



**Features from your Advisors**

*February 2018 (Volume 21 Issue 2)*

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## TOOLS FOR IRRIGATION MANAGEMENT: SPECIAL CIMIS VERSUS CIMIS DATA

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

Weather parameters (solar radiation, air temperature, humidity and wind speed), crop characteristics, management and environmental aspects are factors affecting crop evapotranspiration ( $ET_c$ ) or crop water use. Crop ET for a daily period may be estimated by multiplying daily reference evapotranspiration ( $ET_o$ ) by a crop coefficient ( $K_c$ ) which is specific for an individual crop (Figure 1). The  $K_c$  value depends on growth stage, soil surface wetness, light absorption, canopy roughness, and plant physiology.

The reference ET ( $ET_o$ ) is derived from well-watered grass and may be obtained from a CIMIS (California Irrigation Management Information System) station. CIMIS is an integrated network of 145 automated weather stations located throughout California. CIMIS supplies the data used to determine when to irrigate and how much water to apply. In the Imperial Valley, there are currently five active CIMIS stations including, Calipatria (CIMIS #41), Seeley (CIMIS #68), Meloland (CIMIS #87), Palo Verde II (CIMIS#175), and Westmorland North (CIMIS#181). Data from the CIMIS network are available at: <http://www.cimis.water.ca.gov>.

The average  $ET_o$  value at Meloland may vary between a maximum of 0.36 inches per day during June-July and a minimum of 0.07 inches per day in December (Figure 2). The cumulative annual  $ET_o$  is approximately 76 inches (6.3 acre-feet/acre).

To calculate the ET values of each crop ( $ET_c$ ), we can obtain daily  $ET_o$  data from the nearest CIMIS station to our field. For example, if the field is located around Holtville, Meloland (CIMIS #87) would be the appropriate CIMIS station to be

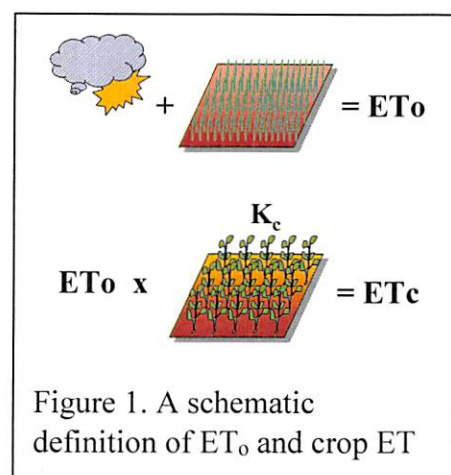


Figure 1. A schematic definition of  $ET_o$  and crop ET

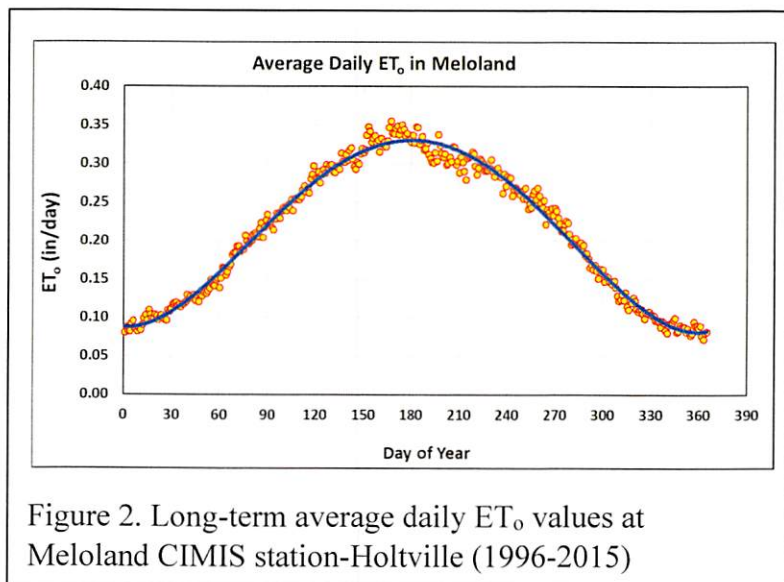


Figure 2. Long-term average daily  $ET_o$  values at Meloland CIMIS station-Holtville (1996-2015)

considered. While this is the most common source of  $ET_o$  data available, the CIMIS stations produce estimates of reference evapotranspiration for the station location and their immediate surroundings. Because of California's diverse landmass and climate, many locations within the state lack a representative CIMIS station. As a result, there are significant spatial  $ET_o$  data gaps. To mitigate this problem, CIMIS coupled remotely sensed satellite data with point measurements from the weather stations to generate spatially distributed  $ET_o$  values ( $ET_o$  maps), which is called **Special CIMIS**. In fact, Spatial CIMIS combines remotely-sensed satellite data with traditional CIMIS station data to produce more accurate maps of  $ET_o$  on a 2-km grid. These maps are produced on a daily basis for the entire state of California and are available at <http://www.cimis.water.ca.gov/SpatialData.aspx> (Figure 3).

