

Update

California State University, Fresno

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Table grape rootstocks tested for nematode resistance

California table grape growers may face some serious production problems in the future with the likelihood that one of the most common and effective pesticides they use will no longer be available.

Methyl bromide, a soil fumigant that controls destructive pests such as nematodes and phylloxera, is under increased use restrictions and may be banned entirely in the near future, reports California State University, Fresno viticulture researcher Sayed A. Badr. Since nematodes live in the soil and attack the roots of a plant, grape growers typically apply methyl bromide to the soil before vines are planted to provide protection to the vines, Badr explained. This method has been very

effective at least in the early life of vineyards.

With the expected ban of methyl bromide, more growers are supporting research and development of rootstocks that are resistant to nematodes, phylloxera, or both. While much study already has been conducted on rootstock adaptation for wine grapes, that information offers little aid to table grape growers in central California, where nematodes are the dominant soil-borne pest, Badr noted.

“Most of the rootstock research has been conducted in the north or central cost regions on wine grape varieties, where phylloxera is the primary target pest,” Badr said. “There is urgent need to address problems related to rootstocks for table grapes, using rootstocks with a broad spectrum of resistance to several species of nematodes and phylloxera under conditions of the central San Joaquin Valley.”

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Above: Typical graft shows table grape variety grafted onto Harmony rootstock. Right: Viticulture researcher and professor Sayed Badr (left) examines growth of experimental vines with the assistance of research technician John Tufenkjian.



Study eyes economic issues in agricultural communities

Researchers at California State University, Fresno recently completed a study examining the potential effects of anticipated public welfare program changes on the Fresno County communities of Selma and Parlier.

The study was led by Professor Mark Hanna of the Department of Social Work Education.

Expected changes the study team examined include reductions in financial aid, which may have a dramatic economic effect on many low-income families and the cities in which they reside.

The major objective of the project was to predict the effects of welfare reform on the agricultural economies of these cities. Researchers hypothesized that certain aspects of welfare reform may affect agricultural labor supply by increasing incentives for some welfare recipients to enter the

See Study, Page 8



ARI opportunities attract students

Youthful researchers play significant role in day-to-day project operations

When Fresno State student Xavier Arellano decided in 2001 to pursue an agricultural degree in plant science, he knew he would be spending a lot of time studying and learning about plants and their growth cycles.

He didn't know he would gain work experience as an assistant in one of the most important areas of water and plant science research in California in this century – irrigation water quality on the San Joaquin Valley's West Side.

Through an applied research program encouraging collaboration between California State University, Fresno; the U.S. Department of Agriculture; other universities, agencies and private industry, Arellano has been able to team with doctoral-level scientists to conduct research supporting California agriculture.

Base funding for the research comes from the California State University Agricultural Research Initiative (ARI), approved by the California State Legislature and the governor four years ago. ARI provides \$4 million per year for agricultural and natural resources research. To be approved and funded, project proposals must obtain matching support from other state, federal, and private sources.

The ARI program is administered by Fresno State's California Agricultural Technology Institute (CATI).

The project Arellano has assisted with is overseen by USDA research scientist James Ayars, in partnership with David Zoldoske, director of Fresno State's Center for Irrigation Technology (CIT). The study addresses "Integrated Management of Irrigation and Drainage



Systems on the West Side of the San Joaquin Valley."

Agriculture in the once prime West Side region has been diminished due to a thick sub-layer of clay soil which prevents irrigation and drainage water from percolating down into deeper layers. Naturally occurring elements such as salt, selenium and boron are also prevented from percolating and instead collect in high concentrations in the topsoil layer.

For one phase of his project, Ayars set up 36 column lysimeters to measure the growth rate of alfalfa under different soil conditions and irrigation regimes. The lysimeters are made from PVC plastic and are 1.5 feet in diameter and five feet high. They are filled with soil and planted with alfalfa or other crops. Groups of lysimeters are irrigated with varying concentrations of saline water to determine how the crop performs.

The goal is to determine the regime that allows the greatest amount of saline water use with acceptable plant growth. The lysimeters are located at the USDA's San Joaquin Valley Agricultural Sciences Center in Parlier, California, about 15



Top photo: Student research assistant Xavier Arellano uses a laptop computer to download drainage flow data in the field. Left: A row of 36 column lysimeters enables researchers to test salt tolerance of various crops.

miles southeast of Fresno.

