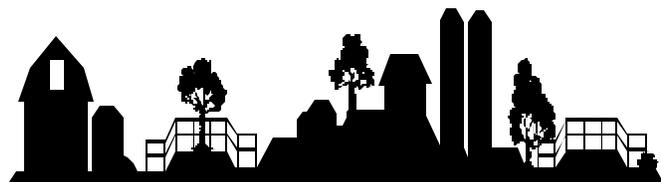


The Washington Irrigator

Newsletter



Vol. 3, Issue No. 7

A WSU Cooperative Extension – Prosser Publication

December 2000

INFORMATION SHEETS FROM IRRIGATION SCHEDULING CONFERENCE

The Innovative Technologies in Scientific Irrigation Scheduling Conference was held in Richland, WA on September 21st. This conference was convened to advance and promote the many Scientific Irrigation Scheduling (SIS) methods being marketed and developed in the Pacific Northwest. Over 75 individuals participated in the conference and some of the content of this meeting is being published here for the benefit of the newsletter readers. The SIS products that were examined and the companies that presented the SIS products are as follows:

AM 400 WaterMark Datalogger
M. K. Hansen Company
Outrider WaterMark Datalogger
Clearwater Supply
Troxler Sentry Probe and PRISM Software
Irrigation Scheduling Methods
User-Friendly Neutron Probe Software
Hevly Technical Services
ECH2O – Dielectric Aquameter
Decagon Devices, Inc.
EnviroScan Remote System
Sentek Sensor Technologies & Simplot
Gro-Point and Intelligent Irrigation Software
Irrigation Specialists & Environmental Sensors Inc
C-Probe and Adcon Telemetry
Cenex Harvest States And Wilbur Ellis
CS615 and HydroSense
Campbell Scientific, Inc.

The following newsletter pages contain the one-page fact sheets that were provided by the invited speakers at the conference. Fact sheets from the Bureau of Reclamation, Idaho Department of Water Resources and Washington State University on AgriMet, IrriTalk, and WISE are also included. The conference was sponsored by the Northwest Energy Efficiency Alliance

*Brian G. Leib,
WSU Extension Irrigation Specialist*

SOIL MOISTURE GRAPHS ON WSU WEBSITE

Many of the soil moisture monitoring methods presented at the Innovative Technologies in Scientific Irrigation Scheduling Conference have been tested by Washington State University. Over the past three growing seasons, sensors have been placed in field trials that were irrigated by solid-set sprinklers, center-pivot sprinklers, linear-move sprinklers, and drip tubing and used to grow apples, alfalfa, carrots, onions and potatoes. The soil type varied from course sand to silt loam but no soils with a predominant clay fraction were encountered. The sensors were also placed at various depths within and below the crop root zone.

Surprisingly, most sensors produced similar trends when directly compared under this variety of conditions. This is not to say that the sensors produced the exact same value at every reading. In fact, the soil moisture readings could be quite different in value with only the upward and downward trends changing at the same time. The most notable exception being the ability of some sensors to show different soil moisture levels in course sand. If absolute accuracy is important for your irrigation scheduling then calibration will be required for most sensors. However, many producers will be able to adjust their understanding of the soil's moisture status to the uncalibrated sensor readings.

A graph showing the soil moisture sensor results at a single depth in a single trial is shown on the last page of the newsletter. The complete set of graphs can be found

at <http://sis.prosser.wsu.edu> under the subheading SENSORS. This web site also contains other irrigation scheduling tools along with contact information for irrigation scheduling service-providers.

*Brian G. Leib,
WSU Extension Irrigation Specialist*

The Northwest Energy Efficiency Alliance is a non-profit group of electric utilities, state governments, public interest groups and industry representatives committed to bringing affordable, energy-efficient products and services to the marketplace.



