Field Notes
San Joaquin County
May 2015
University of California
Agriculture and Natural Resources | Cooperative Extension

Drought Update and Field Crop Irrigation Strategies

The Water Year 2015 (October 1, 2014 to September 30, 2015) is the driest on record in California, according to the Department of Water Resources. As of April 28th, the Department had recorded 10.57 inches of precipitation in Stockton, which is 81 percent of average. While rainfall statistics are alarming, Sierra snowfall statistics are worse, with water content of the snowpack at only one inch, or four percent of normal. Consequently, reservoirs are low, with the two largest, Shasta and Oroville, holding 69 and 63 percent of average, respectively.

Under these drought conditions, it is important to think about how water is used and how it can be conserved. Water use statistics may be understood in a couple of ways. Dedicated water use is the overall use of water in the state, among agricultural, urban, and environmental uses. Under dedicated water use, approximately 47 percent of water goes to the environment, for things like wild and scenic rivers, wetlands, and required Delta outflows. The remaining 53 percent of dedicated water use goes to agriculture (42 percent) and urban uses (11 percent). That 53 percent of dedicated water going to agriculture and urban uses is water for human consumption. Of that amount, agriculture uses about 80 percent. That water fuels our $46.4 billion agricultural industry (2013 USDA NASS statistics). The drought has and will impact California agriculture, but the University has developed materials to help growers cope with water shortages. I will highlight some strategies for two widely grown field crops – alfalfa and corn.

Alfalfa is a high water-using crop because it is grown year-round. In the Central Valley, the seasonal evapotranspiration (ET) for alfalfa is around 54 inches. Alfalfa yield is directly related to crop ET; as crop ET increases, yield increases in a linear relationship. That said, any strategy to reduce water use below crop ET will reduce yields, but certain deficit irrigation strategies can help to sustain the stand. One strategy is to irrigate early in the season and then cut off irrigation later in the season. Because the most important irrigation is the irrigation after the first cutting, growers should sufficiently irrigate at that time. The benefit of this strategy is that the yield and quality is best at the beginning of the season, so growers would be capitalizing on early season harvests. Another strategy is most feasible in sprinkler irrigated fields, and that is to irrigate with less water at each irrigation. Growers would want to make sure that this strategy still promotes enough growth to make harvest economical. Finally, a strategy that does not involve deficit irrigating but could save water by reducing surface runoff is cutting off the water when it has covered 80 to 90 percent of the check.

The seasonal ET of corn is about 25-29 inches or about 0.3 inches per day. Corn has a relatively small root system, compared to sorghum for example, and draws water from only the top two feet of soil. Any water stress during the season will reduce biomass production, which affects silage corn yields but water stress during the period of two weeks before to two weeks after silk emergence is damaging to grain yield. Under conditions of limited water, a grower could consider applying less water during the vegetative stages but should not stress the crop as it transitions to reproductive stages. Another potential time to deficit irrigate is during grain fill. This will reduce kernel size but not kernel number. The most important time not to deficit irrigate is that four week window around silking. Deficit irrigating at that time could delay silking and misalign silking with pollen shed, resulting in reduced pollination. Potential irrigation strategies to reduce water applications are alternate furrow irrigations, furrow torpedoes to smooth the soil surface allowing water to move more easily down the field, and surge irrigations where alternate sets get a surge of water, advancing the water down the field with each surge. Using sprinklers in the early season to reduce runoff or deep percolation could be another irrigation strategy. Alternatively, while growers generally choose longer season varieties for their yield potential, shorter season varieties may be a better choice in years of limited water supplies.

More information on these irrigation strategies for alfalfa and corn, as well as strategies for other crops, is available online (http://ucmanagedrought.ucdavis.edu/Agriculture/Crop_Irrigation_Strategies/).

Michelle Leinfelder-Miles, Farm Advisor, Delta Crops

Table of Contents:

In the Vineyard

With the end of April it looks like the rainfall total will mark the fourth year of drought. This is more severe than the 2007-09 drought or the dry spell from 2002-03. The current rainfall season will end below the long-term average as 2015 approaches the end of the "rainy season". However, there has been some good news in the fact that this year's rainfall occurred in a fairly effective pattern to provide some good deep soil moisture, with a couple of good "irrigations" in April. Things could change somewhat in May but on average very little rain occurs in May, except for brief shower during cherry harvest in most years. The historical caveat that California is always a year away from drought is well founded.

