Considerations for March/April, 2015
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The spring time months of March and April provide a load of challenges in managing almonds. Irrigation, nutrient applications, disease management, and weed and insect control begin during this period and are critical in developing a successful crop.

Drought management within Almonds. Many farmers across the state will be impacted by the fourth year of severe drought. Within almonds, there has been a lot of research conducted to determine better strategies to apply water. The Univ. of CA Division of Agriculture and Natural Resources has recently published an article titled "Drought Management for California Almonds" (Publication #8515, Downloadable for free at http://anrcatalog.ucdavis.edu/) which highlights the two consistent, easier applied strategies. These strategies, as well as other considerations, are highlighted below.

The strategy applied should be based on water available. If 15% of less than full ETc is available, Hull Split strategic deficit irrigation (SDI) could be considered. If greater, the strategy of Proportional Deficit Irrigation should be considered. An example of both strategies is given in table 1.

Hull split SDI: Hull Split SDI maintains full irrigation until the completion of kernel fill. After kernel fill and until 90% hull-split, irrigation is applied only when trees reach SWP values of -14 to -18 bars. Field research has shown that this technique will decrease water use by as much as 34% during this period, reducing total seasonal water use by about 15%, while having minimal impacts on current and next season's crop. In practice, it can be difficult to fine-tune the irrigation schedule to this SWP threshold. Many growers will initially reduce water applications by 50% around mid-June and will adjust the amount of subsequent irrigations once stress levels increase and soil moisture depletion occurs. Water should be applied prior to harvest to improve hull-split and reduce hull tights. This strategy is a particularly effective method for reducing hull rot, if that is a problem, but it also improves harvest-ability by reducing the force and time required for shaking, which can benefit the long term health of the orchard.

Proportional Deficit Irrigation: If the pressure chamber is unavailable, or the anticipated seasonal water deficit is greater than 15% for the seasonal evapotranspiration (ET_c), then reduced water applications can be made by applying a fixed proportion of ET_c. In this method, the amount of water available for the season should be calculated as a percentage of full ET_c. This percentage should be applied to spread the deficit evenly across the season. In other words, if it is determined that enough water is available to supply only 55% of ET_c for the whole season, then each irrigation would match 55% of the determined ET_c for that irrigation period. Current season and future yield loss should be expected when using this strategy, but research has shown this to be the most effective strategy in minimizing losses for large irrigation deficits.

There are many other orchard practices that should be considered when managing drought. They include:

Age of orchard block/block removal. Orchards will take two years of full irrigation to bring back to near-normal production. If water is short for the entire orchard operation, it could be diverted from older blocks in order to save or reduce the recovery time of younger orchard blocks.

Thinning of crop load. Research in peaches suggests that crop removal has little, if any, impact on water use and is not recommended. In some cases, crop removal may increase vegetative growth, which may increase total water use.

Severe pruning is not recommended. Stumping or "dehorning" of trees will increase vegetative growth, which may increase water demand. Furthermore, studies have shown that more wood is removed from the pruning treatments than what is killed by severe water stress.

Increasing of soil salinity. Reduction of water applications or reliance on low quality groundwater may increase soil salinity, impacting yields. Almond trees are relatively sensitive to sodium, chloride, and boron. Yields are impacted when average root system salinity increases above 1.5 dS/m, with research indicating a 19% decrease in potential yield with every 1.0 dS/m increase. This yield reduction is due to the osmotic effects of the salts, which basically makes the tree “work harder” for water reducing growth and vigor. If excess salts continue to accumulate within the rooting zone, trees will ultimately uptake the salts and cause tissue toxicity. The salts of primary concern are sodium, chloride, and boron. A leaching program should be implemented when EC of the entire rooting depth exceeds 1.5 dS/m or sodium, chloride, and boron exceed an exchange saturation percentage of 5%, 5 meq/l, and 0.5 mg/l, respectively.

Removal of cover crop. When managing severe drought, vegetation on the orchard floor should be eliminated. Depending on the coverage, cover crops may increase water usage by as much as 30%. Keep in mind that cover crops do provide soil health benefits and should be replanted when water is available.

Maintaining micro-irrigation systems and application timing. Maintenance should be performed on systems to increase the distribution uniformity. This include flushing and replacing of lines, irrigating in smaller sets to maintain pressures within the operating range, and matching water application rates with soil intake rates. Sets should be no less than 6 hours and should be completed in the cooler, calmer part of the day.

