Imperial County Agricultural Briefs

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Agriculture and Natural Resources

Features from your Advisors

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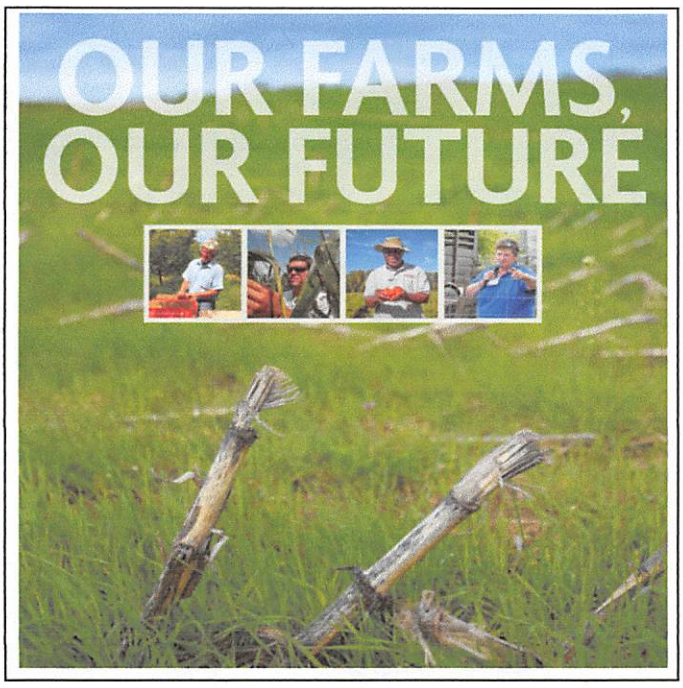
AN INTRODUCTION TO SUSTAINABLE AGRICULTURE RESEARCH AND EDUCATION (SARE) PROGRAM

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



"Our Farms, Our Future" conference was held by USDA's Sustainable Agriculture Research and Education (SARE) program in Saint Louis, Missouri on April 3rd to April 5th, 2018.The conference aimed to celebrate 30 years (1988-2018) of the Sustainable Agriculture Research and Education program and to plan the next 30 years of productive and sustainable American agriculture. Nearly 1,000 people gathered at this very important national conference. I had the chance to attend this conference and became familiar with this program. I would like to share some information which you might find useful.

What is USDA's SARE program?

USDA's SARE program, is a farmer-driven research and knowledge-sharing program that encourages farmers, ranchers, educators and researchers who are passionate about innovating to experiment and make growing food more rewarding for themselves, the environment and their communities. The program is run by four regions—North Central, Northeast, South, and West.

SARE functions through competitive grants conducted cooperatively by farmers, ranchers, researchers and other agricultural professionals to advance farm and ranch systems that are profitable, environmentally sound and good for communities. Western SARE (https://www.westernsare.org/) is located at Utah State University in Logan, Utah and services the Western United States and Island protectorates, thereby being the largest region in the SARE program.

Farmer/Rancher Sustainable Agriculture Grants

These grants are for farmers/ranchers to explore innovative sustainable agriculture solutions to production, marketing, labor, and other problems. Sustainable agriculture practices are tested through on-farm research, education, or demonstration projects and results are shared with other farmers/ranchers. The 2019 Farmer/ Rancher Grant will open after September 1, 2018, with proposals due in December. Projects may address issues on sustainable agriculture in various areas such as:

- Water challenges for the coming decades
- Building soil health with cover crops and other strategies
- The ecology and economics of grazing for beef and dairy
- The social components of sustainable agriculture
- Integrated approaches for managing crop pests
- Pollinators, wildlife and biodiversity on farms
- Surviving and thriving with vegetable and fruit production
- Sustainable communities through local foods and marketing

Western SARE farmer/rancher research and education projects should:

- Design innovative on-farm/ranch experiments that will lead to a more sustainable agriculture.
- Conduct on-the-ground research and education (outreach) within the scope of the project. Both research and education components must be distinct elements of the proposal.
- Identify how the results of the project and the adoption by other producers could advance sustainable agriculture.
- Detail creative education outreach plans that deliver the new knowledge to other producers and professionals in the western region.

