



Annual Report, 2004

Agricultural Experiment Station at Colorado State University

It is a pleasure for me to present the annual report for the Agricultural Experiment Station at Colorado State University. Through this report, it is our desire to share the exciting and dynamic aspects of the research conducted by a selected group of the more than 150 ongoing research projects supported by the Agricultural Experiment Station.

As an integral component of a land-grant university, the Agricultural Experiment Station is committed to conducting research on the agricultural and natural resource needs of the people of Colorado. Our mission is to conduct research that addresses the economic viability, environmental sustainability, and social acceptability of activities impacting agriculture, natural resources, and consumers in Colorado. The Agricultural Experiment Station research efforts extend across the entire campus, involving faculty and staff from more than 15 academic departments in 7 colleges. In addition to projects conducted by faculty located at the main Colorado State University campus in Fort Collins, we have a network of off-campus research centers conducting research to meet agricultural production needs in different regions of the state. To address the complex problems facing agriculture, it is essential that academic departments and off-campus research centers work in concert with each other to solve problems through interdisciplinary efforts.

Many of the research projects described in this report receive significant support from state, regional, and federal funding agencies. Each year the Agricultural Experiment Station compiles a report on external funding of our

agricultural and natural resource research program. The total external funds received by our faculty exceed \$20 million per year. Thus, funds provided by the state of Colorado leverage at least a two-fold increase in external support for our research programs. We are proud of our faculty and their abilities to conduct relevant and important research.

This annual report was a joint effort with Cooperative Extension at Colorado State University. Because the research and education linkages are fundamental to a land-grant university, we felt it important to highlight that connection and the collaborative efforts that result in relevant and effective programs. Milan Rewerts, director of Cooperative Extension, and I encourage your review of the joint efforts between Cooperative Extension and the Agricultural Experiment Station. We are committed to conducting relevant research programs through faculty and staff supported by the Agricultural Experiment Station and subsequently providing information and education across the state through the Cooperative Extension network to bring educational resources and information to help Coloradans solve problems. We, as always, invite your feedback and comments.

I hope you enjoy this report. Please contact me if you have any questions concerning any of the research programs supported by the Agricultural Experiment Station at Colorado State University.

Lee E. Sommers
Director
Colorado Agricultural Experiment Station
E-mail: lee.sommers@colostate.edu

It is essential
that academic
departments
and off-campus
research
centers work in
concert to solve
problems.

**Colorado
State
University**

Knowledge to Go Places

Colorado Agricultural Experiment Station Funding for Fiscal Year 2004-2005

The Agricultural Experiment Station at Colorado State University is funded by appropriations from the Colorado legislature through the Colorado Commission on Higher Education, from the federal government through the United States Department of Agriculture and from self-generated income through the sale of commodities. The relative amount of each funding source is shown in the chart.

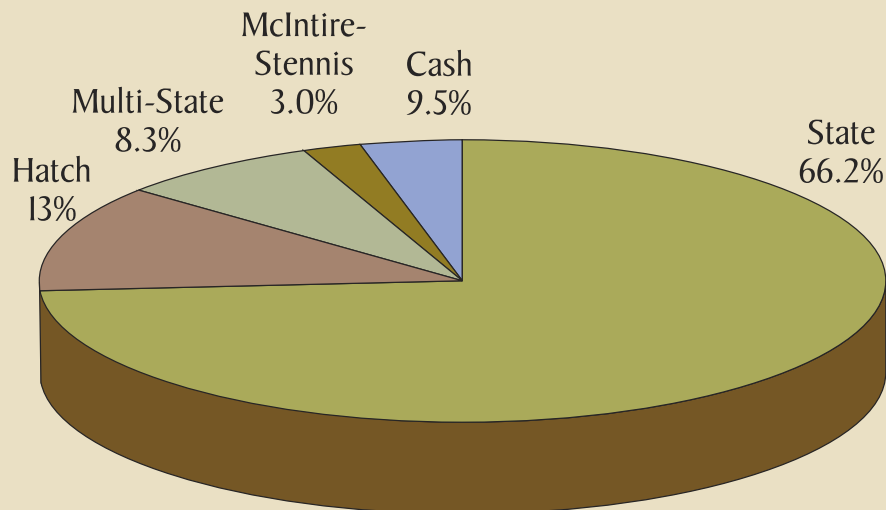
- State – Funds appropriated by the Colorado legislature and allocated to Colorado State University by the Commission on Higher Education.
- Hatch – Funds appropriated by the federal government to each land-grant university for support of a base research program in agriculture and natural resources. These funds were authorized by the Hatch Act of 1887, as amended by the Agricultural Research, Education, and Extension Reform Act of 1998 and administered by the Cooperative States Research, Education, and Extension Service of the United States Department of Agriculture. The funds are prorated to each state based on a formula that includes several factors such as rural population and number of farms.