Minimal impacts of Anti-transpirants. University of California research has not been able to document water savings or reduction of plant stress with the application of anti-transpirants, or “plant coolants,” and thus they are not recommended. Many new products, however, enter the market annually, and there is always the possibility that some may prove to be of benefit. When

applying these products, it is important to leave several untreated areas in the field in order to determine product's effectiveness.

Reduced nitrogen applications. Nitrogen applications should be reduced during periods of drought. The reduction rate should be proportional to the expected reduction in yield from deficit irrigation. Nitrogen rates in the spring should be reduced to prevent growth, as excessive vegetative growth increases tree water demand. Most data suggest that long-term yield reductions generally follow a 1:1 relationship with long-term water reductions, meaning that a 30% reduction in relative applied water leads to a 30% reduction in relative yield.

Pest management considerations. Periods of drought influence insect pest populations. Mites flare on stressed trees, and increased miticide applications may be needed. Navel orangeworm (NOW) populations are impacted by drought as well. Reduced winter rains can make it difficult to remove mummies with winter shaking, leading to an increase in the over-wintering population. Warmer temperatures common during drought years lead to faster insect development. Furthermore, hull split is generally accelerated in drought years, which changes the timing to apply a hull split NOW spray.

Spring-time Nitrogen Management. Nitrogen applications tend to begin in mid to late March for many operations. New nitrogen regulations require a crop estimate in order to determine the seasonal amount of nitrogen to apply. Crop removal studies have indicated that around 65 lbs of nitrogen are removed with every 1000 kernel pounds of harvest. Taking into account nitrogen application inefficiencies, 85 lbs of nitrogen must be applied to replace the removed amount. Further research has indicated that multiple applications of nitrogen should be made through the season with 80% of the total budget being applied prior to kernel fill with the remaining 20% applied in the postharvest. Spring applications should be split to reduce the potential of plant toxicity and leaching from spring rains or over-irrigation. A good plan for a sandy loam or finer soil would be 20-30-30-20 for mid-March, mid-April, mid-May, and the postharvest period, respectively. In coarser or soils with lower water holding capacities, smaller, more frequent applications should be applied.

Pest and disease considerations for March/April. Disease concerns tend to run high in the spring as rains may provide environmental conditions conducive for infection. Sprays for shot-hole, anthracnose, jacket rot, and bacterial spot should be based on rainfall events. Summer diseases of rust and scab, however, may still be problematic and may require a treatment even in dry spring conditions. Treatment timings for scab is 2-5 weeks post petal fall, and 5 weeks post petal fall or later for rust. Orchard history, cultivar, and irrigation systems should be factors in determining the need for treatment.

Insect concerns include San Jose Scale (SJS), Peach Twig Borer(PTB), and Leaf-footed Plant Bug (LPB). With the warmer spring, male emergence for SJS and the biofix for PTB will be earlier. Therefore, the traditional "May Spray" timing may also be earlier. Timing of a growth

regulator for SJS control should be 400 DD after the male flight. A spring treatment for PTB should be made 400-500 DD after the biofix. Keep in mind that the PTB timing often overlaps with the spring flight of NOW. If timed properly, this spray could provide early season control for both pests.

LPB is erratic and hard to predict. Research does suggest that over-wintering populations are reduced by below freezing temperatures. In years with mild winters, such as this past year, populations tend to be higher. Furthermore, lack of vegetation in the foothills or riparian areas reduces food, which drives populations into almond orchards for feeding. Sprays should be timed once adults are first detected, not once damage occurs. Damaged nuts do not show symptoms for several days to weeks after initial feeding.

Please keep in mind that there are more pests that affect almonds during this time period. More information can be found at ucipm.ucdavis.edu.

The Final Thought. Unless the rain begins to fall, we will be experiencing another year of severe drought. The prolonging of this natural disaster will lead to increased difficulty in finding resources for many farming operations across the state. During this time of hardship, it is important to keep an eye on your friends and family - especially if you become aware that a major problem has occurred (e.g. well going dry). If a friend seems unreasonably moody or withdrawn, talk with them and ask them how things are going. If you suspect problems, encourage them to find someone to talk to or get professional help. There are also some excellent resources available online which include "Making Decisions and Coping with Drought (Univ. of CO extension system)" www.ext.colostate.edu/pubs/consumer/10256.pdf and the Disaster Distress Helpline available online (http://disasterdistress.samhsa.gov/disasters/drought.aspx) by phone (1-800-985-5990) or text (Text "TalkWithUs" to 66746).

Clear gumming exuding from the hull of the almond may indicate feeding by leaf footed plant bug. If scraped away, a small hole should be visible piercing through the hull into the developing kernel.