Imperial County Agricultural Briefs

University of California
Agriculture and Natural Resources

Features from your Advisors

November 2018 (Volume 21 Issue 10)

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COVER CROPPING IN THE DESERT

Jose Luis Aguiar, Farm Advisor, UCCE Riverside County

A good alternative to the common practice of mono-cropping and improving soil quality is using cover crops as organic mulches. Cover crops grown as green manures contribute nutrients and organic matter to the soil making them available to crops as the organic matter decomposes. They serve the same purpose as adding animal manures to the soil. Many crops can benefit from cover crop use, including table grapes, dates, citrus and vegetables crops. This article will briefly describe some of these practices.

Which cover crop to use?

The first step is to identify the benefits desired and then to figure out how to apply this practice to your cropping system. To be effective, a cover crop must fit into the crop production cycle and at the right time. There are benefits along with some problems using cover cropping systems. One big problem is that land is out of crop production temporarily during the cover crop season unless it can be grown alongside the main crop. Which cover crops are suited for the summer and which cover crops are suited for the winter? For perennial crops, growing alongside the cover crop is an option. For annual crops, a way around this is to grow the cover crops during the summer fallowing period when the land would not normally be in production. In this situation, a cover crop that grows well and quickly in the summer is appropriate (Table 1). There are also cover crops suited for perennial or permanent crops such as grapes, dates and citrus production (Table 2). A cover crop requires management just like growing any other crop. Herbicide applications and cultivation tillage may still be required. Irrigation is required for cover crop growth. Some cover crop residues may be phytotoxic to certain crops that follow a green manure mulch. We have seen cases of phytotoxicity on lettuce that followed Sudan grass. Also, cover crop seeds and the proper seed inoculant must be purchased annually. One should consider all the potential benefits and costs before deciding to grow a cover crop.

Table 1. Summer Cover Crops for use a green manures (any reference for it?)

Crop	Genus Species	Planting Rates lb/acre
Cowpea	***Vigna unguiculata***	30-50
Sesbania	***Sesbania bispinosa***	10-20
Pigeon peas	***Cajanus cajan***	20-30
Sudan grass	***Sorghum sudanense***	20-30
Crotalaria	***Crotalaria spp.***	20-40
Soybeans*	***Glycine max***	
Lab Lab*	**Lablab purpureus**	
Guar*	***Cyamopsis tetragonoloba***	

*These could be used as cover crops, in our area they are not the preferred crops.

Our research indicated that organic mulches in vegetable systems could be adapted to California's row crop production system. Cowpeas have proven to be a good fit for the summer fallowing period. Growers are applying water to leach salts in preparation for the fall bell pepper/lettuce plantings. The leaching is done with flood or sprinkler irrigation. See Figure 1 for cowpeas used a cover crop in young citrus tree establishment.

Table 2. Winter Cover Crops for use as green manure

Crop	Genus Species	Planting Rates lb/acre
Fava Beans	***Vicia faba***	125-175
Whooly Vetch	***Vicia villosa***	40-50
Purple Vetch	***Vicia benghalensis***	50-65
Black Mustard*	***Brassica nigra***	5-12*
Seco Barley*	***Hordeum vulgare L.***	20-30

*rate depends on the seed size; smaller seed has lesser rate and if used in row or spread.

Hairy vetch is a winter annual legume that has been used successfully as both a cover crop and green manure mulch in date production in the Coachella Valley. Dr. Aref Bakii, a retired USDA scientist, reported that vetch fixes nitrogen, recycles nutrients, reduces soil erosion and adds organic matter to the soil when used in a fresh market tomato operation. When mowed the vetch reduces weed emergence, lowers soil temperatures, reduces water loss from the soil and acts as a slow release fertilizer. Vetch is adaptable to large and small-scale low-input production. See Figure 5 for vetch as a cover crop in mature date palm garden.

Basic information for the two most common cover crops used in the Coachella Valley (please complete the sentence.)

Cowpeas

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
				PP	PP	PP	HP	HP	HP		

Acceptable Planting Period (PP): May to July 30th
Harvest Period (HP)`: 90 days from planting date
Can harvest seed October to November for next production period

Vetch

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
PP	PP			HP	HP	HP				PP	PP

Acceptable Planting Period: November 15 to February 15
Harvest Period: Depends on the crop that follows
If in a permanent crop, it will dry out and reseed itself for the following season

Below are some pictures of cover crops in the Coachella Valley.

