

November, 16,2006

High-Speed Internet Access in the Back 40 -
<http://www.farmnetworks.org/Default.aspx?tabid=63>

John Mascoe & Jim Hook
Vancoe and University of Georgia
johnm@vancoe.com & jimhook@uga.edu

This summer, a group of farmer cooperators near Albany, Ga., became a test bed for a wireless network. Several field locations were equipped with soil moisture sensors, thermometers and network cameras. Using their web browsers, growers were able to access real-time information from these sensors.

The wireless network and its monitoring system takes the guesswork out of irrigation scheduling and ensures that water resources are being used as efficiently and effectively as possible. But the project has other important goals too. Wireless access to on-farm information will improve overall farm management. As a pilot project, it provides a platform for manufacturers to test their products.

An Unusual Partnership

Launching this network took an unusual partnership. The Nature Conservancy, looking for ways to lessen the impact of irrigation on the regional watersheds, partnered with the Flint River Soil and Water Conservation District and their technical support in USDA Natural Resource Conservation Service in southwest Georgia. Each recognized the benefits of pumping less water and sustaining flows in the region's streams and rivers.

The University of Georgia's C. M Stripling Irrigation Research Park and USDA's National Peanut Research Lab had shown that irrigation scheduling could lead to lower and more effective use of water. What has been limiting is time for farmers to track their crop's water needs.

That's where VanCoe Environmental, LLC. came in. With expertise in remote, automated soil water monitoring and network creation, we offered a solution to the water management and opened the door for other improvements through wireless access.

Calhoun County, Ga., was chosen for the wireless network because it was typical of rural areas where there is minimal infrastructure and local experience needed to establish a wide-area wireless network. It was has high concentration of center pivot irrigation systems.

Currently, we are delivering high-speed Internet access at speeds of 400 Kbs to 1200 Kbs to some areas of the county. Most of our energy has focused on building the network and ironing out the wrinkles of the system, and farmers have been very patient. This winter, we will be educating growers about the capabilities of the network and how best to utilize the information it delivers.

Project Rational

As water becomes an increasingly precious resource, it is critical that we target its use as effectively as possible. In agriculture, this means better irrigation scheduling using in-field sensors. Wireless networks offer a platform for delivering this information to growers.

The two important features gained by wireless high-speed are:

1. Speed. High-speed wireless has the capacity to operate at 2,400 Kbs. Although it will not operate at maximum capacity all the time.

2. No wires. This means flexibility to collect and access information wherever you have internet access.

Lessons Learned

Establishing the wide-area wireless network in Calhoun County was filled with a multitude of challenges. Lessons learned from this project include:

1. Understand the limitations of wireless technology. For wide area coverage there is no single network solution that can do it all. The fewer the obstructions from trees and topography the greater your flexibility in building a network. Site surveys and testing are a must to ensure a reliable system. Line-of-site means that the systems need to see each other to communicate and can typically operate over longer distances. Non-line-of-site means that the systems can communicate through trees and other obstructions but have a shorter range.
2. Towers are key to establishing reliable communication. The higher the antennas, the fewer obstructions will degrade signal strength. Existing towers or structures may be unable to handle the extra wind load of additional antennas and will require regular maintenance. Telecom towers may be an option, but will incur high monthly fees. It may be more cost effective to build your own towers. Mounting equipment will require tower climbers who are scarce and fairly costly.
3. Power. Access points used in a wireless network require reliable power. Power sources in remote areas are usually non-existent. Solar power is an option, but can be expensive. Tying into power at a pivot is possible, however power along the system is usually restricted to the operation of the system. Consider the expense of setting poles and running power to the access points when planning the project.
4. Be selective when choosing any contractors and specific in your communications with them. You may need to look outside the local area for trained expertise to help install and support a network.
5. Prepare for Mother Nature. Lightening, wind, rain and heat all played a factor in slowing down the progress of this project. Make sure you have a well-grounded system (towers included), lightening arrestors, surge protectors, backup power supplies and breakers on your power supply on both the hot and neutral sides. This will not prevent lightening damage but will reduce your risk. Know the operational temperature of your equipment, cooling fans may be required.
6. Think outside the box. Understand that you are already outside the box by providing wireless internet access. Look outside agriculture for solutions, other industries are already utilizing wireless technologies.
7. Limit expectations for the first year. It takes time to make a system fully functional. Invariably there will be delays and the learning curve will be steep for all parties. Often what works in a non-rural environment does not work well in a rural setting.
8. In designing and building a network consider ease of expansion and compatibility with other technologies. This is not always easy since the technology is changing rapidly.

For more information, contact the authors at johnm@vancoe.com or jimhook@uga.edu