Arellano has assisted Ayars as a field technician, working from 20-25 hours during the school year and nearly full time in the summer. His duties have included weekly travel to the lysimeter site to take water use and plant growth readings. He has cut alfalfa and gathered soil samples, taken them to a laboratory, and conducted plant and soil analysis.

He has also done fieldwork on the West Side, using a laptop computer to download data from underground drainage water lines. He even participated in redesigning and re-installing the lysimeters when the original design proved inadequate for the data they were attempting to gather.

Arellano said he is considering a career in production agriculture, perhaps specializing in irrigation, after he obtains his bachelor's degree.

"This has been a great opportunity for me," he said. "I've learned a lot about soil properties and interaction between water and soil."

Ayars said the benefits of student assistants in research go both ways. First, the lead researchers get help they

See Student, Page 7

Center for Agricultural Business

Remote sensing guides PGR application on cotton



A recent study of plant growth regulator use on cotton indicates that the costs of using remote sensing technology to control application may prove to be lower than simple blanket application over the entire field.

The experiment was conducted last year through a joint effort of the Center for Agricultural Business (CAB), NASA, the USDA, and the Institute for Technology Development, a nonprofit research group studying commercial applications of remote sensing technology for agriculture. Private industry collaboration was provided by Sheely Farms of Kings County, which hosted the trials on cotton planted in California's southern San Joaquin Valley.

CAB Director Mickey Paggi and senior research economist Fumiko Yamazaki provided economic analysis for the experiments, which featured the use of field images recorded from an airplane as a guide for application of

plant growth regulator on the cotton.

"Chemical plant growth regulator is commonly applied to cotton to increase yield by redirecting plant growth from the vegetative leaves to the boll," Paggi said in explaining the study. Most growers simply make a blanket application based on the recommendations of a crop consultant. Since an entire field of cotton rarely exhibits completely uniform growth characteristics, uniform PGR treatment inevitably results in

tion. The variable rate treatment employed varying application rates across the treatment block. The experiment also included treatment blocks of blanket 100 percent PGR application and blocks of no application whatsoever.

In a growing season that proved to be excellent for no PGR application, the experiment's net profit results nevertheless showed that site-specific application of PGR, even with the airborne imagery expenses factored in, was 19 percent less

"There is a promise of a more effective and efficient application of Pix[®] in cotton through the use of remotely sensed imagery."

over-application in some areas and under-spraying in others.

"The objective was to try to reduce chemical input of PGR while maintaining or exceeding yields of normal 100 percent PGR application through site-specific and variable rate applications based on imagery," Paggi said.

The research team used multi-spectral imagery recorded from the air to determine plant growth characteristics across the entire field. Using actual plant samples taken by field scouts, researchers correlated the image data and from that determined variable and site-specific applications of plant growth regulator. The prescribed applications were made using GPS technology on board a tractor and spray rig.

The site-specific treatment featured either 100-percent application or none, depending on the image-based prescrip-

tion. The site-specific treatment reduced chemical application by more than 50 percent with no significant difference in yield, Paggi reported.

While this was only a one-year study, the numbers indicate "a promise of a more effective and efficient application of Pix[®] in cotton through the use of remotely sensed imagery," Paggi said.

A second year of study is under way, Paggi added. Meanwhile, a detailed report of the first-year methodology and results has been published and is available from Fresno State's California Agricultural Technology Institute.

Titled "The Economics of Image-based, Variable Rate Plant Growth Regulator Use in Cotton," the report may be viewed on the CAB website at cati.csufresno.edu/cab. Print copies also may be ordered using the form on Page 7.

Upcoming events

July 25 – Farm Worker Motor Vehicle Project Media Kick-off from 9:30 to 11 a.m. at Fresno State's Smittcamp Alumni House. For details call 559-278-4405

Aug. 19 – Farm Labor Contractor Education Institute (in English and Spanish) in Moreno Valley, California. Call 559-278-4405 for info.

Sept. 17 – Farm Labor Contractor Education Institute in Santa Maria, California. For more info call 559-278-4405.

Sept. 23 – Agricultural Safety Program – Supervisor Safety Training in Santa Maria, California. Call 559-278-4405 for details.

Center for Irrigation Technology

Soil salinity mapping expected to aid growers

CDFA agrees to support additional studies in vegetable crop areas

Soil salinity studies conducted by specialists from the Center for Irrigation Technology (CIT) will continue over the next three years with funding support from the California Department of Food and Agriculture.