Figure 1. Cowpea as a cover crop on young citrus trees. Also helps in weed control and limits wind damage.

Figure 2. Sesbania, grown as a green manure that will be incorporated into the soil.

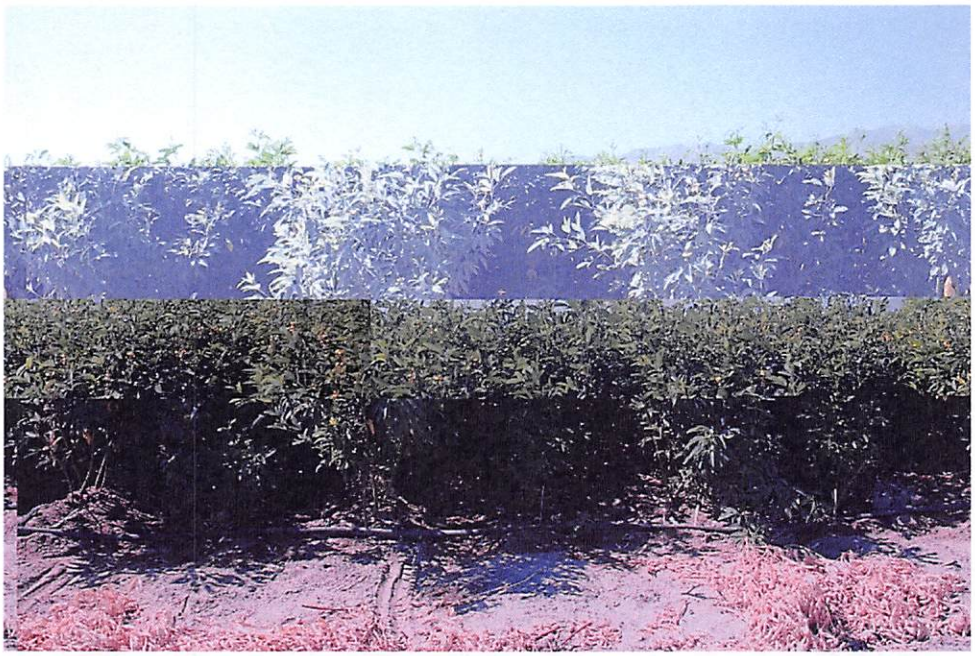

Figure 3. Pigeon Peas, is the cover crop of choice at the Coachella Valley Agricultural Research Station. This has a lot of potential, grows vigorously and produces a lot of biomass.

Figure 4. Fava Bean grown for fresh market but market prices were too low so it was used as a green manure cover crop.

Figure 5. Purple Vetch, this picture is from Dr. Aref Bakii's early experiments on use of purple vetch in date crop production. Grower planted the cover crop in every other basin and this allowed them to do the cultural practices needed.

Conclusion:

Cover crops are good alternatives to using animal manures. Both are good soil building practices and each one has its benefits and drawbacks. This article briefly touches upon a few of the common cover crops used in the desert.

References:

Cover Crops for California Agriculture. Publication 21510.
Nitrogen Contribution of Annual Legumes. W. Williams, W. Graces, 1997.
Managing Cover Crops Profitably. Sustainable Agriculture Network, Handbook Series Book 3.

MORINGA TO BE TESTED FOR LIVESTOCK FEED POTENTIAL WITH OTHER FORAGE CROPS

Oli Bachie, Agronomy Advisor, UCCE Imperial, Riverside & San Diego Counties & Director UCCE Imperial County
Brooke Latack, Livestock Advisor, UCCE Imperial, Riverside, and San Bernardino Counties

A study will be conducted in the Imperial Valley comparing productivity of five major forage crops: Rhodes grass, Teff, Bermuda grass, Klein grass, and Moringa. Some of the crops are already grown in the low desert and some are new to this region. All forage crops will be grown under similar growing conditions to evaluate the performance of each crop in the low desert. Additionally, samples will be taken to determine the nutritive value of each crop as a livestock feed. Moringa, specifically, is a new crop to the Imperial Valley and might have potential to be a substantial forage crop in the area. Christian Lydick will be an important collaborator. He will provide Moringa seeds for the project.

