CALIFORNIA AGRICULTURAL TECHNOLOGY INSTITUTE

FALL 2008

Update

California State University, Fresno

In this issue...

Canola shows promise as biofuel source

Tolerance of selenium in irrigation water makes seed plant attractive as source of fuel oil, feed

Sustainable agriculture practices in the western San Joaquin Valley are advancing through a research partnership featuring a Fresno County grower and scientists from the USDA and California State University, Fresno.

The research team has succeeded in reducing selenium content in West Side soils by growing canola, processing the seed oil to be mixed with diesel fuel, and then using the canola meal by-product – with trace elements of selenium – as a supplement for cattle feed.

The continuing project is directed by Gary Banuelos of the USDA's Agricultural Research Service based in Parlier, California. Cooperators include Fresno State professor Alam Hasson from the Department of Chemistry, and grower John Diener, owner of Red Rock Ranch in western Fresno County.

USDA research scientist Gary Banuelos adjusts irrigation pipe during canola growth trials on John Diener's Red Rock Ranch in western Fresno County. The canola seed was pressed for oil for use as a biofuel and feed supplement.

The research focusing on canola was undertaken for several reasons, Banuelos said. First, canola has been shown to tolerate and absorb more selenium from irrigation water than most agronomic crops. Second, canola seed can not only be processed into cooking oil, but also "transesterified" for use as a blend with diesel fuel. Third, the "press cake" left over from processing shows potential not only as a livestock feed, but also as a source of supplemental selenium.

So far two of the three key project research objectives have been met, Banuelos said in a recent report to the California State University Agricultural Research Initiative (ARI), which funded the research jointly with Diener.

"In order for canola to be widely accepted as a crop and used as a practical tool to manage selenium content of drainage water, viable

*See **Canola,** Page 8*

Food safety, water are conference topics

Two of the most serious agricultural issues of the times – food safety and water resources – will be the lead discussion topics at the 27th Annual Agribusiness Management Conference to be held Tuesday, Nov. 18, at the Radisson Hotel and Conference Center in Fresno.

The conference in recent years has drawn more than 400 participants from across California to learn of the latest developments and trends in agriculture and agribusiness, both locally and globally. It is sponsored by Fresno State's Center for Agricultural Business (CAB) and Bank of America.

"We are looking at the critical issues facing California agriculture, and there are many," stated CAB director Mickey

*See **Conference,** Page 3*

CATI

CALIFORNIA AGRICULTURAL TECHNOLOGY INSTITUTE

Going organic

USDA grant enables Fresno State farm to set aside 25 acres for organic farming program

Above: Fresno State research scientist Mint Pasakdee shows a portion of the 25-acre university farm plot being converted for organic farming research, education and production. Left: Volunteers plant border shrubs along the edge of the .8-acre plot already being used in research production.

Up to 25 acres on Fresno State's University Farm will be certified organic in three years – available for agricultural research, production and education – thanks to a $250,000 grant recently awarded by the U.S. Department of Agriculture.

The proposal for developing an organic plot was submitted by Sajeemas "Mint" Pasakdee, Ph.D., a soil scientist and agronomist for the California Agricultural Technology Institute (CATI), and Ganesan Srinivasan, Ph.D., director of Fresno State farm operations.

Pasakdee has been involved for several years in sustainable agricultural research through the California State University Agricultural Research Initiative (ARI) – administered by CATI – and the organic agricultural research program at the University of California, Santa Cruz.

"This grant is most timely and will help us expand our capacity to do research and train students in organic farming and sustainable agriculture," Pasakdee said. In addition to her research and teaching assignments at Fresno State, she is an environmental representative on the California Department of Food and Agriculture Organic Product Advisory Committee.

Srinivasan has experience in international agriculture and sustainable farming systems. He said the project will help to fulfill Fresno State's commitment to promoting sustainable and environmentally friendly practices on its campus farm.