*If your field is far away from CIMIS stations, it would be a good idea to use spatial CIMIS data.*

To personalize your CIMIS report, select the Spatial Reports tab through the CIMIS webpage (If you have not logged in, this tab will say Spatial Reports Login.) You can add the coordinates of your own field into the Special CIMIS and set up automated email delivery; after logging in. Early every morning, the spatial CIMIS mathematical model calculates and creates layers required and estimated  $ET_o$  data. You will receive an email early every morning which provides you with  $ET_o$  values of the past seven days for your field. Then, you can use this data to schedule irrigation events.

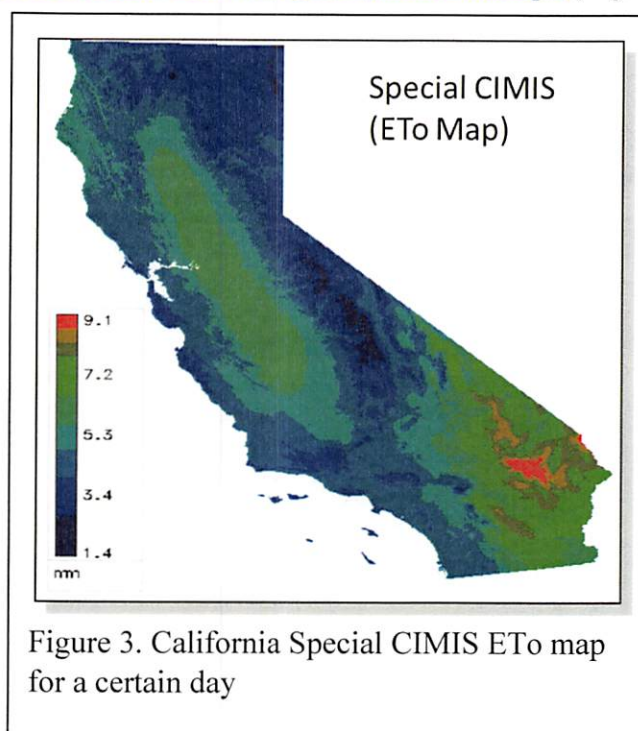


Figure 3. California Special CIMIS  $ET_o$  map for a certain day

For more information about ET, crop coefficients, and irrigation management tools feel free to contact the UC Imperial County Cooperative Extension office (442-265-7707) or through e-mail, [amontazar@ucanr.edu](mailto:amontazar@ucanr.edu).

## UNDERSTANDING THE IMPACT OF ANIMAL AGRICULTURE ON GREENHOUSE GAS EMISSIONS

*Brooke Latack, Livestock Advisor, UCCE Imperial, Riverside, and San Bernardino Counties*

A recently released study evaluated the consequences of eliminating meat from the American diet. The study is extremely relevant at a time when pressure to combat greenhouse gas emissions is focusing much of its attention on the animal agriculture sector. There are many documentaries featured on popular media streaming sites speaking on the environmental benefits of veganism, but often the data used do not accurately represent what we are experiencing in the U.S. Values as high as 51% of total greenhouse gas emissions have been used in describing the animal agriculture industry, when the true value is closer to 3.8% of total U.S. emissions. Compared to the manufacturing industry, electricity generation, and transportation, agriculture as a whole plays a much smaller part than it is often portrayed (see figure 1).

In the study, researchers addressed the scenario of completely eliminating animal production. This would help to understand what the overall impacts on greenhouse gas emissions and food security would look like without the consumption of animal products. The study revealed that eliminating animal production would increase total

agriculture food production by 23%. While the amount of food produced would increase, people would need to consume a diet with a much greater caloric content to meet nutritional needs. This increase in consumption would render the scenario of mitigating U.S. animal products ineffective as the increased amount of food available would not be great enough to overcome the increased energy consumption per person. When assessing greenhouse gases, researchers found that eliminating animal agriculture decreased total U.S. emissions by 2.6%. This decrease, while beneficial, would not make up for the emissions from transportation, electricity generation, and manufacturing industries.