- Multi-State Research – A portion of the Hatch funds are mandated by Congress to be applied to research problems that are regional in nature and involve the efforts of several states. Funds are administered the same as Hatch funds.

- McIntire-Stennis – Funds appropriated by the federal government to support research in forestry and forest resources. Funds are administered the same as Hatch funds.

- Cash – Funds originating from the sale of goods and services associated with Agricultural Experiment Station programs. Commodities sold include crops and livestock, which are by-products of applied research programs conducted at research centers.

In addition to the above direct funding sources, scientists supported by the Agricultural Experiment Station are active in securing contract and grant funding from numerous private sources, as well as state and federal agencies. In the 2003-2004 fiscal year, contract and grant funding from these external sources contributed in excess of \$20 million of support to our research programs.



Total Budget: \$11,531,785



Storming the State

Volunteers Recruited and Trained to Help Measure Precipitation

Nolan Doesken uses a frosty pay phone near a general store in Lake County, Colorado, to call in about his work with the Colorado Climate Center. He's on the road storming the state for volunteers for the Community Collaborative Rain, Hail, and Snow Network (CoCoRaHS), a group of lay people who report on precipitation from locations around the state. Doesken, a senior research associate, and his colleague Roger Pielke, professor and state climatologist, piece together information gathered from low-tech projects like CoCoRaHS and high-tech automated weather stations to create a detailed picture of Colorado's complex weather patterns.

The CoCoRaHS project represents the largest network of weather observations in the state. More than 2,000 volunteers have been recruited and trained to measure precipitation for the program. Doesken says, "CoCoRaHS is a kind of weather family. The volunteers span generations. Just yesterday in Montrose, we had a grandfather and grandson team up." After their training, the volunteers receive e-mail that keeps them abreast of how water shortages and excesses are impacting different areas of the state. CoCoRaHS was founded in 1998, with the support of the Agricultural Experiment Station and Cooperative Extension at Colorado State University, in response to the Fort Collins flood of 1997. More recently, the program has played an important part in quantifying drought.

The Colorado Climate Center uses the measurements taken by CoCoRaHS along with data from the more than 50 automated weather stations and collected by dozens of National Weather Service cooperative observers to monitor the state's weather.

These networks, along with data from other organizations, allowed Doesken, Pielke, and research coordinator Odie Bliss, as well as other Colorado Climate Center staff and Colorado State University researchers, to respond quickly to the recent drought. Research was made available via the Internet, articles were written, and interviews were given.

"Prior to the drought, the message that we'd been trying to send was that drought is a regular part of life in Colorado. Severe drought is not the once-in-a-lifetime event in any location in the state. Rather, it's the kind of thing that at any location in the state takes place several times in a lifetime. But every drought has a different shape. The one we've just experienced covered the entire state. That's why it hit the headlines, and that's why our message is getting more attention," Doesken asserts.

In researching drought, Pielke says that the Colorado Climate Center has found that as a result of population growth and competition for water "we are more vulnerable today to drought than we would have been if the same precipitation deficits had taken place in the past. Our recommendation is to develop and use our water resources as efficiently as possible in order to reduce this increased risk." Pielke and his team also have done research that shows that the impact of drought is dependent on the effected person, community, or industry. The researchers have developed a color-coded system that shows the impacts from minimal to severe in Larimer County.

Doesken uses agriculture as an example of how weather data are being used to help manage precious water resources more wisely:

Weather
measurements
are used to
determine water
efficiency for
growing crops.

**Colorado
State**
University

Knowledge to Go Places

"In the past, researchers were gathering data to see how much water is lost in transpiration from plants or to evaporation from soils, but now weather measurements are used to determine the best estimates of how water can be used efficiently for growing crops in Colorado. That's one of the reasons for the existence of CoAgMet, the Colorado Agricultural Meteorological Network."