AM400 Soil Moisture Data Logger With Graphic Display

The AM400 is a low-cost soil moisture data logger with a built-in LCD graphic display. Operating on two AA batteries, the AM400 allows the user in the field to view graphs of soil moisture readings from six sensors located up to 1000 feet away. At a glance, the user can determine soil moisture minimums, maximums, and trends at selected locations and soil depths. Data from the AM400 can also be downloaded to a notebook computer through a serial port.



FEATURES

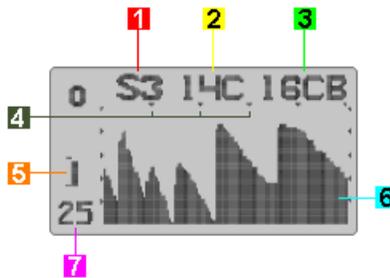
- Runs on two AA batteries for a complete growing season.
- Logs data from 6 Watermark™ soil moisture sensors.
- Soil moisture sensors can be located up to 1000 feet away.
- Automatically records temperature corrected soil moisture readings every eight hours.
- Over 10 months of data is maintained in non-volatile memory.
- Displays graphs for each sensor showing five weeks of soil moisture readings.
- Ten months of stored soil moisture and temperature readings can be downloaded to a notebook PC.
- Optional software is available to display graphs of downloaded data on a PC.
- Installation requires no special tools or skills.

Watermark is a trademark of the Irrrometer Company.

DISPLAYED INFORMATION

1 Moisture Sensor Identifier

This number identifies the sensor from which the displayed data was obtained. It can range from 1 to 6. Soil moisture data from a particular sensor is selected using the single external pushbutton.



3 Current Soil Moisture

The current soil moisture is displayed here. Soil moisture levels are expressed in terms of the negative pressure in centibars required to extract moisture from the soil. As the moisture increases, the number decreases.

4 Horizontal Scale

Each mark on the horizontal axis represents one week.

2 Current Soil Temperature

This is the current soil temperature reading in degrees Celsius obtained from the temperature correction thermistor assigned to this moisture sensor. Each moisture sensor can have its own temperature correction thermistor or multiple sensors may share a thermistor.

6 Soil Moisture Graph

The soil moisture graph shows soil moisture measurements taken three times per day for five weeks (35 days). Each column represents one measurement (data point) in centibars. As the moisture level increases, the column height increases. When the graph is updated, the new data point is inserted at the **right** and all previous data points are shifted one to the **left**.

5 Battery Voltage Gauge

This indicator shows the current battery voltage. It functions like a fuel gauge to show the user how much battery life remains.

7 Vertical Scale Indicator

This field shows the lowest moisture level (highest centibar reading) that can be represented on the graph. Auto scaling is employed on the vertical axis. The scale can be 25 to 0 centibars, 50 to 0 centibars or 100 to 0 centibars depending on the lowest moisture level recorded over the last five weeks.



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OutRider
WATERMARK Sensor Data-Logging System

The **OutRider** is an inexpensive, stand-alone data-logger designed specifically for Watermark soil moisture sensors (Irrometer Co.). The **OutRider** can read up to 16 inputs (15 Watermark sensors plus 1 soil temperature) at hourly intervals for the entire growing season powered by a single 9 V DC lithium battery. The data is downloaded and charted using a lap-top PC in the field.

Features:

- The **OutRider** can store up to 23,000 values, or the equivalent of 60 days of data.
- Temperature compensation of Watermark readings is achieved by monitoring soil temperature for input into the calibration equation.
- Sensor excitation is achieved by applying a short 5 VDC pulse of precise duration, requiring very little power.
- Watermark sensors are grounded prior to and after each excitation to remove stray voltage that may have accumulated. This process keeps electrolysis damage to a minimum.
- Data files are in ASCII format and can be viewed as a text file or they can be imported into a spreadsheet program such as Microsoft Excel®. Data files contain unconverted raw data.
- The desktop PC charting software gives the user the ability to group sensors by site, sensor depth or any other combination. The desktop PC software can also be used for downloading.