According to CIT Director David Zoldoske, initial research led by soils specialist Florence Cassel Sharmasarkar has proven the potential of a new method for measuring soil salinity over broad areas and presenting the data in graphical format to growers.

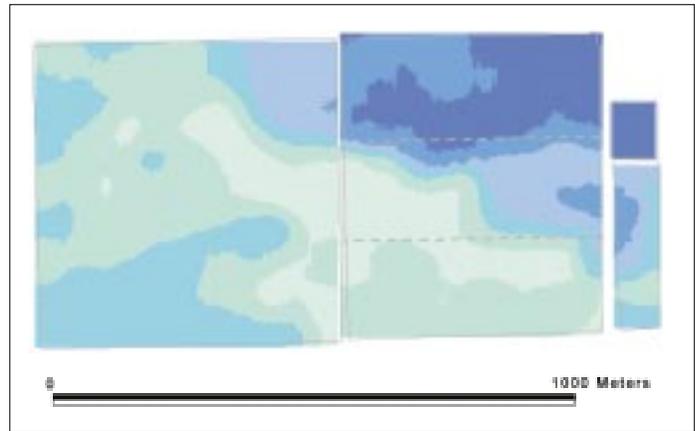
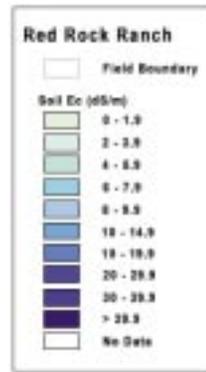
The mapping method uses a special instrument for measuring soil electrical conductivity in combination with satellite tracking technology (GPS) and custom computer software to produce a

“This information provides a way for growers to manage their land in regards to crop selection, irrigation and drainage practice.”

graphic representation of a field. The display uses colors to indicate soil salinity levels.

“This information provides a way for growers to manage their land in regards to crop selection, irrigation and drainage practice,” Cassel said.

The study began two years ago with a grant from the CalFed program, a partnership between California and federal water agencies aimed at solving water and drainage problems in California, especially in the West Side San Joaquin Valley. The buildup of salt, selenium and boron in the soils of that



Surface contour map above shows salinity distribution of two quarter sections of John Diener's Red Rock Ranch in the western San Joaquin Valley. Darker colors indicate higher soil salinity levels. Areas in upper right and extreme right are planted to salt-tolerant crops and halophytes.

area has made much of the ground unsuitable for farming. With problems appearing only to increase, entities such as CalFed, the CDFA and California State University, Fresno are joining to support research that may bring solutions.

One approach being tried (and evaluated through the soil salinity mapping project) is called integrated on-farm drainage management (IFDM), which features the re-use of irrigation water several times, with the collected drainage applied after each use to a crop that is more salt tolerant.

A typical progression, Cassel explained, is to apply water first to salt sensitive crops such as vegetables, then to less sensitive crops such as cotton or grasses, then to highly-salt tolerant crops called halophytes (atriplex, saltgrass), and finally into a collection facility where the water is evaporated and the dry salts collected for sale or disposal.

The key benefit to soil salinity mapping is its ability to provide a graphic image of an entire field or area, giving growers timely feedback on how well their IFDM system is working.

“Knowledge of soil salinity distribution at the farm level will be critical to evaluating the effects of the new practice and maintaining crop productivity,”

Cassel said.

The new three-year mapping project, funded through the state's Buy California Initiative, will enable Cassel to partner with specialists from the California Department of Water Resources, the Westside Resource Conservation District and the Westlands Water District to map soil salinity in prime vegetable crop areas. Vegetables in general are the most sensitive of all crops to salt buildup in the soil.

Details from Cassel's preliminary study are available in a report entitled “Assessing Spatial and Temporal Variability of Soil Salinity on Farms Implementing Integrated Drainage Management Practices.” The report is on the CIT website at cati.csufresno.edu/cit. Print copies may be requested by using the order form on Page 7.

Upcoming events

July 10 – Agricultural Pumping Efficiency Program seminar from 11 a.m. to 1 p.m. in Half Moon Bay, California. Contact Tim Frahm at (650) 560-0232 for details.

Aug. 14 – Agricultural Pumping Efficiency Program seminar from 8:30 a.m. to 1 p.m. in Atwater, California. Call (559) 278-2066.

