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Features from your Advisors

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DRIP IRRIGATION AS AN EFFECTIVE WATER AND FERTILIZER CONSERVATION TOOL IN DESERT VEGETABLES

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Introduction. There are likely to be significant shortfalls between water supply and water demand in the Colorado River Basin in the upcoming years. Knowing water related issues in the region and to support the environment and neighboring urban areas, Imperial Valley growers have been remarkably investing in water conservation measures over the past decades. This could be a major driver of adapting tools and technologies to enhance water and fertilizer use efficiency in the low desert. Drip irrigation in vegetable crops has been one of the water conservation tools adapted by local growers. This article presents some of the research findings on using drip irrigation in desert vegetable production systems.

Methods. The experiment was conducted in 23 commercial fields in the Imperial Valley over three growing seasons (Fig. 1). A comprehensive data collection was carried out for onions, sweet corn, and lettuce crops to evaluate the impacts on marketable yields, actual soil nitrate content and total N in the plants, applied water and fertilizer, and soil salinity. Out of the 23 trial fields, 11 fields were drip irrigated, 10 fields were furrow irrigated, and 2 fields were under solid-set sprinkler irrigation. Dominate soil texture was sandy loam to loamy fine sand at the sweet corn trial fields, and silty clay loam to loam at the onion and lettuce trial fields.

Fig. 1. Drip irrigated trial fields of lettuce, sweet corn, and processed onions in the Imperial Valley.

Results. While using sprinkler irrigation is a common practice for germinating sweet corn, lettuce, and onion fields in the low desert, all drip irrigated trial fields were effectively germinated using drip irrigation. Considerable water conservation was suggested at the drip trial fields in comparison with conventional irrigation practices (Figs. 2 and 3). For instance, an average of 2.4 and 0.4 ac-ft/ac less water applied was observed at the drip irrigated onion fields than the furrow and sprinkler irrigated fields, respectively. This

measure was 2.2 ac-ft/ac at the sweet corn trial fields. The average water conserved was found to be 1.0 ac-ft/ac across the experimental lettuce fields as a result of adapting drip irrigation.

Higher nitrate-N concentration at the topsoil (1-ft) was observed at post-harvest and during the crop season at the furrow irrigated fields (Fig. 4). The results demonstrated a greater nitrogen-use efficiency at the onion drip irrigated fields, nearly 40% and 8% more than furrow and sprinkler irrigated fields, respectively. 26% fertilizer conserved ($146 per acre) was gained due to adapting drip irrigation in sweet corn.

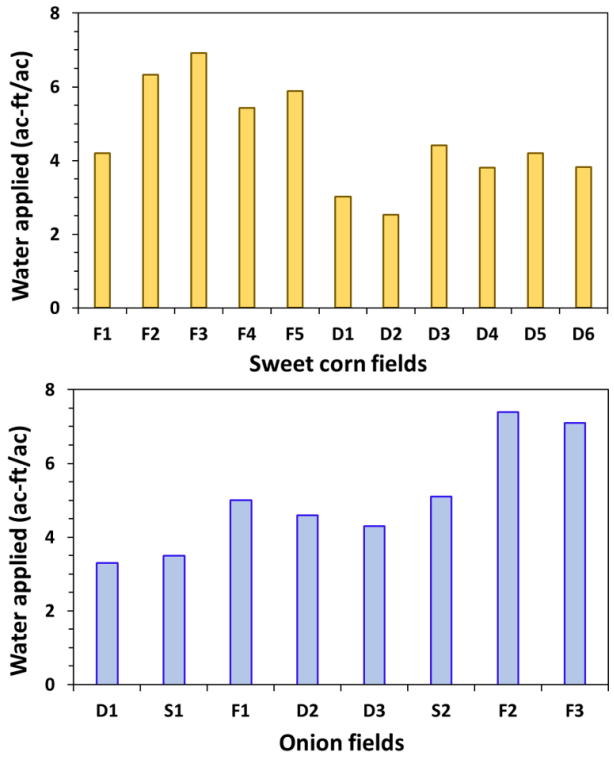

Fig. 2. Water applied in the sweet corn and onion trial fields. D, F, and S stand for fields under drip, furrow, and sprinkler irrigation methods.

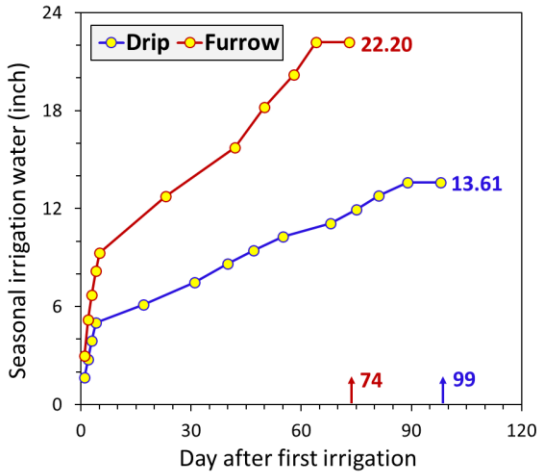

Fig. 3. A comparison of seasonal irrigation water between furrow and drip irrigated romaine lettuce fields planted in the early – to mid - crop season.

