Viticulture from Space: USU-NASA Study Analyzes Vineyard Water Use

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Published in Utah State Engineer – Oct. 2, 2017 – In drought-prone Central California, grape producers are looking for new ways to improve crop production with less water. And it’s not just winemakers feeling the pinch. The citrus groves, nut orchards and alfalfa fields of tomorrow will depend on an increasingly sophisticated toolkit to get the most out of the region’s precious water resources.

Dr. Alfonso Torres-Rua

Engineering researchers at Utah State University are pioneering the technologies that will make the next era of precision agriculture possible. Dr. Alfonso Torres-Rua and Dr. Mac McKee of the Utah Water Research Lab and USU’s Dr. Lawrence Hipps are leading a three-year, $1.3 million NASA-funded study aimed at estimating vineyard water use and stress using a combination of ground-based sensors, unmanned aerial systems and satellite imagery.

Torres-Rua, an assistant professor of civil and environmental engineering, says grape production covers about 1 million acres in California’s Central Valley and contributes $6 billion to the state’s economy. Fruit and nut orchards represent an additional 2.6 million acres and $10 billion-plus in economic impact.
Alfonso Torres-Rua and research engineer Ian Gowing take GPS Measurements at a Vineyard near Borden, Calif. USU researchers are leading groundbreaking research that combines satellite and UAS imagery to analyze vineyard water use and stress.

The USU team is collaborating with scientists at USDA’s Agricultural Research Service and Ernest & Julio Gallo Wineries. The goal of the study is to improve the maps and models that depict grape crop water use, water stress, soil moisture and other factors. Torres-Rua says improved models can help water vineyard managers make better decisions about when to start irrigating and how much irrigation water to apply. The current methods used by vintners across California often lead to over-irrigated vines.

“A water savings of just five percent can mean significant economic impact for growers in this region,” said Torres-Rua. “Developing more efficient irrigation strategies is both good for the crop and good for business.”

Torres-Rua and his team will focus on providing ultra-high resolution images acquired from USU’s AggieAir unmanned aerial vehicle program. AggieAir’s new line of all-electric UAVs, known as BluJay, can fly three hours on a single charge and cover 50 square km or 12,000 acres. The images from BluJay will be combined with satellite imagery to provide a new digital mapping tool for visualizing crop water usage and stress. Torres-Rua says the images reveal so much information, they can tell vineyard managers the status of a single grapevine.

“UAVs provide the best remote sensing information from which satellites can benefit,” he said. “This will allow us to recognize the crop’s water needs in real time which translates to irrigation efficiency.”

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