509-488-5793 888-750-8141



Inexpensive Soil Moisture Monitoring using Dielectric Aquametry and Telemetry.

Colin S. Campbell, Ph.D.

Decagon Devices, Inc. will soon provide inexpensive dielectric aquametry probes to schedule irrigation from real-time information on field soil moisture levels. The ECH₂O soil moisture probes offer high accuracy, long-term durability, and have only nominal dependence on soil texture and salinity. Field tests show the probes have a negligible failure rate over a 3-month growing period, while wetting and drying cycles are easily discernable from probe data collected in fields with continuous center-pivot irrigation. In addition, laboratory tests demonstrate ECH₂O probes were not affected by soil textures from sandy loam to clay, neither were readings altered by soil solution electrical conductivities of at least 4 mmho cm⁻¹.

Capable of connecting to a datalogger/radio or hand-held readout, the ECH₂O soil moisture probes offer the flexibility of both on-site and remote data collection to suit the needs of the user. Probes use 3.5 mm (0.14 in.) stereo plugs that can be easily attached to hand-held or long-term datalogger/radio devices. For remote moisture monitoring, up to six probes can be connected to a datalogger/radio device that allows up to six soil water content measurements in a 1.8 m (6 ft.) radius. The number of datalogger/radio systems in each field is only dependent on the moisture sensing requirements, while the number of fields that can be monitored is only limited by the distance from the central data collection system (up to 8 km [5 mi.]), and the maximum number of dataloggers (>200).

Collection from each datalogger/radio requires a single, central data collection and storage device that receives data from all transmitting radios and stores it for download. The frequency of moisture data storage is defined by the user, but can vary from 15 min to several days. Once the data is stored, it can be downloaded to a personal computer via cell phone using a modem and specialized software. By collecting data over the modem, users collect both real-time and historical information on field soil moisture levels and can schedule irrigation remotely.

Sentek Sensor Technologies

Sentek Sensor Technologies was established in 1991 to commercialize sensor technology for application in water management and irrigation scheduling. The company has since gone on to revolutionize soil-water management around the world.

Sentek technology is now used extensively around the globe with over 180 000 sensors now in use in agriculture, research, mining and turf applications.

EnviroSCAN® - Integrating the Future

EnviroSCAN® is a system that continuously measures soil moisture over multiple depths in a crop's rootzone. Utilizing the best irrigation management software available, EnviroSCAN® provides a clear and continuous picture of crop water use and water management in the rootzone.

The EnviroSCAN® for Windows® software graphically presents irrigation, rainfall and crop water use, allowing accurate and timely decisions on how much and when to irrigate for maximum yield and quality.

EnviroSCAN® offers flexible configuration and data download options including:

- ✓ mobile phone
- ✓ radio
- ✓ modem
- ✓ landline
- ✓ in-field downloading

EnviroSCAN® has paved the way for continuous, Real Time, irrigation monitoring technology and continues to lead the market. Combining global experience with the latest technology, EnviroSCAN® is exported to over 20 countries and is used in over 100 different crop types worldwide.

The EnviroSCAN® system continues to be updated and with an Open Integration Platform now being developed, EnviroSCAN® will be soon be able to integrate with other farm management tools, such as weather stations and automated irrigation controllers.

Diviner 2000® - The Portable Success Story

Diviner 2000® is a portable and robust soil moisture monitoring device that utilizes the same sensor technology as EnviroSCAN®. It offers speedy measurement and can monitor up to 99 sites with one hand-held unit.

The Patented Swipe and Go™ technology means the Diviner 2000® does not need to be held at each individual depth in the soil profile. To take a reading the encapsulated sensor is simply swiped in and out of the access tube, measuring up to 16 depths in just a few seconds.

A large backlit LCD screen for viewing data in-field means that Diviner 2000® does not require a computer. However, data can be downloaded to a computer for closer analysis in the powerful user friendly EnviroSCAN® for Windows® software (version 4.1 or later).