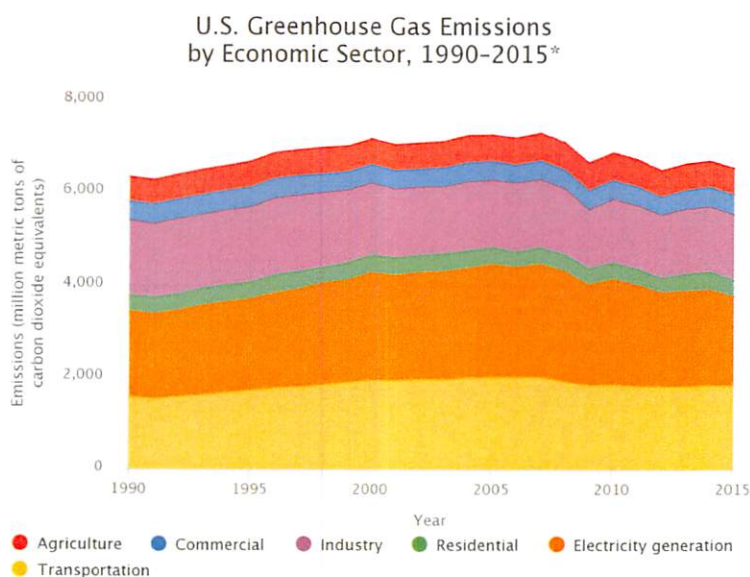


Figure 1. Source: U.S. EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2015. <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks>

With the great strides made in animal agriculture, including improvements in genetics, nutrition, and other critical management techniques, the U.S. can produce more high-quality products with fewer animals. By continuing to increase efficiency of production and focus on the management points within the livestock system that will make an impact on decreasing greenhouse gas emissions, the livestock industry can continue to provide high quality foods while addressing the global need to reduce emissions.

As a person whose background is based on the sustainability of animal protein production, I plan to provide knowledge to the industry on how to navigate new laws and regulations on greenhouse gas emissions, environmental impacts, and how to remain economically and productively robust in the coming years. From my experiences, there is not always an obvious answer that has the greatest effect. By understanding the entire system, vast improvements can be made.

For more information on this study and the greenhouse gas inventory, please see:

- White, R. R. and Hall, M. B. (2017). Nutritional and greenhouse gas impacts of removing animals from US agriculture. *PNAS*, 114(48)
- <https://www3.epa.gov/climatechange/ghgemissions/inventoryexplorer/>
- Frank Mitloehner, professor and air quality extension specialist at UC Davis; Farm to Table Talk podcast titled “Environmental Hoofprint Matters” at the url <http://farmtotabletalk.com/environmental-hoofprint-matters-frank-mitloehner-uc-davis>



# **DESERT AGRICULTURE AND NATURAL RESOURCES SYMPOSIUM**

*For growers, landscapers, & agriculture professionals*

**February 28, 2018**

**At UCR Palm Desert Auditorium  
75080 Frank Sinatra Drive, Palm Desert, CA**

**Morning Session: 8:00 AM – 11:30 AM**

(FREE – no registration required)

Learn about desert research and education activities from UC experts and about services and programs offered by other desert non-profits.

(Lunch available on-site between sessions for a nominal fee)

**Afternoon Session: 12:15-5:30pm** (\$40 if pre-registered by Feb. 23):

Attend one of the three workshops sponsored by UC ANR & CAPCA specifically, oriented for the desert agriculture industry:

- ✓ **Crop Production/Irrigation** (3.5 DPR, 5 CCA, 2 ISA, 3.5 CCN Pro CEUs approved)
- ✓ **Landscape/Turf Management** (5 DPR, 5 CCA, 4 ISA, 5 CCN Pro CEUs approved; GCSAA points pending).
- ✓ **Livestock Production** (No CEUs)

**Registration for the Afternoon Session is mandatory on the CAPCA Website; Topics and Speakers are Listed:** <https://capca.com/events/palm-desert-capca-ed-uc-anr-desert-agriculture-landscape-symposium/>

*For more information contact: Oli Bachie (442-265-7700), Janet Hartin (951)313-3023 or Eta Takele (951)683-649*

Refreshments generously provided by the Coachella Valley Resource Conservation District.

**University of California**  
**Desert Agriculture & Natural Resources Symposium**  
**Wednesday, February 28, 2018**

University of California Riverside, Palm Desert Campus  
75080 Frank Sinatra Drive, Palm Desert, CA 92211

**For question / further information regarding, please contact the main organizers;**

Oli Bachie, [Agronomy Advisor, Imperial County, \(obachie@ucanr.edu\)](mailto:obachie@ucanr.edu), (442)265-7700; Desert WG co-chair and UCCE Imperial County Director

Etaferahu Takele, Farm Management Economics Advisor, southern California, [ettakele@ucanr.edu](mailto:ettakele@ucanr.edu), (951) 683-649, UCCE Riverside County Director

Janet Hartin, Environmental Horticulture advisor, San Bernardino, Riverside and Los Angeles Counties, [jshartin@ucanr.edu](mailto:jshartin@ucanr.edu), (951) 313-2023 UCCE San Bernardino County Director

**Who Should Attend?** Growers, Agronomists, Land Managers, Landscapers, Livestock Industry Personnel, and Other Public Agency and Allied Industry Professionals Involved in Desert Farming and Farm-Related Activities Will Benefit from Attendance.