Rootstocks: Data collection on growth, yield to begin next year

from Page 1

With funding support from the California State University Agricultural Research Initiative (ARI) and the table grape industry, Badr and his research team selected nine rootstocks for planting on the Fresno State vineyard. They include Freedom, Harmony, Salt Creek, 1103 Paulson, C1616, SO4, and three new USDA selections (10-17A, 10-23B, and 6-19B) that have broad-spectrum resistance to several nematode species.

The test plots included five table grapes cultivars (Crimson, Autumn Royal, Princess, Sweet Scarlet and new experimental red seedless selections) that were grafted on each of the nine rootstocks. According to Badr, the goals of the research are 1) to evaluate the effect of rootstocks on vine growth, yield, and fruit quality of the new table grape cultivars and selections; 2) to determine the influence of rootstocks on the nutritional status of the vines; and 3) to determine the effect of rootstocks on the population dynamics of nematodes and phylloxera in the test plots. Un-grafted vines are used as a control treatment.

Initial plantings of the grafted vines were done in 2001, with additional plantings made last year. Vine training and development is continuing this season, with data collection on growth and yield expected to begin in 2004. That will be none too soon for growers, with a possible ban on methyl bromide looming as soon as 2005, Badr said.

Overhead photo shows first- and second-year plantings of experimental vines on Fresno State's university farm laboratory.



“When it comes time for growers to replant vines, there will be no room for guesswork on proper rootstock use, since the cost of establishing a new table grape vineyard ranges from \$9,000 to \$12,000 per acre,” he noted. “This research is designed to address this problem by providing table grape growers in the San Joaquin Valley with scientifically based information to assist them in selecting the appropriate rootstock for new varieties.”

Teaming with Badr in the selection and evaluation of rootstocks and varieties is USDA geneticist David Ramming of the San Joaquin Valley Agricultural Science Research Center in Parlier, California. In addition to ARI, funding and materials support for the project have been provided by Duarte Nursery Inc. and a trellis system funded in part by local table grape growers.

Badr presented preliminary information on vine growth and development at Fresno State Grape Day and the American Society for Enology and Viticulture's annual meeting last year. An update is planned for Fresno State Grape Day in August 2004. For details on other research and events sponsored by Fresno State's Viticulture and Enology Research Center, visit the center website at cati.csufresno.edu/verc.

Researcher compares methods for analyzing nitrogen in grape juice

Fresno State chemistry professor Barry Gump has recently completed a study of methods for measuring nitrogen content of grape juice. Nitrogen is a key element necessary for successful fermentation of juice into wine.

The four common methods for measuring nitrogen content include Formol titration, two spectrophotometric methods, and a high-performance liquid chromatography method.

The Formol method already is used extensively, but it was analyzed to determine correlation with other methods. If correlations were found to exist, winemakers would gain a better understanding of each method's results in comparison to the others. This in turn would provide winemakers with more options in juice analysis.

Research data demonstrated the comparability of the Formol, OPA, and HPLC methods for nutritional nitrogen analysis, Gump concluded from his research. Details of the work are contained in a report published by the California Agricultural Technology Institute under the project title “Nutritional Status of Grape Juice as an Indicator of Wine Quality” (ARI Project #00-2-022).

To view or download the report, visit the California State University Agricultural Research Initiative (ARI) website located at ari.calstate.edu. Look under “Funded Projects” and choose the Research Focus Area: *Production and Cultural Practices*.

Project funding was provided by the CSU Agricultural Research Initiative, the Virginia Wineries Association and the American Vineyard Foundation.

JULY 2003



CIMIS

California
Irrigation
Management
Information
System

Quality control flags assist CIMIS data users

The California Irrigation Management Information System (CIMIS) collects weather data from all over California using pyranometers, anemometers, wind vanes, rain gauges, and temperature and relative humidity sensors. Some of these measured weather parameters are used to estimate reference evapotranspiration (ET_o). ET_o and the weather parameters are used for planning, design, and management of irrigation systems and many other applications statewide. Therefore, it is essential that the data be as accurate as possible.

CIMIS has developed a stringent quality control (QC) criterion to help its users identify potential data quality problems. Problems with CIMIS data quality can be due to sensor malfunction, sensor deterioration, unexpected obstruction of sensors, abnormal weather, and communication problems between the datalogger and the central computer. Missing and questionable data are flagged by the CIMIS QC.

