Imperial County *Agricultural Briefs*

University *of* California
Agriculture and Natural Resources
UC Cooperative Extension

Features from your Advisors

July 2018 (Volume 21 Issue 7)

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HOW MUCH WATER DO SUGAR BEETS NEED IN THE IMPERIAL VALLEY?

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Introduction. Sugar beets (*Beta vulgaris L.*) are one of the high water consuming crops in the Imperial Valley, with an average harvested acre of 25,000 per year, due to the long growth period (up to 10 months) and seasonal water consumption. The seasonal water use of sugar beet crops is strongly dependent on weather conditions, irrigation management, and the length of the growing season (early or late harvest). Here, we present *preliminary findings* on crop water use of sugar beets using our first-year measurements at three sugar beet commercial fields in the Imperial Valley near Westmorland. The field measurements were conducted during the 2017-2018 growing season. Field A was under sub-surface drip irrigation (SDI) and fields B and C were under furrow irrigation. Fields A and B have very similar soil type, clay loam, and field C has a clay soil type.

Field measurements. The actual crop water use (actual crop ET or ET_a) was measured using the residual of the energy balance method with a combination of surface renewal and eddy covariance equipment (fully automated ET station showed in Figure 1). As an affordable tool to estimate actual crop ET, Tule Technology sensors (www.tuletechnologis.com) were also set up at all experimental sites. The Tule ET data were verified using the ET estimates from the fully automated ET station. Soil moisture sensors were installed at multiple depths to monitor soil water potential on a continuous basis.

Figure 1. Fully automated ET station and Tule sensor at the experimental fields.

Results. Figure 2 shows daily actual crop ET from early January through the day before harvest (early mid-season through late-season at the experimental fields). As can be seen from Figure 2, different crop ET values on a daily basis were observed at different sites. Over this period, the actual crop ET varied from a minimum of 0 in/day to a maximum of 0.36 in/day.

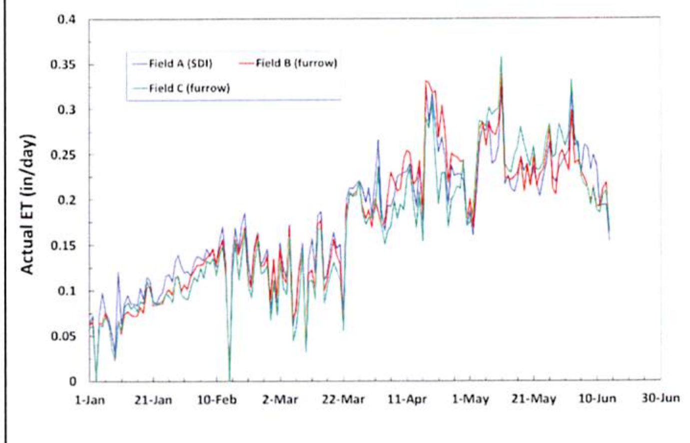

Figure 2. Daily actual crop ET at the experimental fields (mid-season through late-season).

According this data, a cumulative crop actual ET of 33.8", 32.5", and 31.4" was estimated for the growing season at fields A, B, and C, respectively (Figure 3). The total ET_o was 40.1 inches for this period (October 21st, 2017 to June 14th, 2018). Overall, the sugar beet field under sub-surface drip irrigation showed an average of 4.8% higher seasonal crop water use (ET_a) than fields under furrow irrigation. More frequent irrigation events and maintaining soil moisture status at a desired level during the entire crop season (Figure 4) could be the main reason for better plant growth and more above-ground biomass production from the SDI field. There may have been no periods analogous to those in surface irrigated crops when water stress develops briefly.

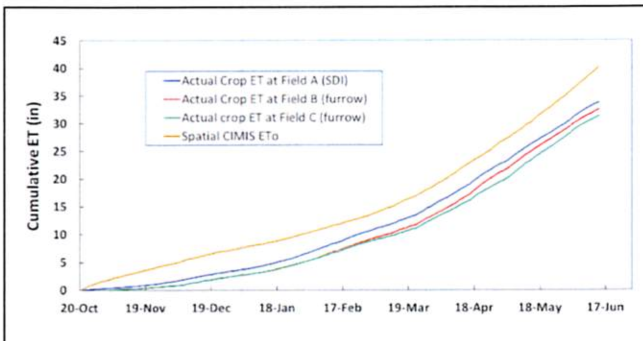

Figure 3. Cumulative crop water use at the experimental fields over the growing season vs. reference ET.

