# Imperial AGRICULTURAL BRIEFS

COOPERATIVE EXTENSION
UNIVERSITY OF CALIFORNIA


## *Features* *December 2003*



Our Website is http://ceimperial.ucdavis.edu/

1050 E. Holton Road Holtville, CA 92250-9615 (760) 352-9474

## CALIFORNIA'S WATER SUPPLIES

**Khaled M. Bali**

California Department of Water resources issued last month 'SHOW ME THE WATER' guidebook for Senate Bill 610 and Senate Bill 221 to assist water suppliers, cities, and counties in integrating water and land use planning. The bills were effective January 1, 2002 and require that approvals of large new developments be linked to assurances that there is an adequate water supply. Prior to the legislation, large projects could be approved without a demonstrated water supply. The new guidebook provides a foundation for developing comprehensive water plans and policies to meet the future water needs for the State.

These bills are examples of good efforts that are being developed to address many water challenges that are facing California. The quantity of water available for Californian's has not increased over the past five to ten years while the population continued to increase. Most of the demand was met by increased water use efficiency, recycling of water, and agricultural-urban water transfer programs. Most of the water that will be available to urban users in the near future will come from improved agricultural productivity and water use efficiency.

In the long run, most of the water that will be available to meet the expected increase in population will come from recycling of municipal water, urban water use efficiency measures, desalination, water quality protection, and other measures. Agriculture to urban water transfer plans will play a major role in meeting the expected demand for more water. Despite the statewide aggressive agricultural water use efficiency measures that have been implemented over the past 10-15 years, we have not and may not see any substantial increase in irrigated acreages in California. Growers in California will continue to improve water use efficiency and increase productivity and most of the saved water will be transferred to urban users. Tailwater or runoff recovery systems and drip or low-volume irrigation systems are examples of the measures that are used locally to improve water use efficiency.

### Where is the water?

California's main water sources are either surface sources such as rivers and creeks or groundwater sources. California has a wide range of climatic zones with average annual precipitations ranging from 51 inches in the North Coast region to 5.5 inches in the Colorado River region. The average statewide precipitation in a normal year is about 23 inches. Almost two-thirds of this water is used by native vegetation, evaporation, and groundwater storage. About 80% of the natural runoff occurs north of Sacramento, while 80% of the demand is south of Sacramento. The uneven distribution of runoff water is due to the various climatic zones in the state.

There are ten hydrologic regions in California. The Colorado River region includes Imperial County, the central and east part of Riverside County, the east part of San Diego County, and the southern part of San Bernardino County. The average annual runoff in Colorado River region is 0.2 million acre-feet (MAF) and the average annual precipitation is 5.5 inches (1 acre-foot is about 326,000 gallons of water). Natural runoff and precipitation in our region are the lowest among the ten hydrologic regions in the state.

Colorado River water is an example of a surface source that is originated in other western states. The River is used in seven states and Mexico. California's share from the Colorado River is 4.4 MAF, however, California has been able to use about 5.2 MAF of Colorado River water because other states were not yet utilizing their full allotment. This situation will change in the near future and in 15 years, California may not be able to use more than its apportionment of 4.4 MAF.

In a "normal year", the average statewide runoff is about 71 MAF. About 35% of this water is used by agricultural and urban users, 30% for environmental uses, and 35% is lost to the Pacific Ocean to prevent saltwater intrusion into the fresh waterways of California.

During drought years, urban and agricultural water users face drastic rationing measures to conserve water. Drought emergency measures may reduce the available water to agricultural and urban water users and increase the amount of water diverted to protect fish and wildlife. Groundwater use can double from the average 8.5-9.0 MAF in a normal year to more than 16 MAF in a drought year. Extracting groundwater to make up for the difference between supply and demand results in over drafting of groundwater. Over drafting, ground water may result in water quality

degradation, seawater intrusion, and land subsidence.