Moringa, *Moringa oleifera,* is a fast-growing crop, native to the subtropical regions of Pakistan and India, but is widely grown in Ethiopia, the Philippines, the Sudan, West, East and South Africa, tropical Asia, Latin America, the Caribbean, Florida and the Pacific Islands. It is referred to as a drought resistant crop that also performs well in neutral to slightly acidic, well-drained sandy or loamy soil, but does not tolerate freezing or frost condition. Moringa is also known as miracle tree, the drumstick tree, horseradish tree, or ben oil tree. As a tree, it can reach a height of 32-39 ft but are commonly cut back to 3-6 ft for production. It can be grown on marginal lands with high temperatures and low water availability and where it is difficult to cultivate other agricultural crops. According to FAO sources (http://www.fao.org/traditional-crops/moringa/en/), Moringa is a genus of shrubs and trees with multi-purpose uses: its leaves, roots and immature pods are consumed as a vegetable. All parts of the moringa tree, bark, pods, leaves, nuts, seeds, tubers, roots, and flowers are edible. The leaves are used fresh or dried and ground into powder. The seed pods are picked while still green and eaten fresh or cooked. Moringa seed oil is sweet, non-sticking, non-drying and resists rancidity, while the cake from seed is used to purify drinking water. The seeds are also eaten green, roasted, powdered and steeped for tea or used in curries. The seeds grow in a three-sided pod and are dark brown and round when mature.

Another factor to consider in Moringa is that it grows much more intensely than traditional livestock feeds. Some studies revealed that, in regions where alfalfa produces on average, around 7 tons per acre at optimum growth conditions, Moringa have produced more than 280 tons of green matter per acre of which approximately 70% is reported to be stems and wood. Moringa as a forage crop can be harvested up to 8 times a year starting 60 days after seeding and at about 5 to 6 feet of growth for subsequent harvests. Some suggest that it can yield an average 10.9 to 48.6 tons/acre/year with a higher yield in rainy season or with irrigation. In South America, Moringa leaves were found to improve milk output and growth of low performing cattle but has not been tested on high performing cattle in the United States. Moringa leaves are packed with protein, calcium and other important components of a balanced diet for livestock, and they can be grown with much less fertilizer and pesticides than traditional forage crops. Some care must be taken as the protein levels are high in Moringa feed, so balancing the diet with other feeds is critical to maintain animal health and performance.

Hence, Moringa's forage or fodder quality for livestock needs to be assessed under local low desert environmental conditions. The assessment of the potential benefits of Moringa as a livestock feed could make it a potential alternative forage crop for use in the Imperial Valley. Understanding the productivity and usability will allow livestock producers to choose their feed with a better understanding. Recognizing the potential benefits that may be obtained from Moringa, the UCCE Imperial county is planning to conduct a research project to test productivity comparisons of existing and new forage crop species. The project is planned for February 2019 planting and will be conducted in collaboration with the Agricultural department of Imperial Valley College (IVC). If you have any concerns or want to know more about the project or the Moringa plant, please feel free to contact us.

For more information, please refer to the following materials;

- FAO. Traditional Crops – Moringa. http://www.fao.org/traditional-crops/moringa/en/
- Nouman, W. & Basra, S., Tahir Siddiqui, M., Yasmeen, A., Gull, T., Angelica Cervantes Alcayde, M. (2014). Potential of Moringa oleifera L. as livestock fodder crop: A review. TURKISH JOURNAL OF AGRICULTURE AND FORESTRY. 38. 1-14. 10.3906/tar-1211-66. https://www.researchgate.net/publication/270121487_Potential_of_Moringa_oleifera_L_as_livestock_fodder_crop_A_review
- Heuzé V., Tran G., Hassoun P., Bastianelli D., Lebas F., 2017. Moringa (Moringa oleifera). Feedipedia, a programme by INRA, CIRAD, AFZ and FAO. https://www.feedipedia.org/node/124
- Reyes Sanchez, N., Sporndly, E., Ledin, I., 2006. Effect of feeding different levels of foliage of *Moringa oleifera* to creole dairy cows on intake, digestibility, milk production and composition. Livest. Sci., 101 (1/3): 24-31. https://www.sciencedirect.com/science/article/pii/S0301622605003830

- Foidl, N., Makkar, H. P. S., Becker, K., 2001. The potential of *Moringa oleifera* for agricultural and industrial uses. In: What development potential for Moringa products? October 20th - November 2, 2001. https://miracletrees.org/moringa-doc/the_potential_of_moringa_oleifera_for_agricultural_and_industrial_uses.pdf