**PLENARY SESSION (FREE)**  
**8:00 AM-11:45 AM**

Time	Presentation	Speaker (s)
8:00 AM	Welcome	Oli Bachie, Co-Chair Desert Workgroup
8:05 AM	UCANR Programs and Strategic Initiatives	Wendy Powers, UCANR Associate Vice President
8:25 AM	UCANR Strategic Initiatives and Statewide Programs	Mark Bell, UC ANR Vice Provost
8:45 AM	UCR's Role in Desert Agriculture	Kathryn Uhrich & Peggy Mauk (UCR)
9:15 AM	Overview of UCCE Research and Education Programs in the Desert	UCCE County Directors Eta Takele, Janet Hartin, and Oli Bachie
9:45 AM	<b>Coffee Break</b>	
10:00 AM	Role of the Riverside County Agricultural Commissioner	Ruben Arroyo

PLENARY SESSION ...../cont..

10:20 – 11:15 AM	Overview of Non-Profit Organizations Serving the Desert (Speakers from several organizations)
• Al Kalin	Representative, Imperial County Farm Bureau
• Yvonne Franco	CV Resource Conservation District
• Ellen Way	CV Chapter, Women for Agriculture
• Jim Schmidt	Hi-Lo Golf Course Association
• Katie Barrows	CV Association of governments
• Ginny Short	CV Preserve
• xxxxx	Friends of Desert Mountains

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***On-Site Lunch (nominal fee): 11:15 AM to 12:15 PM***

**You are Invited to Bring your lunch into the auditorium and hear *Marion Champion's* Update on the Salton Sea**

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**Concurrent Afternoon Sessions**

**12:15 PM-5:30 PM**

**(\$40 if Pre-registered by February 23, 2018)**

**Participants Must Register on the CAPCA Website:**

**<https://capca.com/events/palm-desert-capca-ed-uc-anr-desert-agriculture-landscape-symposium/>**

Sessions	Moderator (s)
<i>Session I:</i> Irrigation and Crop Production	Pratap Devkota & Ali Montazar
<i>Session II:</i> Landscape Management	Janet Hartin
<i>Session III:</i> Livestock Production	Brooke Latack

## **Concurrent Session I: Irrigation and Crop Production Session**

### **12:15 Session Overview**

- 12:20 Strategies for Improving Irrigation Efficiency in the Low Desert Region:** Ali Montazar, UCCE, Irrigation & water management advisor, Imperial & Riverside counties, Holtville, CA;
- 12:40 Alternative Low Water Use Crops in the Low Desert –** Khaled Bali, UCCE Irrigation Water Management Specialist, Kearney Agricultural Research & Extension Center, Parlier, CA;
- 1:00 Irrigation Management for Salinity Control,** Todd Skaggs, US Salinity Laboratory, USDA agricultural Research Service, Riverside, CA;
- 1:20 Pests, Soil health and Biochar-** Michael Piña., UC Cooperative Extension Specialist & Plant Physiologist, UCR, Riverside, CA;
- 1:40 Update on the Diamondback Moth in the Desert-** John Plaumbo, University of Arizona;
- 2: 00 Insect and Disease Problems of Vegetable Crops in the Coachella Valley- –** Jose Aguiar, Vegetable Crops Farm Advisor, UC Cooperative Extension Riverside County, Indio, CA;
- 2:20 Management of Canker Disease on Table Grapes in the Coachella Valley –** Carmen Gispert, Area Viticulture/Pest Management Advisor, UCCE, Riverside County, Indio, CA;

### **2:40 – 2:55 PM - BREAK**

- 2:55 Downy mildew and other diseases of vegetables in desert production -** Alexander Putman, Assistant Specialist in Cooperative Extension and Assistant Plant Pathologist, UC Riverside, Riverside, CA;
- 3:15 Bell Pepper Nematodes of the Coachella Valley and other Desert fields -** Antoon Ploeg, Associate Nematologist & Associate CE Nematology Specialist, UC Riverside, Riverside, CA;
- 3:35 Weeds of Low Desert Region and Their Identification,** Pratap Devkota, Weed Science Advisor, UC Cooperative Extension Imperial & Riverside Counties, Holtville, CA;
- 3:55 Climatic factors and bunch management influence date fruit skin separation -** Sonia Rios, Area Subtropical Horticulture Advisor, UC Cooperative Extension Riverside & San Diego Counties, Moreno Valley, CA;
- 4:15 Causes of Sugarbeet Seedling Mortality and Emergence Failure in the Imperial Valley-** Steve Kaffka, Extension Specialist, Department of Plant Sciences and Director, California Biomass Collaborative, UC, Davis, CA;

