

# Update

California State University, Fresno

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## Air sampling indicates dairy emissions lower than previously believed

*Initial readings of reactive organic gas levels are less than half of past estimates*

**P**reliminary readings of air samples taken by a California State University, Fresno emissions researcher have indicated that San Joaquin Valley dairies may not be quite the air pollution sources that state government regulators thought they were.

Plant science professor Charles Krauter has taken air samples around a central valley dairy in an attempt to measure atmospheric levels of reactive organic gases (ROG). The gases are known to react with other airborne compounds such as oxides of nitrogen to form ozone, an irritant to the human respiratory system that has been linked to asthma and other serious health problems.

To his surprise, the readings Krauter obtained using a new sampling and measuring technique were lower than those estimated using the current method for measuring ROG levels.

As part of a research study funded in part by the California State University Agricultural Research Initiative (ARI), Krauter has been collecting air samples from all over the valley since 2000, using a device that resembles a weather station. The tripod-based tower stands 35 feet tall and is equipped with an assortment of sensors that record the presence of compounds and gases found in the air samples.



At left, tower unit with air sampling equipment stands downwind of San Joaquin Valley dairy. Above, student research technician Matt Beene adjusts flow level of vacuum canister used to collect air samples.

Krauter's work initially focused on atmospheric ammonia levels over agricultural lands. That research is helping scientists to determine how much ammonia vaporizes from the soil after application of nitrogen fertilizer. And while that work continues, Krauter and his research team are now also focusing on air quality around dairy operations.

"The current emissions inventory for ROG in California estimates dairy operations as one of the largest sources of ROG in the San Joaquin Valley," Krauter said. However, the method that state agencies use for estimating ROG is based on studies of different animals in the laboratory, not real dairy environments, and therefore may be questionable. "The questions are especially

pertinent since the estimation method causes dairies to be ranked among the highest emitters of ROG," he said.

In an effort to obtain more accurate measurements of ROG based on direct atmospheric readings, Krauter set up his sampling unit at various locations on the

*See Emissions, Page 7*



# Mapping ag lands

*Digital files will allow for analysis of water consumption, pesticide application and crop inventories*

**C**omputer specialists at California State University, Fresno have recently completed a new geographic database containing the outlines of 36,817 agricultural fields and other land-use areas in Fresno County.

The work is part of a digital mapping project designed to aid agricultural producers as well as public and private agencies that oversee San Joaquin Valley land use issues. The major portions of the project were conducted at Fresno State's Interdisciplinary Spatial Information Systems (ISIS) Center.

According to ISIS Center Director Robert Slobodian, land-use mapping is not a new concept. What is new is the integration of several technologies to develop a digital product that can be updated relatively easily, is accessible through the Internet, and is useful for a variety of purposes.

"Data produced will be used to feed several kinds of analyses including crop mapping and distribution, water consumption, pesticide application, and crop inventories," Slobodian said.

The development of the crop field borders involved the integration of three technologies: aerial photogrammetry, which provides outlined overhead images of the fields; database technology, which allows storage of the information; and geographic information systems (GIS), which allows for inputting and managing spatial data.

Through crop identification methods, agricultural agencies such as cooperatives and marketing commissions can examine digitally-produced maps and make more specific determi-



nations of selected crop acreages. State agencies could make more accurate estimates of pesticide use, and water agencies could more efficiently project irrigation needs.

"The \$15 billion per year agricultural industry in the San Joaquin Valley will benefit widely from a more fine-grained and timely approach to crop data than is currently available," Slobodian said. "It is fair to anticipate that greatly enhanced data will benefit reporting, research, regulation, promotion and other areas."

In addition to agricultural parcels, project specialists also collected spatial data on urban areas, such as the cities of Fresno and Sanger. The spatial data allows database managers to outline city and county boundaries, as well as streets. Spatial data layers of hospitals, schools and residential areas in Fresno County were also created.

Partnering with ISIS in the mapping project was the University of California's



Database specialists from the ISIS Center (Debra Dunn, GIS technician; and Xiaoming Yang, senior analyst) display a map produced by the center's large format printer. At left, a closeup of fields shows red division lines.

Kearney Agricultural Center based in Parlier, California. The UC center used some of the same geo-spatial data to develop additional base maps of land use. Specific maps detail mosquito abatement information in the Fresno area, populations of western tarnished bug (lygus) on cotton in Kern County, and citrus tristeza virus in orchards of the eastern San Joaquin Valley.