"This will provide us with a year-round production facility for organic seedlings of various herbs and vegetables that we plant on our farm and sell at the Gibson Farm Market," Srinivasan said.

The organic production plot comprises acreage along the north side of Campus Pointe, a mixed-used university development being constructed along Chestnut Avenue between Shaw and Barstow avenues.

Before farmland can be certified for organic production, there must be a minimum three-year transition when no chemical pesticides or synthetic fertilizers are applied. The three-year USDA award is from the agency's Hispanic-Serving Institution Education Grant Program. It will establish Fresno State's organic farming initiative under the Sustainable Agroecosystems and Efficient Resource Management program (SAERM).

Fresno State's organic agricultural program has been in the planning stages since 2004, Srinivasan noted. At that time, professors James Farrar and Dave Goorahoo of the Department of Plant Science initiated a .8-acre plot for organic vegetable production. That land recently was certified for organic production by California Certified Organic Farmers (CCOF) and is currently planted with fall vegetable crops.

In February, CCOF granted certification to a section of the university's greenhouse unit under the supervision of horticulture enterprise manager Calliope Correia and plant science professor John Bushoven.

> ***"This grant is most timely and will help us to expand our capacity to do research and train students in organic farming and sustainable agriculture."***

U.S. sales of organic food and beverages grew from $1 billion in 1990 to more than $20 billion in 2007, with double-digit annual growth projected for the next decade. California leads the nation with more than 500,000 acres certified for organic production.

For more information about the organic initiative, contact Pasakdee at spasakdee@csufresno.edu

Center for Agricultural Business

Conference: Penson, Yates to offer keynotes

from Page 1

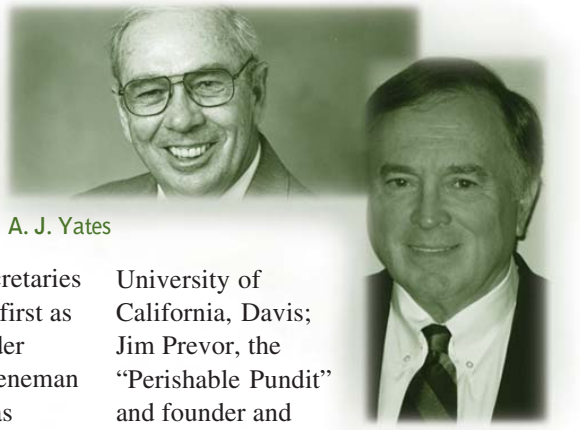
Paggi in recalling planning meetings. "We thought that at least for this year, we must look at the recurring problems with food safety and the dire consequences of water shortages," he said.

Food safety and water will be discussed during panel presentations with input and questions from the audience.

Prior to the panels, economist John B. Penson Jr., Regents Professor and Stiles Professor of Agriculture at Texas A&M University, will provide the morning keynote address. Penson conducts research in the areas of finance and the macroeconomics of agriculture. He is the recipient of several awards, among them the Outstanding Alumnus Award from the College of Agriculture at Southern Illinois University, where he received his doctorate.

Penson's understanding of macroeconomics will be especially valuable as he shares insights into the national mortgage crisis and the economic unrest it is causing, Paggi said.

Providing the conference keynote luncheon address will be A.J. Yates, a Fresno County farmer who has served in top-level administrative positions for both the California and U.S. agricultural departments over the past 17 years.



A. J. Yates

John B. Penson Jr.

Yates, from Kerman, was appointed to the California Department of Food and Agriculture (CDFA) in 1991 and served eight years under secretaries Henry Voss and Ann Veneman, first as deputy secretary and then as under secretary. He also worked for Veneman in Washington D.C. after she was appointed U.S. Secretary of Agriculture in 2001. Yates returned as under secretary for the CDFA for two years under Gov. Arnold Schwarzenegger before retiring in 2007.

"His experience in Washington and Sacramento give him a unique perspective from which to discuss California agriculture – where it's been and where it's going," Paggi said.