There are many challenges and uncertainties related to water quantity in California. Most likely, the amount of water needed to meet expected the population growth and maintaining agricultural productivity will continue to increase. Except for desalination of seawater, new sources for water are limited and the most likely measures to meet the demand are conservation and recycling measures at the urban and agricultural levels.

* Published in Imperial Valley Press on 11/6/03.

**LEGACY OF A FARM ADVISOR**

**Keith S. Mayberry**

I may not have been the one who met you at your field to diagnose the reason why your carrot stand did not germinate as expected, but… I may have been the person who worked with your seed representative to solve the problem.

You may not use the Vegetable Guidelines to Production Costs and Practices data that I prepared in spreadsheet format, but…your banker, CPA, or joint venture partner may have used it to compare values against your own figures for growing crops.

You may not have called me for advice when your crop is dying, but…. I may have provided training or answers for your Pest Control Advisor who met with you to solve the problem.

You many not have read my article on proper placement of fertilizer before applying your ammonical fertilizer, but…your fertilizer sales rep probably did when he/she advised you on how to apply it. It could be that your field of watermelons is wilting and dying. I determine that the problem is a soil-borne disease. The watermelons are lost, but I provide a crucial warning: Do not, as planned, grow cantaloupes as a rotation crop--they are susceptible. You switch to broccoli and save an estimated $30,000.

You may not know that CALTRANS appraisers came to me to find a fair value for taking farmland (with existing crops) out of production in order to widen some Imperial Valley highways. The appraisers were enlightened to the fact that some crops have value not just at the present time, but also for potential production in future years. They were also shown a fair market value for the crops.

You are probably not aware that the California Highway Patrol contacted me to educated their farm road safety officers on what kinds of equipment may be moved on the Valley's backroads and highways. Or that I showed the officers that there were peak seasons of use for various types of equipment.

You probably do not remember that I was the first to identify the needle nematode as a plant pest on a wide array of Imperial County crops. Numerous professors and graduate students from the University of California studied the problem. Today we have good knowledge of how to find and control the needle nematode.

Nearly every farmer was affected by whiteflies in early ‘90’s. I was an important member of the team that found that the insecticide, Admire, was far more effective when injected under the seed line than sprayed on the plants.

You may not have read my Desert Gardener column on how to fertilize a lawn, but maybe the lush green grass growing in you neighbor’s yard that your wife likes to see out her kitchen window happened because the neighbor saw the article.

These are but a few examples of how an advisor provides crucial information that enhances the lives and pocketbooks of the residents of Imperial Valley. Now that the State has made massive cuts in our operating budget and staffing, it is time to support the advisors that you still have on board. They help you far more than you know.

## CORKY ROOT OF LETTUCE

**Thomas A. Turini**

The disease, corky root, is caused by the soil-borne bacterium, *Rhizomonas suberifaciens*. It is widespread in costal production areas of California and was detected in Imperial County in Spring 2003.

Symptoms of this disease begin as yellow lesions on the tap-root and larger laterals. Later, these bands expand and develop a greenish-brown rough appearance and longitudinal corky ridges are apparent. The center portion of the root may become brown and hollow. When the disease is severe, roots become brittle and may be pinched off.

This disease will reduce plant size, reductions by 30 to 70% have been reported. The disease tends to be more severe when soil temperatures are high. Between 50° and 87°F, growth of *R. suberifaciens* increases with increases in temperature. Over 97°F, growth ceases.

The disease is worse in fields where lettuce is grown during consecutive seasons. Leaf and head lettuce types are susceptible and the host range includes endive, sowthistle and prickly lettuce. Rotating away from lettuce and controlling susceptible weeds may decrease the chances that this will become a problem.

## IMPLEMENTING CONSERVATION TILLAGE

**Herman Meister**

Conservation tillage has become a widespread practice in many parts of the Midwest and eastern states. In fact, as of 1997 more cropland on a national basis is farmed using conservation tillage practices than using standard tillage practices. Conservation tillage production practices are based on the goal of reducing primary tillage operations such as plowing, ripping, disking, and chiseling. The term includes no-till but also any practice that reduces tillage operations.