Researchers have presented information to growers in various seminars and have led discussions on the use of pest and disease control measures.

Funding for the land-use mapping project was provided by the California State University Agricultural Research Initiative (ARI).

The summary report containing key findings of the project is available from the California Agricultural Technology Institute (CATI). It is titled "The San Joaquin Valley Crop, Water, and Land Use Mapping Project." It may be viewed on or printed from the ARI website, located at [ari.calstate.edu](http://ari.calstate.edu).

For more information about the ISIS center or the Kearney Agricultural Center, visit their websites at [isis.csufresno.edu](http://isis.csufresno.edu) or [uckac.edu/gis](http://uckac.edu/gis).

## Center for Agricultural Business

# Lending institute offers second round classes to area professionals

**S**econd and first-year classes provided by a new institute for agricultural lending professionals have been scheduled for June 23-27 at California State University, Fresno.

The classes are provided by the California Agricultural Lending Institute (CALI), which began last year under the leadership of the Center for Agricultural Business (CAB) at California State University, Fresno.

CALI was designed to provide in-depth training for lending professionals granting and maintaining agricultural loans and portfolios. The institute prepares participants to be effective leaders in agricultural lending, promoting the success of their financial institutions and the growth of agriculture in California and the nation.

During the course of the week, first- and second-year participants will attend more than a dozen classes covering topics ranging from loan structure and lending strategies to evaluating loan

guarantee programs.

CALI is a two-year program. The first-year sessions, which were held last summer and will be offered again, address the loan process and those agencies and institutions that provide support services to lending institutions.

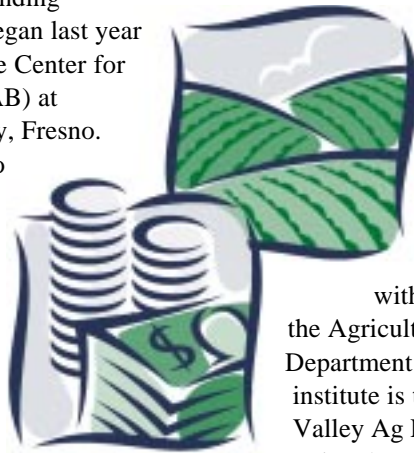
The second-year sessions will focus on maintaining and servicing loans, with a special emphasis on problem loans.

Joining with CAB and the Agricultural Economics Department in developing the institute is the San Joaquin Valley Ag Lenders Society, a regional professional organization dedicated to supporting professionals in agricultural lending and finance.

CALI has arranged for faculty with expertise in all areas of the lending process to deliver the program. Instructors include senior professional lenders, university faculty in agricultural finance, and experienced professionals in agricultural lending.

Successful program participants will be awarded a "Certificate of Completion" from California State University, Fresno and a "Certificate of Accreditation" from the San Joaquin Valley Ag Lenders Society. The first-year class last summer attracted 18 students who will receive their certificates upon completion of coursework this summer.

Cost to attend the institute is \$1,500 per year. For registration information, or to obtain a brochure, call CAB at (559) 278-4405 or visit the CAB website at [cati.csufresno.edu/cab](http://cati.csufresno.edu/cab). Seating for the school is limited, and the registration deadline is June 1.



## *'Survival' issues on agenda of ag labor, employment summit*

**R**ising costs of workers' compensation insurance will be among the "survival" issues discussed at the Agricultural Labor and Employment Summit set for Thursday, May 8, at the Harris Ranch near Coalinga, California.

The Center for Agricultural Business (CAB) is hosting the event.

Summit speakers will include Guadalupe Sandoval, director of Risk Management Services for USI Northern California. Sandoval will present methods employers can use to manage workers' compensation, including proven strategies that will help control the cost of injury claims and also reduce the number of claims companies pay for.

Michael C. Saqui, partner in the law firm of Barsamian, Saqui and Moody, will discuss "Labor and Employment Law Survival Strategies." His presentation will include a hands-on, interactive legal and legislative update.

Ron Barsamian, also a partner in the Barsamian, Saqui and Moody firm, will address amendments to the California Labor Relations Act "Mandatory Mediation."

L. George Daniels III, vice president of Farm Employers Labor Service, will focus on employee handbooks and their importance. He will also discuss establishing and publishing employment policies.