Crop coefficients. To determine the actual crop coefficient (K_a) values, we used the equation of $K_a = ET_a/ET_o$. The reference ET (ETo, as well-watered grass water use) was derived from Spatial CIMIS (https://cimis.water.ca.gov). Spatial CIMIS combines remotely-sensed satellite data with traditional CIMIS station data to produce more accurate maps of ETo on a 2-km grid, which provides a better estimate of ET_o for the individual fields. Accordingly, an average seasonal

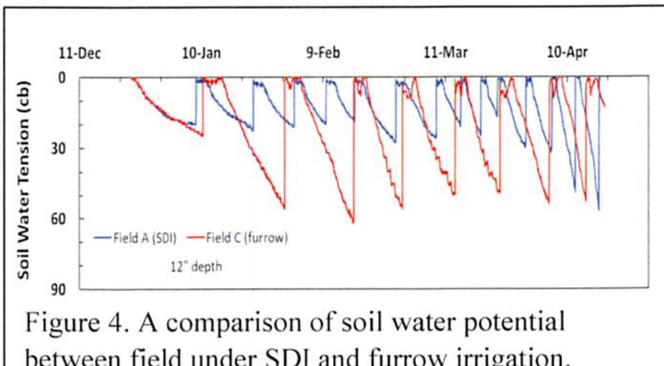

Figure 4. A comparison of soil water potential between field under SDI and furrow irrigation.

K_a value of 0.84, 0.81, and 0.78 was obtained for fields A, B, and C, respectively.

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Assuming that the SDI field was the most effectively irrigated in the comparison, this field may be assumed as a well-watered sugar beet field. The crop water use data from this field may be considered to represent the most accurate estimate of sugar beet crop water requirements. The K_a values of this field (field A) was used to develop a preliminary crop coefficient curve for sugar beets (Figure 5). From this preliminary finding, the average value of 0.23, 0.98, and 0.60 was determined as crop coefficient values of sugar beets at early-season, mid-season, and late-season, respectively. This proposed crop coefficient curve can be used and tested subsequently to estimate a seasonal crop water use for sugar beets in the Imperial Valley. The curve and crop coefficients are still preliminary and need to be verified through more data collection at least for one more year.

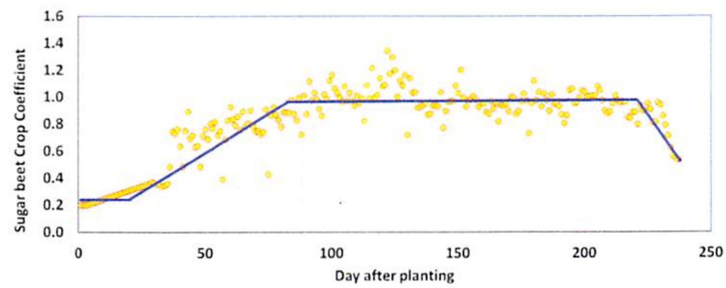

Figure 5. Sugar beet crop coefficient curve for the Imperial Valley (a 240-day crop season period, mid-October to mid-June).

Preliminary conclusions. To estimate seasonal crop water use for sugar beets (October 1st to June 30th), we used the developed crop coefficient curve at this study and the average of long-term daily ET_o (1996-2016) from CIMIS station in Meloland (CIMIS#87). The proposed crop coefficient curve was justified for a 270-day crop season period. Consequently, *a seasonal crop water use (crop ET) of 42" (3.5 ac-ft/ac) was estimated for sugar beet crops in the Imperial Valley.* This amount may vary due to irrigation practices and soil types. While we plan to collect more data during the next growing season and to use more locations to verify the crop coefficient curve proposed at this study and the seasonal water use of beets, the current estimate can be used as a preliminary estimation.

