Farm Water Quality News

University of California Cooperative Extension

Monterey, San Benito, San Luis Obispo, San Mateo, Santa Barbara, Santa Cruz & Ventura Counties

Farm Water Quality Planning News from Central Coast Farm Advisors

Volume 1, Number 1, Fall 2008

Editors Note

Welcome to the first edition of the University of California's Farm Water Quality News! This quarterly newsletter builds on your participation in the Farm Water Quality Short Course, and will deliver the latest news on integrating environmental quality with your crop production practices.

You can **register to receive future issues via email** or provide suggested topics through our online survey at

http://ucanr.org/fwqpnewsletter-reg

Copies of Farm Water Quality News may also be downloaded from the county Cooperative Extension websites of the Farm Advisors listed below.

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Editor, Fall 2008 Issue

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Welcome!

An Invitation From the Farm Water Quality Project Team

Congratulations!! Since you are receiving this newsletter, you are a successful graduate of the Farm Water Quality Planning Short Course. You asked for more information and we listened.

The following topics are questions/suggestions directly from you:

- ☑ Managing sediment, irrigation, pesticides, and nutrients
- ☑ Irrigation and erosion control
- ☑ Need more nutrient management info, quit dwelling on pesticides
- ☑ The science involved in soil nutrients and testing
- ☑ Pesticides and nutrients
- ☑ Pesticides and nutrients, sediment movement control
- ☑ Specific nutrients and pesticide alternatives including general frequency and applications
- ☑ Pesticides, Irrigation, laws and regulations
- ☑ Involve RWQCB more and have them discuss their future requirements

Free access to the information you need is at your fingertips:

Subscribe to this University of California Cooperative Extension ELECTRONIC NEWSLETTER. Each quarter we will publish links to information about upcoming events, a regulatory update, technical tip and the latest research.

To subscribe to future electronic issues of this newsletter, visit our registration page address at http://ucanr.org/fwqpnewsletter-reg. We will publish a link to this newsletter each quarter. An email with the link will be sent to you, which will connect you to the latest issue.

If you know of growers or others in the agricultural industry who would like to receive this newsletter but do not have internet access, please have them contact their local University of California Advisor with their contact information.

Information Sources for Upcoming Events

Agricultural Water Quality Alliance
http://www.awqa.org/involved/getinvolved.html

Central Coast Regional Water Quality Control Board Approved Educational Programs
http://www.waterboards.ca.gov/centralcoast/AGWaivers/Index.htm

Southern San Luis Obispo and Santa Barbara Counties Ag Watershed Coalition - please email Kay Mercer at sbagcoalition@verizon.net for a email list of upcoming events.

Regulatory Update

Central Coast Region Irrigated Agriculture Program Update, September 2008

Alison Jones, Ag Waiver Program Staff Environmental Scientist

(For information on the Los Angeles Region Waiver Program, including Ventura County, contact the Los Angeles Regional Board: http://www.waterboards.ca.gov/losangeles/)

Background

The Conditional Waiver for Irrigated Lands (Ag Waiver), adopted July 2004, is a regulatory program put in place to ensure that farming operations are taking adequate steps to protect water quality. Currently, about 400,000 irrigated acres out of a total of about 438,000 in the Central Coast Region are enrolled (about 93%). While this is an excellent start and reflects the amount of effort that the ag community has made to comply with the new requirements, it is important for the remaining operations to enroll, and for all operations to ensure that they are not contributing to water quality impairments.

Inspections

Water Board staff is also focusing on what growers are doing on the ground to protect water quality. In September 2007 we began conducting on-farm inspections throughout the region, both on a random basis to verify information submitted to us and better understand what farmers are implementing, and in response to complaints or identified problems. We work with farmers to identify and solve problems, make referrals to technical assistance providers, and initiate enforcement actions when appropriate.

Management Practice Implementation

Growers should continue to implement practices in their Farm Water Quality Management Plans. Based on 2007 field observation and management practice checklists, we see relatively low use of irrigation system evaluations, irrigation scheduling using weather data, and nutrient budgeting. These are key management practices that can help reduce over-irrigation and associated offsite movement of nutrients and pesticides. Vegetated buffers, also limited in their use, can help filter any remaining pollutants that could be carried by stormwater or irrigation water.