**4:35 DPR Laws and Regulations Update – Riverside County Agricultural Commissioner’s office, Moreno Valley, CA (UCR PD auditorium)**

**5:30 Session Adjourns;**  

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***Concurrent Session II: Landscape Management Session***

**12:15 Diseases of Landscape Trees – Akif Eskalen, Department of Plant Pathology UCR, CA;**

**1:15 Update on the South American Palm Weevil - Mark Hoddle, UCR, Riverside, CA;**

**2:15 – 2:30 PM – BREAK**

**2:30 Identification and Control of Invasive Plants in the Coachella Valley - Chris McDonald, UCCE, San Bernardino, Riverside and San Diego Counties;**

**3:30 Disease-Resistant Landscape Trees for the Coachella Valley - Janet Hartin, UCCE, San Bernardino, Riverside and San Diego Counties;**

**4:30 DPR Laws & Regulations Update-Riverside County Agricultural Commissioner’s Office (UCR PD auditorium);**

**5:30 Session Adjourns;**  

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***Concurrent Session III: Livestock and Feed Quality Session (12:15 – 5:30 PM)***

**12:30 Instruction to the session**

**12:35 TBD (forage analysis/quality) – Daniel Putnam, Agronomist and Forage Specialist, UC Cooperative Extension, Davis, CA;**

**1:05 U.S. forage exports: Markets, trends, and challenges – Bill Plourd, President/CEO El Toro Export, LLC;**

**1:35 Bovine tuberculosis in California and Mexico – Dr. Andrea Mikolon, DVM, MPVM, Binational Liaison for Animal Health, California Department of Food and Agriculture, Animal Health and Food Safety Services;**

**2:05 Common diseases in backyard poultry flocks – Dr. Alisha Olmstead, DVM, California Department of Food and Agriculture, Animal Health and Food Safety Services;**

**2:35 – 2:50: BREAK**

- 2:50 Heat stress and dairy cattle productivity, a challenge to solve in Northwestern Mexico – Leonel Avendaño-Reyes, Research Professor, Instituto de Ciencias Agrícolas at the Universidad Autonoma de Baja California, Mexico;**
- 3:20 Physiological and metabolic responses to heat in livestock – Miguel Cervantes, Researcher, Instituto de Ciencias Agrícolas at the Universidad Autonoma de Baja California;**
- 3:50 Desert Livestock Research Update – Brooke Latack, Livestock Advisor, UC Cooperative Extension Imperial, Riverside and San Bernardino Counties, Holtville, CA;**
- 4:20 Final Comments**
- 4:30 DPR Laws & Regulations Update-Riverside County Agricultural Commissioner's Office (UCR PD Auditorium)**
- 5:30 Session Adjourns;**

## TO THE GROWERS OF THE IMPERIAL COUNTY,

From Oli Bachie (UCCE Imperial County), on behalf of Glenda Humiston, UCANR Vice President

We would like to emphasize the importance of filling out the Census of Agriculture. “The collected census information is not only extremely useful for various research efforts, but it is also vital to show the full scale and reach of California agriculture for our policy efforts and help increase public investment in the farm sector. Your effort to complete the census is greatly appreciated!” said Glenda Humiston.

As can be seen from the map, as of February 2, 2018, only 26 percent of California farmers had responded. Farmers are still being urged to complete the [Census of Agriculture surveys](#). Although February 5, 2018 was the

deadline, a USDA National Agricultural Statistics Service representative said the Ag Census website

<https://www.agcounts.usda.gov/cawi>

was strained due to heavy traffic on Monday so it will be accepting census survey responses the rest of the week. Accordingly, farmers can get extensions to March 27 by calling 800-727-9540. They’ll also be contacting people who haven’t responded.

