Long Range Internet Connectivity to Improve Farm Management

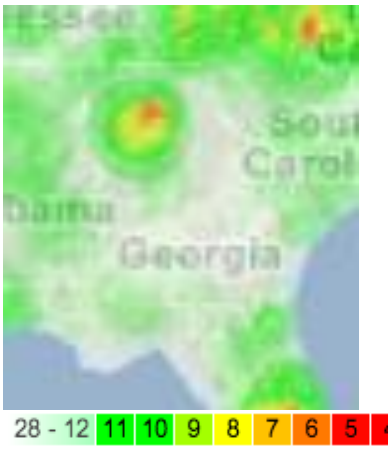
a preliminary report to the Georgia Peanut Commission -2/12/2014

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Objective: To evaluate new approaches to delivering Internet to wide spread farm operations and thereby increase human, natural resource and energy use efficiencies.

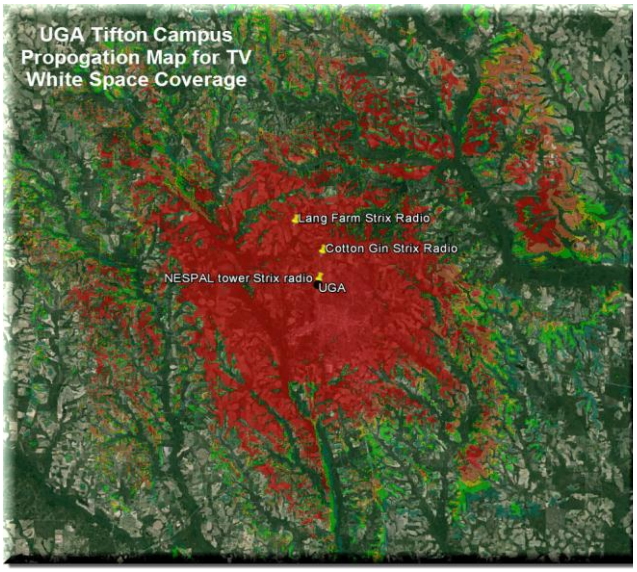
Rational & economic significance of project : Remote monitoring and control of equipment and farm operations enable growers to "be" in and look in at several places at once, resulting in time and energy efficiencies through reduced travel time and increased efficiency of equipment operation. Yet, setting up an Internet cloud over a farm can be challenging and expensive because tree lines, and a rolling topography will interfere with most Internet signals. While cellular and satellite connections help, they can be expensive and slow.

A new option to farmers is to use TV "white space". As TV stations moved from analog to digital and to cable, unused lower frequency "white space" frequencies became available. These frequencies have long-range penetration and there is more bands available in the rural areas than in urban zones (see picture to the right). Connection speeds in these bands will be comparable to 4G cellular systems (3-4 MHz). "Super Wi-Fi ", as it is often referred to, is much more powerful than existing Wi-Fi networks as they can penetrate thick concrete walls and travel over hills and around trees. The 470 --698 MHz (UHF bands) "Access points" would have a range of approximately a dozen miles (compared to about a football field for standard Wi-Fi).



Available Channels

"Super Wi-Fi" may not be super in terms of speed, but it is as far as range goes – see the White space propagation map (in red) for the UGA Tifton Campus below. Today our current UGA network radios cost $28,000 to cover isolated areas within the campus. As part of this project we will be testing a Super Wi-Fi system which promises to cover a much larger area at about half the cost.



With the rapid expansion of smartphones, tablets, machine-to-machine devices and the smart grid, the number of devices connected to mobile networks worldwide is expected to grow tenfold by 2020, from 5 billion to 50 billion. To help meet this growth Super Wi-Fi systems will use dynamic spectrum sharing, where a database—updated daily by the FCC, indicates which frequencies are available for use in a given area at a specific time of day and what power can be used at a particular time. An enabled device then would query the database to discover what it is allowed to utilize at that particular moment, given its GPS coordinates; once it has this information, the device automatically selects an available frequency and adjust its power accordingly.

Impact: *Lower cost and longer range Internet connectivity will lead to more on-farm systems that will save growers time, energy and money in addition to stimulating rural communities through the creation technical jobs.*