Comprising the food safety panel will be representatives of government regulatory agencies, growers and the media, Paggi said. Panelists include Barbara Cassens, director of the U.S. Food and Drug Administration's San Francisco District; Trevor V. Suslow, extension research specialist for post-harvest quality and safety for the University of California, Davis; Jim Prevor, the "Perishable Pundit" and founder and editor-in-chief of *Produce Business* and *Deli Business* magazines; and Ed Beckman, president of California Tomato Farmers.

The water panel will feature U.S. Congressman Jim Costa and Timothy Quinn, executive director of the Association of California Water Agencies.

A special panel will be called to address another topic – Succession Planning for Farmers, Ranchers and Ag Business, Paggi said. Specialists in finance will discuss the one thing business owners do have control over during uncertain financial times – how they plan their business. Panel members are Kevin Spafford, founder of the legal firm Legacy by Design; Neil Koenig, a family business and management consultant; and Kenneth J. Fransen, a partner in the law firm of Bolen, Fransen and Russell.

For those who attend the conference, written commodity reports also will be included in the proceedings. Commodities reported on will include almonds, beef cattle, citrus, cotton and pima cotton, dairy, grains and protein meal, pistachios, raisins, table grapes, wine grapes, tomatoes and tree fruit.

The event will conclude following the luncheon. Registration fee is $100 for registrations postmarked by Oct. 31. For registration or conference details, call 559-278-4405 or visit the CAB website at http://cati.csufresno.edu/cab.

Upcoming events

Oct. 14 – Agricultural Supervision Development Program Management Seminar to build knowledge, skills and teamwork, in Salinas – for middle and upper-level managers – in English, from 1 to 3:30 p.m. For details, call 559-278-4404 or visit http://safeinfor@agsafe.org.

Oct. 15, 16 – Agricultural Supervision Development Program Supervisory Short Course to build knowledge, skills and teamwork, in Salinas – for foremen, crew leaders and mayordomos – in Spanish. For details, call 559-278-4404 or visit http://safeinfor@agsafe.org.

Oct. 29 – Farm Labor Contractor Education Institute from 8 a.m. to 5 p.m. at the Piccadilly Inn Airport in Fresno. Presented in English and Spanish. For details call 559-278-4677.

Nov. 18 – 27th Annual Agribusiness Management Conference at the Radisson Hotel and Conference Center in Fresno. For details, call 559-278-4405.

Nov. 20 – Farm Labor Contractor Education Institute from 8 a.m. to 5 p.m. at the Hilton Hotel in Santa Rosa. Presented in English and Spanish. For details, call 559-278-4677.

Center for Irrigation Technology

Sprinkler museum presents irrigation artifacts

Exhibition cases display sprinklers, valves more than a century old

More than 100 years worth of sprinklers and other artifacts representing the history of irrigation are now on display in the Water and Energy Technology (WET) Incubator at California State University, Fresno.

The new display represents the vision of key water industry leaders to illustrate the development of one of the most important technologies the world has ever known – irrigation. The WET Lab is housed together with the International Center for Water Technology (ICWT) across Chestnut Avenue from Fresno State's Center for Irrigation Technology (CIT).

> ***"We've had people drop in with boxes of vintage pieces and say, 'Do you want these?' And of course we say 'Yes.'"***

CIT has served as an international research and testing facility for irrigation and water delivery equipment for more than 25 years, so it is only fitting that it make some space at the WET Lab to exhibit some of the more than 500 museum-quality pieces collected over those years, noted CIT project manager Kate Norum.

"We've been looking for a permanent home for these items, and now we think we have it," she said. The CIT collection includes prototypes of sprinklers and valves that were first tested in the hydraulics lab, fine-tuned and retested, then manufactured and eventually sold worldwide.