Learning center

In addition to funding numerous grant opportunities, the SARE program also provides a wide range of free educational resources such as video success stories, fact sheets, webinars, presentations, courses, bulletins, books on ag production practices, newsletters profiling funded research, and biennial research report and activities. One may find more information on SARE Learning Center through link below: https://www.sare.org/Learning-Center.

INCREASED INCIDENCE OF ANIMAL ACTIVISM ON CALIFORNIA FARMS

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

Recently, farms in California have seen an increased incidence of trespassing by animal activists. In late April, 2018, a teenage girl jumped into a pen at Cal Poly with pigs and a few weeks later chained herself to the gates in front of Cal Poly's meat processing center. Most recently, an organic poultry farm in Petaluma, CA experienced damaged barns due to activist trespassing, which resulted in 40 arrests. Many producers of dairy, beef, and poultry throughout California have experienced increased incidents of activists trespassing, some of which used drones to attempt to take pictures of the animal facilities or ruses to gain entry onto the farm.

With the risk of activist trespassing high in California, it is important for animal producers to take precautions. Maintaining and following farm security procedures can minimize the risk of damages and harm. Reporting any incidences immediately will alert law enforcement and other producers to watch for further disturbances.

BASIC PRINCIPLES TO ATTAIN THE MOST EFFICIENT USE OF IRRIGATION WATER

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

While there are various means to improve efficiency of water use for irrigation, the basic principles that one could follow to attain the most efficient use of water in the low desert region may be illustrated as follows:

1. Identify the soil type. A fundamental requirement for efficient agricultural irrigation is to know more about soil and spatial variability of soil properties within the field. A few simple soil tests such as soil type, water holding capacity and infiltration rate of the soil may provide valuable information on irrigation efficiency. Having access to soil maps (such as NRCS soil map) and/or surveying the soil to identify variations within the field are useful for adjusting nutrient and water application needs during crop growing seasons. Plant nitrogen uptake and actual crop water use are greatly affected by soil properties and variabilities within the field. Thus, soil information is a critical tool to maximize crop yield. Figure 1 shows actual crop water use measured at the east and west side of a sugar beet field in Westmorland over a five-month period. The results demonstrate 9.7% higher crop water use (consumption) at the west side than the east side over the period and is accountable to variations in soil type. While we should expect crop yield quantity due to soil variation, the impact of soil variability can be minimized through optimal nutrient and water applications at each side of the field. Additionally, understanding soil salinity and how it may interact with water source can influence the effectiveness of irrigation scheduling events in the desert region is very vital.

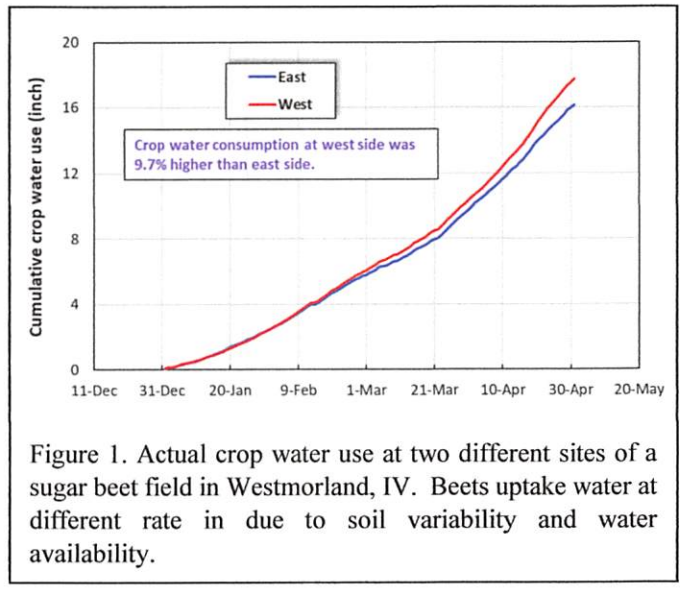


Figure 1. Actual crop water use at two different sites of a sugar beet field in Westmorland, IV. Beets uptake water at different rate in due to soil variability and water availability.