Additionally, monitoring data has shown that irrigation tailwater is carrying pollutants into streams. For cropping systems using tailwater systems, reducing or eliminating tailwater is an important step in improving water quality. Water Board staff is currently working with technical assistance providers to develop and fund a program to provide more irrigation and nutrient management services in the region.

Ag Waiver Renewal

The Conditional Waiver will be up for renewal in July 2009. Water Board staff will again convene an advisory panel of agricultural and environmental representatives to provide recommendations for any changes to the existing requirements; in addition, staff will look closely at management practice implementation, trends in water quality and other indicators of efforts by agriculture to address water quality problems facing the Central Coast. All growers can assist in this evaluation by completing education and planning requirements, implementing practices, and providing us with accurate and up to date information.

Questions? Contact Alison Jones at Central Coast Water Board, (805) 542-4646.
For additional information on the ag waiver, go to our website,
http://www.waterboards.ca.gov/centralcoast/AGWaivers/Index.htm
For water quality information, contact Sarah Greene, Central Coast Water Quality Preservation, Inc. at (831) 331-9051.

Technical Tip

Atmometers for Irrigation Management

Mark Battany, UC Cooperative Extension
Viticulture/Soils Farm Advisor, San Luis Obispo and Santa Barbara Counties

Efficient and precise irrigation management is becoming increasingly important in California agriculture, both for maximizing crop quality and for conserving water. The most advanced irrigation scheduling strategy is based on local measurements of reference evapotranspiration (ETo), which is converted to crop evapotranspiration (ETc) with an appropriate crop coefficient (kc).

To be able to use this method, an irrigation manager needs to have locally accurate ETo values throughout the growing season. However, the highly variable microclimates that characterize many farming areas often make it difficult to use data from distant weather stations; therefore an accurate local measurement may often be preferable to relying on a regional value.

One inexpensive option for measuring ETo locally is to use a simple atmometer (Fig. 1). Atmometers are water-filled devices, in which the actual evaporation of water is measured over time. In their simplest form, the atmometer is outfitted with a graduated sight glass on the water supply tank which allows the user to easily measure the evaporation that occurred over a given period. In practice, this type of atmometer is most suited for making readings at multiple day intervals, for example once per week, or on days when irrigation is applied.

The performance of atmometers versus more expensive weather stations was evaluated on the Central Coast in 2003. In this study, atmometers were placed adjacent to seven weather stations throughout the area, and weekly values for both methods were compared (Fig. 2). The results indicate that the atmometers and weather stations have very comparable ETo readings, with the atmometers indicating somewhat lower ETo values under conditions of lower evapotranspiration.

Like any technique, using atmometers has advantages and disadvantages. Advantages include their very low cost and ease of operation, with no computer or power required. Disadvantages include the potential for damage by freezing weather, the need to refill the water supply (every three to six weeks), and the need to read the gauge manually. Also, if they are installed in a large open area, birds may tend to perch on the evaporating surface and foul it with their droppings; for this reason several wires are installed on top of the device to discourage birds from perching there. In general, atmometers function quite reliably with few problems.

Converting atmometer ETo readings to the amount of irrigation run time required to replenish the soil moisture lost to evapotranspiration is fairly straightforward. A relatively simple example for a sprinkler-irrigated field is presented below in Table 1.

Table 1. Example conversion of ETo to irrigation run times for a sprinkler irrigated field

A. Measured atmometer ETo for one week	2	inches
B. Crop coefficient (kc)	0.8	
C. Calculated ETc for the week (=AxB)	1.6	inches
D. Sprinkler application rate	0.13	in/hr
E. Hours of irrigation required (=C/D)	12.3	hours

(Note: To convert Gallons to Inches: Gallons / Area (square feet) / 0.6234 = Inches
To convert Inches to Gallons: Inches * Area (square feet) / 1.604 = Gallons)

Technical Tip ~ Continued

Figure 1.
An atmometer installed on a steel fencepost at the end of a vineyard row.