Gro-Point™, Aqualink, and "Ischedule"

Synopsis of Presentation at Scientific Irrigation Scheduling Workshop

Irrigation Specialists Inc is a multi-disciplined irrigation dealership in business for 30 years serving the Columbia basin and surrounding area with branches in Pasco, Othello, and Grandview. We offer project capabilities involving all methods of irrigation such as solid-set, drip, center pivot, handline/wheeline; and have built our reputation with our first class service department.

One of the Companies we represent is E.S.I. (Environmental Sensors Inc), established in 1973 & headquartered in Victoria, B.C. Canada. E.S.I. is a publically traded technology corporation specializing in the design, manufacture and distribution of instrumentation and systems for environment measurement. Worldwide, their **Gro-Point™** TDR sensor has now become the preferred means of measuring soil moisture, requiring no calibration and reporting directly in "percent by volume".

Recently, E.S.I. teamed up with an Australian company called Intelligent Irrigation Systems, to bring to N.America a system of irrigation management software and hardware called **Aqualink™**, which uses an open architecture and a Windows™ operating platform. **Aqualink** reads data from soil moisture, flow meters, weather and a variety of other sensors, and determines optimum irrigation and nutrient requirements. Virtually any sensor can be read and its output used to initiate appropriate pre-programmed action, and every action or sensor output can be logged and analysed. A map of the grower's property is displayed on the PC screen showing the various irrigation zones with icons representing key components, such as probes, sensors, valves, pumps, etc. A mouse click on the icon will instantly display data records and current status. **Aqualink** has the ability to respond immediately to adverse environmental conditions by ringing alarms or initiating action eg powdery mildew spray requirement, or a hot wind starting a rapid irrigation or cooling cycle.

The next generation of software, currently being developed and tested, is a program called **"Ischedule"**. This is an advanced irrigation scheduling program which analyses information specific to each and every site, and predicts when next to irrigate and how much water to apply. Unlike other scheduling tools which rely on generic information, eg ET & "standard" crop factors, **Ischedule** is an intelligent program which is continuously "learning" the dynamic relationships and characteristics of its particular site. It operates by initially being given some buffered limits and an irrigation strategy involving a series of soil moisture set points relevant to dry out depths, field capacity and stress onset values. It then calculates the actual water holding capacity of the soil, and the water requirements of the plants under different weather conditions as the strategy is implemented. The system will automatically adjust its schedule to maintain moisture set points when conditions change. At any point the grower can adjust the irrigation strategy, eg by entering future predicted ET data, and **Ischedule** will automatically recalculate required irrigation times and durations to achieve the new strategy. This fine tuning can be used to modify the plants growth or may be necessary due to a change in water availability.

For further information please contact **Irrigation Specialists Inc** at: Ph. 509-882-2060; Fax. 509-882-6206 or E-mail to sanon1214@bentonrea.com

Adcon's Wireless Capacitance Probe

The C-Probe is a soil moisture-monitoring device that records volumetric soil moisture data using capacitance sensors. The C-Probe is specifically designed to connect into the Adcon Telemetry wireless networks using the A720 addIT mini-transceivers. This eliminates the installation costs and problems associated with older systems that require expansive lengths of cable throughout the monitoring site.