The summit is from 8 a.m. to noon at the Harris Ranch, located at the intersection of Interstate 5 and Highway 198. Registration fee is \$35 for registrations postmarked by May 2. Discounts are available.

For more information, call (559) 278-4405 or visit the CAB website at [cati.csufresno.edu/cab](http://cati.csufresno.edu/cab).

### Upcoming events

April 29 – Agricultural Safety Resource Alliance – Safety Breakfast Meeting in Calistoga: Robin Nicola – (707) 968-2194.

April 30 – Labor and Employment Law Breakfast Briefing in Sonoma. For info call (707) 206-0603.

May 8 – Sixth Annual Labor and Employment Summit at Harris Ranch, Coalinga (see article this page). Call (559) 278-4405.

May 29 – Farm Labor Contractor Education Institute (in English and Spanish) in Fresno. Call (559) 278-4405 for more info.

June 11 – Agricultural Safety Program – Fresno Safety Breakfast Meeting. For details call (559) 278-4405.

## Center for Irrigation Technology



# Testing surfactants

on turf

*Application meant to enhance water penetration and irrigation efficiency*

CIT research specialist Genett Carstensen applies water with surfactant to one of 32 treatment sections to determine the surfactant's effect on water infiltration.

**R**esearchers at the Center for Irrigation Technology (CIT) teamed recently with private industry to evaluate the addition of surfactants to water as a management strategy for commercial turf irrigation.

As in the agricultural industry, the turf grass industry has adopted best management practices (BMPs) to help guide water users in their irrigation methods, explained CIT soils scientist Dave Goorahoo in outlining the project. As defined, a BMP is a practical, affordable approach that will eliminate or minimize air, water and soil degradation without sacrificing productivity. Examples of BMPs currently used by the turf grass industry include laser leveling of fields, soil moisture monitoring devices, wind and rain sensors, the reuse of water on site, higher mowing during the hotter months, and use of effluent water.

Another approach being adopted by the turf grass industry is the application of non-ionic surfactants.

"The premise behind the use of the surfactant is that it reduces the 'surface tension' of the water, and thus enhances its penetration into the soil," Goorahoo said.

Laboratory tests have shown significant improvements in water infiltration rates through a soil column

with the use of surfactants, Goorahoo noted. However, little work has been done at the field scale for commercial turf sites such as golf courses.

The objective of Goorahoo's study was to evaluate the systematic application of surfactants as a management strategy on a commercial turf system. The impacts of three surfactant formulations applied at two rates on overall turf quality, steady rate infiltration and water storage in the root zone were investigated.

The experiment featured the use of commercially available surfactants that were applied to experimental plots at a Fresno-area golf course. Three surfactants were applied at high and low rates on a total of 32 plots, each two meters square.

The effect of the surfactants in enhancing water infiltration was measured by rating the turf plots for color, density, uniformity, general growth vigor, and overall turf quality. Results indicated that the surfactants significantly affected infiltration rates at both high and low application, and that "there was a generally positive effect of the surfactants on overall improvement in turf quality."

A primary objective in exploring surfactant use is enhancing water use efficiency, Goorahoo noted.

"Economic and population growth

has resulted in increased competition between the agriculture sector and the urban population for limited water supplies," he said.

Care must always be taken in surfactant use in turf irrigation, Goorahoo added, because too high an application rate can result in water infiltrating down past the root zone too quickly and becoming unavailable to the plant.

Funding for this study was provided by the California State University Agricultural Research Initiative (ARI). Additional details will soon be available in a complete final report to be published on the ARI website located at [ari.calstate.edu](http://ari.calstate.edu).

The project is titled "Addition of Surfactants to Turf Systems: Effect on Infiltration Rates and Root Zone Water Storage" (ARI Proj. #01-2-012). It is listed under the Research Focus Area: Water and Irrigation Technology.

For more information on CIT or related irrigation research, visit the center website at [cati.csufresno.edu/cit](http://cati.csufresno.edu/cit) or call (559) 278-2066.

### Upcoming events

April 17 – Chemigation/Well Head Protection, morning seminar at the Tulare AgTAC. Call (800) 772-4822 to register.

April 22 – Chemigation training from 8 a.m. to noon at the Fresno County Agriculture Commissioner's office, Fresno. For details, call (559) 278-5752.

May 15 – Chemigating with a Microirrigation System, at the AgTAC in Tulare. Registration fee: \$65. For details call (559) 278-5752.