Excess irrigation for salinity management in the Imperial Valley is necessary. Keep in mind that excess water for salinity management in the low desert region can be considered beneficial water use. A 3-inch annual rainfall of the region is insufficient to accomplish this task. In other words, 3.5 ac-feet/ac is just an estimation of seasonal crop water use for sugar beet crops. Excess water for salinity management purposes must also be applied. The amount of additional irrigation water to drain salt from the effective crop root zone depends on the soil circumstances and level of salinity. If pre-irrigation is used to create better tillage and seedbed conditions, or if surface methods are used for stand establishment, slat management may be adequately met.

The irrigation water that needs to be applied in an individual field depends on crop water requirements and the efficiency of the irrigation system. Furrow irrigation is the most common irrigation practice for sugar beets. If we assume an average irrigation efficiency of 65% for a particular field irrigated by furrows, the approximate irrigation water applied per acre of this field (considering 3.5 ac-ft/ac as crop water needs) would be 5.4 ac-feet. Part of this excess irrigation water may be considered to be necessary for salinity management. Switching to sub-surface drip irrigation may have the potential to enhance irrigation efficiency in sugar beet fields and consequently serve as a new approach to conserve water. Further research work is needed to better understand the feasibility of SDI application in sugar beets, and to help maintain profitable sugarbeet production in the Imperial Valley as water and labor costs increase.

SOIL SOLARIZATION: A NON-CHEMICAL METHOD FOR PEST CONTROL

Pratap Devkota, Weed Science Advisor, UCCE Imperial and Riverside Counties

Soil solarization, referred as solar heating of the soil, is a method for controlling soilborne pathogens, insect pests, and weeds by disinfesting soil by using solar heat. Soil solarization is considered to be an effective method for pest control under the arid-region cropping system. Solarization is implemented during summer months, where soil is heated by covering with transparent polyethylene mulching/tarping, thereby killing crop pests (Fig 1). The recent advancement in plastic mulch technology helped soil solarization to be implemented on larger acreages. Moreover, the increase in organic production has contributed to wider adoption of soil solarization technique. At present, solarization is adopted in more than 70 countries for controlling pests on various crops, including vegetables, field, ornamentals, nurseries and fruit crops.

Figure 1. Soil solarization implemented field in the Imperial

Various research studies have evaluated soil solarization and reported it to be effective for controlling a wide range of soilborne pests, including phytopathogenic fungi (such as *Verticillium, Fusarium, Pythium)*; pathogenic bacteria; nematodes; insect eggs, larvae and pupae; and weeds. The biological processes involved in solarization include the weakening effect on pathogen propagules induced by

Figure 2. Solarized field is full of little mallow and nettleleaf goosefoot during the produce season. Solarization is ineffective on these weeds.

sublethal heating. In addition, soil solarization also enhances the activity of biological control agents such as *Talaromyces, Aspergillus, Bacillus* and *Pseudomonas* present in the soil. Although, soil solarization is effective in controlling a variety of pests, there are cases in which effective control has not been achieved through soil solarization alone (Fig 2). Likewise, the duration required for soil solarization as effective control is variable depending upon pest species and especially for weeds (Fig 3).

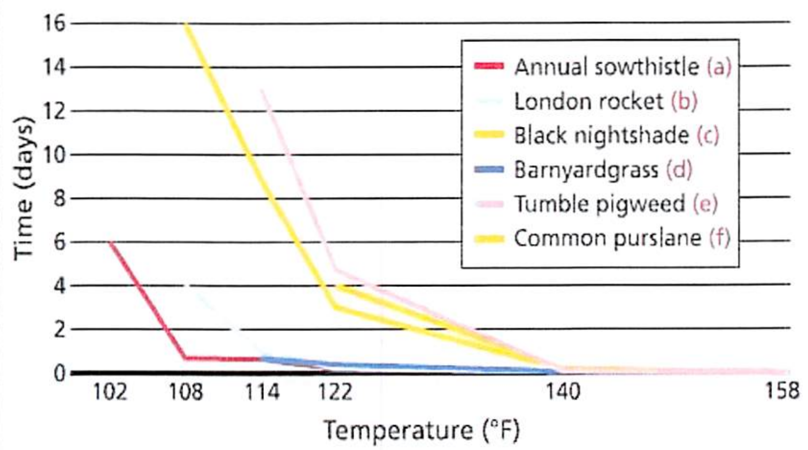

Figure 3. Estimated temperature and time (days) required for controlling weed species with soil solarization (Stapleton, Prather et al. 2000)