HARDWARE FEATURES

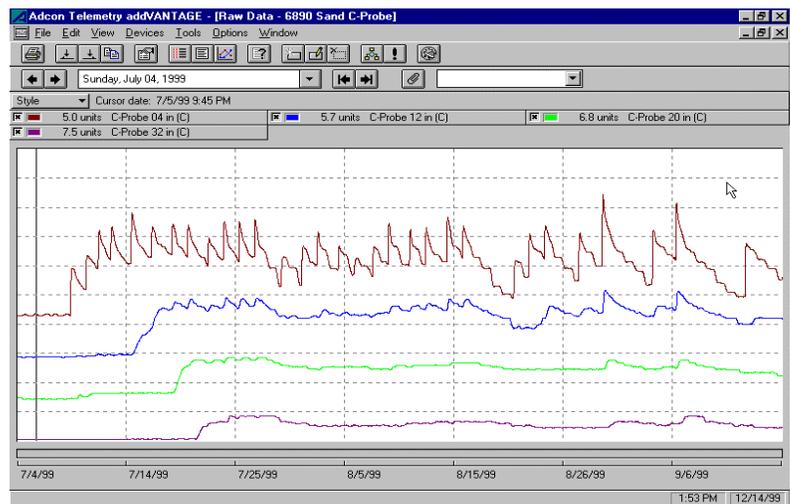
The C-Probe incorporates a wide range of design features that make it easy to use, economical, and almost maintenance free. These features include:

- Standard probes depths of 0.5m, 1m, 1.5m, and 2m.
- Up to 6 sensors per probe.
- Real time data delivery; no need to download data from a logger in the field. Sensors are mounted at user defined depths along a column inserted into a PVC access tube. Sensors can be added or adjusted at will.
- Ability to service in moments without re-installation or disturbing the soil profile.



SOFTWARE

The C-Probe data is viewed with the easy-to-use addVANTAGE software. The C-Probe extension enables the user to view the data in separate levels just like a soil profile. Besides displaying the moisture content intuitively, this allows the user to easily assess issues such as infiltration rates, depth of irrigation, water logging, and plant stress. This separate level graphic is typically used to determine how much to irrigate. The layers may also be summed to display the overall picture of soil moisture and is typically used to determine when to irrigate. The user can select a wide range of agronomic lines to indicate various levels of soil moisture conditions ranging from saturation to wilting point. Additionally the user can input marker lines to indicate soil moisture levels for crop growth stages



For more information you can call **1-800-352-5309**, or contact your local **Cenex Harvest States Branch**.
If you would like to visit us on the web: www.adcon.com

Commercial Ag

Benefits of Our Systems

1. Monitor ET_0 , weather, and soil parameters.
2. Open format allows data to be input into third-party crop, disease, and pest models.
3. Evapotranspiration stations provide daily estimates of water use.
4. Data from remote locations can be transmitted to a home or office.
5. Long-term operation is provided by batteries and solar panels.
6. Systems operate reliably in harsh environments.



The portable HydroSense provides instant measurements, displayed as soil water content or water deficit.



Irrigation needs can be estimated using the ET106 Evapotranspiration Station.

Campbell Scientific measurement systems are used extensively in agricultural applications for both day-to-day and research purposes. Our automated weather stations and other measurement products provide accurate and reliable data that can assist in the overall management of crops and farm operations. Our systems are used by large commercial and private farms, agricultural engineers, and agronomy researchers. The versatility of our measurement systems allows them to be used in a variety of applications including:

- ET_0 /soil moisture
- Heat/chill monitoring
- Pesticide & fertilizer application
- Integrated pest management
- Irrigation scheduling



Our systems provide reliable and accurate data allowing the farmer to make informed crop management decisions.

Typical systems used for farming include evapotranspiration stations and soil moisture measurement systems.

ET101/106 Evapotranspiration Stations

Our ET106 station provides data that can be used in many ways. Measurements include wind speed and direction, solar radiation, RH, rain, soil moisture, and temperature (air and soil). This data can be input into crop models, providing information for optimized crop management. Data can be used for integrated pest management, disease prediction, growing degree days, and frost forecasting. Wind speed and direction measurements are useful for fungicide, pesticide, and fertilizer applications.

Stations provide an accurate method of estimating crop water needs to eliminate under- and over-watering, which saves money and improves crop quality. These automated stations calculate ET_0 using the Penman-Monteith equation. The output provides daily estimates of water needs. Our low-cost, preconfigured ET101 station calculates ET_0 from a reduced set of sensors.