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

Although flagging is automatic, it is regularly monitored by the CIMIS staff. If data is missing because of sensor malfunction or communication problem, corrective measures are taken as soon as it is practical. Such measures include replacing problematic sensors and repopulating the data by downloading from the datalogger, when possible.

However, there are circumstances where the weather data is available but of questionable quality. CIMIS utilizes statistical and scientific tools to identify such data. Once identified, the data is flagged and stored in the CIMIS database. Users make their own decisions regarding whether to use the flagged data. It should be noted that flagging data does not necessarily imply erroneous data as it can very well be

because of extreme weather conditions. However, determining whether the data is flagged due to sensor problem or extreme weather phenomenon is not an easy task. The following simple steps can help users make such decisions:

- Check whether the data for related sensors at the same station are also flagged. For example, an increase in solar radiation at the surface usually increases air temperature. Therefore, if solar radiation is flagged as “extremely out of range,” it is likely that air temperature has either been flagged or has significantly increased for that time period.
- Compare the flagged data from the station with nearby stations that have similar microclimates. Although some weather parameters can vary within short distances depending on weather, others remain similar over large areas.
- Contact CIMIS staff.

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.

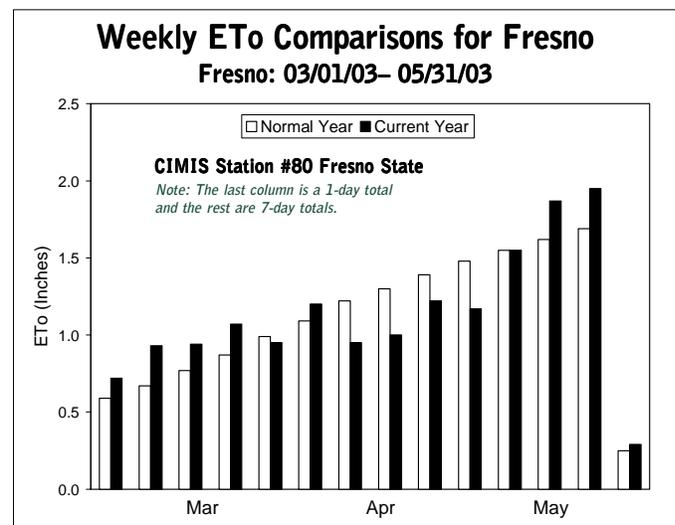


Chart shows ETo variation from normal over last three months.

Student: Lower-cost labor helps keep project costs down

from Page 2

need for labor-intensive fieldwork, at a reasonable price. Second, the students get valuable training in research and work experience.

"The students get out into the fields on a larger farm and really see what's going on out there, and they gain confidence when they start seeing the application of their school work in the field," Ayars said.

Arellano also took an additional academic step that netted more positive results. He teamed with two other students to develop a science poster of project work and presented it at the American Society of Agronomy statewide conference held in February in Sacramento. His poster won first place (and \$150 in cash) in the student competition.

Ayars hopes to continue at least one more season of tests in the alfalfa study to help confirm data already obtained. Once the research is concluded, he plans to compile a set of irrigation management strategies that include a crop coefficient and other information that will help West Side growers produce alfalfa, as well as other crops, in saline soils.

Most research projects funded by ARI involve a principal investigator from a university such as Fresno State, CSU Chico, Cal Poly Pomona, or Cal Poly San Luis Obispo. Cooperators join from other universities and agencies such as the USDA, NASA, the U.S. Forest Service, the California Department of Water Resources, and from private agricultural businesses.

Project results are typically shared through workshops, seminars and publications hosted and produced by researchers from the USDA, Fresno State and other universities. For more information on ARI research, visit the website at ari.calstate.edu.

Legislators seek additional federal funds for water center

Central California congressional representatives continue to solicit needed financial support for the International Center for Water Technology (ICWT) through federal appropriations legislation.

Newly elected representative Devin Nunes, who represents the geographical district that includes the main campus of California State University, Fresno, led a

and Fresno State also are supporting development of the ICWT.

A key function of the Phase I facility will be to provide testing and certification services. The planned Phase II facility will support education, cooperative marketing services, and technology demonstration related to water technology and management.

The physical plant is to consist of a

Center for Irrigation Technology

recent petition of the House Appropriations Committee for \$6.18 million to complete phase two of the ICWT, to be located on the Fresno State campus. Joining Nunes in the House petition were veteran representatives Dennis Cardoza, Cal Dooley, George Radanovich, and Bill Thomas. Senator Barbara Boxer has also submitted a petition with similar language for support in the Senate.