Being a non-chemical control method, solarization is considered as a potential alternative to chemical or soil fumigation methods, and it has been widely practiced in organic and biological farming. Solarization can be an effective component for the integrated pest management and biological control systems. In conventional crop production systems, solarization can be combined with other pest control measures to develop a robust integrated pest management system. Combining soil solarization with other methods improves pest control because of the combined thermal killing and effect from other methods. For example, adding organic amendments or crop residues generates biotoxic volatile compounds. Volatile compounds including alcohols, aldehydes, sulfides, and isothiocyanates are generated by incorporating mustard crop residues during soil heating. Soil pathogens and pest sensitivity to biotoxic volatile compounds may also be enhanced by the increase in soil temperature.

While soil solarization holds promise for pest control, the weaknesses related to this technique also need to be addressed. It is a non-chemical and environmentally friendly method for pest control. However, solarization alone is not sufficient for controlling a wide range of pest species. This technique needs further improvement to be effective across various pests and weeds. Strategies for combining soil solarization with pesticides (including soil fumigants), organic amendments or beneficial microorganisms, and crop residues need to be extensively evaluated for developing a robust IPM strategy.

Keeping Your Birds Safe from Disease:

The California Department of Food and Agriculture (CDFA) has identified several cases of **virulent Newcastle disease** in small flocks of backyard birds in Los Angeles County and San Bernardino County. The initial case was detected at the UC Davis School of Veterinary Medicine's California Animal Health & Food Safety Laboratory (CAHFS) when a private practitioner submitted a sick bird for testing. All detections are confirmed at the United States Department of Agriculture (USDA) Animal and Plant Health Inspection Services (APHIS) National Veterinary Services Laboratory (NVSL) in Ames, Iowa. This was the first case of virulent Newcastle disease, previously referred to as exotic Newcastle disease, in the U.S. since 2003. CDFA is working with federal and local partners as well as poultry owners to respond to the incident. State officials have quarantined potentially exposed birds and are testing for the disease.

Virulent Newcastle disease is a **highly contagious** and **deadly virus in birds;** the virus is found in respiratory discharges and feces. Clinical signs in birds include:

- Sneezing, coughing, nasal discharge, green watery diarrhea, depression
- neck twisting, circling, muscle tremors, paralysis, decreased egg production
- swelling around eyes and neck, sudden death.

It is essential that all poultry owners follow good biosecurity practices to help protect their birds from infectious diseases such as virulent Newcastle. These include simple steps like *washing hands* and *scrubbing boots* before and after entering a poultry area; *cleaning and disinfecting tires and equipment before and after moving them on/off the property*; and *isolating any sick birds*. New or returning birds from shows should be isolated for 30 days before placing them with the rest of the flock.

For backyard flock owners, biosecurity measures include using dedicated shoes and clothes when caring for birds and not to use/wear those clothes/shoes in other areas.

In addition to practicing good biosecurity, all bird owners should report sick birds or unusual bird deaths through California's Sick Bird Hotline at 866-922-BIRD (2473). Additional information on VND and biosecurity for backyard flocks can be found at https://www.cdfa.ca.gov/ahfss/Animal_Health/Newcastle_Disease_Info.html

Sick or dead backyard birds can be submitted to CAHFS laboratories for post-mortem examination ($20 plus shipping and handling). Information on this program can be found at: https://www.cdfa.ca.gov/ahfss/Animal_Health/pdfs/CAHFS_NecropsyFactsheet.pdf

For additional information on who to contact for issues regarding backyard poultry, see: http://ucanr.edu/sites/poultry/contact/

Virulent Newcastle disease is NOT a food safety concern. No human cases of Newcastle disease have ever occurred from eating poultry products. Properly cooked poultry products are safe to eat. In very rare instances people working directly with sick birds can become infected. Symptoms are usually very mild, and limited to conjunctivitis and/or influenza-like symptoms. Infection is easily prevented by using standard personal protective equipment.