Soil Water Content Systems

Soil moisture sensors also provide water management information. They can be added to ET101/106 evapotranspiration stations or used independently. For portable water content measurements, the hand-held HydroSense probe can be easily carried from site to site and provides instantaneous soil water content readings. Low power requirements and fast measurement times provide thousands of measurements, powered only by 2 AA batteries.

System Components

Our ET_0 stations are based around state-of-the-art instrumentation that features proven reliability, even in harsh environments. Most communications methods are compatible with our systems, including phone (land-line, cellular, and voice-synthesized), radio, short haul and the Internet.

AgriMet

An agricultural weather information system serving the Pacific Northwest.

The U. S. Bureau of Reclamation, in cooperation with other federal, state, and local sponsors operates an agricultural weather information system to promote energy and water conservation in the Pacific Northwest. AgriMet is a network of over 50 automated weather stations that collect and telemeter weather data from major irrigated areas in Washington, Oregon, Idaho, and Montana. This information is translated into crop specific water use information. The primary emphasis is on irrigation water management -- applying the right amount of water to crops at the right time.

While AgriMet's primary purpose is modeling evapotranspiration (the amount of water used by a crop), there are many other uses of AgriMet data, including integrated pest management, frost protection, and other crop management activities.

How does AgriMet work?

The weather stations are located at sites that closely represent irrigated crop environments throughout the Pacific Northwest region. A typical AgriMet station consists of a data logger, satellite transmitter, antenna, battery, solar panel and various sensors. The station transmits the data every 4 hours by the GOES satellite. Each station is equipped to monitor:

- Air temperature
- Solar radiation
- Relative humidity
- Wind speed and direction
- Precipitation

Some stations have additional sensors, such as soil temperature. AgriMet stations require little maintenance. Stations are self-contained units requiring no external power source: they are powered by storage batteries and are recharged by solar energy. Each AgriMet station is subjected to a rigorous calibration and maintenance visit each spring. All sensors are carefully inspected and calibrated in preparation for the growing season.

Why so much interest in evapotranspiration?

Plants move water up from the soil, through the roots, out the leaves, and into the atmosphere in a process called transpiration. Evapotranspiration, or simply "ET", is the total amount of water lost to the atmosphere both by transpiration and by evaporation of water from soil and plant surfaces.

AgriMet uses the Kimberly-Penman ET modeling procedure developed by the USDA Agricultural Research Service in Kimberly, Idaho. Since there are so many types of crops, alfalfa is used as a benchmark to calculate a standard reference ET. Individual crop ETs are determined by multiplying the reference ET by a crop coefficient. Crop coefficients vary throughout the season based on the stage of plant growth. Daily crop water use information is computed based on these variable crop coefficients. This information is made available on the internet early each morning during the growing season.

Irrigators use ET information to schedule irrigation water applications. Knowing the water holding capacity of their soil, an irrigator tracks the daily crop water use from AgriMet. When it reaches the allowable depletion level, it's time to irrigate again.

Irrigation scheduling using AgriMet ET data can provide significant savings in water, pumping costs, and fertilizer, herbicide, and pesticide applications. Everyone benefits from reduced soil erosion and protection of surface and ground water quality.



Typical AgriMet Weather Station

Since agriculture accounts for 80 to 90 percent of all water use in the western states, scientific irrigation scheduling can go a long ways in conserving water and energy and helping to maximize the efficient use of limited irrigation water supplies.

AgriMet is a cooperative program, and relies on financial support from numerous partnerships to help fund the operation and maintenance of the weather station network.