In California, adoption of conservation tillage has not been widespread for various reasons. In cotton production, plow-down requirements make no-till impossible and reduced tillage difficult. There is current research in cotton to develop a system that would cut and bury stalks with a minimum of disturbance to the soil. While progress has been made, a completely workable system for all soil types has not yet been perfected for incorporating cotton stalks without major tillage.

Another reason for slow adoption is that pre-emergence herbicides are the primary weed control method used for many crops. For most of these herbicides, soil tillage is the incorporation method of choice because rainfall is not dependable under California conditions. Sprinkler germination and incorporation of herbicides is not economical on many non-vegetable type crops. On many crops there are not, any post-emergence herbicides registered for use. For other crops, until the development of Roundup-Ready varieties, the selection of post-emergence herbicides is not wide enough to depend on them alone for weed protection.

A third reason that conservation tillage is not widespread here is that specialized equipment is often needed because of increased crop residue when planting. Despite these drawbacks, there is increasing interest in conservation tillage in the state. A few local growers have utilized cotton root pullers instead shredding and discing the cotton stalks. They followed this operation by planting wheat with low-till drills and sprinkling the wheat up.

Benefits of conservation tillage are reduced tractor use, reduced labor and fuel costs and reduced time in field preparation. Other benefits, which are not so easy to measure, quantify and put on a ledger sheet, might include increased soil organic matter, better soil tilth, and reduced dust emissions. Recent reports in Imperial County suggest that air pollution could be a potential problem that could be partially addressed with conservation tillage. Increases in soil organic matter and tilth could help with improved water infiltration and water holding capacity. On the other hand, there are concerns about the build-up of soil compaction after a few years of reduced tillage and questions if root diseases will become more prevalent. It is difficult

to do conservation tillage research on commercial farms because special equipment is needed. Several years are needed to look at the long-term effects, and changing one aspect of management often requires changes in cultivation, irrigation, or harvest methods. Therefore, most work has been done on field stations or in relatively few places where a grower is just really interested in exploring and developing methods that work with his/her management conditions.

## MUDDY PENS

**Juan N. Guerrero**

Average annual rainfall in the Imperial Valley is only about 2.85 inches. The wettest months of the year are November, December, January, and February; mean monthly precipitation of 0.36, 0.36, 0.46 and 0.32 inches, respectively. While the irrigated Sonoran Desert is known principally for its torrid summers, winter rains may cause problems for penned cattle. Locally, during the winter, the worst climate related problem for penned cattle is mud, not cold. Cattle in mud 4 to 8 inches deep may have decreased feed intakes of 20%, cattle that do not eat do not gain weight. Cattle in mud 4 to 8 inches deep may have reduced weight gains, 15 to 20%, and have reduced feed efficiency by 10 to 15%. Cattle in mud will gain less weight and the weight that the do gain will be more expensive. Cattle that are belly deep in mud may have reduced feed intakes by as much as 30% and may gain 25% less. Mud is a serious problem for pen-fed cattle.

For persons feeding only a few cattle in one small pen, runoff diversion is a good practice to keep pens dry during rainfall events. Building a berm around the high side of the pen to prevent rainfall runoff from the adjacent field will help keep the pen dry. Small cattle pens should also have drainage. Pen runoff may be diverted to an adjacent field. Great care must be taken, however, that pen drainage not flow into canals or irrigation drains. Federal law prohibits the contamination of the nation's waterways from the runoff of cattle pens.