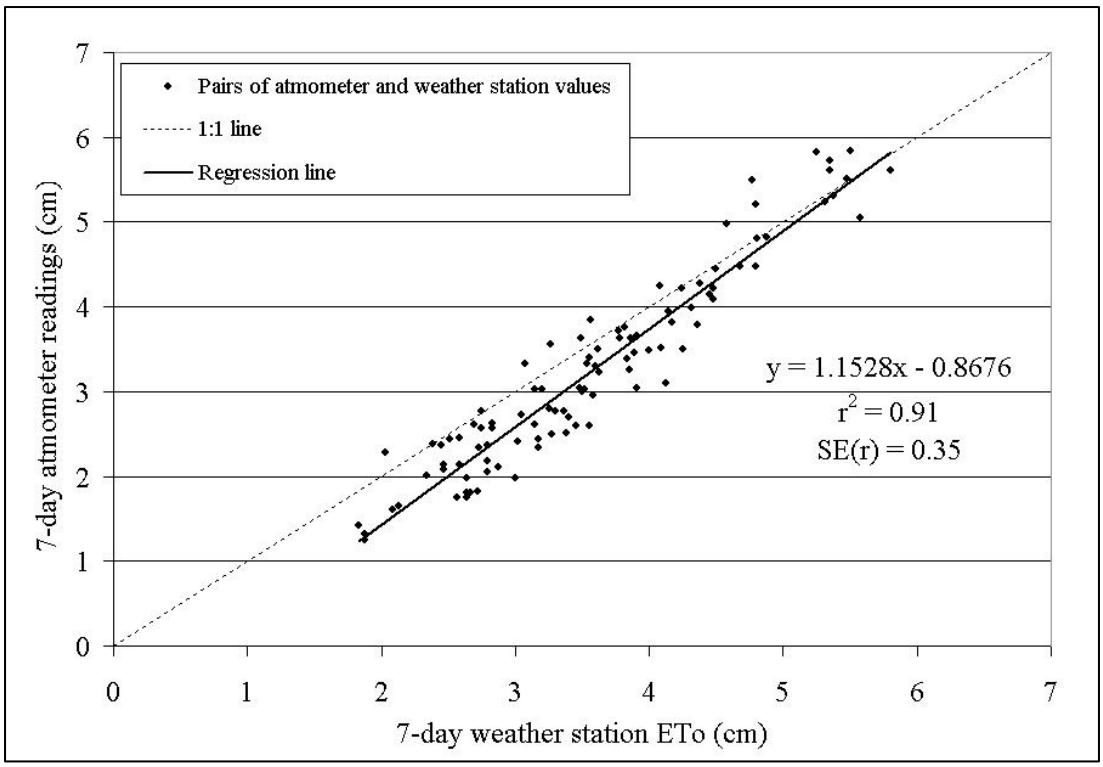

Figure 2.
Comparison of atmometer and weather station ETo readings at seven locations in the summer of 2003.

Research Update

Phosphorus Fertilizer Management for Lettuce Production and Water Quality Protection

Richard Smith, University of California Cooperative Extension, Farm Advisor for Monterey, Santa Cruz and San Benito Counties and ***Tim Hartz***, UC Davis Extension Vegetable Specialist

" The good news is that growers can take advantage of the high residual levels of P in their soils and economize on the use of P fertilizers."

Background: Phosphorus (P) fertilization practices in vegetable production have changed recently due to the dramatic rise in the price of P fertilizer. In addition, regulatory pressure from the Regional Water Quality Control Boards to reduce nutrient concentration in surface water is also building. In the Salinas Valley, phosphorus is commonly applied in excess of vegetable crop needs and has increased soil P levels. Table 1 compares adjacent sites (within ¼ mile of each other) in the Salinas Valley with different management histories. The pasture area has the lowest soil P value; the research station is moderately managed and has an intermediate soil P level; and the soil in the production field has a high soil P level. Heavy P fertilization of crops in the Salinas Valley have unwittingly built up soil phosphorus levels in the valley (Table 2). The common P levels found in Salinas Valley soils can lead to elevated levels of phosphorus in drainage waters, creeks and rivers and seriously reduce water quality. Parts of the Salinas and Pajaro River watersheds have been placed on the Environmental Protection Agency 303(d) list due to excessive nutrient concentration. .

Phosphorus is a critical element for plant growth. Its availability is related to soil temperature, pH, sorption on clay and iron oxides, and interactions with secondary soil minerals such as calcium and iron phosphates. These factors generally keep phosphate in the soil solution at low levels. However, in heavily fertilized fields P absorption sites can become overloaded, and environmentally problematic amounts of P can leave such fields in runoff; in extreme cases even drain tile effluent can have high P concentrations. When field runoff has high sediment content, large amounts of sediment-bound P can also enter the river systems.

