OPEN+ Sensors for Bioenergy and Agriculture Cohort

PROJECT DESCRIPTIONS

Geegah LLC – Ithaca, NY

Integrated Gigahertz Ultrasonic Imager for Soil: Towards Targeted Water and Pesticide Delivery for Biomass Productions – $500,000

Geegah will develop an inexpensive wireless sensor, using ultrasound from MHz to GHz, that can measure water content, soil chemicals, root growth, and nematode pests (a type of small worm), allowing farmers to improve the output of biofuel crops while reducing water and pesticide use. The reusable device will include a sensor suite and radio interface that can communicate to aboveground farm vehicles. This novel integration of sensing and imaging technologies could provide a low-cost solution to precision sensor-based digital agriculture.

Northeastern University – Boston, MA

Zero-Power Wireless Infrared Digitizing Sensors for Large Scale Energy-Smart Farm – $1,630,925

Northeastern University will develop a maintenance-free sensor network to improve energy and agricultural efficiency by monitoring water content in plants. The team's zero-power sensors will form distributed networks that can capture, process, and communicate in-field data to help farmers determine how to maximize yield. Specifically, sensors will monitor water stress-related plant characteristics, relaying these data wirelessly to a control center in the irrigation system. The proposed technology does not consume any power in standby mode, eliminating the cost of battery replacements.

University of Colorado, Boulder – Boulder, CO

Precision Agriculture using Networks of Degradable Analytical Sensors (PANDAS) – $1,690,415

The University of Colorado, Boulder will develop 3D-printed, biodegradable soil sensors that enable farmers to precisely understand crop water and fertilizer needs. These sensor nodes can be embedded in a field, to accurately and continuously monitor soil and crop health for an entire season before degrading completely and harmlessly into the soil. This approach could enable real-time soil monitoring by farmers, enabling them to reduce agriculture's energy footprint and water needs and increase soil carbon.

University of Utah – Salt Lake City, UT

Low-Cost Wireless Chemical Sensor Networks for Early Detection of Invasive Parasitics in Biofuel Crops – $2,164,314

The University of Utah will develop low-power sensors to enable the early detection of invasive weeds and/or insects in biomass crop production. This would increase the overall energy efficiency of crop production. Farmers currently lose about 40% of biomass crops due to weeds and insects that ideally need to be removed within a week of detection. Early detection could minimize such a loss even with much smaller applications of pesticides and herbicides, significantly increasing the economic viability of biomass generation.