Left: Glenn Bowlin and Kate Norum hold a Larchmont pop-up sprinkler designed for golf course irrigation, manufactured in the 1950s. Below: Part of museum collection showing an assortment of vintage lawn sprinklers from the 1920s, 30s and 40s.

And the collection has grown in other ways as well: "We've had people drop in with boxes of vintage pieces and say, 'Do you want these?' and of course we say 'yes,'" Norum quipped.

Another major source of pieces is the Irrigation Association (IA), an international organization that promotes efficient irrigation through education, certification, research and innovation. With the blessing of former executive director Tom Kimmell, the entire IA collection of sprinkler and irrigation-related artifacts was recently moved to Fresno, Norum said.

"Work is still ongoing to identify, catalog and photograph the more than 1,000 pieces amassed over the past 50 years," she said.

Instrumental in the move was Glenn Bowlin, an irrigation consultant with Broussard Associates of Clovis, California and currently chair of the IA History Committee.

Spider valve? A residential main sprinkler valve dating from around 1925. Cast iron center supports copper tubes for attachment to sprinkler lines. Weight: Approx. 35 pounds. Manufacturer: Unknown.

Bowlin, who's been in the irrigation business for 35 years, began to collect vintage and trend-setting sprinklers and equipment years ago when he realized the importance of the technology to California and the world.

"We decided to re-energize our history committee and find a way to tell the story of sprinkler development – to show the history of irrigation" Bowlin said. "We wanted to create a virtual museum and also one from brick and mortar."

Norum, also a member of the History Committee, appreciates how much work has been done in such a short time. A series of custom made glass cases along the WET lab's main hallway

See ***Museum,*** *Page 7*

Upcoming events

Nov. 5 – Sonoma County Wine grape Growers energy efficiency workshop from 9 a.m. to noon in Healdsburg, California. Includes Agricultural Pumping Efficiency Program (APEP) description and eligibility, how to specify an efficient pump, how to maintain an efficient pump, how much water needs to be pumped, and how much water has been pumped. Call Jim Salomone at 707-579-6437 for details.

Viticulture and Enology Research Center

New faculty member Kurtural specializes in precision farming

A specialist in precision agricultural technology has joined the research and teaching team at Fresno State's Viticulture and Enology Research Center (VERC).

Kaan Kurtural, Ph.D., a researcher and instructor from the University of Kentucky, has assumed the inaugural Bronco Wine Co. Viticulture Chair for VERC and the Department of Viticulture and Enology. The new position is funded as part of a 10-year pledge through the College of Agricultural Sciences and Technology by Ceres-based Bronco Wine Co., the nation's fourth largest winery.

Kurtural will conduct research focusing on wine-grape production and vineyard management in the San Joaquin Valley. He also will teach undergraduate and graduate classes in general and mechanized viticulture. He will work closely with valley grape growers to improve efficiencies and quality.

The new faculty researcher, with a doctorate in plant physiology from Southern Illinois University, said he is looking forward to tackling vineyard management challenges in the San Joaquin Valley.

"One thing that attracts me to the valley is that there are real-world industry problems here," Kurtural said. "I want to be involved in new technology issues related to precision agriculture, such as the use of GIS (geographical information systems) and GPS (global positioning systems) to do vineyard quality mapping."

He also has noted the openness of the industry to technology changes.

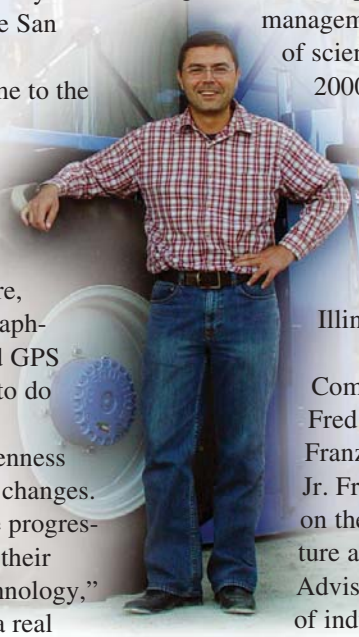
"I am impressed with the progressiveness of growers here and their willingness to adopt new technology," Kurtural said. "They exhibit a real cooperativeness with the university. I also see that industry comes to the university and tells us what they need. That presents real opportunities for partnerships."

