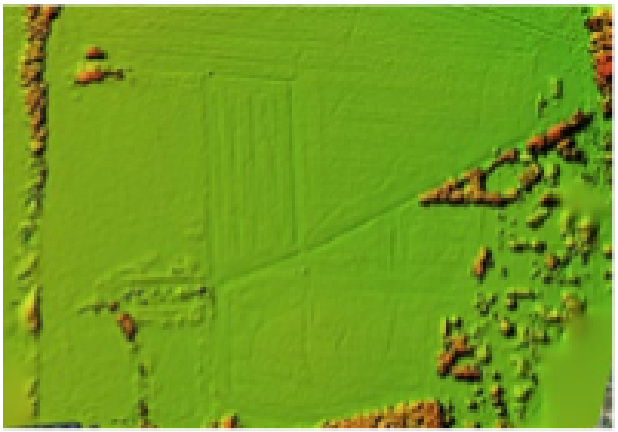
COUNTING AND SIZING

Instead of ground-based sampling and estimating counts, Judd used **PrecisionAnalytics's Plant Count and Sizing tool to determine the number and size of plants, relative to the field**. They used these measurements to determine that their male hemp plants grew bigger and faster, on average, than females.



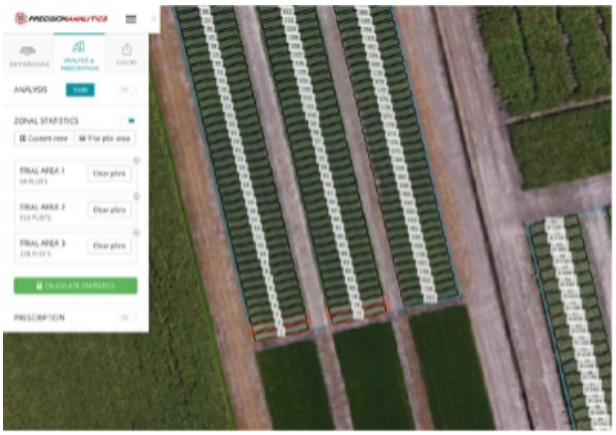
VEGETATIVE HEALTH

The multispectral sensor data enabled Judd to capture early indicators of issues with the crop, and to **know exactly which rows and which plants were affected. U**sing the Exports feature in PrecisionAnalytics, Judd was able to **print out data products** from the drone flights, such as an NDVI map, that she then used to precisely locate problem spots physically while in the field.



TERRAIN MAPPING

Like many researchers and farmers, Judd and the team had to manage wet and dry areas of their field. Wet areas tend to cause hemp to grow slower, with smaller canopies, and make plants more susceptible to disease. This can delay and diminish flowering and harvest. With the **PrecisionAnalytics terrain tool, users can identify high and low areas across their fields** and make more informed decisions about irrigation management and field drainage.



ZONAL AND PLOT TOOLS

Judd tracked the maturity and CBD content of different cultivars across the trial. MTI's lead drone pilot, Austin Roggen, flew the field biweekly and uploaded captured data into PrecisionAnalytics. There, the researchers could **apply zonal and plot statistics to break up their five acres of hemp into manageable rows of plants.** They could create parameters in-app to tailor management for those specific plants, based on maturity levels. This made identifying hemp plants at different growth stages, and tracking their development, more efficient.

GENDER

Cross-pollination can damage a hemp yield or affect research outcomes. While Judd wasn't able to specifically identify male vs female plants using drones, she found a correlation between size and gender. By applying PrecisionAnalytics' plant sizing and density tool to the data, they learned that male hemp plants grew bigger, faster. The use of drones to capture and correlate size data to gender helped them reduce the time spent scouting the fields by 96 percent.

