

SPRING 2006

Update

California State University, Fresno

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Turf trials show color

Research team explores new irrigation strategies for tall fescue landscape turf

In the face of increasing demands on California's limited water resources, state government officials are developing new programs that will encourage and in some cases require urban water users to enhance efficiency in their landscape irrigation systems.

Beginning this year the state Legislature and the governor will begin considering how to implement a set of 43 recommendations submitted by a statewide task force with the goal of reducing urban water use by up to one million acre-feet of water per year.

The task force recommendations include adopting and enforcing prohibitions on residential overspray; requiring

moving to California during the next 20 years. In short, state residents are going to have to do learn to with less water.

Fortunately, researchers from Fresno State's Center for Irrigation Technology (CIT) and the University of California Cooperative Extension (UCCE) are exploring strategies to enable urban water users to get the most out of every drop

Michelle Le Strange of the Fresno and Tulare County UCCE centers.

The trials were based on a formula using evapotranspiration (ET) standards developed to project the amount of water needed by turf grasses and other plants based on temperature, rainfall and other climate conditions. In central California, the amount of water pro-

See Fescue, Page 4



Tall fescue turf plots receive periodic mowing as part of their treatment regime during irrigation trials at Fresno State's Center for Irrigation Technology .

Task force recommendations include adopting and enforcing statewide prohibitions on residential overspray.

dedicated water meters for larger urban water users; and mandating that all irrigation controllers sold or installed by 2010 use "smart" technology, where the controller automatically increases or reduces irrigation times based on climate conditions.

The recommendations are based on projections of 12 million more people

sprayed on their lawn and garden areas.

In a recent cooperative effort, CIT Director David Zoldoske organized a research team to study different irrigation and fertilization regimes for tall fescue, a cool-season turf grass that performs well in inland California's hot, dry climates. The trials were led by horticulture and landscape specialists Pamela Geisel and



Pleasing produce

Pomology team studies methods for enhancing texture, flavor of peaches

Study results released by a team of Fresno State and University of California researchers have provided some important tools California stone fruit producers may use to improve consumer perceptions of their products.

While production of fruits such as nectarines, peaches and plums has increased over the last decade, consumption has remained static, noted former Fresno State plant science professor Earl Bowerman in outlining the reasons behind the research effort.

Surveys have shown buyers are often disappointed with fruit from supermarket, saying it lacks flavor or has a mealy texture. With more products vying for supermarket space, "this has resulted in a loss of shelf space in stores and decreasing return for the growers," Bowerman said.

Fruit must be picked at just the right maturity level to withstand the rigors of packing and shipping, Bowerman noted. Normally, color and firmness are the primary traits for determining optimal maturity, and those traits are determined by the grower or by fruit inspectors working for packers. Unfortunately, inspectors sometimes have difficulty making precise deter-

A nondestructive tester is used to measure fruit firmness.



Left: Student research assistants conduct in-store evaluations of fruit to determine consumer perceptions of quality.

Below: Peach fruit flesh firmness is measured using a penetrometer



minations of fruit maturity because of the wide variety of cultivars and the different ripening characteristics of each.

To help resolve this problem, Bowerman teamed with pomology professor Carlos Crisosto of UC Davis to test mechanical sensors.

"Recently, nondestructive sensor technology has advanced greatly to the point that there are now several technologies available to measure fruit quality," the researchers state in a report recently made available to the industry.

The first phase of the study required training of a sensory panel to identify fruit attributes such as sweetness, sourness, aroma, texture, firmness, and flavor intensity. Panel members conducted in-store tests to determine consumer standards for fruit acceptability.

In the second phase, researchers evaluated two new firmness testers, one soluble solids concentration analyzer, and one fruit flesh color analyzer.

Tests showed that the sensors worked well with some varieties. However, the diversity of varieties complicated the calibrating process.

"The optical taster in particular required us to develop a new calibration curve for each cultivar." This would be a drawback for the industry, Bowerman noted.

Major project suc-

cesses included establishment of flavor parameters for use in evaluating fruit acceptability to consumers. Other advances included the evaluation of nondestructive sensor technologies for determining fruit characteristics along the processing line. Additional testing and refinement of these technologies must occur before they are commercially implemented, the authors said.