If you have any questions, please do not hesitate to call the Animal Health Branch Tulare District Office at 559-685-3500.

Jennifer McDougle, Veterinarian, Animal Health Branch, Tulare District Office.

UC DAVIS VETERINARY MEDICINE

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Thoughts on vaccination against virulent Newcastle Disease (vND) from UC Davis School of Veterinary Medicine-Cooperative Extension

First and foremost focus on good management and biosecurity to protect your backyard birds. This is the "lowest hanging fruit" with respect to protecting your flock. The virus can easily spread easily from contaminated birds to your birds via feces, respiratory excretions, feed, clothing, and equipment. Tips for preventing disease transmission via biosecurity can be found here.

If you purchase poultry internationally, poultry should be bought only from suppliers who can certify that the birds have been imported legally or bred in the U.S., and are healthy.

In short use common sense and good biosecurity!

In addition to biosecurity, vaccines are appropriate to consider if you live in affected areas and want an extra level of protection. However, vaccines are not a "bandaid" for poor management.

The LaSota and B1 vaccines are often available from feed stores. Make sure they are licensed in the U.S. In addition follow the instructions and/or consult a veterinarian. A list of small animal veterinarians who treat poultry in California by county can be found here

The best way to deliver the vaccine is via the eye drop method.

Be aware that the vaccines can produce some mild clinical signs including a drop in egg production and some mild respiratory signs.

Be aware that vaccinations against vND often need to be given at least 2x a year to remain efficacious.

Again, vaccination is not a substitute for good biosecurity which is the best way to prevent your flock from getting infected from all infectious diseases including vND.

Lastly, use your network. If you suspect you have a sick bird (vND or other) UC Davis, the California Department of Food and Agriculture (CDFA) and the California Animal Health and Food Safety Lab (CAHFS) have resources to help answer questions. Feel free to contact Dr. Maurice Pitesky from the UC Davis School of Veterinary Medicine-Cooperative Extension at mepitesky@ucdavis.edu or 530-219-1407 if you have questions, comments or suggestions.

INDUSTRIAL HEMP COULD BE AN ALTERNATIVE CROP OF THE LOW DESERT

Oli Bachie, Agronomy Advisor, UCCE Imperial, Riverside & San Diego Counties & Director UCCE Imperial County

Hemp, *Cannabis sativa* L. is a dioecious annual plant (Hall, et al., 2012). It has not been grown legally in California for many years, due to regulatory restrictions. In recent years, the restriction has become loose and many industry groups have shown research interest with industrial hemp. The 2015 federal law removed hemp from the list of controlled substances as long as its tetrahydrocannabinol (THC) content did not exceed 0.3%. The Senate bill #566 (the California Industrial Hemp Farming Act), defines industrial hemp as a fiber or oilseed crop, or both, that is limited to the non-psychoactive types of the plant and the seed produced, having no more than 0.3% THC contained in the dried flowering tops. The bill emphasizes that industrial hemp be grown only if it is on the list of approved seed cultivars and would require the Department of Food and Agriculture to determine the methodology and procedure by which the list of approved seed cultivars may be amended, as specified.

Industrial hemp is a versatile fiber crop and is known to produce food, fuel, feed, fiber for textiles, bio-composite plastics and other advanced manufacturing materials, oils for industrial and cosmetic purposes, and pharmaceuticals, with over 25,000 linked products. Hemp seeds possess a protein digestibility amino acid score (PDAAS) that is equal to or greater than certain grains, nuts and some pulses (House, et al., 2010). In terms of resource requirements for production, Cherrett, et al., 2005, suggested that it is possible to produce three times the amount of hemp fiber as cotton from the same amount of land with lower impact in terms of water, energy and the ecological footprint. Hemp is considered to consume 66% to 76% less water than cotton (Yvonne S-azcentral.com); it is heat-tolerant and produces excellent fiber.