Efforts by Radanovich, Thomas, and Dooley already helped secure \$1.8 million in federal funds to begin first-phase establishment of the planned \$40 million facility. The San Joaquin Valley Water Technology Cluster, the Fresno Area Workforce Investment Council,

building complex with an exposition center, conference rooms, testing and training facilities, and offices.

Once the center is operating, income will be generated from industry support, grants for various projects, and from fee-based services such as research, testing, conferences and trade shows, and memberships.

Center for Irrigation Technology Director David Zoldoske has been appointed interim director of the ICWT. Architectural design for the facility is under way, Zoldoske said.

Persons interested in supporting the project are encouraged to call the ICWT phone line at 559-278-2066.

Publications available

Update:
Summer 2003

(These publications may be viewed in their entirety on CATI's World Wide Web pages, located at cati.csufresno.edu. Single print copies are also available by mail at no charge.)

- r **The Economics of Image-based, Variable Rate Plant Growth Regulator Use in Cotton**, by Matthew Bethel, et al. CATI Pub. #030602.
- r **Assessing Spatial and Temporal Variability of Soil Salinity on Farms Implementing Integrated Drainage Management Practices**, by Florence Cassel Sharmasarkar, et al. CATI Pub. #030603.

Ordering Information:

Check the publication(s) desired and mail or fax form to:

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Study: Reforms to aid programs suggested

from Page 1

agricultural labor force and by reducing long-term support for current seasonal workers.

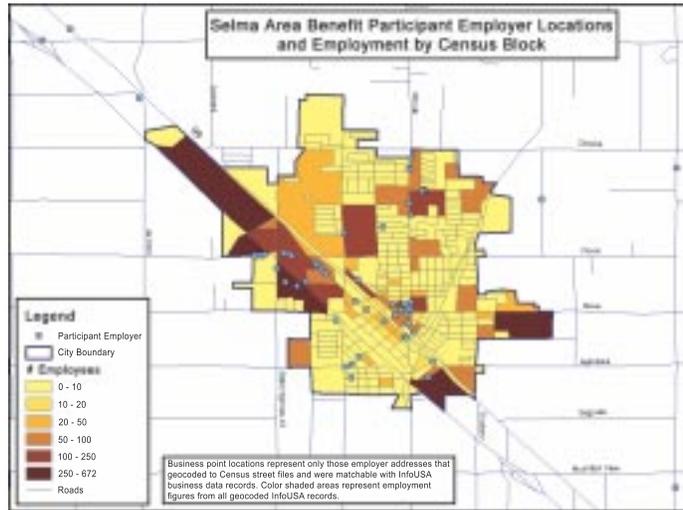
Another factor considered is the possibility of state support for subsidized childcare being reduced, resulting in a negative economic impact in small communities as families are forced either to rely on informal child-care or remain out of the agricultural workforce.

Research team leaders formulated three basic questions: How much of an economic effect will these anticipated changes have? When will these effects be felt? Who will feel them?

Study results were obtained by making predictive calculations of economic data, in collaboration with the Fresno County Department of Employment and Temporary Assistance.

Results showed that there is an important difference between the economic effects of the loss of public welfare benefits for individual families and the effect upon industry or the economic infrastructure of either the cities or the county. The effects of such losses on individual families may lead to increased hunger, turnover among low-income families, and possible out-migration.

Furthermore, the study showed that



Sample map from Mark Hanna's report illustrates the strength of the economic corridor that extends from the northwest to the southeast along Highway 99 in Selma, California. Darker color sections denote areas with the highest concentrations of employment.

seasonality of employment earnings is vastly significant. Results underscore the importance of income and food stamp supplementation during the fall and winter months when earnings drop by more than one third. There is a need for long-term investment in public employment, feeding, and health care resources to provide security during off-season periods, researchers said.

Funding for this project was provided by the California State University Agricultural Research Initiative (ARI) and by the Fresno County Human

Services System.

Additional results are provided on the ARI website located at ari.calstate.edu. The project may be found under "Funded Projects" (Research Focus Area: *Public Policy*) by the title, "The Selma/Parlier Project: The Economic Impact of Welfare Reform and Child Care Access on Selected Rural Cities in the Central Valley" (ARI Project #01-1-009).

For more details, Hanna may be contacted at the Department of Social Work Education at 559-278-3992.

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

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