The good news for this year is that unlike last year deep soil moisture is very good from the December rains. A completely dry January and below average February were mitigated by cold mornings, fog and low weed growth. With a somewhat recharged the soil profile, most vineyards are not as stressed as last year. It has not been necessary to winter irrigate, compared to last year when many growers irrigated two or three times, or more during the winter.

The rainfall total for the months of October, November, and December ended up at 9.2 inches (7.3 inches, the average) for the north county. Rainfall was less effective in the south county. January, with no rain recorded but a few very foggy days, did provide almost measurable "rain" that was historically low. Grapes are a low demand crop for water and nitrogen, compared to most other fruits and nuts, but extremely dry conditions can affect the strength and uniformity of bud push in addition to negatively affecting the final development phases of this year's fruit buds. So there was some reported budbreak variability in older vines or vineyards that may be fighting off disease or soil pests.

			Rainfall Seasonal		**2002-15**				
			Lodi		inches				
	Total	**% Avg**	**OctNovDec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**
2001	**16.6**	**100**	3.6	3.6	3.7	1.9	3.7	0	0.1
2002	**16.3**	**98**	9.7	2.0	1.0	2.5	0.2	0.9	0
2003	**15.2**	**92**	8.7	0.6	4.7	1.1	0.1	0.1	0
2004	**15.3**	**92**	9.2	0.6	0.9	0.6	3.6	0.4	0
2005	**23.1**	**139**	10.4	3.2	3.3	3.5	1.4	1.3	0
2006	**23.4**	**141**	7.1	5.4	1.1	5.2	3.8	0.8	0
2007	**12.1**	**73**	4.6	0.3	4.3	0.6	2.3	T	0
2008	**13.7**	**82**	4.5	7.3	1.8	0.1	0	0	0
2009	**15.1**	**91**	4.0	1.9	5.3	1.9	0.7	1.3	0
2010	**19.2**	**116**	6.1	4.5	3.6	1.8	2.9	0.3	0
2011	**26.3**	**158**	12.1	1.4	4.1	5.8	0.2	1.4	1.3
2012	**12.4**	**74**	3.0	2.9	1.3	3.3	1.9	T	0
2013	**15.8**	**95**	11.0	1.6	0.3	2.1	0.6	0.1	0.2
2014	**10.2**	**61**	2.2	0.1	4.7	1.9	1.4	0.02	0.0
2015	**13.0**	**78**	9.2	0.0*	1.9	0.3	1.6		
Average	**16.6**		7.3	2.3	2.7	2.2	1.5	0.6	0.1

*Two days (0.01 inch each) of "dripping fog"

A very heavy rain on April 7th and another good rain on April 24th alleviated drying soil conditions. The bad news was that for a few localized areas in the district hail about the size of peas damaged scattered vineyards and orchards, with losses ranging from slightly scarred leaves and shoots to total defoliation and crop stripping.

Now is a good time to check out the soil profile with an auger or even just a little digging with a shovel may help confirm how good a recharge the winter rains and irrigation may have done. It seems there is good deep soil moisture form the December soaking; as evidenced by the strong bleeding of vines this year at pruning.

Even with warm temperatures, vineyards have only been using about 0.10 of an inch of water per day at "full" or 100% ET" (Evapotranspiration) levels, mostly from the soil moisture, if present. This is equal to a very "seat-of-the-pants" 2 hours' worth of irrigation time per day of Full ET, depending on emitter output and spacing. That will increase soon with warmer weather. All that considered, it's good to stay ahead of vine demand even if you are on a strict regulated deficit irrigation (RDI) regime that uses much less than full ET. This helps avoid using deep soil moisture early in the season. That deep moisture is good to have available for late summer and early fall during hot spells. The dry year makes it easier to control vines, but it will be good to be earlier rather than later in starting irrigations in this fourth year of drought in 2015.