CoAgMet is a joint venture between Colorado State University plant pathology Extension specialists, the Agricultural Research Service Water Management Unit of the United States Department of Agriculture, and dryland agricultural research and involving Extension specialists, some county agents, and a number of other collaborators. It is devoted to collecting localized weather data in irrigated agricultural areas. The Colorado Climate Center has made CoAgMet data available to users via the World Wide Web at <http://ccc.atmos.colostate.edu/~coagmet>.

Weather data also is being used to take a long view of climate issues. Pielke has been at the forefront of investigating issues like the effects of changes in land use on Colorado's climate. Using data and models, he has ascertained that the presence of large

irrigated areas (both lawns and agriculture) in parts of the state have significantly modified weather and climate in these areas. Pielke says, "Many summer days are cooler but more humid and nights are warmer than they would be with the natural landscape of the region."

The Colorado Climate Center monitors climate using a variety of low- and high-tech programs in order to investigate the complex interactions between atmosphere, oceans, continental glaciers, land, and vegetation with the hope of reducing the state's vulnerability to climate variability and change.

The magazine *Colorado Climate* is published four times per year in order to disseminate the climate center's latest studies as well as summaries of recent climate. A subscription form for the magazine is available online at <http://ccc.atmos.colostate.edu/magazine.php>.



Annual Report, 2004

Agricultural Experiment Station

Colorado State University
16 Administration Building
3001 Campus Delivery
Fort Collins, CO 80523-3001

www.colostate.edu/Depts/AES
Phone: (970) 491-5371
FAX: (970) 491-7396

The Historical Record

The Fort Collins Weather Station, located on the Colorado State University campus just north of the new transit center, is aging well. Looking at the shiny new fence that surrounds the well-maintained weather equipment, it would be hard to guess that the weather station has been operating without interruption since 1889.

Every 10 minutes, automated measurements of temperature, humidity, wind speed and direction, pressure, solar radiation, and soil temperatures are taken at the station. Every 12 hours, precipitation, snowfall, cloud and sky conditions, visibility, evaporation, winds, temperature, humidity, and other standard variables are measured manually. Some of the techniques used for collecting the data have changed over the years. For instance, soil temperature used to be measured by inserting giant thermometers into the ground, and solar radiation wasn't accounted for at all. However, a number of weather observations are made in very much the same way they were a century ago. These traditional methods maintain consistency, ensuring that measurements don't change with a change in instruments.

In recent years, the construction of the new campus transit center placed the historic station in danger of being dismantled and moved. Fortunately, advocates of the station pointed out the unique quality of the station's historical record. The station at Colorado State and a station in Rocky Ford have produced the longest uninterrupted weather records in Colorado.



Predicting Profit

Identifying Economically Relevant Traits with a Measurable Indicator

It's no secret that cattle ranching can be a hard, high-risk business. The rancher is at the mercy of everything from weather to market forces, but a team of researchers at Colorado State University is dedicated to taking some of the risk out of ranching by identifying economically relevant genetic traits in cattle and simulating the results of management decisions for individual ranchers. Mark Enns, assistant professor, and Dorian Garrick, professor of animal sciences, and their research team have developed a decision support system (DSS) to help ranchers choose cattle with genetic traits that will make ranches money over the short and long term.

The DSS is the latest in a line of groundbreaking tools that have been developed by the Agricultural Experiment Station at Colorado State University for evaluating Expected Progeny Differences (EPDs) in cattle. EPDs reflect the overall genetic merit or effects for traits in an animal's offspring. Seedstock breeders select individual animals for breeding based on what they think that animal will contribute to its offspring. Historically, EPDs often were identified on an ad hoc basis without concern for whether the identified traits directly impacted profit, but recently Enns, Garrick, and their colleagues have concentrated on identifying what they call "economically relevant traits" – traits that directly affect profitability by being associated with a specific cost of production or an income stream. Each trait is associated with a measurable indicator or indicators. For instance, one economically relevant trait EPD is the probability of calving ease. The indicators for this trait are calving ease score, birth weight, and gestation score.

In the past, information on EPDs was primarily delivered to seedstock producers, but the DSS that Enns and Garrick have developed allows information for making management decisions to go straight to commercial producers. The DSS, in the form of a Web site, is being tested in prototype by producers now.