EVALUATION OF POST-TRANSPLANT APPLICATION OF PREFAR 4-E HERBICIDE ON BROCCOLI AND CELERY

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

Introduction

Cole crops (broccoli, cauliflower, cabbage etc.) are major vegetable commodities for the low desert region of California. Celery is also grown in the Imperial Valley; however, in small acreage compared to other major vegetable crops. Various crop pests, including weeds, are major problems for broccoli and celery production. Many winter weeds emerge during winter vegetable growing months and compete with the crops. Broccoli and celery yield and quality can be significantly reduced if weeds are not controlled to effective levels. Therefore, weeds have to be controlled at an optimum level to grow healthy broccoli and celery crops and optimize yield. Although there are different weed control methods, herbicides are widely adopted for the low desert conventional vegetable production system. Herbicide products currently not labeled for these crops for California are often needed to be tested for crop safety and weed control efficacy under the local crop growing conditions.

Prefar 4-E herbicide is being applied post-transplant for broccoli production in Arizona. This herbicide is registered for post-transplant use on *Brassica* crops under Section 24 (C) Special Local Need Label, but is **not labeled for such use in California**. Information on Section 24 (C) Special Local Need Label for Arizona is available at the link: http://www.cdms.net/LDat/ld142010.pdf.

This research will focus on evaluating crop safety, weed control efficacy, and crop yield with post-transplant application (chemigation and spray application) of Prefar 4-E herbicide in comparison to the standard application of Dacthal herbicide for broccoli and celery production in the low desert region of California. The findings from this trial will provide information if Prefar 4-E herbicide could be an option for transplanted broccoli and celery production under California's low desert region.

Materials and Methods

The trial is being conducted at University of California Desert Research and Extension Center near Holtville, CA. After ground preparation, beds were listed at 40" spacing from furrow to furrow. Two lines of broccoli or celery seedlings were transplanted into each bed. At the time of transplanting, both broccoli and celery seedlings were 3-4 leaf stage. Both broccoli and celery were transplanted at 7" spacing between plants in a row. For both crops,

the treatments consisted of:

1. Non-treated check
2. Prefar 4-E herbicide at 6 qt/A - applied with chemigation
3. Prefar 4-E herbicide at 6 qt/A - applied with backpack sprayer
4. Dacthal herbicide at 12 pt/A - applied with backpack sprayer

For chemigation treatment, 12 beds wide (6 beds for broccoli and 6 beds for celery) and 60 ft, long plots were blocked at four sites in the field for herbicide application through sprinkler system. Sprinkler system was run for 30 minutes with no herbicides at the start and then Prefar 4-E herbicide was chemigated for 60 minutes. Following 60 minutes chemigation, the, sprinkler system was run for 10 hours.

For the other spray treatments, each plot consisted of 4 beds wide (2 beds for broccoli and 2 beds for celery) and 30 ft. in length. Prefar 4-E and Dacthal herbicide treatments were applied at 25 GPA using a CO_2 backpack sprayer. Herbicide treatments were applied over the top of transplants and sprinkler was run the next morning (18 hrs. after transplanting/treatment application) for 10 hours.

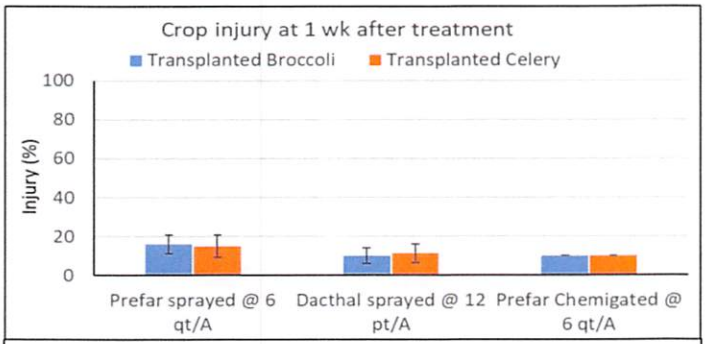
Fig 1. Planting broccoli and celery transplants at the

The following day, sprinkler was run in the entire field (both chemigation and spray application plots) for 14 hours. Overall, 2 inch-acre water was applied in the trial field to incorporate and activate herbicides. We will follow the standard practice for broccoli and celery production during the trial period. The trial will be evaluated for the entire crop growing season until broccoli and celery reach the harvest stage. Data will be collected for broccoli or celery crop injury and weed control at appropriate timings. Crops will be harvested from 1-m^2 area in each plot for yield evaluation.