Average Date of Budbreak*

Chardonnay 1986-2014

Lodi

Year	Date in March	Year	Date in March	Year	Date in March
1986	9	**1996**	15	**2006**	15
1987	26	**1997**	1	**2007**	14
1988	13	**1998**	14	**2008**	12
1989	17	**1999**	25	**2009**	20
1990	23	**2000**	17	**2010**	15
1991	21	**2001**	17	**2011**	17
1992	13	**2002**	13	**2012**	15
1993	22	**2003**	10	**2013**	18
1994	14	**2004**	13	**2014**	9
1995	5	**2005**	2	**2015**	28 (Feb)

* Budbreak = 10% of buds at ½ inch shoot length or first leaf unfolding

Average Date **March 14**

Budbreak did occur about 15 days ahead of average and beat the old record of March 1st that I observed in 1997 (see table above). The curious weather pattern this winter, besides extreme dryness, was one of very mild temperatures mid-winter with scattered periods of cold and fog. Overall total chilling hours ended up below average and may have slight effect, if any significant effect on budbreak. Surprisingly, chilling hours (hours below 45 F) totaled 7**08** hours, compared to the long term average of about **800** hours (Fruit and Nut Center, UC Davis). Grapes require few chilling hours but a "good chill" may help encourage strong and uniform budbreak.

Weed growth started out less than average, but good soil moisture and a recent rain has encouraged some new growth. Effective weed control means not waiting for weeds to complete their growth cycle and set seeds of future problems. This year glufosinate (Rely and several other new generics) will be available. If you have had troubles with horseweed or fleabane, I have seen some effective "burn down" with combinations of glyphosate and glufosinate in ratios of 2 or 3 parts glyphosate to 1 part glufosinate. But check with your PCA, and remember treating any weeds at small growth and especially before they set seed stage is important in both control and resistance management.

Fortunately there are some newer materials becoming available. Rotation of herbicides for particular weed species continues to be important and should be considered. Combinations of materials, either foliar or residual can help achieve better weed control in different sites. There are varying opinions on how best to avoid resistance in pest management of insects, mites and diseases; with regard to high versus low label rates, combinations of materials or alternate use of individual compounds, etc. But with weeds it appears high label rates may be better and combination of materials with different modes of action are also helpful. (This is my take from sitting in on some very heated discussions of the experts). If you have related questions, check in at www.ipm.ucdavis.edu or www.wric.ucdavis.edu .

As summer approaches, the good news is no new pests have been reported in fields around the county. The new Ag Commissioner, Tim Pelican, and his staff have done a lot of work and have been helped in their efforts by growers in the ongoing vigil for new pests.

The bad news is that light brown apple moth (LBAM) continues to establish and is scattered around the county. It's still under a quarantine protocol. The good news is; it's easy to control. It is a lepidopteran pest very similar to the OLR and it seems to be susceptible to the same biological control of our native beneficial insect predators and parasites. If you are within a mile of a commercial nursery you probably are in a quarantine zone. If you haven't been contacted by the Ag Commissioner's office, you should check with your PCA.

So far the spotted wing drosophila (SWD) doesn't seem to do well in vineyard situations. It is a concern for cherry growers, but currently not grape growers. If you do have cherries next door, keep an eye out if you suspect excessive occurrence of sour rot.

The most recent arrival in 2012 is a new leafhopper that has been reported in Lodi/San Joaquin County. This is the Virginia creeper leafhopper (VCLH). As its name suggests, it is from Virginia (by way of Canada and Washington/Oregon, it

(Continued from page 3)

appears) and thrives on creeping ivy species. But it also does well on many crops. The hope is that it's not much different than the regular grape leafhopper or variegated grape leafhopper and may be controlled by beneficials and sprays, if needed.

A new pest to be aware of is the brown marmorated stink bug (BMSB), as its name indicates it is a fairly nondescript bug that appears similar to one already here but of no problem. If you see large numbers of a brown stink bug congregating near buildings or landscape check with the Ag Commissioner, or our office or the web site: http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn74169.html

Good Luck in 2015

Paul Verdegaal, Viticulture and Pomology Advisor

A thought for the day:

"The object of life is not to be on the side of the majority, but to escape finding oneself in the ranks of the insane."
Marcus Aurelius

Distinguishing Bacterial Canker from Phytophthora Root and Crown Rot in Almonds

I have had more bacterial canker farm calls this spring than usual, so I thought I would review some distinguishing characteristics between bacterial canker and Phytophthora root and crown rot. Bacterial canker is caused by a plant pathogenic bacterium *Pseudomonas syringae* which can live on the surface of both infected and healthy plants. *Pseudomonas syringae* lives most of the time as an 'omnipresent epiphyte,' always present on the surface of plants, living happily, just waiting for certain environmental conditions (cold and wet) that allow it to multiply, enter the plant, and trigger a disease (bacterial blast or canker).