The California Canning Peach Association is starting a pilot program featuring the use of LED-based color meters and Sinclair nondestructive firmness testers in grading stations, the authors noted.

Details of this research may be found in a project report located on the ARI website at <http://ari.calstate.edu>. It is titled "Producing and Delivering Stone Fruits with High Consumer Acceptance," ARI Project No. 01-2-005, and may be found under Research Focus Area: Production and Cultural Practices.

Project funding was provided by the California State University Agricultural Research Initiative (ARI), with additional support from UC Davis; ETSI Agronomics in Madrid, Spain; and the Food Industry Science Centre in New Zealand.

Center for Agricultural Business

Study compares cotton production costs

Economists from the Center for Agricultural Business (CAB) at Fresno State have teamed with researchers from California and across the Pacific Ocean to study cotton production in the Peoples Republic of China.

Most cotton produced in China is grown on small, family farms, noted CAB director Mickey Paggi, one of the study participants. However, with millions of small farms scattered throughout the country, China has become the world's largest producer, harvesting an estimated 29 million bales in 2004-05, compared to 23.3 million bales produced in the United States.

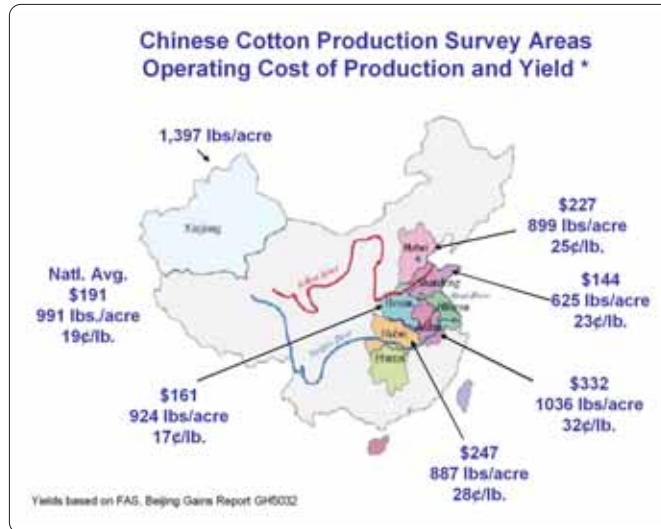
And not only is China the world's largest producer; it has become the leading user and importer of cotton, last year consuming an estimated 39 million bales for its massive textile industry. Second leading user was India, with 14.9 million bales. The United States used 6.7 million bales last year.

“A key to the future pattern of Chinese demand and hence U.S. export opportunities will be the price competitiveness of their domestic cotton production.”

The good news for U.S. producers is that China's use and import trends are rising, Paggi noted. And while that provides opportunities for expanding American exports, production efficiency will be critical for U.S. growers.

“A key to the future pattern of Chinese demand and hence U.S. export opportunities will be the price competitiveness of their domestic cotton production,” Paggi said. To help U.S.

Family efforts reduce operating costs on Chinese farms; but rising wage rates could force costs up



Survey data show variation in cotton production costs in China's different agricultural regions.

comparison, California labor costs range from \$11 to \$12 per hour.

In spite of these differences, “those labor cost advantages [in

China] may erode over time due to the upward pressure on wage rates from competing industries,” Paggi said. In addition, the increasing profitability of other crops such as vegetables may draw more farmers away from cotton, which would reduce production and possibly increase demand for U.S. imports, he added.

Overall survey results indicate that Chinese producers have a competitive advantage in terms of lower operating costs than some of their U.S. counterparts. Cotton production costs in China,

grows learn more about Chinese production costs and methods, Paggi joined economists from UC Davis and the Chinese Academy of Sciences in Beijing to survey 450 growers scattered across five of China's major cotton producing provinces.

Most growers subsist on family plots less than an acre in size. Since family members do most of the field work, it is difficult to assess a wage value for the hours worked, Paggi said. Labor costs were reported in the range of \$1.66 per day for family workers and \$3.29 per day for hired labor. By

See *Cotton*, Page 8

Upcoming events

April 13 – Farm Labor Contractor Education Institute at the Embassy Suites in San Luis Obispo, California. Presented in English and Spanish. For details, call 559-278-4677.