2. Understand crop water requirements. As crops grow, it is important to account for the stages of development and the responses to changes in the weather. Some crop growth stages are very sensitive to the adequacy of soil water for maximum crop yield. One of the best methods to determine crop water needs is to consider crop

evapotranspiration (ET) data. Accessing reference ET data (CIMIS data, ET_o) and modifying it to fit individual crop needs can be used to estimate the next irrigation event and the amount of water that will need to be applied. This needs to include an account for the current level of available water in the crop root zone.

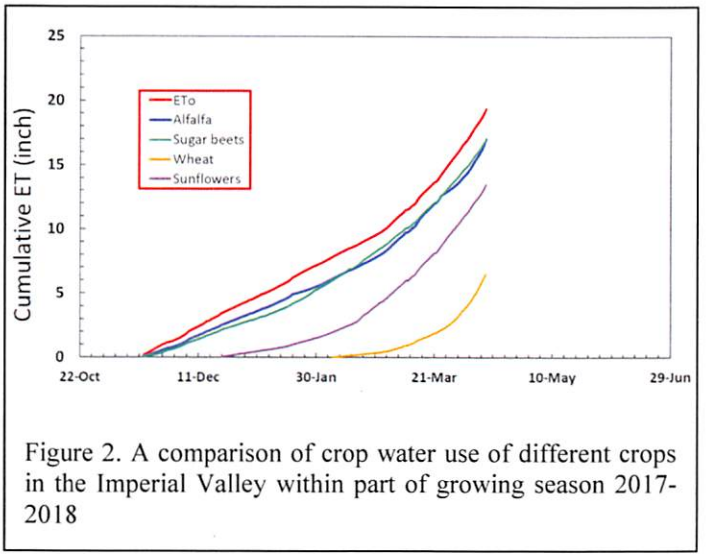


Figure 2. A comparison of crop water use of different crops in the Imperial Valley within part of growing season 2017-2018

The irrigation water needs to be determined by using ET data that is field-verified with site measurements and observations to maximize the benefit of each irrigation event. Figure 2 shows the cumulative crop water use of alfalfa, sugar beets, wheat, and sunflowers measured by surface renewal and eddy covariance equipment in the Imperial Valley from November 15, 2017 to April 12, 2018. I plan to continue and expand these measurements during the next couple of years and develop crop water use information for the low desert cropping systems. This information will provide more accurate estimates of water use by each individual crop over the growing season which may help our growers to improve irrigation scheduling and efficiency in the Imperial Valley.

3. Select appropriate irrigation methods. Irrigation methods are categorized into pressurized irrigation and surface or gravity irrigation. Pressurized irrigation involves the use of pumps, piping, valves and either sprinklers or low-volume emission devices. An efficient irrigation method must consider the soil type and properties, field topography and the type of crops being grown. The cost of water, energy and labor, and long-term cost of system ownership should also be part of the evaluation process when selecting an irrigation system. Several irrigation methods can be used for a given field, but often the economics influence the final selection of irrigation method. Properly designed and maintained systems will have a positive impact on the expected application efficiency of any system, but the management skills of the operator in implementing irrigation schedules will impact the overall irrigation efficiency. For the desert region, integrating irrigation methods together could be a reliable solution for maintaining agricultural productivity and environmental sustainability.

4. Implement effective irrigation scheduling. Irrigation scheduling is a planning and decision-making process used to determine the amount and timing of irrigation applications. Water is such a critical component for a crop

yield. Water transfer is considered a new driver of the water conservation program in the low desert. One can have different motivations or goals that will influence irrigation scheduling and the amount of water to be applied.

For most irrigation events, a fixed amount of water is applied allowing only a certain fraction of the available water to be used by the plant. The variable becomes the interval between irrigation events. If the irrigation event timing or interval is fixed, then the quantity of water to apply becomes the variable, which becomes more challenging to manage, especially for surface irrigation methods. The main methods of irrigation scheduling include climate-based, soil-based and plant-based. Soil-based and plant-based indicate when irrigation is needed, and climate-based scheduling determines the amount of water to apply. For the cropping system we have in the low desert, a combination of climate-based (ET-based) and soil-based (soil moisture monitoring) may be recommended for effective irrigation scheduling.