June 10 – Variable Frequency Drives on Irrigation Pumping Plants, morning seminar at Tulare AgTAC. Details: (559) 278-5752.

## Viticulture and Enology Research Center

# Microbiologist tries new method for reducing urea in wine

**A** microbiologist at California State University, Fresno is searching for a way to lower the costs of winemaking.

Roy Thornton, a research scientist for the Viticulture and Enology Research Center (VERC), is exploring alternatives to an expensive formulation used to reduce ethyl carbamate levels in finished wines. Ethyl Carbamate (EC) is a compound formed from the interaction of other compounds during fermentation and is classed as a carcinogen, or cancer-causing agent.

Most wines contain such small amounts of EC that it is not considered harmful to consumers. However, the Canadian government, as well as others outside the United States, has set EC limits for imported wines, and the U.S. Food and Drug Administration is



Research scientist Roy Thornton (left) and graduate student assistant Jeff Farthing prepare a liquid media for growing *Acidomonas Methanolica*. Below, a closeup view of the culture unit.



bacterium *Lactobacillus fermentum*, produced by Takeda Industries of Japan. However, the patented product is high priced and can cost wineries thousands of dollars for a single large-tank treatment, Thornton said.

rights to the new urease enzyme.

“If we can establish that this enzyme works in wine, then we can look for a commercial partner. In the end you have to commercialize it to make it available,” he said.

Addition of an alternative EC reducing formulation in the marketplace hopefully will reduce prices, he added.

For more information on this project, Thornton may be contacted through VERC at 559-278-2089.

***“If we can establish that this enzyme works in wine, then we can look for a commercial partner. In the end you have to commercialize it to make it available.”***

considering guidelines for domestic production.

“They [the FDA] have been threatening to drop the other shoe for about 18 months now. At the moment we’re thinking it’s going to be set at about 15 parts per billion (ppb),” Thornton said.

EC results from the interaction of urea and ethanol during fermentation, Thornton explained. Since urea comes from nitrogen, most research on reducing EC has focused on first reducing nitrogen levels in grapes, he noted. While viticulture production methods can reduce nitrogen levels, in many cases that doesn’t happen, and winemakers must use special strategies during winemaking to reduce EC levels.

One method is the addition of a commercial formulation containing the

“We are looking for another enzyme, from another bacterium called *Acidomonas methanolica*, that would produce the same results,” he said. The effort requires culturing the bacteria in special media, breaking it apart and “harvesting” the enzymes that can reduce urea levels.

The key focus of his work now is creating the right conditions for growing the bacteria that produce the enzyme, he said. The enzyme then must be tested in the winemaking process to determine how effectively it controls urea.

Thornton hopes that positive test results obtained later this year will attract the interest of a pharmaceutical or agricultural chemical company that would support further research and eventually obtain patent and production

### Upcoming events

April 23 – Enology Seminar on Electrodialysis and Sterilization from 9 a.m. to 4 p.m. at the California State University, Fresno Winery. For more info, call (559) 278-2089.

May 15 – Viticulture and Enology Graduates Dinner. For details, call (559) 278-2089.

June 1 – A Celebration of Wine, from 3-6 p.m. at the Dennes Coombs Riverbend Ranch, Madera, California. Annual wine tasting and fundraiser for the Vincent E. Petrucci Library. For ticket info call (559) 244-5741 or visit [www.acelebrationofwine.com](http://www.acelebrationofwine.com).

June 18-20 – American Society of Viticulture and Enology Annual Meeting in Reno, Nevada. For details visit [www.asev.org](http://www.asev.org).

APRIL 2003



# CIMIS

California  
Irrigation  
Management  
Information  
System

## Web site upgraded to handle increased demand

The California Irrigation Management Information System (CIMIS) web site is undergoing substantial technological improvements which will provide more effective and thorough data services for its web-clients. For years CIMIS has supplied weather data primarily for the purpose of more efficient irrigation scheduling. While this remains the cornerstone of the new system, scheduled for release this year, the new system will provide more information, with improved layout design, and navigation.

CIMIS has been upgraded to use the Java powered Struts-based framework, which is state-of-the-art technology. This allows future CIMIS applications to be developed and enhanced more effectively and enables the system to take advantage of powerful new tools and features that add value. Web-clients will find the new Struts-based web site easier to navigate and understand. The

Visit the CIMIS home page at the following address:

<http://www.cimis.water.ca.gov>

frameless design, a departure from the current frames-based design, provides better navigation, accessibility for the visually impaired, the ability to segment portions of the webpage for different purposes, and to do it all using less screen real-estate than the current system.