Within the general area of vineyard irrigation management, Kurtural hopes to focus on strategies specific to the San Joaquin Valley – for example, on how deficit irrigation affects yield under different pruning regimes. He has made contacts with local irrigation service providers and will test some of the latest electronic technologies in areas such as soil moisture sensing and wireless control of irrigation systems.

Kurtural noted the importance of soil properties in any vineyard irrigation scheme.

"More and more we are facing the issue of water quality here, and how it affects the soil," he said. "We are seeing the salting of water, and it's something that growers are going to have to deal with."

At Kentucky, Kurtural was an adjunct assistant professor-viticulture specialist. He received his bachelor's degree in field crops and business management in 1997, a master of science in pomology in 2000 and his doctorate in plant physiology, with a specialization in viticulture and minor in statistics in 2005, all from Southern Illinois University.



The Bronco Wine Company is owned by Fred T. Franzia, Joseph S. Franzia and John Franzia Jr. Fred Franzia also serves on the university's Viticulture and Enology Industry Advisory Board, composed of industry leaders.

Recent varietal plantings include table, wine grapes

Three new grape varieties have been planted on Fresno State's university farm, providing for enhanced research, education and production capability, reported vineyard manager Mark Salwasser.

The plantings include 4.4 acres of "Scarlet Royal" table grapes on Freedom rootstocks, a new USDA variety released by breeder David Ramming. "Scarlet Royal" is described as a large, red seedless that stores well. The vines are expected to produce their first crop in 2009.

The wine grape enterprise has directed plantings of 3.6 acres of "Touriga Nacional" and 3.5 acres of "Albarino." These varieties, with origins in Portugal and Spain, respectively, were donated by Duarte Nursery in Hughson, noted Ken Fugelsang, winemaster for the Viticulture and Enology Research Center. First production is set for 2009.

"The Fresno State winery team looks forward to utilizing these varieties in our educational program, as well as in upcoming wines," Fugelsang said.

Upcoming events

Oct. 24 – Viticulture Club Fall Harvest Dinner. For details, call 559-278-7151.

Nov. 20 – Le Vin Nouveau wine tasting at the Fresno State Winery to celebrate the release of Nouveau vintages. Includes light hors d'oeuvres. Discounts on admission and wine purchases available. Ticket sales limited. Must be 21. Call 559-278-2089 for details.

Dec. 3 – Filtration Day at the Fresno State Winery. Call 559-278-2089 for more info.

Dec. 11 – Central California Winegrowers workshop at Fresno State. Call 559-278-2089 for more info.

OCTOBER 2008

CIMIS California Irrigation Management Information System

DWR and UCD test surface renewal method

The Department of Water Resources (DWR) contracted with the University of California, Davis (UCD) to test the Surface Renewal (SR) method for developing crop coefficients (Kc) for use with reference evapotranspiration (ETo).

The ability to improve and expand Kc values will enable DWR to more accurately calculate crop water use, reflect current irrigation practices, improve irrigation efficiency, and capture potential changes in crop water use due to climate change. Surface Renewal is one of several energy balance methods available to develop Kc values.

The energy balance of a plant canopy is the balance between net radiation received from the atmosphere (Rn), sensible heat exchange between the plants and the atmosphere (H), latent energy used to evaporate the water (LE), and conductive energy exchange between plants and the soil below (G).

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

The energy balance methods for estimating ETo measure or estimate Rn, H, and G and calculate ETo as a residual.

In the SR method, H is estimated using high-frequency temperature data. In combination with other energy balance measurement (Rn and G), latent heat flux density (LE) is calculated as the residual of the energy balance equation. Surface renewal has the advantage of low cost and portability when compared to other energy balance methods.