May 9 – Grower-Shipper Vegetable Association Office Wage and Hour Update, in Salinas, California. Call 559-278-4405.

May 10 – Agricultural Labor and Employment Briefing at the Atria Maria Del Sol in Santa Maria, California. For more information, call 559-278-4405.

May 11 – Farm Labor Contractor Education Institute at the Piccadilly Inn Airport in Fresno. Presented in English and Spanish. For details, call 559-278-4677.

May 17 – Agricultural Labor and Employment Summit from at the Harris Ranch in Coalinga, California. Call 559-278-4405.

July 13 – Farm Labor Contractor Education Institute at the Embassy Suites in Seaside, California. Presented in English and Spanish. For details, call 559-278-4677.

Center for Irrigation Technology

Fescue: Banking strategy enhances overall turf quality

from Page 1

jected for turfgrass use is approximately 53 inches annually.

“We wanted to look at the best way to put on that amount of water over the course of a year,” Geisel said. Because a typical residential sprinkler system does not have highly efficient coverage, the standard 100-percent ETo formula tends to leave

While the 75-125 strategy proved effective, it also requires careful oversight, Geisel noted.

“The time for changing the percent of application is critical,” she said. For example, the test formula called for percent ETo application to be adjusted from 75 percent to 125 percent on May 15, when hot weather typically begins in the San Joaquin Valley. As valley

Right: CIT field research director Greg Jorgensen examines tall fescue turf plots at conclusion of irrigation trials. Below: Closeup of tall fescue turf.



lawns dry and stressed during the hot months. Therefore, the researchers tested a “water banking” strategy that used less than the required amount during winter months, placing a slight stress on the turf, and then over-applying that same percentage during the summer months.

Results showed that banking 25 percent of water needed during the winter months and applying that extra amount during the summer produced a turf grass that was greener and healthier than grass irrigated by the straight 100-percent formula throughout the year. In all treatment cases, nitrogen fertilizer, applied in various forms, enhanced turf growth.

residents know, however, a hot spell can occur in early May or even April, and if one were to strictly adhere to the formula in that case, the lawn area could suffer serious stress and damage.

The key for successful application of any irrigation formula is to use it as a guide, but also to be aware of and adjust to changing climate conditions, Geisel noted. For more information on the study, or on general turf irrigation, contact Geisel at 559-456-7554 or visit the UCCE horticulture website at cefresno.ucdavis.edu/horticulture.

This research study was funded in part by the California State University Agricultural Research Initiative (ARI), administered by the California Agricultural Technology Institute (CATI). For more information on this project or related research, visit the ARI website at <http://ari.calstate.edu>

Task force lists recommendations for saving water

A task force of California irrigation industry leaders recently completed a year-long study of strategies aimed at enhancing urban water use efficiency.

The strategies are summarized in a report titled “Water Smart Landscapes for California: AB2717 Landscape Task Force Findings, Recommendations, & Actions.”

Presented to the governor and state Legislature last December, the document aims to help urban as well as agricultural water users prepare for unprecedented demands anticipated on the state’s water resources in the near future, noted Center for Irrigation Technology (CIT) Director David Zoldoske, who served as task force vice chair.

“The California Department of Water Resources projects that California’s population will grow by 12 million by 2030,” Zoldoske said. Based on that projection, “it is imperative that we manage our urban water supplies to reduce impacts on our environment and farmland,” he said.

The task force was asked to develop recommendations and actions that will either inspire or require homeowners as well as public entities to increase efficiency in their irrigation practices.

The recommendations include legislative, regulatory, and administrative changes, along with research and financial incentives, public education, and training and certification programs.

Implementing the changes will take several years but will save up to one million acre-feet of water annually, the task force report states.

To access a complete copy of the report, or for more information regarding water and irrigation issues, visit the UWCC website at www.cuwcc.org.

Viticulture and Enology Research Center

Prospects good for new table grapes

Marketplace appears to have room for new “Autumn Royal” and “Sweet Scarlet” varieties

Viticulture research at California State University, Fresno suggests a strong market potential for two table grape varieties recently introduced to commercial growers.