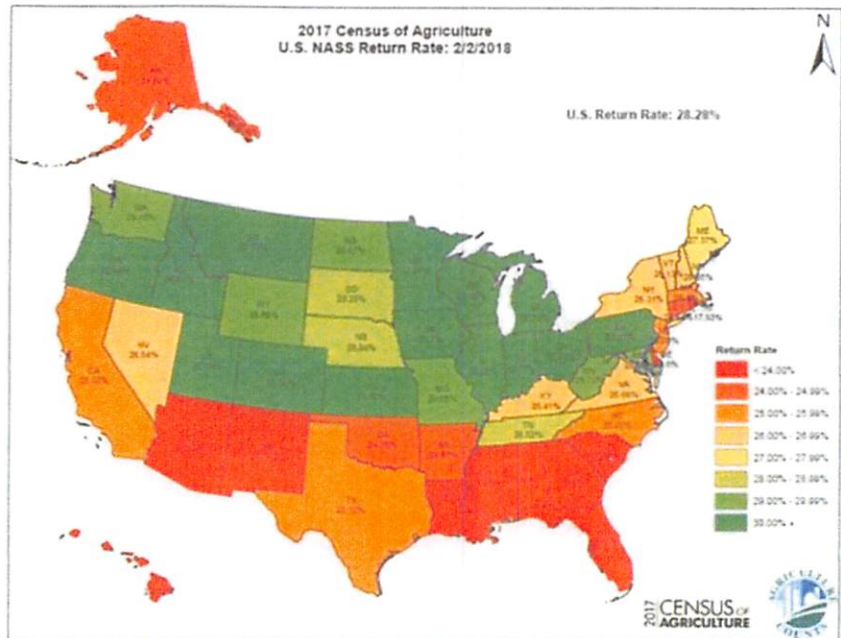
It is easier than ever to

respond online. If you have not done yet, please visit <https://www.agcounts.usda.gov/cawi> and [be counted](#) today.

For more information, visit [www.agcensus.usda.gov](http://www.agcensus.usda.gov) or call 1-800-727-9540.

View or leave comments for ANR Leadership at <http://ucanr.edu/sites/ANRUpdate/Comments>.

*This announcement is also posted and archived on the [ANR Update pages](#).*



## IMPERIAL VALLEY CIMIS REPORT AND UC WATER MANAGEMENT RESOURCES

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

The reference evapotranspiration ( $ET_0$ ) 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  $ET_0$  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  $ET_0$  for the period of February 1<sup>st</sup> to April 30<sup>th</sup> 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 ( $ET_0$ ) in inch per day

Station	February		March		April	
	1-15	16-28	1-15	16-31	1-15	16-30
Calipatria	0.12	0.13	0.16	0.19	0.22	0.25
El Centro (Seeley)	0.13	0.15	0.19	0.22	0.24	0.28
Holtville (Meloland)	0.12	0.14	0.17	0.21	0.23	0.27

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/>.

## ALFALFA WEEVILS ACTIVE EARLY IN 2018

*Michael Rethwisch, UCCE Palo Verde Crop Production and Entomology Advisor  
Oli Bachie, Agronomy Advisor, Imperial, Riverside & San Diego Counties &  
Director UCCE Imperial County*

The above normal temperatures that were prevalent this fall, and winter have resulted in an earlier than normal appearance of alfalfa weevil adults in the low deserts of California. Larvae were swept from alfalfa as early as January 13 in the Blythe area. The discovery of weevil larvae on January 13 also indicates that eggs were deposited onto alfalfa stems prior to this date.

Following the weevil detections in the Palo Verde Valley, three alfalfa fields were sampled in Imperial Valley, all in the Holtville, CA area between February 6 to 8, 2018 (*we thank Martin Lopez and Rafael Lara for sweep sampling*). Alfalfa weevil larvae numbers ranged from 0-4/180 degree sweep in fields at that time but may have since increased. The current UC IPM pest management guidelines suggest 20 or more larvae/180 degree sweep as a threshold level for alfalfa weevil on alfalfa.

Alfalfa weevil activity was first noted in fields near trees and undisturbed vegetation, which was expected as the adult alfalfa weevils over-summer in such habitats. Adults emerge when temperatures are cool in late winter or early spring and migrate back into alfalfa fields to oviposit in alfalfa stems. The hatching larvae make their way into the alfalfa terminals, with low desert damage most serious in late winter and early spring. The young weevil larvae damage alfalfa by feeding on terminal buds and leaflets. Feeding by older larvae is the most damaging, leaving a 'lacey' look of upper leaves when alfalfa weevil populations are at high levels. The adult weevils may feed on alfalfa but generally do not cause significant damage.



The early appearance of alfalfa weevils at both Palo Verde and Imperial should serve as a warning to alfalfa producers in the vicinity of both regions and nearby areas. Growers/PCAs need to scout for weevil populations now and plan for field treatment sooner than normal. Several fields have already been treated in the low desert.

A field should be treated if the scouted or swept count per given area is equal or greater than the economic threshold level. If you are new to sampling alfalfa for alfalfa weevils and want to utilize sweep sampling, follow the guidelines shown in the accompanying table.

When to start	In late January or later, depending on location. Sweep foliage. (If plants are too short to sweep, monitor terminals for damage and/or leaves for shot holes associated with larvae feeding).
How often	Twice a week
Divide field	4 sections; 5 sweeps per section (20 sweeps total)
Special instructions	Record numbers of weevils and sweeps. Continue to monitor weekly during spring or after a pesticide application. Continue through March.
Treatment thresholds	For sweep net sampling, treat when weevil larval count reaches an average of 20 larvae per 180-degree sweep.

