419/1387

2015

NATIONAL PEANUT BOARD/SOUTHEAST PEANUT
RESEARCH INITIATIVE
FINAL REPORT SUMMARY FOR WORK
DONE UNDER RESEARCH AGREEMENT

INSTITUTION: University of Georgia

PROJECT TITLE: - Improving Farm Systems with Internet, & Solar-Powered Sensing and Control Systems – Phase II

RES. AGR. NO.: PID #419 PROJECT LEADER: Craig Kvien
GACCP Budget No.: SID #GA-169, BID # 1387

EXPIRATION DATE: 6-30-2016 NPB CONTACT: Bob Parker/Maria Mehok
NPB Budget No.:

Final Report - Summary:

In this project, we tested a "Super WiFi system, from Carlson Wireless, that uses UHF TV channels in the 470 to 698 MHz. to provide a cost-effective, non-cellular way to transfer information from remote WiFi systems. We identified a system from eero as very farmer friendly WiFi networking devices that will monitor themselves and enable users to see their network operations on a smart phone. The best to date WiFi general use cameras have been the Nest cameras, as they are easy to connect, easy to access through a phone app, relatively inexpensive (3 for $500), and will send notifications, video and audio (mic and speaker) to mobile or office devices. When evaluating solar systems we noted that when even a tiny part of some arrays were shaded (by trees, building parts, clouds) during part of a day, electrical production was greatly reduced. Some panel types, such as amorphous thin film, are less efficient than crystalline panels in unshaded situations, yet come equipped with bypass diodes which minimize the effects of partial shading by enabling electricity to 'flow around' the shaded cell or cells. This feature enables the amorphous panels to function better than the crystalline panels in partially shaded or cloudy situations. To determine how much power different devices are consuming we decided on a system called The Energy Detective (TED). The system can be networked, has good software and a suitable number of current sensors to cover the needs of most applications.

419/1387
2015

NATIONAL PEANUT BOARD/SOUTHEAST PEANUT RESEARCH INITIATIVE
FINAL REPORT FOR WORK DONE UNDER RESEARCH AGREEMENT ______

INSTITUTION: University of Georgia

PROJECT TITLE: - Improving Farm Systems with Internet, & Solar-Powered Sensing and Control Systems – Phase II

RES. AGR. NO.: PID #419	PROJECT LEADER: Craig Kvien
GACCP Budget No.:	SID #GA-169, BID # 1387
EXPIRATION DATE: 6-30-2016	NPB CONTACT: Bob Parker/Maria Mehok NPB Budget No.:

We tested a "Super WiFi system, from Carlson Wireless, that uses UHF TV channels in the 470 to 698 MHz. The omni antenna at the base station was placed first at 100 ft , measurements taken and then lowered to 60 ft and measurements taken. The field sites used a smaller directional antenna at 6 ft. At 100 ft the omni antenna received signal from the field antennas for at least a 5 mile radius. At 60 ft the omni antenna was receiving a reliable signal from field antennas at least 3 ½ miles away. Because the Carlson system uses lower frequencies the system needs a standard WiFi system to link to take full advantage of the many devices that use these frequencies. The Carlson system provides a cost-effective, non-cellular way to transfer information from remote WiFi systems.

To identify more farmer-friendly standard WiFi systems to link to Super WiFi we tested a number of router, range extender and access point devices. Most devices from different companies were difficult to link together and form a smooth, and seamless operation. Yet, one system – eero, recently brought to market by a new startup company based in California, is significantly easier to set up and maintain. The eero system can be purchased as single or multiple devices that link through a self-forming mesh network. The devices monitor themselves, eliminating the need for manual reboots, and automatically determine network settings and device type. Yet, multiple devices are needed to adequately cover the home and out buildings (about one per 1,000 sq ft).

We also tested a number of simple, inexpensive WiFi camera systems. The best to-date has been the Nest cameras, as they are easy to connect, easy to access through a phone app, relatively inexpensive (3 for $500), and will send notifications, video and audio (mic and speaker) to mobile or office devices.

Our studies to evaluate the capacity and types of solar photovoltaic cells and storage devices continue. This year we first looked at several inexpensive solar panels and controllers that were attached to water pumping systems. The power demands of these systems necessitated a switch to larger solar arrays and better controllers. We noted that when even very small parts of a panel or array were partially shaded during the day electrical production was greatly reduced. Shading some types of solar panels is similar to water flowing in a pipe that becomes constricted. If shade from a tree or a cloud is cast on even one of the panels, or in some cases even a portion of one panel, in the string, the output of the entire string will be reduced to virtually zero for as long as the shadow sits there. Yet if there are other strings of panels, all non-shaded, these strings will continue to produce power as per usual.

Some panel types, such as amorphous thin film, are less efficient than crystalline panels in unshaded situations, yet come equipped with bypass diodes which minimize the effects of partial shading by enabling electricity to 'flow around' the shaded cell or cells. This feature enables the amorphous panels to function better than the crystalline panels in shaded or cloudy situations.

To determine how much power different devices are consuming we tested several and decided on a system called The Energy Detective (TED). This system allows us to hold all the data locally, and does not result in a monthly charge – as is the case with other systems we have looked at. The system can be networked, has good software and a suitable number of current sensors to cover the needs of most applications.

We are now gathering many types of solar panels to create a small test array that will enable us to better provide unbiased information to growers on solar panel and system performance.