“Autumn Royal” and “Sweet Scarlet” were introduced through a long-term table grape development program operated jointly by Fresno State and the U.S. Department of Agriculture. Leading the program are Fresno State viticulture professor Sayed Badr and USDA geneticist David Ramming. The pair has collaborated in developing a number of other table grape varieties including Crimson, Princess and Summer Royal. Ramming’s specialty is breeding for desired characteristics and Badr’s is evaluating viticultural practices.

In today’s breeding programs, care must be taken develop a varieties that not only appeal to consumers’ taste preferences, but fit well into retail marketing strategies, Badr explained

“Retailers like to have a mix of colors in their table grape displays, such as red, green, and black. A good display



Above left: Untreated cluster of “Autumn Royal” table grapes shows tightness. At right: “Autumn Royal” with girdled treatment shows looser cluster. Left: Research technician John Tufenkjian spur prunes an experimental vine at Fresno State’s university vineyards, while research scientist Sayed Badr observes.

of colors has eye appeal to consumers,” he said. Timing is also a key element in marketing. Newer varieties have the best opportunity for success if they ripen later or earlier than existing popular varieties – that way retailers have a continuous supply of California-grown, good-tasting grapes available through the summer and fall months.

Of the several varieties Badr and Ramming have been testing, “Autumn Royal” is growing in popularity because it is seedless, has a large berry, a neutral flavor, and it comes in at the right time in the marketplace, Badr said.

Production trials at the Fresno State

campus vineyards have shown that the “Autumn Royal” grows well in the San Joaquin Valley – so well in fact that limiting vine production is crucial for producing a high-quality crop.

“With over-cropping we can delay fruit maturity, inhibit color development, and reduce berry size and sugar levels,” Badr said. “So you can have a large crop, but the quality tends to go in the other direction.”

“For Autumn Royal we are recommending quadrilateral training with spur pruning five to seven spurs per cordon and one to two nodes per spur,” Badr said.

While “Autumn Royal” is a late-maturing variety, “Sweet Scarlet” is a mid-to-late season red grape that has become popular among retailers and consumers since its release in 2003.

“It has a special flavor, a light to medium Muscat flavor with a pleasing aftertaste,” Badr said. And because of its color and earlier maturity, it tends to compliment rather than compete with the black Autumn Royal.

Viticultural research trials on

See Grapes, Page 8

Upcoming events

April 20 – Fourth Annual Vino Italiano wine tasting from 5:30 to 8 p.m. at the Fresno State Winery, featuring Italian varietals produced by Fresno State students. For more info, contact Cynthia Wood at cynthiaw@csufresno.edu.

April 22 – FFA Field Day Vine Judging Contest, in conjunction with FFA Field Day state finals, at the Fresno State vineyards. For more information call 559-278-2011.

May 18 – Viticulture and Enology annual year-end dinner at Fresno State for grape and wine industry members, alumni, faculty, staff, students and their families. For registration information, call 559-278-2089.

June 4 – A Celebration of Wine—annual wine tasting and fundraiser to benefit the Vincent E. Petrucci Library at California State University, Fresno. Call 559-244-5741.

APRIL 2006



CIMIS

California
Irrigation
Management
Information
System

CIMIS data quality control revisited: temperature and relative humidity

Visit the CIMIS home page at
<http://www.cimis.water.ca.gov>

In the winter 2005-06 issue of Update, we presented methods that CIMIS uses to conduct the quality control (QC) of one of the most important weather parameters, solar radiation.

We indicated that we will present QC methods for other weather parameters in the future issues. This article is, therefore, a continuation of the previous discussion and describes methods that CIMIS uses to QC air temperature, soil temperature, and relative humidity. Unlike solar radiation, there are no maximum limits for these parameters against which measured values can be compared. That is why we always hear about record high or low temperatures from our local news casts.

CIMIS uses statistical methods, based on means and standard deviations of historical data, to QC air temperature,

soil temperature, and relative humidity. Statistical quality controls require that the data to be evaluated has a normal probability density function.

CIMIS has determined through research that these weather parameters indeed have normal probability density functions and therefore statistical methods are appropriate. The statistical methods are used to develop a set of QC criteria for the purpose of identifying data that falls outside of the control limits. The control limits are set using the mean and standard deviations of historical data. A minimum of 5 years of historical data is required by CIMIS for this purpose.