5. Adopting new technology. There are new innovations and advances in technology, which can be utilized to use water more efficiently to achieve desired yield goals. The concept of "precision agriculture" relies extensively on technology to maximize the benefit of resources being used to grow a crop. Wireless technology is being incorporated into other technologies such as soil moisture sensors and plant canopy sensors, making it user-friendly to access the data and get real-time feedback from field conditions (Figure 3). Irrigation controllers on linear move machines (Figure 4) can utilize GPS and customize water application to areas of the field. Other technologies such as thermal imaging in different spectrums from instruments on unmanned aerial vehicles (Figure 5) can affordably

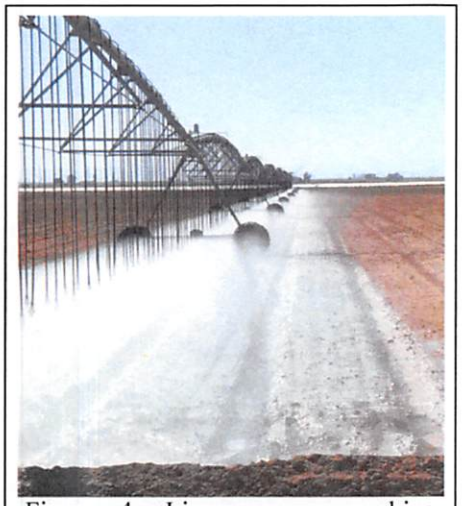


Figure 4. Linear move machine irrigates spinach field in the Imperial Valley.

Figure 3. Wireless soil moisture and irrigation controller network provides precision irrigation management at an alfalfa research trial under buried drip.

Figure 5. An unmanned aerial vehicle takes pictures at a date palm in the Coachella Valley as virtual orchard survey.

survey the entire field so that one can make better and quicker management decisions. The key to success for using any of these technologies is making it more practical to use. Getting data from field instruments (along with interpreting data) or accessing weather data or irrigation scheduling programs enables a grower to respond quickly to changing conditions. Timely decisions can have a profound impact on improving irrigation efficiency and crop yields. In addition to technology that can directly affect the amount of water used for irrigation, many pressurized irrigation systems can be combined with other technologies to deliver fertilizers and other agrichemicals to the crop. Fertigation (applying fertilizers through irrigation) and chemigation (applying any other chemical through irrigation) can save time, energy and product conservations, but success is very dependent on the proper equipment and the skill and knowledge of the irrigator. To attain the most efficient use of water in agricultural systems, we need technology and management tools together. Recruiting only technology wouldn't necessarily result in optimal benefits of agricultural irrigation.

CROPS DISORDER OR UNKNOWN DISEASE OF THE LOW DESERT SUNFLOWER

Oli Bachie, Agronomy Advisor, Imperial, Riverside & San Diego Counties &

Director UCCE Imperial County

Sunflower (*Helianthus annuus* L.) is a C_3 plant of the family Asteraceae. It is an annual broadleaf plant with a strong taproot and spreading lateral surface roots. Sunflower is desirable for its source of edible oil of polyunsaturated fatty acid. Sunflower is widely grown in central California and to some extent in California's low desert. Its deep root system penetrating the soil to 6.5 ft, aids the plant during water stress (Putnam etal., 1990), but is not considered highly drought tolerant. The crop is classified as tolerant of both low and high temperatures and moderately tolerant to salinity (Francois, 1996). In the low desert, sunflower is planted between early to mid-February (verbal information from a local PCA), although planting periods may stretch a few days before and after by some growers. Research findings on low desert sunflower stated that early plantings (January and February) help produce higher seed yield than late plantings (March or later months). Hybrid seed production fields generally plant 6, 10, or 12 rows of the female and two rows of male line with a spacing of 8 inches between plants along the row. Bed size of 30 in. is most common.

While there can be many pests of sunflowers in the low desert, birds are the major problem. The most common damaging birds are blackbird, dove, grosbeak and sparrows. With regards to sunflower diseases, most are caused by fungi. However, sunflower researchers suggest that the hot, dry climate and long growing season of the low desert would have a low incidence of most foliar and head diseases. In other sunflower growing regions of CA, rust, downy mildew, verticillium wilt, sclerotinia stalk. head rot, black stem and leaf spot are some of the major sunflower diseases.