To use the DSS, ranchers must input their herd's information regarding production, management, genetics, and cost/income information. Production information includes details on the number of cows raised, weaning percentage, and calving problems. Management questions deal with whether the ranch breeds their own replacement females or whether they are bought, the cow per bull ratio, and how old cows are before they are removed from the herd. The genetics of the herd are determined by the breed or breeds used, the type of bull that is purchased, and the average EPD for the cows in the herd or the EPDs on the bulls they have purchased in the near past. Cost and income reflect how much a cow costs if it is added to the herd and the price the producer gets for calves. Feed requirements associated with maintaining the beef cow, which account for upwards of 70 percent of the costs of production, also are figured in by the DSS. The program allows the producer to select between choosing to operate at the optimal level of resources they currently have or to buy or lease more land or feed for their cows in the event the cow requires more feed due to genetic changes over time.

Using the information that the producer provides, the DSS simulates a base economic profile of the herd. Then the entire database of the breed association of their choice is

Use of a
decision support
system helps
ranchers use
cattle genetics
for profit.

**Colorado
State**
University

Knowledge to Go Places

pulled up so that producers can see what bulls and semen are available for purchase and at what cost. They then can use the DSS to simulate how the genetics of a herd are likely to change and the associated economic value of any change. By running different simulations, producers can choose which EPDs to emphasize in their herds or which bulls best meet their production system's needs. "This can be extremely useful, as some breeds have more than 20 EPDs to evaluate," Enns says. In the future, Enns anticipates that the DSS might be useful as a guide for producers who want to create specific markets for their beef.

What is next for EPD research? In addition to beef cattle, EPDs also are being used in the dairy and hog industry. Private corporations overseas are calculating their

own EPDs to use in managing deer herds, and Colorado State University is interested in researching equine EPDs.

For now, Enns is elated that the cattle industry as a whole is experiencing a boom. Despite the recent Bovine Spongiform Encephalopathy scare and the closing of markets in Japan and elsewhere, near-record high prices are being paid for calves, and farm incomes are hitting new highs. Even Colorado is bouncing back from the drought, which caused many producers to sell off their cattle. Enns who grew up on a farm in Oklahoma that raised cattle, wheat, and alfalfa, is excited about being in the forefront of research that could be so useful in maintaining the profitability of the United States cattle industry.



Annual Report, 2004

Agricultural Experiment
Station

Colorado State University
16 Administration Building
3001 Campus Delivery
Fort Collins, CO 80523-3001

www.colostate.edu/Depts/AES

Phone: (970) 491-5371

FAX: (970) 491-7396

Big Business

Facts about the Colorado beef industry:

- It is the largest component of Colorado agriculture.
- Colorado is home to approximately 3.3 million beef animals, valued at around \$2.3 billion.
- Large Colorado feedlots, with greater than 1,000 animal capacity, market approximately 2.6 million cattle annually.
- In any month, approximately 150,000 to 300,000 animals are marketed.
- Colorado is ranked tenth in the nation in overall cattle numbers.
- The cattle industry plays a major part in the economic health of almost one-third of Colorado counties.



The War on Terra

NASA Helping to Develop Technology to Detect and Prevent Spread of Invasive Species

Research scientist Thomas Stohlgren is drawing the battle lines to combat what he describes as the number one environmental threat of the 21st century – invasive species. More specifically, Stohlgren, an employee of the United States Geological Service (USGS), alongside Colorado State University Professor K. George Beck, are partners with the National Aeronautics and Space Administration (NASA) to map the presence of invasive plants across the United States.

Invasive plants cost the nation billions of dollars in damages. Some are poisonous to cattle and wildlife. Others compete with native plants and degrade the environment. It has been difficult to develop strategies to control these plant populations because they are poorly mapped and documented. This is where Stohlgren steps in. Using a combination of remote sensing (satellite images and aerial photography), high-performance computing, and new spatial models developed by Colorado State University in cooperation with NASA, Stohlgren and his team are able to identify where invasive species are growing and pinpoint potentially vulnerable areas.

The project began with what seemed like a modest goal: Catherine Crosier, a Ph.D. student, was hired to gather datasets on the top 25 weeds in Colorado. She soon found out that there were more than 40 different weed data services, including the USGS, wildlife refuges, and state heritage sites, that all were collecting data in different formats. Eventually, a team of researchers including Crosier and Stohlgren succeeded in combining the datasets and creating a predictive model.

To create the model, samples were taken by county weed coordinators and resource managers of different environmental areas in Colorado. The most dangerous species were identified, and areas vulnerable to invasion were quantified. It was necessary for the model to provide good predictions of where species are likely to invade because sampling is costly and almost impossible over such a huge area.