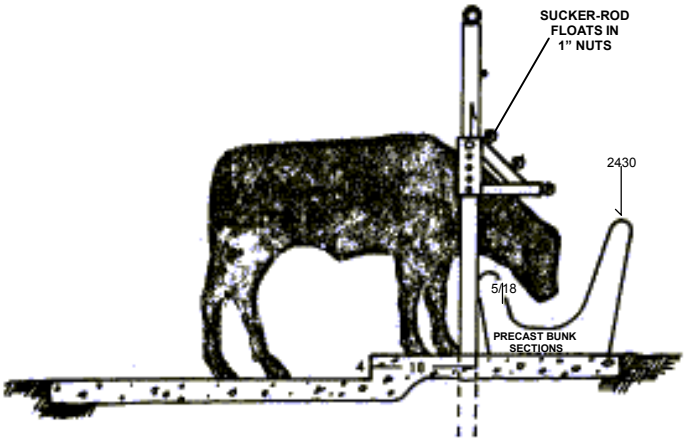
Locally, a small rainfall event, as small as 0.25 inch, may cause mud problems in cattle pens. When cattle walk in muddy pens, they expend great amounts of energy merely for locomotion; that same amount of energy may have been used for weight gain. Moreover, in muddy pens, the skin of cattle is in contact with cold, wet mud; which causes greater energy expenditures to maintain normal body temperatures; again, energy that might have gone to weight gain.

Because of the problems that we have with heat in the irrigated Sonoran Desert, we generally place more cattle within a given area, than in the rest of the country. Locally, we recommend from 110 to 150 ft² per head of pen space. On dirt pens, in the rest of the country, from 250 to 500 ft² per head of pen space is generally recommended. Placing so many animals in a given space helps reduce dust problems, an equally unhealthy problem, during the desert summer. However, this practice of placing so many animals within such a small area does have its associative negative effects during winter rains.

Perhaps the best way to maintain feed intake in muddy pens is to construct a concrete apron (Figure 1) along the interior of the feed bunks. Note that there is a small 4" step. From the fenceline to the edge of the apron, the apron should be 8 to 10 ft. wide. The apron should also be 4 to 6 inches thick. The use of this cement apron will help prevent the problems associated with muddy cattle pens.

An emergency effort that may be made during wet weather is to place bedding in cattle pens to reduce the effects of muddy pens. Old, weathered hay is the perfect solution.

Figure 1. Cement apron at feed bunk to maintain feed intake in muddy pens.



## COMPARISON OF FUNGICIDES FOR CONTROL OF DOWNY AND POWDERY MILDEW ON ICEBERG LETTUCE, 2003

**Thomas A. Turini**

Fungicide efficacy against downy and powdery mildew on lettuce was compared in a study conducted at the University of California Desert Research and Extension Center on a Meloland clay loam. Beds were spaced 40 in. center to center. On 20 November 2002, 'Coyote' iceberg lettuce was sown in two seed lines per bed and irrigated. The experimental design was a randomized complete block with five replications. Each fungicide, was applied over 25 feet of two beds. Plots were separated by two untreated planted rows. On 16 February, 2 and 13 March, materials were applied in 30 gallons of water per acre with a $CO_2$ pressurized backpack sprayer at 30 psi. A 2-nozzle spray boom was used with Teejet 8002 flat fan nozzles spaced 20-inches apart. Maximum and minimum temperature ranges ($^oF$) were as follows: Dec, 60-76, 32-46; Jan, 71-88, 39-52; Feb 61-85, 32-55; Mar 64-89, 40-59. Rainfall quantities (in.) are as follows: Dec 0.00, Jan 0.00, Feb 1.07, Mar 0.42.

On 20 March, the number of downy mildew lesions per plant on each of 10 plants per plot were recorded. On 28 March, powdery mildew severity was rated according to the following scale on each of 10 plants per plot: 1 = no powdery mildew observed; 2 = powdery mildew on lower wrapper leaves only; 3 = powdery mildew on upper wrapper leaves; 4 = powdery mildew on cap leaf; 5 = extensive powdery mildew on the entire plant. Disease severity was analyzed with ANOVA. Student-Newman-Keul's Multiple Range Test was used to separate means.

Downy mildew disease pressure was high and treatment differences were present. Treatments containing Maneb 75DF and Cabrio EG tank mixed with Acrobat 50WP provided good control of downy mildew in this study (Table 1).

