FINAL REPORT

Project No.: TR-05-501
Project Title: FST Sensor Beta Testing
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Quarterly report (4th and FINAL)

OBJECTIVES:

1. Construct, sell, install, and service about 50 FST sensors for Beta testing. Some sensors will be used with the self-contained system (i.e. sensor that transmits to a portable receiver unit) and some with "local networks" of the AgWeatherNetwork stations.
2. Construct, install, and service FST sensors on the Beta sites of the AgWeatherNetwork system. These sensors will be loaned for use at these Beta sites during 2005.
3. Continue research with different controllers and timer systems to identify reliable systems at a reasonable cost.
4. Continue research, if needed, to improve the FST sensors. Study reliability and life of the sensors and control systems.
5. Conduct studies to learn more about spatial variability within an orchard.
6. Continue search for cost-effective manufacturer, distributor, and retailers

RESULTS:

1. In 2005, 58 Model B sensors were built; 49 were connected to visual read out unit (read out of transmitter and receiver units) with 4 to the AWN units and 5 to the SS100 (local network) units. The sensors were installed throughout the area in counties of Chelan, Yakima, Benton, Grant, Douglas and Okanogan of Washington State.

2. Eight Model A sensors were built. Three were used to activate timers to turn on evaporative cooling (EC); 2 were used to open and close solenoid valves; 2 were used to turn on a irrigation pump; 1 was not installed.

3. Model B visual read out unit: All of the installed units functioned, read the temperature of the fruit surface and provided the information on the recommended temperature to turn the evaporative cooling on and the temperature to turn it off. Growers were pleased with their ability to know when to turn the EC on and off. Some of the units needed to be reset (i.e. remove and reinstall the batteries of the receiver and transmitter in proper sequence). This was a learning experience and did not affect the unit's function. At one location there was a problem of the receiver not picking up the signal from the transmitter. This was found to be related to frequency interference from power lines, telephone lines and frequency equipment in the truck with the receiver.

4. Model A: All the sensors, either connected to a pump, a timer or a solenoid functioned as designed. All of them opened solenoid valves when FST reached a set point (usually 104 °F) and closed the valves when FST dropped to the lower set point (usually about 90 °F). The FST stayed within that temperature range and protected the fruit from sunburn. Model A was also used to activate a Fogging system automatically for a comparison with EC. At harvest time, Gala fruit color was significantly improved with both EC and Fogging, but sunburn protection was more effective with EC. The growers were pleased with the performance,

the savings in water and the peace-of-mind in knowing their evaporative cooling was operating as needed to protect their apples from sunburn.

4. AgWeatherNetwork (AWN): The sensors connected to the AWN at an orchard near Wenatchee and one near Brewster provided written and recorded temperature of the fruit surface and the ambient temperature. This was done continuously 24 hours each day. The sensors connected to the AWN in Royal Slope and Wiley City did not consistently record or failed to record the temperature of the sensor. The sensors were taken from these locations and interchanged with the sensors in Douglas County. The sensors from Wiley City and Royal Slope functioned properly on the AWN in Douglas County. The reason for the AWN not recording the temperature of the sensors at Royal Slope and Wiley City is not known, but the problem does not seem to be in the FST sensor.

7. SS100: Four of the sensors connected to the SS100 provided fruit surface temperature information. The temperature reading at high temperatures (about 95 F and above) was not consistent within all units. The differences were at times 5 to 8 F. At lower temperatures the readings were within 2 to 3 F. Work is continuing to determine the nature and source of the problem whether it be in the sensors themselves or in the interface to the receiver/transmitters of the SS 100.

8. Other: Discussions were initiated in early December with an irrigation company to determine their interest in marketing and servicing the FST sensors. We are awaiting their response.