Monthly means and standard deviations are calculated for each hour of the day, for the hourly QC, and for each day of the month, for the daily QC.

Then, an upper control limit (UCL) and a lower control limit (LCL) are established from the means and standard deviations for each weather parameter.

Depending on where each hourly or daily measured data falls, different flags are assigned. For example, the flag R is used if the data is over 3 standard deviations from the mean, and Y is used if the data is within 2-3 standard deviations from the mean. Other flags are also used to specify different scenarios.

More information on the flags that are currently used can be obtained by visiting the CIMIS web site. It should be noted, however, that flagging a data does not necessarily mean it is erroneous, as it can simply be an artifact of an extreme weather condition.

For more CIMIS information...

CIMIS information is published quarterly in the CATI Update newsletter. Articles are provided by the California Department of Water Resources, CIMIS program staff.

For more information about CIMIS or its programs, contact any of the following representatives at these offices:

Northern District
Mark D. Rivera
(530) 529-7301
mrivera@water.ca.gov

Central District
Marc L. Anderson
(916) 227-7603
marcla@water.ca.gov

San Joaquin District
Steve Ewert
(559) 230-3334
sewert@water.ca.gov

Southern District
Sergio Fierro
(818) 543-4652
sergiof@water.ca.gov

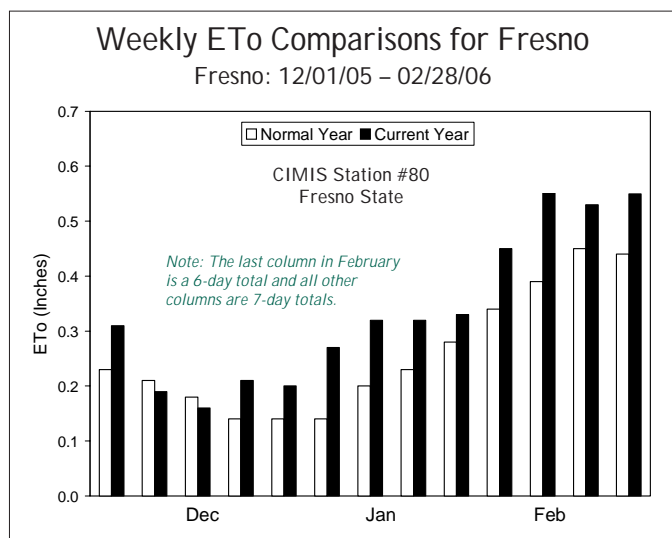


Chart shows ETo variation from normal over last three months.

Dairy compost shown to control fusarium

Soil pathogen research recently conducted at California State University, Chico has provided further evidence that dairy manure can serve as an effective biological control agent of certain plant diseases.

Collaborating on the study were animal and plant science professors Cynthia A. Daley and Pat Delwiche, both of CSU Chico's College of Agriculture. Their work focused on the role of composted dairy manure in suppressing *Fusarium* infection in watermelon seedlings. Funding was provided by the California State University Agricultural Research Initiative (ARI), administered by the California Agricultural Technology Institute (CATI), and by the Center for Urban Environmental Research and Education.

In the United States nursery industry, compost has been shown to be at least as effective as fungicides in controlling diseases such as Phytophthora root rot, Daley noted in a report on the project. Moreover, potting soils containing composted broiler litter, dairy manure, and steer/horse manure have been found to suppress Pythium and Rhizoctonia.

To expand that body of knowledge, Delwiche and Daley conducted a study to examine the effects of composted dairy manure on seedling watermelon plants. Results showed the mixture successfully suppresses *Fusarium* infection when added in amounts as small as 10 percent to a soil mixture, Daley reported.

As part of the project, researchers inoculated watermelon seedlings with the fungus prior to transplant into soil mixed with 10 percent, 20 percent, or 30 percent compost. Morbidity rates were reduced in inoculated plants by 55.7 percent at 10 percent compost, 62.6 percent at 20 percent compost, and 70.6 percent at 30 percent compost. Morbidity reductions were significant at 10 percent compost.