Although some researchers pointed out that hemp prefers a mild climate, experimental hemp is already grown in the states of Nevada (www.coloradohempproject.com) and Arizona, which have very similar weather to the low deserts of Southern California. Some suggested that hemp may have evolved originally as a desert plant and is even referred to as xeric plant, plants that develop survival mechanisms for environments with low rainfall. One of the adaptation mechanisms to an arid climate is the development of trichome, which helps reduce any rapid loss of water from the leaves when there is a water deficit. Furthermore, the deep tap roots of hemp can find water sequestered in the ground (Amaducci, et al. 2008) with preferences to alkaline soil ranging between pH 7 to 7.5. All the desirable characteristics and resource conservations methods of hemp makes it a potential alternative crop to be used instead of cotton in regions that have long abandoned growing cotton or as a rotation crop in the still cotton producing low desert regions, such as the Blythe and Palo Verde areas. Hemp grows faster, produces high yields and can be grown without the heavy use of pesticides. In general, it is forecasted as an emerging crop in the United States.

Although hemp characteristics point out that it has great adaptability potential to the low desert, most of the currently available industrial hemp cultivars are developed for cooler environments and hence, may not be suitable for the low desert conditions. It is known that the hemp plant is sensitive to both temperature (Amaducci, et al. 2008) and its reproductive cycle commences when photoperiods are shorter than a critical length (Hall, et al., 2012). The UCCE Imperial County with approval from the University of California Agriculture and Natural Resources (UCANR) head office intends to conduct research on industrial hemp at the UC Desert Research and Extension Center (DREC). The objectives of our trials are to test adaptability and potential yield of some selected cultivars. The outcome of our research will help to identify cultivars that may withstand heat, high temperatures and other environmental conditions of the low desert. We will evaluate seed and fiber (straw) yield and productivity, strictly following the guidelines specified by the U.S. Farm Bill (Agricultural Act). According to this bill, industrial hemp must be grown or cultivated for research purposes conducted under an agriculture pilot program or academic research with a THC concentration of no more than 0.3% on a dry weight basis. If levels exceed this value, the trials should be destroyed. In summary, our trial (s) will confirm if industrial hemp can withstand the dry and hot weather and be productive under mostly long photoperiod seasons of the low desert. Seasonally repeated trials will identify the best planting dates, adaptability and suitability of hemp varieties for California's low desert environment.

Note: This is not an endorsement of hemp production by growers or any other interested party in the low desert. This is to simply state that the university will soon be conducting industrial hemp adaptability and yield potential under the low desert environment. We encourage growers and the farm community to share their concerns on our intended trial(s) with the UCCE Imperial County. For interests in producing industrial hemp, interested individuals should verify the law, permits and regulations with the county Ag Commissioner's office, the California Department of Food and Agriculture, and other concerned institution (s).

For further information, please refer to the following **reading materials**

Howard Fischer (Capitol Media Services), https://tucson.com/news/local/arizona-farmers-will-soon-be-able-to-grow-hemp/article_8497e46a-43f5-50c5-9ccb-8b8aed04b3da.html

Amaducci, S., et al. 2018. Characterization of Hemp (Cannabis Sativa L.) Roots under Different Growing Conditions. Plant and Soil, 313 (#1-2): 227–235.

Cherrett, N., et al. 2015. Ecological Footprint and Water Analysis of Cotton, Hemp and Polyester. Stockholm, Stockholm Environmental Institute, 2005.

Hall, J., et al. 2012. Review of Flowering Control in Industrial Hemp." Journal of Natural Fibers, 9 (1): 23–36.