Powdery mildew severity levels were sufficient for treatment differences to be obvious. Under the conditions of this study, Microthiol Special 80W with or without Maneb 75DF, Quitec, BAS 516, Cabrio EC with or without Acrobat 50WP and Flint 50WDG provided excellent control of powdery mildew (Table 1).

**Table 1. Fungicide activity against downy mildew on 'Coyote' iceberg lettuce at Holtville, CA.**

| Treatment | Downy mildew (lesions/plant)[w] | Powdery mildew (rating)[x] |
|---|---|---|
| Untreated | 67.2 ab[y] | 2.9 a |
| Curzate 60DF 5.0 oz + Maneb 75DF 2.0 lb[z] | 3.5 d | 1.7 bc |
| Maneb 75DF 2.0 lb | 5.7 d | 2.5 ab |
| Curzate 60DF 5.0 oz + Maneb 75DF 1.5 lb | 9.0 d | 2.7 a |
| Maneb 75DF 1.5 lb + Microthiol Special 80W 6 lbs | 10.8 d | 0.0 d |
| Cabrio EG 16.0 oz + Acrobat 50 WP 6.4 oz | 14.7 d | 0.1 d |
| Quadris 2.08F 15.4 oz | 41.2 c | 1.0 c |
| Cabrio EG 16.0 oz | 54.6 b | 0.1 d |
| DPX-KP481 50WG 8.0 oz | 65.8 ab | 2.3 ab |
| Microthiol Special 80W 6 lbs | 65.8 ab | 0.0 d |
| Curzate 60DF 5.0 oz | 66.8 ab | 2.6 a |
| Quintec (250g/L) 4.0 fl oz | 69.9 ab | 0.0 d |
| BAS 516 (1.45 lb ) | 71.4 ab | 0.0 d |
| Quintec (250g/L) 6.0 fl oz | 77.9 a | 0.0 d |
| Flint 50WDG 1.5 oz | 77.9 a | 0.1 d |
| DPX-KP481 50WG 12.0 oz | 78.0 a | 1.4 c |

[w] On 20 March, the number of downy mildew lesions per plant on each of 10 plants per plot were recorded.

[x] On 28 March, powdery mildew severity was rated according to the following scale on each of 10 plants per plot: 1 = no powdery mildew observed; 2 = powdery mildew on lower wrapper leaves only; 3 = powdery mildew on upper wrapper leaves; 4 = powdery mildew on cap leaf; 5 = extensive powdery mildew on the entire plant.

[y] Within the same column, means followed by the same letter do not differ significantly as determined by Student-Newman-Keul's Multiple Range Test (P≤0.05).

[z] Materials separated by a "+" were tank mixed

.

## EGYPTIAN ALFALFA WEEVIL MANAGEMENT

**Eric T. Natwick**

Egyptian alfalfa weevil, *Hypera brunneipennis*, can be a serious pest of alfalfa in the low desert during the winter and early spring. Adult weevils spend the summer and most of the fall in a resting state called aestivation. When nighttime temperatures drop below 42º F in the fall, adult Egyptian alfalfa weevils emerge from their aestivation sites, fly to alfalfa fields, feed, and mate. The adult weevils do not cause economic damage, but this is an indicator of the levels of larval populations, which will be present from January through March. Females chew holes in the stems of alfalfa plants and lay eggs. Adult females insert 10 to 30 smooth, shiny, yellowish eggs into the centers of living and dead stems 3 to 6 inches

above the soil surface or into stems in debris on the ground. A single female may deposit from 400 to 1,000 eggs during a single season. Eggs usually hatch in 5 to 10 days and larval development takes about a month.