Compost beds for watermelon seedlings were treated with three different percentages of dairy manure in order to test for control of *Fusarium*.

The ability of compost-amended soil to support beneficial microflora depends on the availability of biological energy to the organic matter, Daley said. The quantity of readily biodegradable organic matter, mostly present as cellulosic substances, determines how long the beneficial effects last. Highly mineralized soils deficient of organic matter do not support this beneficial microflora, and disease develops.

Although little is known of the actual effect, disease control with composts is often attributed to four mechanisms, Daley related. They are 1) competition for nutrients among pathogens and beneficial microorganisms (on roots as well as leaf surfaces),

2) antibiotic production (by microorganisms in the compost), 3) predation and parasitism (one organism consuming another), and 4) systemic resistance induced in plants in response to compost treatments.

Project results should promote healthier growth of many plants often afflicted by certain types of plant diseases, Daley said.

To view and/or obtain a copy of the complete final report, titled "Effect of Compost as a Soil Pathogen Suppressant" (ARI Project No. 00-5-004), visit the ARI website at <http://ari.calstate.edu>. Go to "Projects: Funded Projects by Focus Area: Production and Cultural Practices."

ARI/CATI on the Web!

The California State University Agricultural Research Initiative (ARI) oversees applied agricultural, agribusiness and natural resources research on behalf of California agriculture. For information on our research and project results, visit our website at ari.calstate.edu.

The California Agricultural Technology Institute (CATI) administers ARI funding and oversees additional applied agricultural research. For more information about CATI and its research centers, visit us at cati.csufresno.edu, or at our centers:

Center for Agricultural Business (CAB) – cati.csufresno.edu/cab

Center for Food Science and Nutrition Research (CFSNR) – cati.csufresno.edu/cfsnr

Center for Irrigation Technology (CIT) – cati.csufresno.edu/cit

Viticulture and Enology Research Center (VERC) – cati.csufresno.edu/verc

Agricultural Technology Information Network (ATI-Net) – cati.csufresno.edu/atinet

Cotton: Report gives global data to U.S. growers

from Page 3

excluding labor, range from 17 to 32 cents per pound, depending on the area. By comparison, costs in California's San Joaquin Valley average around 45 cents a pound, based on UCCE budgets.

Funding for this study included a grant from Cotton Incorporated, based in Cary, North Carolina, Paggi reported.

"This is part of a Cotton Inc. project to examine the costs of production in other countries. It provides a means for U.S. growers to understand who their competition is and learn where the advantages in marketing will be in the future," Paggi said. Additional funding has been provided by Cotton Inc. this year to extend the survey effort to cotton producers in the northwest province of Xinjiang.

Following further data analysis, a complete report outlining details of the survey is to be published. Contact CAB at 559-278-4405 or visit the website at <http://www.cati.csufresno.edu/cab> for more information.

Grapes: Growers encouraged to use data as guide, not exact prescription

from Page 5

"Sweet Scarlet" over the last three years have focused on the effect of pruning methods, gibberellic acid (GA) application and girdling on yield and fruit quality. Different treatment combinations produced varying effects on berry size, weight, and titratable acidity, Badr said.

"Girdling or GA alone caused a slight increase in berry weight or size. However, girdling plus GA at 20 or 40 mg/L significantly increased berry weight and berry size," he said.

The results should be valuable to

growers, not as exact prescriptions, but as guides for leading to optimum production, Badr emphasized.

"Every vineyard has its own climate, soil, and rootstock conditions. That's where the variability comes in. The grower has to fine-tune these practices depending on his particular vineyard conditions," he said.

Details of the viticultural trials for both "Autumn Royal" and "Sweet Scarlet" are available in poster presentations on display at Fresno State's Viticulture and Enology Research Center (VERC). Complete written

reports are to be released later this year. Call VERC at 559-278-2089 or visit the website at <http://cati.csufresno.edu/verc> for more information.



Quadralateral vine training was used for the "Autumn Royal" treatments and one phase of "Sweet Scarlet" treatments. A wide open gable trellis system (left) supports the vine cordons and canopy.

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Director of Operations: Joe Bezerra

Publications Editor: Steve Olson

Assistant Publications Editor: John Norton

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