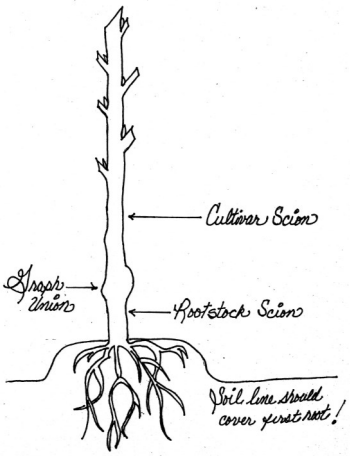
Phytophthora root and crown rot is caused by the plant pathogen *Phytophthora*, which means 'plant destroyer'. *Phytophthora* is present in most soils where it waits for soils to become saturated, either from over irrigation or too much rainfall, before it can infect the roots and crowns of almond trees.

Symptoms of Phytophthora root rot and bacterial canker are often the opposite of each other, making diagnosis possible. The roots of *Phytophthora*-infected trees just below the soil line are often brown and decayed and as you work your way up the tree, cutting into the vascular system, you usually find healthy tissue in the scaffolds and branches. Usually you find a distinct margin between rotten and healthy vascular tissue as you follow the advance of Phytophthora. The roots of bacterial canker affected trees are usually healthy and these trees are often suckering because root systems are still alive.

Bacterial Canker

Trees with bacterial canker usually have shoots and scaffold death and gumming. Often only one branch or scaffold is infected. If you cut into affected wood you will almost always find a sweet sour smell, and as you work your way down the tree, cutting into vascular tissue, you eventually find green healthy tissue as you approach the roots. There is usually not a distinct margin of infected tissue as in *Phytophthora* infections. Bacterial canker usually occurs in sandy soils in association with ring nematode while Phytophthora is more often found in heavier soils where over irrigation or rain can increase disease susceptibility. Bacterial canker control usually includes preplant fumigation for ring nematode, proper rootstock selection, proper irrigation, and post plant nematicide treatments (Enzone or Movento).

Roger Duncan, UC Farm Advisor in Stanislaus County, has shown Viking and Lovell rootstocks to be more tolerant than peach-almond hybrids (Hansen, Nickels, and Brights) and Nemaguard. Phytophthora control usually includes proper irrigation management, planting trees high on a berm so that the graft union and rootstock part of the scion are above the soil line. Phosphorus acid treatments have also been shown to reduce Phytophthora root and crown rot as a common preventative measure.



Brent Holtz, Pomology Farm Advisor and County Director

Announcements / Calendar of Events

Advances in Walnut Production **course now open for online registration**

For the first time in many years, an intensive 4-day short course in walnut production will be held this fall, November 16-19, at the UC Davis campus. This course includes four days of instruction, including lectures and field tours taught by UC Farm Advisors, Faculty, and Specialists involved for decades in research and work in California walnut production. Recent production techniques derived from their current active UC research programs will be presented.

The course program allocates time for discussion in every session, quality time with instructors, and networking opportunities among participants. Participants will receive a hard copy of lecture slides and electronic resources.

Space is limited and will be provided on a first-come, first served basis. To enroll online and for more information, go to: http://fruitandnuteducation.ucdavis.edu/education/Walnutcourse/

The Importance of Dry Matter: Tips for Feeders and Dairy Producers

Dry matter (DM) is what remains when water (moisture) is removed from a feed. In the example corn silage report, you'll see DM is listed at 35.9% (for simplicity, we'll round to 36% DM). Another way to think about the concept of DM is: for every 100 lbs of this corn silage that is fed, 64 lbs of it is water.

Knowing the DM of a feedstuff is important for a number of reasons, including:

- Buying forages. When purchasing feeds we don't want to pay for excess water.
- Ensiling forages. Ensuring proper moisture of forage at the time of ensiling is critical to putting up a quality product.
- Making hay. We want to minimize mold growth and heating.
- Comparing feedstuffs. It's imperative that we compare the composition (nutrient and energy) of different feedstuffs on a DM basis. Basically, DM basis puts everything on an equal basis for comparison.
- Formulating rations. Water is an essential nutrient, but water does not contain energy, which is required to make milk (you'll notice in the report that the components are all reported on a percentage DM basis).
- Mixing rations and feeding the herd. This will be the focus of the rest of the article.