*Source of table contents: UC IPM Pest Management Guidelines*

### **Current situation in the Palo Verde and Imperial Valley**

Controlling alfalfa weevils is a concern this year for at least two reasons, with the first being potential economic loss associated with non-control/multiple applications, and second being that alfalfa weevils in northern California were found to have developed insecticide resistance to pyrethroid insecticides. There have already been several reports of “less than satisfactory” control following application of certain pyrethroid chemistries in the Palo Verde Valley in 2018. Testing is underway to help determine if insecticide resistance is the cause.

Eric Natwick and Martin Lopez at UCCE Imperial County evaluated a number of insecticides almost annually for their effectiveness against alfalfa weevils. The accompanying table shows the average control ratings of the various insecticides and rates from all the trials combined since 2010. A rating of A+ indicates 95-100% control, an A = 90-95% control, B+ = 85-90% control, etc. As the table is for alfalfa weevil larvae control only, PCAs and growers will need to be cognizant of the presence/absence of predators and potential interactions with the insecticides.

Growers are encouraged to call their UC Cooperative Extension office to get support in determination pest population density in the fields and for assistance if control measures are warranted. PCAs and growers are also asked to report field failures following an insecticide application to help document potential insecticide resistance in the low desert.

**Alfalfa Weevil Control Ratings from Registered Insecticides Tested in the Low Desert, 2010-Present.**

Active Ingredient	Product tested	Rate/acre	Days post treatment		
			3-5	7	14
INSECTICIDE CLASS					
PYRETHROID					
Beta-cyfluthrin	Baythroid XL	1.9 oz.*	B+	D	C
Lambda-cyhalothrin	Warrior II	1.92 oz.	A+	A	B+
		1.5 oz.*	A+	A+	A+
	Paradigm VC	3.84 oz.*	B+	B+	B
Zeta-cypermethrin	Mustang 1.5 EW	4.3 oz.	A	A	B
BUTENOLIDE					
Flupyradiflurone	Sivanto 200 SL	10 oz.*	A	A	C
		7 oz.*	D+	D+	D+
ORGANOPHOSPHATE					
Chlorpyrifos	Lorsban 4E	32 oz.*	F	C+	B+
	Lorsban Advanced	32 oz.*	D+	B+	D+
		26 oz.*	D+	B+	B+
		24 oz.*	F	C+	D+
MIXED CLASSES					
Gamma-cyhalothrin + chlorpyrifos	Cobalt 2.54	24 oz.*	A+	A+	A+
Lambda-cyhalothrin + chlorpyrifos	Cobalt Advanced	26 oz.*	A+	A+	A
		24 oz.	A+	A+	A
	Stallion	11.75 oz.	A+	A+	A+
		9.25 oz.	A+	A+	A+

A rating of A+ indicates 95-100% control, an A = 90-95% control, B+ = 85-90% control, etc. Rates with an \* indicate only a single year of data.

For more information, please refer to UC IPM Pest Management Guidelines: Alfalfa, UC ANR Publication 3430. <http://ipm.ucanr.edu/PMG/r1300511.html>

## WOULD BIOCHAR IMPROVE CROP PRODUCTIVITY?

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

*Milt McGiffen, CE Specialist and Plant Pathologist, UC Riverside*

*Elizabeth Crutchfield, Post-doctoral scholar, UC Riverside*

### Background

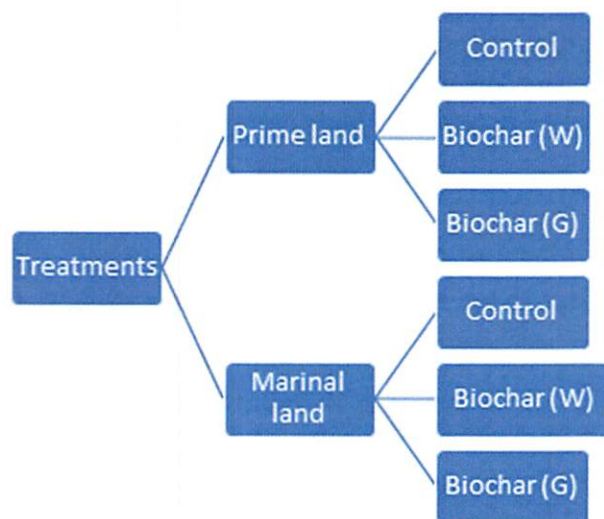
Biochar is charcoal used as a soil amendment. It is made from biomass through a process called pyrolysis; a direct thermal decomposition of biomass in the absence of oxygen. Some suggested that biochar has the potential to help mitigate climate change, increase soil fertility of acidic soils, and increase agricultural productivity. The fine-grained, highly porous charcoal was suggested to help soils retain nutrients and water, hence can be an important tool to increase food security and cropland diversity in areas with severely depleted soils and inadequate water and chemical fertilizer supplies. A comparative study of the different kinds of biochar by Cool Planet; a company that provides engineered Biocarbon™ suggested that the Biochar 1 (W) biochar performs better than Biochar 2 (G) biochar in an alfalfa cropping system. We tested alfalfa crop productivity with two different sources of biochar under a low desert prime and marginal grower's field condition in Holtville, CA.