The Olsen (bicarbonate extractable) P soil test provides the best measure of available P for crop growth in soils above pH 6.2; most vegetable production soils in the coastal production zone are above this pH due to liming to control Club Root of brassica crops. We conducted trials in 2002-2003 to evaluate the need for P fertilization. In 12 field trials only one site showed an increase in yield from P fertilization; this responsive site was the only field with Olsen P < 55 PPM, and it was planted in the spring, in cool soil. Phosphorus fertilization of soils above this level, especially in the warm part of the season, is not likely to improve lettuce yields.

The majority of vegetable production fields in the Salinas Valley have P levels that are above the 55 ppm threshold; however, there are fields below this threshold and fields with marginal P levels that may need P fertilization during the cold times of the year. We conducted several trials examining banded application of various P fertilizers at planting. One trial was conducted at a site with a soil P level of 30 ppm. Results indicated that low rates of P (20 lb P_2O_5) banded over the seedline at planting gave higher yields than a higher application rate of P (60 lbs P_2O_5) applied at listing (Table 3). This may have occurred because the P banded over the seedline was more readily available for crop growth than the P fertilizer shanked into the beds which was farther from the roots of small lettuce seedlings. This shows that we can optimize yields, where P fertilization is justified, by applying rates of P at planting that are similar to rates of P that are removed by the crop. For instance, an application of 20 lbs of P_2O_5 is equivalent to 9 lbs of P. By applying rates of P that are close to what is being removed in the harvested portion of the crop (i.e. 10-12 lbs P/A), we can help to reduce further loading and loss of P in Salinas Valley soils. In many cases growers are already applying moderate rates of P in at-planting anticrustant applications which provide sufficient P to maximize the yield of lettuce. The good news is that growers can take advantage of the high residual levels of P in their soils and economize on the use of P fertilizers.

Research Update ~ Continued

Phosphorus continued~

Recommendations:

- Fertilization of head or romaine lettuce with P can be justified on sites with less than 55 ppm soil P in the winter/spring plantings.
- Once soils warm in the late spring, soils with levels above 55 ppm soil P do not respond to P fertilization.
- In situations where P fertilization is justified, low at-planting treatments applied in a band over the seedlines provides a useful technique to maximize yields. The low P fertilization rates will help reduce further loading of P in Salinas Valley soils.

Table 1.
Comparison of soil P levels in adjacent fields on Chualar loam soil

Site Background	Soil P ppm
Pasture (low intensity agriculture)	37.3
Low intensity vegetable production site (Research station)	53.9
High intensity vegetable production site (Typical of the Salinas Valley)	92.6

Table 2.
Phosphorus levels in Salinas Valley soils

Soil Type	Number of sites	Range of soil P values	Mean Soil P Ppm
Sandy Loam	6	62 - 139	93
Loam	6	36 - 133	90
Clay Loam	5	78 - 134	97

Table 3.
Tissue and soil P analyses, nutrient uptake at harvest and yield data.

Treatment	P/acre lbs	P_2O_5/acre lbs	Application	Mid Growth		At Harvest			
				Tissue Total P (%)	Soil P (ppm)	Soil P (ppm)	Crop P Uptake (Lbs/Acre)	Mean Head Wt. (Lbs)	Mean Wt./Acre (Tons)
Untreated	----	----	----	0.313	35.5	34.17	11.3	1.09	29.57
Actagro 7-21-0	9	20	at planting[1]	0.300	35.9	39.57	12.1	1.18	32.93
Ortho Phos 12-58-0	9	20	at planting[1]	0.277	35.0	36.73	11.8	1.10	30.33
10-34-0 + 1% Avail	9	20	at planting[1]	0.287	37.6	36.93	11.9	1.20	32.77
7-7-0-7	9	20	at planting[1]	0.297	35.5	34.37	11.9	1.17	32.20
15-15-15	27	60	Preplant[2]	0.277	36.1	34.03	10.7	1.04	28.90
LSD, α=0.10				*0.021*	*NS*	*2.68*	*NS*	*0.09*	*2.86*

1 – Applied in two 5-inch wide bands over the seedline;
2 – Shanked into the beds at listing with a commercial applicator

Return Service Requested

Your first edition of the University of California's Farm Water Quality News!

In this Issue:

- ✓ **An Invitation From the FWQP Team**
- ✓ **Upcoming Events**
- ✓ **Regulatory Update**
- ✓ **Technical Tip**
- ✓ **Research Update**