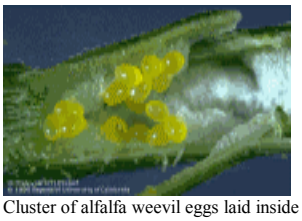
Weevil larvae hatch from the eggs, exit the stem and crawl to the terminal leaves. First, instar larvae feed within the uppermost folded leaves. Later instar larvae disperse over the plant and skeletonize leaves as they feed. The weevil larva is legless, has a brown head and is light green with a white stripe down the back, and is about 0.25 inch long when fully grown. Larvae complete their growth in 3 to 4 weeks. Larvae spin a cocoon and pupate either in the leaves of the plant or on the ground in March and April. Egyptian alfalfa weevil larvae in the low desert are most abundant from late January through March. The numbers of Egyptian alfalfa weevil larvae will decline rapidly beginning in April.

Egyptian alfalfa weevil is usually a problem only during the first cutting, although damaging populations may persist into the second cutting or third cutting. To sample for weevil larvae, divide the field in to 4 or more sections and take 5 sweeps in each section. Divide the total number of weevil larvae by the total number of sweeps to get the field average. The treatment threshold is the same for both species of alfalfa weevil, an average of 20 larvae per sweep.

A field study was conducted during the spring of 2003 at the UC Desert Research and Extension Center. A stand of alfalfa, VAR. CUF 101, was used for the experiment. Plots were arranged in a randomized complete block design with four replications. Sixteen insecticide treatments were included along with an untreated control. Insecticide treatments and rates as pounds active ingredient (ai) per acre are listed in Table 1. Plots measured 35 feet by 50 feet and insecticide treatments were applied February 28, 2003, using a broadcast application with a tractor mounted boom.

Populations of Egyptian alfalfa weevil (EAW) larval populations were measured in each plot with a standard 15-inch diameter insect net consisting of ten, 180$^{o}$ sweeps. Plots were sampled on February 26, March 3, 7 and 14; 2-day pre-treatment (DPT), 3-days after treatment (DAT), 7-DAT, and 14-DAT.

No differences were found among the treatments for EAW larval populations 2-DPT ($P$>0.05), Table 1. All of the insecticide treatments controlled Egyptian alfalfa weevil with larval means that were significantly lower (P̣0.05) than the untreated control treatment means from 3-DAT through 14-DAT.