AgriMet is Sponsored by:

U.S. Bureau of Reclamation
Northwest Energy Efficiency Alliance

Other Cooperating Agencies include:

Northwest Irrigation Districts
University of Idaho
Oregon State University
Brigham Young University
Agricultural Research Service
Natural Resources Conservation Service
Cooperative Extension Service
Soil Conservation Districts
Montana Department of Natural Resources and Conservation
Bureau of Indian Affairs
Various Agricultural Organizations
Various Agricultural Consultants

For more information about AgriMet, contact the AgriMet Program Coordinator:

US Bureau of Reclamation
1150 North Curtis Road, Suite 100
Boise, Idaho 83706-1234
(208) 378-5283
FAX 378-5305
ppalmer@pn.usbr.gov

or visit our website at:

<http://www.pn.usbr.gov/agrimet>



ET as an irrigation management tool – The Idaho Department of Water Resource Energy Division has been perfecting the use of ET in irrigators’ weekly irrigation management. The department provides information to the irrigator to know how long he needs to run his/her irrigation system to “keep-up” with the current crop water demands. If the farmer does check the soil moisture then he also is given the “catch up” time to bring the soil moisture back to target.

The “keep-up” time is the time that one needs to run the sprinkler to “keep up” with the daily crop water use. This is calculated with an average crop water use, acres, type of irrigation system, and the flow (gpm). The current crop water use information is obtained from the nearest USBR AgriMet station. The “catch-up” time is the time you need to add to or subtract from “keep-up” time to bring your field back to target soil moisture by the end of the schedule period. It is calculated from the soil water holding capacity and your irrigation system application rate. The following is the equation for “Keep Up” and “Catch Up” times:

$$KeepUp = coe1 \times \frac{ET \times Acres}{GPM \times Eff} \times 18.86$$

$$CatchUp = coe2 \times \frac{[(Soil \times Root) - (Soil \times Root \times Moisture)] \times Acres}{GPM \times Eff} \times 18.86$$

- Keep Up = Time to run the irrigation system to
- ET = Evapotranspiration of the given crop (in/day)
- Acres = field area (acres)
- GPM = Flow (g.p.m.)
- Eff = Application efficiency of irrigation system
- Coe1 = Conversion to method Day (7) Hours (24) and percent (1)
- Catch Up = Time to run the irrigation system to
- Soil = Soil water holding capacity (in/ft)
- Root = Root Depth (ft)
- Moisture = Current Soil Moisture
- Coe2 = Conversion to method Day (1) Hours (24/7) and percent (1/7)

This information has been developed into a spreadsheet and an Access database.

WASHINGTON IRRIGATION SCHEDULING EXPERT (WISE) RELEASE

WISE software has been developed to facilitate the adoption of scientific irrigation scheduling (SIS) by Washington producers. WISE is intended to help expand the services of existing SIS providers, encourage the formation of new SIS service providers, increase the usefulness of soil moisture sensors, and enable producers to implement SIS for themselves. In order to accomplish these goals, WISE easily integrates crop water use from PAWS with your soil moisture monitoring and irrigation system to predict when and how much to irrigate.

A single example of a forecast from WISE is shown below for Othello on July 30th with center pivot (9 gpm per acre) irrigated potatoes and no adjustment for soil moisture. The forecast for replacing the expected crop water use in the upcoming week is 142 hours of operation. If the operator wants to use a 36 hour revolution, approximately 4 revolutions are needed in the upcoming week (fixed duration), or if the operator plans to make 5 revolutions per week, 28/hours per revolution is appropriate (fixed frequency).

However, WISE is suited for many different situations. WISE downloads the ET data from all 59 PAWS weather stations on a web link and adjusts the reference ET for 37 different crops plus individual field conditions. In addition, soil moisture from any sensor can be entered and graphed by WISE, and finally, the irrigation system parameters are entered to calculate an application rate for a variety of surface, sprinkler and drip irrigation systems.

WISE is downloadable from <http://wise.prosser.wsu.edu>. The software is being released as a complete version 1.1. However, we still would like to get product feedback from producers and ag professionals before the next irrigation season. WISE requires a PAWS account, but potential users can try out a temporary account until March 31, 2001 (login: wisetest and password: temp).