In an effort to expand the availability and accuracy of Kc values for use with CIMIS ETo, DWR is currently participating in the third year of a three-year contract with UC, Davis. Dr. Richard Snyder is the primary investigator for this cooperative Surface Renewal project. Prior to adopting Surface Renewal technology as a means for determining Kc values, DWR must validate the technology and train the staff in the use and maintenance of the equipment and data analysis.

Eight DWR Surface Renewal stations are therefore currently operating throughout California over various crops. Some of these stations are operating at California Irrigation Management Information System (CIMIS) weather station sites and at Five Points Agricultural Station for comparisons with CIMIS, lysimeter, eddy covariance, and Bowen ratio technologies.

If successful, DWR is hoping the Surface Renewal method will provide the means to produce accurate Kc values – for more crops – that are applicable to specific regions of the state over the coming years. Ultimately, improved Kc values will result in increased irrigation efficiencies and the accuracy of projected future water demands.

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:

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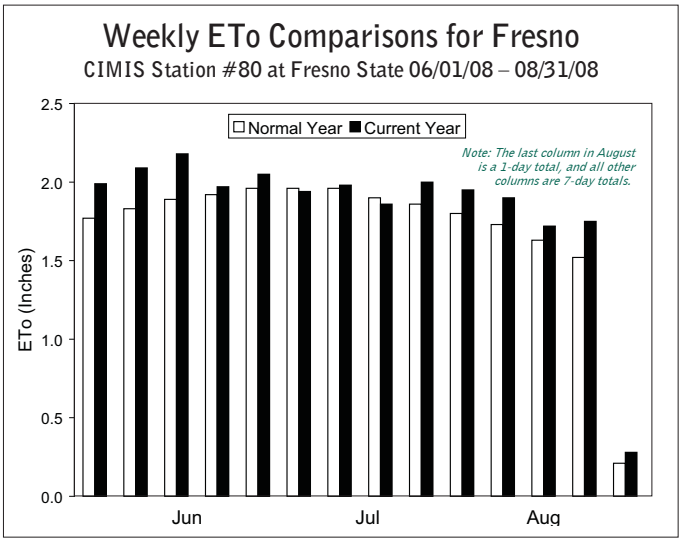

Chart shows ETo variation from normal over last three months.

Museum: Irrigation Association also hosts virtual site

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comprises the first phase of the museum. The cases house more than 100 sprinklers and irrigation artifacts ranging from a 1920s vintage ornamental alligator lawn sprinkler to a giant Buckner 890 rotating agricultural sprinkler that could blast a fire-hose like water stream up to 200 feet.

In addition to the WET Lab museum, the IA also has recently launched a Web-based virtual irrigation museum, Bowlin noted. The site not only displays water-related artifacts, but describes the worldwide history of irrigation back to ancient times.

Photos show top and bottom views of a lawn sprinkler made by Ette & Hanger Mfg. Co. of St. Louis during the 1890s.

Both the virtual museum and the real museum are works in progress, with new artifacts being added all the time, Norum said. Future plans include building display cases that can house larger artifacts such as pipe, pumps and controllers. And a future exhibit will trace the history of sprinkler testing at Fresno State, beginning with the pioneering work started more than 50 years ago by the late Winston Strong, Fresno State professor of plant science from 1940 to 1974, to the current testing work conducted today at CIT.

The CIT Irrigation Museum at the WET Lab is open during the facility's regular business hours, from 8 a.m. to 5 p.m. Monday through Friday. The website address for the virtual museum is http://www.irrigationmuseum.org/. For more information, contact Norum at katen@csufresno.edu or Bowlin at glenn@broussardassoc.com.

New citrus cost-study report models regulatory impacts

A cost-of-production study compiled by the Center for Agricultural Business (CAB) offers southern San Joaquin Valley orange growers new insights into how state and other government regulations will affect their profit margins in coming years.