Web-clients will be armed with a wealth of information about the CIMIS program and information explaining how to leverage CIMIS data to create efficient irrigation schedules and planning. The site will be frequently updated to keep the CIMIS community up to speed on relevant system news, such as the status of weather station maintenance and the announcement of new stations, among other pertinent news items.

Weather station descriptions will be complete and more comprehensive with frequent updates to the sites, such as detailing the area surrounding each station. System performance will be greatly improved by the acquisition of a new database server. Plans are in place for providing personalized features tuned for individual web-clients, such as having "favorite station lists," smart reports that remember reporting preferences, and single-click reporting.

CIMIS is also exploring the potential for using new methods of data acquisition from remote sensing and urban settings and eventually integrating them to the web site. The technical architecture and system design will continue to allow the CIMIS system to evolve and expand to meet future needs and will help ensure that CIMIS remains a key component in improving irrigation management and water planning in California.

## 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  
Jamie Dubay  
(530) 529-7367  
dubay@water.ca.gov

Central District  
Mark 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

If you are unable to reach a CIMIS representative near you, call the CIMIS Helpline at 1-800-922-4647.

### Weekly ETo Comparisons for Fresno Fresno: 12/01/02– 02/28/03

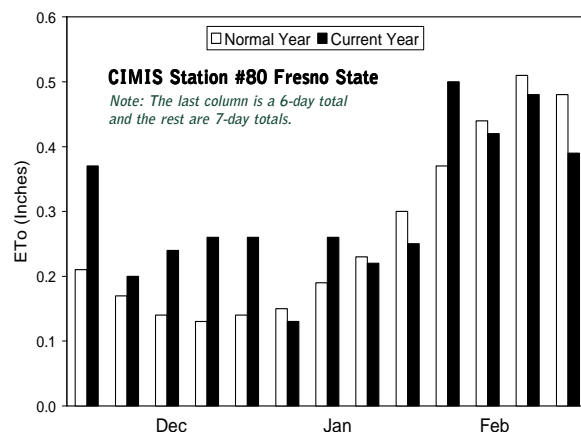


Chart shows ETo variation from normal over last three months.

# ATI-Net provides on-line form for ag educators

**T**he Agricultural Technology Information Network (ATI-Net) and the California Department of Education's Agricultural Education Unit have collaborated to develop an on-line system that allows California high school agriculture teachers to file their annual "r2" reports to the state via the World Wide Web.

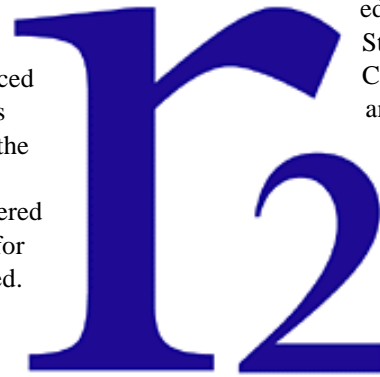
Prior to the online system, the state's 330 agriculture program directors prepared and mailed paper reports with demographic data describing the teachers and their 55,000 students. The data included student summaries calculated by gender, ethnicity, grade level, year in the agriculture program, and program area.

The new system allows the teachers to file demographic data for their annual

r2 report by completing an online form. Data from a prior year can be copied, replaced and then edited as needed, thus saving the time of completing the report from scratch.

With FFA rosters now entered online, student summary data for the entire state can be generated. FFA state staff can then use the web-based system to review the rosters and file them electronically with the National FFA. This system is expected to reduce keyboarding errors and labor costs.

With all information stored in a database, summary information becomes available and easily accessible online. For example, the database is now being used for a research project by teacher



educators at Fresno State; University of California, Davis; and Chico State.

The online r2 form was developed by ATI-Net general manager Mike Spiess with the assistance of web specialists and teachers

who provided feedback during pilot testing last year. ATI-Net is a web-support unit of the California Agricultural Technology Institute (CATI).

The r2 form and related items are housed on the California Ag Education website and can be directly accessed at: <http://www.calaged.org/R2>.