CHEMISTRY ANALYSIS RESULTS		
Dry Matter		35.9
Moisture		64.1
PROTEINS	**% DM**	**% CP**
Crude Protein	7.7	
Adjusted Protein	7.7	
Soluble Protein	5.07	66.2
Ammonia (NPN)		
ADF Protein (ADICP)	0.79	10.3
NDF Protein (NDICP)	1.11	14.5
Rumen Degr. Protein	6.368	83.1
Rumen Deg. CP (Strep.G)		
FIBER	**% DM**	**% NDF**
ADF	29.19	68.2
NDF	42.80	
aNDFom		
NDR (NDF w/o sulfite)		
peNDF		
Crude Fiber		
Lignin	3.44	8.04

So as a feeder or a dairy producer, why is it so important to understand DM and measure it correctly? Because while it's very important to provide cows with clean, readily accessible water, in terms of feeding cows, water does not contain energy and energy is essential for milk production.

Let's look at an example:

Your nutritionist formulates a ration that calls for 6,000 lbs of as-fed corn silage to be added to the mixer wagon. The last DM analysis shows the corn is 36% DM (or 64% Moisture). How many pounds of DM is that?

6,000 lbs x 0.36 DM = 2,160 lbs DM

What if the corn silage is now wetter than the original silage sampled so that the DM is actually 30% DM (or 70% Moisture)?

6,000 lbs x 0.30 DM = 1,800 lbs DM

Because we didn't correct the DM, we've cheated that particular ration of 360 lbs DM from corn silage. At 30% DM, the amount of silage going into the mixer wagon should have been:

2,160 lbs DM ÷ 0.30 DM = 7,200 lbs of as-fed corn silage

(Continued on page 6)

(Continued from page 5)

In simple terms, because we shorted the mixer wagon of corn silage DM, the ration is no longer balanced for the nutrient and energy needs of the milk cows. If the ration is shorted 360 lbs DM of corn silage, there is less crude protein (CP) than formulated. Basically, you thought you were adding 166.3 lbs CP (2,160 lbs DM x 0.077 CP) but only added 138.6 lbs CP (1,800 lbs DM x 0.077 CP). There is also less energy fed than formulated. These differences, over some time period, might impact milk yield and even body condition and reproduction.

Troubleshooting DM results

Sometimes, a DM result just doesn't make sense with what you see at the silage structure or with a previous DM determination. This can happen with on-farm methods as well as samples sent to a commercial lab. Here are a few areas to troubleshoot when presented with inaccurate DM results:

1. Do you have a good sample?
    - Is your sample representative of what you'll be feeding? Be sure to take multiple grab samples of the silage. Mix these grab samples in a bucket, and then subsample to analyze for DM. Do not take the samples directly from the structure face, instead, remove the forage from the face (with a front-end loader, for example), move a safe distance from the face, and sample the removed forage. It's best to do this with forage freshly removed from the face.
    - How was your sample handled? If the sample is not analyzed right away, store your sample in a cool, dry place. Carry an ice chest or refrigerate your sample to store for later use.
2. Is your scale working properly?
    - Check the batteries, and consider buying an inexpensive calibration weight kit.
3. When in doubt – compare!
    - Split your sample and run DM multiple times to see if your results are in agreement.
4. Train, train, and re-train!
    - Having a written protocol for sampling, storing, and analyzing DM on-farm is important to obtain accurate results. Check in on the person responsible for measuring DM to be sure they understand the protocol, have properly working equipment, and don't have any questions or concerns.

Current California Methods

In a 2013 California survey we conducted, most dairies were checking the DM of corn silage one to three times per month (58% of respondents). About 28% of dairies checked the DM one to three times per week, with the remaining 14% of dairies measuring DM one to six times per year. Half the dairies checked the DM on farm, and the other half sent samples to a commercial lab for DM analysis. The most popular on-farm method was the koster tester (76%), with fewer dairies using a microwave method (21%).

Dry matter is an important measurement. Wet feedstuffs, like silages, are likely to fluctuate in DM content and should be checked regularly. Number of cows fed, structure size, past history, etc., will all dictate how often to sample for DM. Talk with your nutritionist to set up a sampling schedule for DM determination on your farm.

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Notes from the Field

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The University of California working in cooperation with San Joaquin County and the USDA.