Figure 1: Sunflower field from where the incidence was reported. Note, there is no apparent display of foliar symptoms

A sunflower plant with "disease looking" symptoms was recently (April 2018) brought to the attention of the UCCE Imperial County. The affected field was located in Holtville, CA and planted on a 40" bed with two rows of male plants after every 6 rows of female plants. A sight at the crop canopy (Figure 1) displayed no eminent symptom. Walking through the field and thoroughly observing the whole plant morphologies, we observed stem darkening and cracking symptoms, mainly on the lower stem portion of the male plants (Figure 2). Another close-up picture of the affected plants is shown in Figure 3.

Figure 2: blackish cracking appearances on lower bottom of male plants

It was only the male sunflower plants that showed the observed symptom. Female plants did not exhibit similar symptoms. Why only the male plants showed the distinct symptoms was a puzzle. All symptoms appeared on the lower portion of stem, just above the soil surface. Some of the cracks were below the soil but mostly on or above the soil surface.

Figure 3: another closeup view of affected male plant.

A few years ago, our former entomology advisor, Eric Natwick collected affected sunflower plant samples with symptoms (as shown in figure 4) on the edge of the desert, east side of the Imperial Valley farms. Although, the symptoms occurred at the same location on the plant as we observed, the samples collected by Eric showed weakened seedlings and gradual cuts at the stem baseline. Furthermore, the symptoms were not specific either male or female plants and both plant types were affected. Eric suggested that the symptoms might have been due to pendimethalin injury. Since we could not make any conclusion and/or recommendation, on the currently observed problem, we sent the affected sunflower plant samples to Dr. Cassandra Swett, Vegetable and Field Crop Pathologist, CE Specialist at University of California Davis (UCD). Her lab diagnosis was "abiotic factors and not any kind of

pathogenic effect", but also a mix of non-pathogenic fungi of Fusarium species. For now, this is the only possible conclusion that can be made.

Another symptom similar to what we observed was reported in North Dakota some time ago. They stated that sunflower growers and PCAs reported plants with the lower portion of the stem having "brownish cracked" appearances. There has been speculation that it might have been caused by herbicide damage. Unlike ours, these symptoms were observed on both male and female sunflower plants. With diagnosis of laboratory specimens, researchers revealed that a potential pathogen effect may have caused mechanical issues producing stem canker. Some reporters suggested a heat canker, which is not a disease but rather a stem tissue damage caused by high temperatures at the soil surface. While this can be a possibility, the season when the symptom occurred (the month of April) in Holtville, CA is not considered a "high temperature" range. Furthermore, the symptoms occurred only on male plants. Unless there are differential heat tolerances for female plants, heat effect causing stem canker cannot be a good justification. Heat canker injury as a result of sunny, warm days is also common on young sunflower seedlings grown in heavy soils forming surface-soil crust, but not on fully mature plants. Some researchers suggested that environmental conditions can cause the outer cells of young plants to collapse, girdling the stem (Figure 5) at the soil line for the inability of food to move downward into the roots. The girdling bulge (just above the constriction) may or may not be pronounced, but the plant is structurally weakened and ultimately falls over and dies. Except the abiotic (non-pathogenic) factors, pathogen caused sunflower disease in California is rare compared to other sunflower producing states of the US. The lack of rains and that the low desert sunflower is furrow irrigated, may have likely kept the desert produced sunflowers relatively disease free than other sunflower producing regions of the California.

Figure 4: Gridling of sunflower seedlings at the stem baseline4

In fields where pathogenic sunflower diseases are a problem, plants showed a basal collar rot caused by *Phytophthora cryptogea*, with ultimate stem girdling and black lesion (Figure 6) at the soil line (A) (left) and black internal tissue necrosis (B) (right). The external morphological appearances observed in Figure 6A resembled the ones we observed in the low desert sunflower field, but the laboratory diagnosis of our samples was suggested as abiotic (non-pathogenic). Other pathogens known to cause stem lesions, *Phoma macdonaldii* and *Phomopsis helianthi*, were isolated from sunflower in North Dakota, but not detected in California.