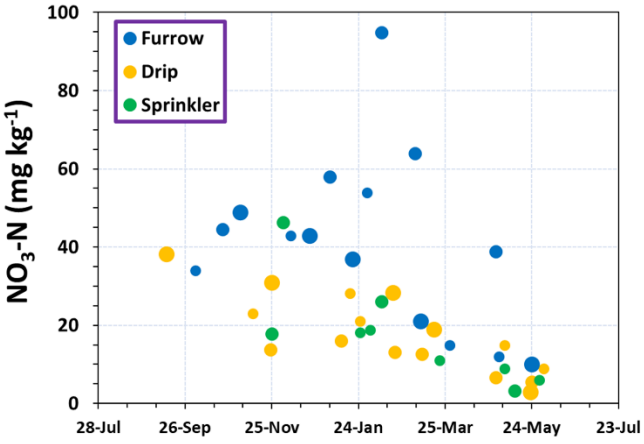

Fig. 4. Soil nitrate-N concentration (top 1 foot) in the onion trial fields (Drip vs. Furrow and Sprinkler irrigated fields). Dots with a similar color and size demonstrate individual field.

A 5% yield improvement was observed at the drip irrigated sweet corn fields. It could be an advantage of drip in onions and lettuce, while more data is required for a solid conclusion.

Soil salinity can be a limitation for using drip irrigation in onions as a longer season crop, while salinity survey at the trial fields revealed that more frequent irrigation events and summer leaching are effective tools to manage the issue.

Salinity may decrease bulb diameter, bulb weight, root growth, plant height, and number of leaves per plant in onions. The conducted salinity survey demonstrated that salt accumulation on the topsoil of the drip irrigated fields (Fig. 5). Soil electrical conductivity (ECe) varied from 3.6 to 10.6 dS/m at the depth of 0-6 inches. The average ECe values at the same depth were lower at the furrow and sprinkler irrigated fields.

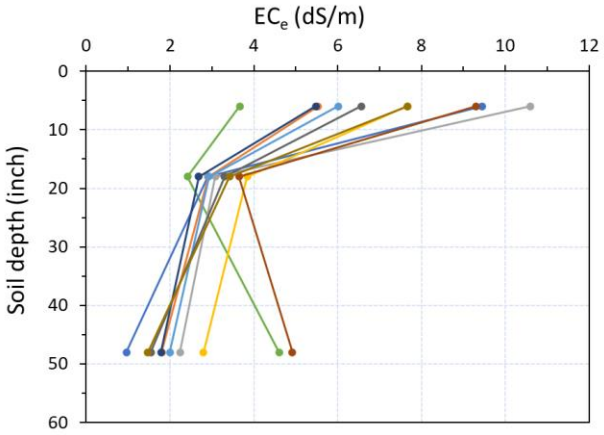

Fig. 5. Soil electrical conductivity (ECe) values within the soil profile in 10 different locations at the drip irrigated onion field two weeks after harvest.

Conclusions. Drip irrigation clearly demonstrated a significant potential to enhance the efficiency of water and fertilizer use and to be considered as an effective water conservation tool in desert vegetables. The findings suggested yield improvement promises for drip irrigation in sweet corn while more data are required to have a solid conclusion for onion and lettuce crops. Further work is needed on the optimal system design and management practices, and strategies on the viability of drip irrigation to maintain economics sustainability for the low desert cropping systems.

RESTORE GRANT PROGRAM OPPORTUNITY

Are you interested in implementing soil health practices? Apply to Restore Grant now!

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If you are interested in applying, please, contact ***CES Ana Resendiz*** at aresendiz@ucanr.edu or call 442-265-7709. Applications will be accepted through **July 20th, 2023**.

More information at: https://www.zerofoodprint.org/apply

Asistencia en Español disponible.

IMPERIAL VALLEY CIMIS REPORT AND UC WATER MANAGEMENT RESOURCES

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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

Station	May		June		July	
	1-15	16-31	1-15	16-30	1-15	16-31
Calipatria	0.27	0.29	0.31	0.32	0.32	0.31
El Centro (Seeley)	0.29	0.31	0.34	0.36	0.33	0.31
Holtville (Meloland)	0.29	0.31	0.33	0.34	0.32	0.31

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/.