The report follows a similar one published by CAB earlier this year projecting profitability of 20 California specialty crops based on production costs, yields and product pricing.

The new study focuses on oranges and addresses the impact of government regulations on profitability, noted CAB director Mickey Paggi.

"Regulatory pressure is a source of increasing concern for California producers," Paggi said. "Though regulations can have a positive impact on society in terms of cleaner air and water, as well as increased worker safety, they impose multiple costs to farmers in the state."

Recent studies on the economic impacts of regulations have revealed increasing demands placed on growers' time. According to a survey conducted in 2006, producers estimated the amount of their management time spent on regulatory issues grew from 7.31 percent in 1999 to 10.27 percent in 2004 – a 40 percent increase.

Regulatory costs themselves also have risen, Paggi noted.

Using data from recently-completed regulatory studies and producer surveys focusing on citrus producers, Paggi and his economics team developed their most recent report. It is titled, "The Impact of California Regulatory Compliance Costs on California Orange Producer Profitability."

Center for Agricultural Business

In addition to Paggi, research team members include Jay Noel, marketing and economics professor at California Polytechnic State University, San Luis Obispo; and Fumiko Yamazaki, CAB senior research economist.

The report offers model projections based on probability distributions of farm income, value, and returns on land and equipment with regulatory compliance costs included or excluded from the cost of production.

Copies are available from CAB and may be requested by calling 559-278-4405, or visiting the website at http://cati.csufresno.edu/cab.

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 **http://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 **http://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**

Canola: Press cake used in livestock feed

from Page 1

economical uses for the plant product also must be available," Banuelos said.

The canola plant, because of its inability to discriminate between absorbing sulfur or selenium ions, can successfully extract selenium from irrigation water, research has shown.

Part of Banuelos' project included constructing a small-scale oil production facility on the Diener ranch near Five Points so that the entire growing and processing experiment could be conducted on-site. Work included assembling an Insta-Pro model 2000 extruder and a model 1500 continuous horizontal press. Other equipment used in processing included a seed hopper, cooling unit and oil storage tanks.

Canola growth trials conducted on the ranch resulted in average seed yields of at least one ton per acre, using poor quality drainage water for irrigation, Banuelos reported. With seeds yielding from 35 to 40 percent oil, approximately 100-160 gallons of 100-percent bio-oil were produced from one ton of seed.

Once transesterified, the canola oil was mixed at a rate of 20 percent with standard diesel fuel to create B20 biofuel for operating diesel-powered engines. The small-scale oil processing and diesel engine operations were successful, Banuelos said.

"On a larger scale, successful operation would require abundant seed for oil extraction, larger oil mill facilities, and alternative and cheaper sources of energy-to-electricity for operating the oil press before sustainable production of biofuel and selenium-enriched meal can be realized on the West Side," he said.

An engineering assistant at the Red Rock Ranch adjusts the horizontal oil press during canola seed processing.

The third phase of the project includes evaluating the selenium-enriched seed meal as a livestock feed amendment. That trial is under way at the Fresno State dairy, involving different feeding regimens for two groups of Holstein and Jersey cows.

"Selenium at low concentrations is essential in animal production," Banuelos said. "And the benefit of having selenium in canola meal at this concentration is that we don't have potentially toxic levels when it is used as part of a daily feed ration. And importantly, the organic source of selenium may be more bio-available for absorption."

The canola plant has the potential to fit an important niche in San Joaquin Valley agriculture, Banuelos noted.

"It is one of the most widely-traded protein ingredients in the world – its use in animal feed rivals soybean meal because of its high nutritional quality in terms of fiber, protein, and fat," he said.

Banuelos has presented information and preliminary project results in an assortment of venues throughout California and elsewhere. For the latest details on his work, contact Banuelos at Gary.Banuelos@ARS.USDA.GOV.

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