Figure 5: plant girdling

Researchers suggest many practices or management strategies that may help minimize the incidence of abiotic and/or pathogenic problems in sunflower. Early planting and proper variety selections may overcome some abiotic problems. On the other hand, pre-plant treatment of seeds with fungicide mix could control downy mildew and seedling blights. Others suggest that early plantings, from mid-January to early February, in the case of the low desert could help avoid major sunflower diseases.

Figure 6: girdling and internal tissue lesson caused by sunflower pathogen

In summary, the sunflower problem we detected in Imperial County may be caused by abiotic (non-pathogenic) agents. What is puzzling is why the problem was specifically on the male and not the female plants. The University of California Cooperative Extension Imperial County would like to pursue monitoring of the symptom

and continue to survey sunflower fields in the upcoming sunflower growing season. In the meantime, we ask growers and PCAs to report any similar situation, if observed in their sunflower fields.

Reading materials for more information

Leland E. Francois. 1966. Salinity Effects on Four Sunflower Hybrids. Agronomy *Journal,* Vol. 88. No. 2. Agron. J. 88:215-219.

Lehman W. F., et al., 1973. Sunflower *in the Desert Killer areas.*

Booker. W. National Sunflower Association https://www.sunflowernsa.com/growers /diseases stem-canker/ Extension Educator, Box Butte County

Putnam, D. H., et al., 1990. Sunflower. In: Alternative Field Crop Manual, University of Wisconsin-Extension, Cooperative Extension. https://www.hort.purdue.edu/newcrop/afcm/sunflower.html November 1990

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

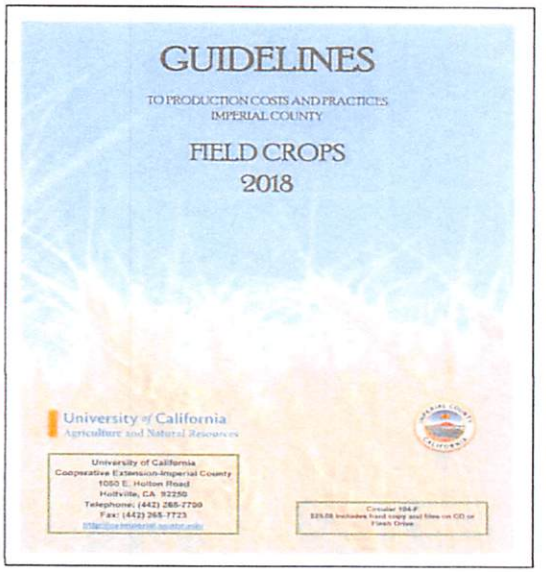
June	June		July		August	
	1-15	16-30	1-15	16-31	1-15	16-31
Calipatria	0.31	0.32	0.32	0.31	0.30	0.28
El Centro (Seeley)	0.34	0.36	0.33	0.31	0.30	0.28
Holtville (Meloland)	0.33	0.34	0.32	0.31	0.30	0.28

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 will be increasing beginning July 1, 2018.

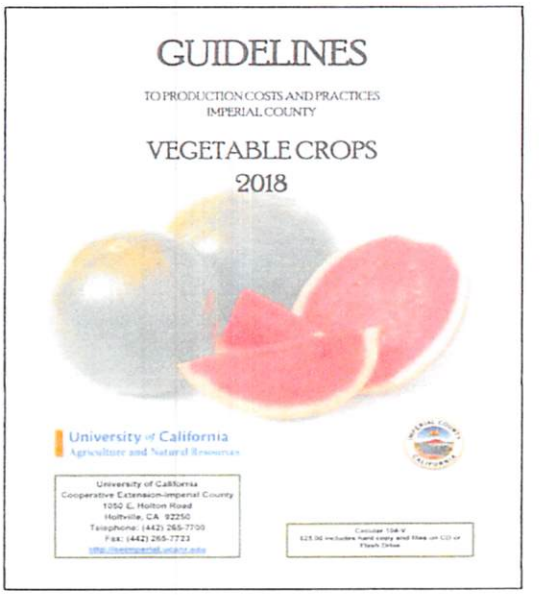
Until then they can still be purchased for $25.00 each.



2018 Field Crops Guidelines

$40.00/book

As of July 1, 2018



2018 Vegetable Crops Guidelines

$40.00/book

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