Cluster of alfalfa weevil eggs laid inside an alfalfa stem


Alfalfa weevil larva

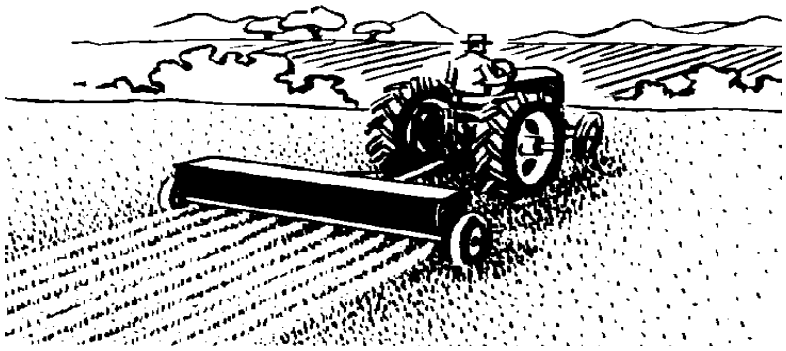

The alfalfa weevil pupates in a coarsely woven white cocoon


Adult Alfalfa Weevil

**Table 1. Mean Numbers[w] of Egyptian Alfalfa Weevil Larvae per Ten Sweeps, Holtville, CA, 2003.**

| Treatment | lb ai/a | 2 DPT[x] | 3 DAT[yz] | 7 DAT[z] | 14 DAT[z] |
|---|---|---|---|---|---|
| Untreated | ------ | 71.25 a | 48.89 a | 21.85 a | 8.48 a |
| *gama-cyhalothrin | 0.015 | 67.75 a | 1.38 bcde | 1.34 b | 1.15 b |
| Warrior 1 CS | 0.03 | 59.50 a | 0.68 de | 0.00 c | 0.19 cd |
| Steward 1.25 SC + Warrior 1 CS | 0.045 + 0.0094 | 96.00 a | 0.78 cde | 0.56 bc | 0.00 d |
| Steward 1.25 SC | 0.025 | 73.25 a | 0.86 bcde | 0.00 c | 0.86 bcd |
| Steward 1.25 SC | 0.045 | 70.25 a | 2.13 bcd | 0.32 bc | 0.32 cd |
| Steward 1.25 SC | 0.065 | 61.75 a | 0.68 de | 0.19 c | 0.19 cd |
| Steward 1.25 SC + Dimethoate | 0.045 + 0.375 | 64.00 a | 2.83 bc | 0.00 c | 0.19 cd |
| Steward 1.25 SC + Pounce 3.2 EC | 0.025 + 0.075 | 66.00 a | 0.68 de | 0.19 c | 0.19 cd |
| Steward 1.25 SC + Malathion 8 | 0.045 + 1.000 | 69.50 a | 0.56 de | 0.19 c | 0.19 cd |
| *Renounce 20 WP | 0.044 | 56.50 a | 1.11 bcde | 0.68 bc | 0.32 cd |
| Baythroid 2 | 0.044 | 80.50 a | 1.06 bcde | 0.19 c | 0.41 bcd |
| Steward 1.25 SC + Baythroid | 0.045 + 0.187 | 86.50 a | 1.00 bcde | 0.00 c | 0.00 d |
| Steward 1.25 SC + Mustang | 0.045 + 0.028 | 51.00 a | 0.56 de | 0.00 c | 0.68 bcd |
| Steward 1.25 SC + Lorsban 4 E | 0.045 + 0.250 | 75.00 a | 2.98 b | 0.68 bc | 0.32 cd |
| *zeta-cypermethrin | 0.025 | 74.50 a | 0.68 de | 0.86 bc | 1.00 bc |
| Furadan 4F | 0.500 | 66.00 a | 0.19 e | 0.00 c | 0.56 bcd |

[w] Mean separations within columns by $LSD_{0.05}$. [x] Days pre-treatment. [y] Days after treatment.
[z] Log transformed data used for analysis; reverse transformed means reported. *Not registered for this use at time of publication.



## CIMIS REPORT

**Khaled Bali and Steve Burch***

California Irrigation Management Information System (CIMIS) is a statewide network operated by California Department of Water Resources. Estimates of the daily reference evapotranspiration ($ET_o$) for the period of December 1 to February 29 for three locations in the Imperial County are presented in Table 1. ET of a particular crop can be estimated by multiplying $ET_o$ by crop coefficients. For more information about ET and crop coefficients, contact the UC Imperial County Cooperative Extension Office (352-9474) or the IID, Irrigation Management Unit (339-9082).

The Irrigation Management Unit (IID) provides farmers with a weekly CIMIS update. Farmers interested in receiving the updated CIMIS report on a weekly basis can call the IID at the above number. Please feel free to call us if you need additional weather information, or check the latest weather data on the worldwide web (visit http://tmdl.ucdavis.edu and click on the CIMIS link).

Table 1. Estimates of daily Evapotranspiration ($ET_o$) in inches per day

| Station | December | | January | | February | |
|---|---|---|---|---|---|---|
| | 1-15 | 16-31 | 1-15 | 15-31 | 1-15 | 16-28 |
| Calipatria | 0.07 | 0.07 | 0.08 | 0.09 | 0.12 | 0.14 |
| El Centro (Seeley) | 0.06 | 0.06 | 0.08 | 0.09 | 0.12 | 0.14 |
| Holtville (Meloland) | 0.06 | 0.06 | 0.08 | 0.09 | 0.12 | 0.14 |

* Irrigation Management Unit, Imperial Irrigation District.

*To simplify our information it is sometimes necessary to use trade names of products or equipment. No endorsement of named products is intended nor is criticism implied of similar products, which are not named.*

**Eric T. Natwick**
**County Director**