Results

The research was recently initiated and currently it is an ongoing trial. Therefore, the results presented here are based only on early week ratings of crop injury and weed control.

Crop Injury: Crop injury ratings at 1 wk. after treatment (WAT) with Prefar applied through chemigation was about 10% (Fig. 2) on both broccoli and celery. However, minimal crop injury was observed (Fig. 3) on both crops from Prefar chemigation at 2 WAT. Broccoli injury with Prefar and Dacthal applied through sprayer resulted in 17 and 10% crop injury, respectively, at 1 WAT. Likewise, celery crop injury at 1 WAT from Prefar and Dacthal herbicide spray applications was 15 and 12%, respectively. At 2 WAT, broccoli or celery injury were about 18 and 15% with spray application or Prefar and Dacthal herbicide, respectively.



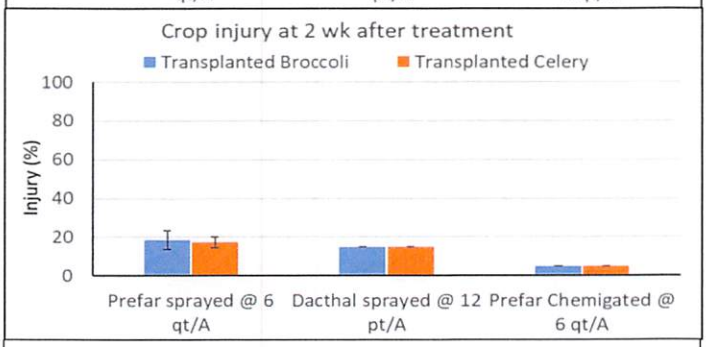


Fig 2 (top) and Fig 3 (bottom): broccoli and celery injury at 1 and 2 WAT, respectively.

Weed Control: There was no weed emergence on any treatment (herbicide treated or non-treated check) at 1 WAT. However, nettleleaf goosefoot and common purslane emerged on the nontreated check at 2 WAT. At this time, weeds were 100% controlled under Prefar chemigated, and Prefar or Dacthal spray-applied plots (Fig. 4).

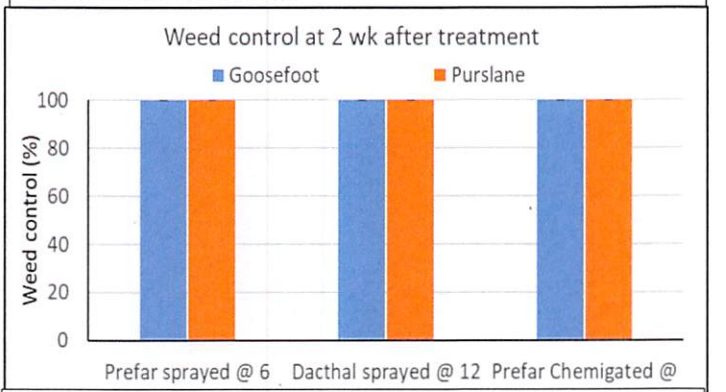


Fig 4: Goosefoot and purslane control at 2 WAT.

This preliminary result on crop injury ratings suggest that Prefar chemigation could be safely used for broccoli and celery production in the low desert region. The project will continue to further evaluate crop response (i.e. broccoli or celery injury ratings, and height measurements), crop yield, and weed control later in the season. The subsequent evaluation and findings will be released following research completion.

29th Annual Fall Desert Crops Workshop

Tuesday, December 4, 2018

Registration at 6:30 am

7:00 am—12:30 pm

Location:

Farm Credit Services Southwest Ag Center Room

485 Business Park Way, Imperial, CA 92251

Pre-Register with:

Nannette at **dnkniffin@ucanr.edu**

No Cost to Attend

Approved Continuing Education Units:

DPR—3.0 hrs. (M-1290-18); CCA—5.5 hrs (CA 56178)

Pending Continuing Education Units:

Arizona Department of Agriculture

Lunch:

Courtesy of Industry Partners

Presented by:

