Location Intelligence

GIS in Biodynamic Viticulture: Happy Vines Make Happy Wines

By Francica
(Jun 15, 2006)

Geospatial information and technology has been used for several years in precision farming applications. Jim Fetzer, a member of the Fetzer family whose name emblazons the popular wines, wanted to apply the technology to grow and manage an "eco-friendly" vineyard near Clear Lake, California.

Fetzer's Ceágo Vinegarden is a 270-acre complex where Fetzer is evangelizing biodynamic viticulture using techniques that were proposed in the 1920's by Austrian scientist and philosopher Rudolf Steiner. In concept, Steiner's theory proposes that the earth's climatological elements are entwined with its plant life and animal inhabitants to sustain each other as a dynamic, living organism. Fetzer hopes to manage a vineyard's ecosystem to develop organically grown grapes of higher quality by "tweaking" certain environmental assets (light, soil moisture, temperature) in just the right proportions. How? Through recycling, cultivation and composting. How does he monitor the ecosystem? Via a bio-sensor network in his fields and a Google Earth-based visualization system (See Figure 1).

Figure 1 (Click for larger image)

Background

Fetzer is a second generation wine maker. He sold the wine label in 1992 and now concentrates his efforts on building a business model that leverages not only the quality of the Ceágo wines but marketing the unique fundamentals of biodynamic viticulture. In 2001, he hired Josh Metz, founder of Geovine, a small geospatial technology firm. According to Metz, his job was "to blend new information technologies and sustainable farming practices to improve crop quality, operating efficiency, and environmental performance of viticulture operations."

Project Details

Fetzer had Geovine define the project specifications and collect the geospatial and weather data. Geovine also worked with Kevin Delin from NASA's Jet Propulsion Laboratory (now with Sensorware Systems) whose expertise was sought in designing the array of sensors, or Sensor Web, that would monitor soil moisture, light, ambient air temperature and other factors. Geovine then collaborated with CH2M HILL to integrate the various land-based sensors and mapping technologies (See Figure 2). CH2M HILL's team supported Geovine's efforts through their expertise in GPS technology, web services, wireless architecture, environmental science, and mobile applications. The entire Sensor Web at Ceágo is wirelessly transmitting data in real-time (See Figure 3) to a central data store which operates on a 900 MHz frequency. This data stream can be viewed on the Internet at

http://sensorwebs.ceago.com/swim/.

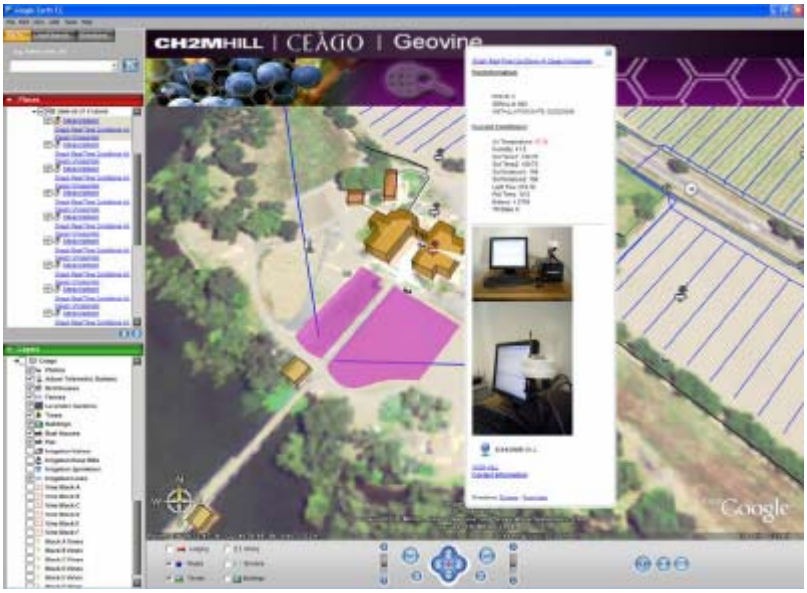

Figure 2 (Click for larger image)

Figure 3 (Click for larger view)

Taken together, the Ceágo-Geovine-CH2M HILL team is in the process of integrating and storing the Sensor Web data and using Google Earth to display the results for its management team. In addition, Ceágo is deploying mobile handheld applications for the vineyard manager to gather data in the field and update a central database. CH2M HILL determined that due to close proximity of the rows, vines, irrigation valves and the location of sensors, the team should use a Trimble ProXH GPS mapping unit with Bluetooth-enabled Trimble Recon data collectors to map the ranch's infrastructure at +/- 1-foot accuracy using a customized Terrasync data dictionary. This approach allows for a detailed microclimatic picture of the entire vineyard. Radio Frequency Identification (RFID) tags were attached to vine rows and scanned using a compact flash RFID scanner inserted, along with a Bluetooth card, in the top of the Trimble Recon data collectors. The vineyard manager can then draw on this database for making "in-field" management decisions by monitoring Sensor Web data in real-time; future versions of the Sensor Web will allow managers to make these decisions autonomously. Such information is vital to determining irrigation schedules but also in exploring how information from light meters can be used to evaluate different management practices for grape ripening and sugar concentration. For Metz, this is still a

research and development effort. He will be working with the University of California extension divisions to refine his methodology. He would also like to use remotely sensed data to monitor plant vigor and well as developing a frost risk model.

Future Goals

In the future, the Ceágo management team wants a system that provides real value for more efficient land practices. They want to collect farm management data efficiently so that data collection doesn't impinge on its workforce. Other vineyards working to implement biodynamic viticulture have noted additional expense with this technique. In an article in the San Francisco Chronicle (July 1, 2004), author Thom Elkjer noted that, "Champagne producer Jean-Pierre Fleury once said that biodynamics increased his workload about 30 percent compared to conventional viticulture. Much of that increase, he said, was in planning, organizing and preparing precisely calibrated natural treatments for his vineyards." Metz, now the Ceágo Vinegarden technology specialist, put that comment in perspective. "The real value of system is for the operation of multiple vineyards," he explains.

From Fetzer's perspective, there is marketing value in telling the story of Ceágo and how biodynamic viticulture combined with geospatial technology are being used in producing the best possible grapes for its varietals and blended wines for making Chardonnay, Sauvignon Blanc, Merlot and Muscat. Says Fetzer, "Happy vines make happy wines."