## Emissions: Findings confirm need for additional sampling

*from Page 1*

dairy, including sites upwind, near the center, and downwind of the main dairy barn and confined animal areas. Air samples were taken over several days and analyzed.

"The ROG results do show a higher level at the downwind edge of the operation so it is likely that the dairy is responsible for measurable ROG emissions," Krauter said. However, these same preliminary readings also show the ROG levels to be less than half of what would be estimated using the existing formula for calculating ROG levels, he added.

The significance of these findings reveals the need for additional research in this area, since California will be required to submit a State Implementation Plan to the federal Environmental Protection Agency (EPA) to reduce the levels of ozone in the very near future. The plan must be submitted for all areas of the state that do not meet current standards for those pollutants, and the plan must address how the excessive

levels will be reduced.

In fact, continued research is already planned, Krauter said. Several more dairies will be sampled this spring, summer, fall and winter, with findings presented to the California Air Resources Board in June 2004.

"If the results from this initial

sampling are consistent with those found at the rest of the dairies sampled, it may be possible to revise the estimated ROG emissions from dairies to a more realistic and scientifically supported level," Krauter said.

In addition to his research on ROG's, Krauter also is using the same equipment to measure atmospheric ammonia on and around dairies. Preliminary data from that work indicates that while dairies may be significant ammonia producers, field crops such as corn, grown near dairies, may draw significant amounts of the gas out of the atmosphere for its own growth requirements. More research in this area also is planned.

Financial and logistical support for this research has come from other sources besides ARI, including the California Air Resources Board, the San Joaquin Valley Air Pollution Control District, the UC Davis Crocker Nuclear Engineering Lab, and the dairy industry.

For more information on this project, Krauter may be contacted by email at [charles@csufresno.edu](mailto:charles@csufresno.edu).

### CATI on the Web!

For timely information about CATI, its research projects or centers, or to view text of research publications, visit us at [cati.csufresno.edu](http://cati.csufresno.edu).

Center for Agricultural Business (CAB) – [cati.csufresno.edu/cab](http://cati.csufresno.edu/cab)

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

Center for Irrigation Technology (CIT) – [cati.csufresno.edu/cit](http://cati.csufresno.edu/cit)

Viticulture and Enology Research Center (VERC) – [cati.csufresno.edu/verc](http://cati.csufresno.edu/verc)

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

# Rice straw + dairy manure = compost

**R**esearch investigators from California State University, Chico have completed a study to determine the feasibility of a new waste management strategy that will address air and water quality issues related to crop residue and animal waste.

The principal investigator of the project, Cynthia A. Daley of the Animal Science Department at California State University, Chico, designed the project in an effort to convert rice straw into a "value-added" product suitable as a soil amendment or organic fertilizer. This was made possible through funding support from the California State University Agricultural Research Initiative (ARI), administered by Fresno State's California Agricultural Technology Institute (CATI). Additional funding was provided by the California Air Resources Board.

Air and water quality issues have been at the forefront of major legislative measures in recent years, including the Connelly-Areias-Chandler Rice Straw Burning Reduction Act of 1991. Burning rice straw is an efficient method of disposal for growers, but it increases airborne particulate matter such as smoke and ash. Since the enactment of the burn-down act, producers have experimented with other, less successful methods of handling rice straw.



At left, tractor operates machine to bag compost made from rice straw, animal waste and other plant material. The bags (below) will preserve the compost for use as a soil amendment.



The goal of Daley's project was to develop an inexpensive composting process using rice straw, crop residues and animal waste in an "in-vessel" composting process. Because compost adds organic matter, nutrients and beneficial microorganisms to the soil, it provides a very sustainable alternative to conventional burning practices. Researchers hypothesized that this method would provide a low-cost, effective end-use for rice straw. As part of the process, rice straw and manure are mixed, composted, and "bagged" in plastic, where the compost can be stored to use as a soil amendment.

After extensive research, investigators concluded that compost production from rice straw and dairy manure is feasible and can be profitable under the right management scenario. Because air and water quality laws will continue to limit the application of raw manures, compost will provide an adequate alternative that is weed, seed, and pathogen free, Daley reported.

A final report of the project is available on the World Wide Web in Portable Document Format, located at [www.csuchico.edu/agr/compost](http://www.csuchico.edu/agr/compost).

In the event of incorrect address information or extra copies to your workplace, please return this address label by mail or fax with your requested changes. CATI fax number is (559) 278-4849.

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