*Brian G. Leib, WSU Extension Irrigation Specialist
Todd Elliott, WSU Engineering Technician for PAWS*

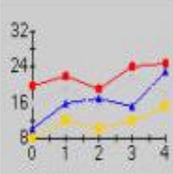
Schedule for Othello/Center Pivot/Potato
_ □ X



Last 3 Days



Potatoes



Sensors



Center Pivot

Reference ET
Station: **WSU OTHELLO**

0.32 in/day X

Crop Coefficient
05/15 To 09/22

1.005 =

Soil Moisture:
Root Zone: 1.5 Ft.

Net Application Rate
Efficiency: 80 %

Actual Crop ET 0.322 in/day X **07 days +/-** **Correction** 0.0 in/wk =

Required Application 2.254 in/wk / **0.016 in/hr =**

Last Irrigation Date:

Crop ET Since Last Irrigation Sensor Depletion

Operation Time 141.8 hrs/wk

WK	DATES	DAILY CROP ET	# OF IRRIGS	HRS PER REV
1	07/30-08/05	0.32	5.0	28.3
2	08/06-08/12	0.28	5.0	24.8
3	08/13-08/19	0.25	5.0	22.0
4	08/20-08/26	0.22	5.0	19.5

WK	DATES	DAILY CROP ET	HRS PER REV	# OF IRRIGS
1	07/30-08/05	0.32	36.0	3.9
2	08/06-08/12	0.28	36.0	3.4
3	08/13-08/19	0.25	36.0	3.1
4	08/20-08/26	0.22	36.0	2.7

Fixed Frequency **Fixed Duration**

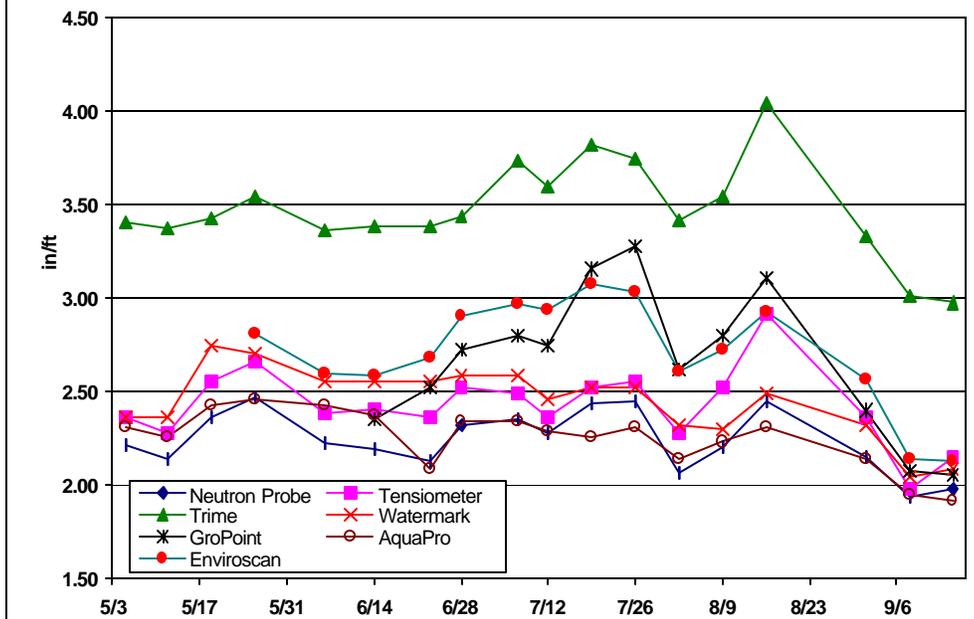
Forecast Date: 07/30

Update Schedule

Print Detailed

Help

Royal City Drip Onions - 12" Soil Moisture Comparison - 2000
 WSU IAREC, Biological Systems Engineering Dept. - Cooperative Extension



Washington State University offers our programs to all persons regardless of race, color, national origin, religion, sex, disability, age, Vietnam era status, sexual orientation, or familial status and is an equal opportunity employer.