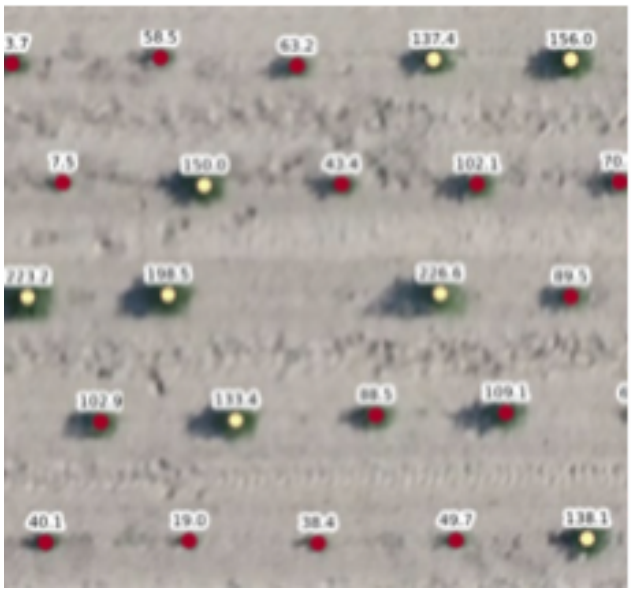
A PARTNERSHIP FOR THE FUTURE OF HEMP RESEARCH

Adopting drone technology enables researchers to make fast, informed decisions about their new hemp crop. Hemp researchers who use drones to collect and analyze data spend less time identifying problems and more time solving them. Having more efficient hemp management practices enables them to scale their practice without sacrificing the quality of their research or yield.

"Five acres of hemp is pretty difficult to manage from any viewpoint. But the drone imagery helped us see the entire field. It provided plant counts and showed where young plants died off--which we wouldn't have noticed as quickly by walking the field."

—Dr. Lesley Judd, Ph.D. SUNY Cobleskill

Drone data provided Dr. Judd and Dr. Hardin with insights into CBD content during the growing cycle. **With the help of MTI's drone teams and PrecisionHawk's plant count/density tool, Judd discovered that larger plants had already begun to lose CBD levels, while smaller plants were reaching their peak CBD content.** This proved critical for identifying the optimal time to harvest, without spending days sampling each and every plant. The application of drones for Dr. Judd's hemp research impacted the success of her trial.



Ultimately, the team was able to harvest 80 percent of their CBD hemp on time.

Despite discovering 80 male hemp plants, **the use of drones helped ensure the health of their harvest** and allowed her team to hand harvest the plants with high CBD levels based on their size and location.

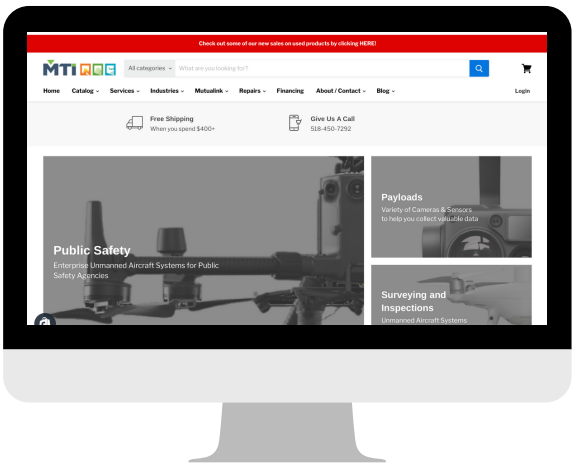
LOOKING FORWARD

The success of SUNY Cobleskill's hemp harvest is just the surface of what they and the agriculture industry can accomplish using drone-based aerial intelligence. While Dr. Judd and Dr. Hardin were successfully able to use drone data to analyze plant density and compare cultivars and input profiles, they realize there is even greater potential for using near-infrared and thermal sensors to better assess soil health, identify signs of stress, and potentially identify males vs female plants using heat signatures.

Researchers who use drones to collect and analyze crop data are improving the quality and quantity of their data, while cutting down on the time and resources it takes to achieve those results.

Ultimately, drones enable researchers to scale the scope of their study and develop cutting- edge practices in precision farming.

To learn how to increase growing and research efficiency using drones, speak to an expert now.



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