House, J., et al., 2010. Evaluating the Quality of Protein from Hemp Seed (Cannabis Sativa L) Products through the Use of the Protein Digestibility-Corrected Amino Acid Score Method." J. Agric. Food Chem. 58 (22): 11801–11807

Senate bill no 566. https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140SB566

Yvonne, S. Arizona could be new testing ground for growing, producing hemp. http://www.azcentral.com. Published Feb. 7, 2017

https://www.coloradohempproject.com

IMPERIAL VALLEY CIMIS REPORT AND UC WATER MANAGEMENT RESOURCES

Ali Montazar, Irrigation and Water Management Advisor, UCCE Imperial and Riverside Counties

The reference evapotranspiration (ET_o) is derived from a well-watered grass field and may be obtained from the nearest CIMIS (California Irrigation Management Information System) station. CIMIS is a program unit in the Water Use and Efficiency Branch, California Department of Water Resources that manages a network of over 145 automated weather stations in California. The network was designed to assist irrigators in managing their water resources more efficiently. CIMIS ET data are a good guideline for planning irrigations as bottom line, while crop ET may be estimated by multiplying ET_o by a crop coefficient (K_c) which is specific for each crop.

There are three CIMIS stations in Imperial County include Calipatria (CIMIS #41), Seeley (CIMIS #68), and Meloland (CIMIS #87). Data from the CIMIS network are available at: http://www.cimis.water.ca.gov/. Estimates of the average daily ET_o for the period of May 1st to July 31th for the Imperial Valley stations are presented in Table 1. These values were calculated using the long-term data of each station.

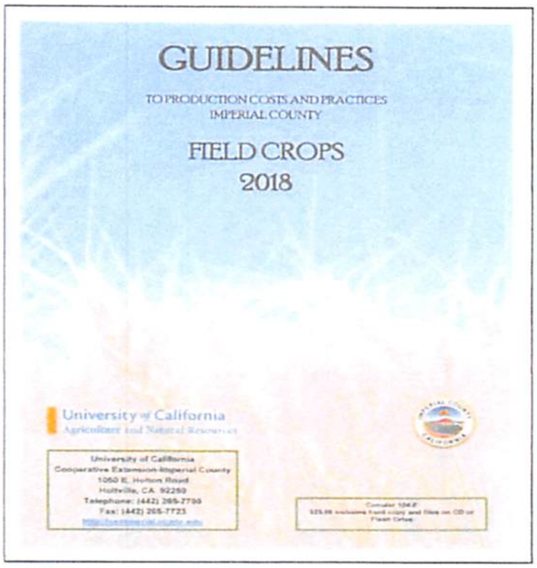
Table 1. Estimates of average daily potential evapotranspiration (ET_o) in inch per day

June	July		August		September	
	1-15	16-31	1-15	16-31	1-15	16-30
Calipatria	0.32	0.31	0.30	0.28	0.26	0.23
El Centro (Seeley)	0.33	0.31	0.30	0.28	0.26	0.25
Holtville (Meloland)	0.32	0.31	0.30	0.28	0.26	0.24

For more information about ET and crop coefficients, feel free to contact the UC Imperial County Cooperative Extension office (442-265-7700). You can also find the latest research-based advice and California water & drought management information/resources through link below:

http://ciwr.ucanr.edu/.

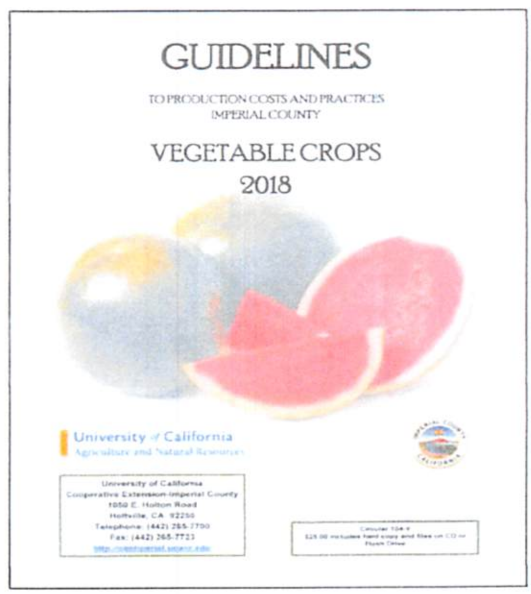
The price of the Guidelines has increased as of July 1, 2018.



2018 Field Crops Guidelines

$40.00/book

As of July 1, 2018



2018 Vegetable Crops Guidelines

$40.00/book

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