University of California Cooperative Extension Imperial County

1050 E. Holton Rd., Holtville, CA 92250 (442) 265-7700 office

http://ceimperial.ucanr.edu

29th ANNUAL FALL DESERT CROPS WORKSHOP
December 4, 2018
Farm Credit Services Southwest, Ag Center Room
485 Business Park Way, Imperial, CA 92251

6:30	**Registration**
7:00	**Welcome Note** - Carlos Ortiz, Agricultural Commissioner, Sealer of Weights and Measures, Imperial County, CA
7:05	**Viability of Sub-surface Drip Irrigation for Sugar Beets Production in the Imperial Valley** – Ali Montazar, Irrigation and Water Management Advisor, UCCE Imperial County, Holtville, CA
7:25	**Mapping Leaching Fraction at Field Scale Using Geophysical Techniques** – Dennis Corwin, Soil and Environmental Scientist, USDA-ARS, U.S. Salinity Laboratory, Riverside, CA
7:45	**Irrigation Water Quality Research on going at the University of Arizona** – Marc Verhougstraete, Assistant Professor Community, Environment & Policy Department, University of Arizona, AZ
8:05	**FREP Technical Resources and Tools** – Natalie Jacuzzi, California Department of Food and Agriculture (CDFA), Sacramento, CA
8:25	**Using Soil Moisture Sensors and the Soil Nitrate Quick Test to Guide Water and Nitrogen Management of Vegetable Crops** – Andre Biscaro, Irrigation and Water Resources Advisor, UCCE Ventura County, Ventura, CA
8:45	**Soil health initiatives** - Jeff Mitchell, Specialist in CE, University of California Davis
9:05	**Could Industrial Hemp be an Alternative Low Desert Crop?** – Oli Bachie, UCCE Imperial County Director and Agronomy Advisor
9:25	**Break**
9:40	**Solarization vs. Biosolarization for Soil Pests: What Are the Advantages?** – Jim Stapleton, IPM Plant Pathologist, Kearney Ag. Research and Extension Center
10:00	**Novel Nematicides: Not Your Dad's Pesticides** – Ole Becker, Cooperative Extension Specialist & Nematologist, University of California Riverside
10:20	**Management of Soilborne Diseases of Vegetables in the Imperial Valley** - Alex Putman, Assistant Specialist in Cooperative Extension and Assistant Plant Pathologist, University of California Riverside
10:40	**Update on Crop Disease of the Imperial County** – Laura Arellano, Imperial County Ag Commissioners Office
11:00	**Entomopathogenic Fungi as Holistic Tools in Crop Production and Protection** – Surendra Dara, Strawberry and Vegetable Crops Advisor, UCCE San Luis Obispo and Santa Barbara Counties
11:20	**Alfalfa Insect Control Update** – Michael Rethwisch, Farm Advisor – Crop Production and Entomology, UCCE Riverside (Palo Verde Valley Office)
11:40	**Vegetable Weed Control Update** – Barry Tickes, Area Agent, Agriculture; and Director, La Paz County Extension
12:00	**Pest Management Products Updates from Industry Reps – Corteva**, Junior Evans; **Gowan Company**, Chris Denning; **Syngenta**, Keili Summey; **Westbridge Agricultural Products**, Heather Palmer
12:30	**Lunch** (Please stay for lunch – Courtesy of Our Industry Sponsors)

Organizers: Oli Bachie, Pratap Devkota, and Ali Montazar; UC Cooperative Extension Imperial County
Sponsors: Corteva, Alforex Seed, Gowan Company, Westbridge Agricultural Products, Syngenta,
APPROVED CEU CREDITS: CALIFORNIA DPR (3.0 hrs.), & CCA (5.5 hrs.)
PENDING CEU CREDITS: ARIZONA DEPT. Of AG (– hrs.)

IMPERIAL VALLEY CIMIS REPORT AND UC WATER MANAGEMENT RESOURCES

Ali Montazar, Irrigation & Water Mgmt Advisor, UCCE Imperial & Riverside County

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.cim is.water.ca.gov. Estimates of the average daily ET_o for the period of October 1 to December 31 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 inches per day

Station	November		December		January	
	1-15	16-30	1-15	16-31	1-15	16-31
Calipatria	0.13	0.11	0.09	0.09	0.09	0.10
El Centro (Seeley)	0.14	0.12	0.10	0.09	0.10	0.11
Holtville (Meloland)	0.13	0.11	0.09	0.08	0.09	0.10

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/.