### Material and Methods

This study was conducted in Holtville, CA. A corner of the field used had historically poor yields and is considered marginal land. Half of the trial was located further into the field where yields are often normal, "prime land". The trial was conducted on a 20 x 20 ft plot and consisted of 3 treatments (untreated control – C, W and G) and replicated 5 times.

All biochar was applied at 1 kg per 20 x 20 ft plot or 2.2 lbs per plot on September 8, 2016. The biochar was broadcasted on to the field and tilled in.

The field was planted with CUF 101 (alfalfa variety commonly grown in the low desert) on November 7, 2016.



The field was irrigated with uniform amount of water; but different volumes during spring and summer. In total, both fields were irrigated with about 5.7 ac-ft of water during the year. The amount includes not only crop water requirement, but also for leaching of soluble salts. Trial fields were harvested on March 23, 2017, April 27, 2017 and May 25, 2017 from a 2 x 2 ft plot area and measured for both fresh and dry alfalfa biomass and converted lbs/acre of biomass.

## Results and Discussion

Prime land increased in yield from harvest to harvest by about 2000 lbs of dry weight, while the marginal land only increased by about 700 lbs of dry weight from harvest to harvest. This is simply an indication of a difference in biomass productivity over a growth period. Alfalfa produces lower biomass during its establishment seasons. Prime lands allowed faster growth and higher biomass between harvests than the marginal field. There were essentially no statistically significant differences between the different biochar treatments and the untreated control for any of the land types (see the table below).



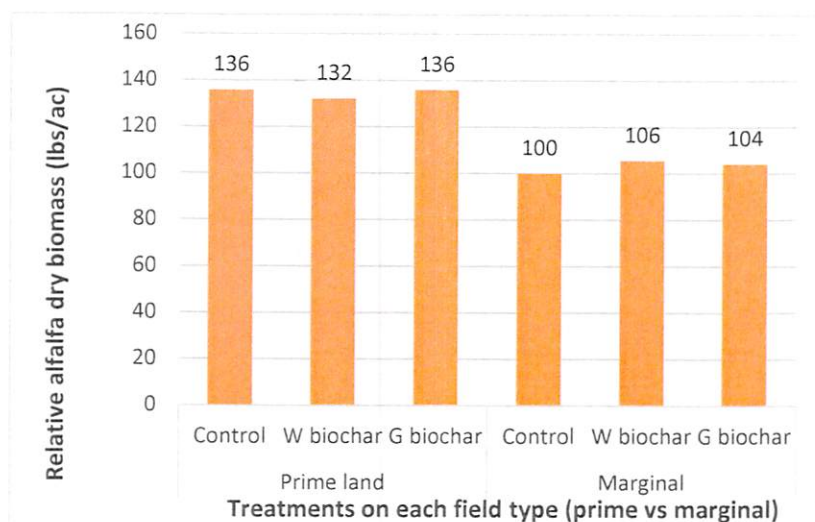
*Trial field, marginal field on the top and prime land at the bottom of the field*

Alfalfa dry biomass (lbs) under different biochar treatments and field types (marginal/prime)\*

Harvest	Biomass (lbs per acre) from the different treatments					
	Prime land			Marginal		
	Control	Biochar 1 (W)	Biochar 2 (G)	Control	Biochar 1 (W)	Biochar 2 (G)
1 <sup>st</sup> harvest	1930A	2132A	1791A	2036A	1935A	1834A
2 <sup>nd</sup> harvest	4365A	4057AB	4552A	2771B	3356AB	3342AB
3 <sup>rd</sup> harvest	6847A	6597A	6809A	4869B	4927B	4898B

\*Means followed by the same letter horizontally across each harvest period are not statistically different from each other.

Looking at the total three harvest biomass yield and adjusted at 100% for the control treatment of the marginal land, alfalfa yield was relatively higher on a prime land regardless of treatments than on a marginal land (see figure), although this is not statistically significant. Furthermore, the relative differences between biochar treated and untreated plots is slightly higher for the marginal land than on the prime land. Therefore, biochar may be considered as



improving crop yield if used on a marginal land. While this is the first trial involving biochar crop productivity test, the results do not warrant significant alfalfa yield improvements from using any of the biochar. A more detailed experimentation is necessary to fully justify the potential benefits of biochar for crop productivity.

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