While looking at a colorful map that shows the web-like spread of the tamarisk along Colorado's waterways, Stohlgren says, "Our emphasis is on early detection and rapid response. We treat the presence of invasive plants like a wildfire. We look for where we can place containment boundaries and extinguish young populations like spot fires."

Tamarisk, or salt cedar, is one of Colorado's top ten invaders. It has pretty flowers but accumulates salt in its tissues and later releases the salt in the soil, making it unfit for many native species. Leafy spurge, Canada thistle, field bindweed, Russian olive, musk thistle, and knapweeds are also high on the list of plant invaders. "In the last century, many invasive plants used to come in to the country with forage seeds," Stohlgren says. "Now, horticulture often brings them in. Kudzu was brought in to stabilize soil in the southern United States. Tamarisk was brought in from Asia as an ornamental. Sometimes, it's like we're playing Johnny Appleweed."

Invasive plants like the same conditions that native plants do: high light, high water, high nitrogen. They are found in agricultural fields, along roads and disturbed areas, and in low areas in riparian zones and wetlands. Stohlgren says that one of the things that surprised him was how his research shows that

Our emphasis is on early detection and rapid response. We treat the presence of invasive plants like a wildfire.

Colorado State
University

Knowledge to Go Places

the rich just keep getting richer. "Areas rich in native species," he explains, "also attract more weeds. There's no sign of competitive exclusion: High plant diversity does not create an environment that precludes coexistence.



So far, there are few extinctions in these rich environments but lots of coexistence." Of course, this may change in the future. All sorts of things may change in the future.

Stohlgren warns that we are living in a time of "Darwin on steroids." Ecology seems to be moving at a faster pace than at any time in human history. "In response," he says, "we need to become much smarter faster." Stohlgren looks with hope towards an invasive species technology forecasting system that

NASA is helping to develop. "What seems impossible today will be possible tomorrow," he says. As an example of the way technology has helped to speed up the chase, Stohlgren points out that models that used to take

16 days to run on a workstation now take less than two minutes on the NASA/USGS supercomputer.

The threat of invasive species delivers a call for collaboration. Right now, Stohlgren and his team are responding with research that establishes the idea of a virtual institute where everyone – from Larimer County

junior high school students to Cooperative Extension, from the Nature Conservancy to the USGS – contributes. Each year, the Colorado Agricultural Experiment Station contributes about \$25,000 to this project, which leverages almost \$1.5 million per year from NASA. The findings of this cooperative effort are disseminated using scientific papers, Web sites, and training. Combining funds, expertise, and data is the only way to win the war.

Annual Report, 2004

Agricultural Experiment Station

Colorado State University
16 Administration Building
3001 Campus Delivery
Fort Collins, CO 80523-3001

www.colostate.edu/Depts/AES
Phone: (970) 491-5371
FAX: (970) 491-7396

One if by Land, Two if by Sea

Thomas Stohlgren likes to point out that invasive plants should be looked at as a part of a greater invasive species problem. "Compared to many invasive species, plants are more immediately identifiable and more easily controlled, but we need to remember that we're being invaded by a variety of species by land and by water. We all need to be vigilant."

Current invaders of concern include:

- Whirling disease – This parasitic infection attacks juvenile trout and salmon. Whirling disease has been found in 22 states including Colorado.
- Purple loosestrife – This highly ornamental plant from Europe can be seen along waterways throughout Colorado. When not controlled, a wetland can become a monoculture of loosestrife, impeding irrigation flows and endangering waterfowl habitat.
- West Nile Virus – In the past few years, Colorado has been the poster state for this invader. Humans, horses, and birds are most severely affected by the virus. In 2003, West Nile Virus killed 63 people in Colorado.



From the Ground Up

Carbon Sequestration and Healthy Soils Are Good for the Air

Keith Paustian's research has him covering a lot of ground. In the space of two weeks, Paustian, professor of soil science at Colorado State University, is speaking at conferences in the United States, Canada, and Central America. He is describing carbon sequestration, the buildup of the stock of carbon in organic matter in soils. Paustian is concerned with measuring how soil carbon is affected by land management and other environmental factors. His work contributes to guidelines that can help produce healthier soils and cleaner air.

Carbon dioxide (CO₂) is the most abundant of the greenhouse gases, and its level in the atmosphere has risen from a pre-industrial level of 280 parts per million to current levels of 395 parts per million. However, carbon dioxide is also necessary for plant life. It is taken up by plants through photosynthesis. When plants die, the carbon goes into the soil as organic matter. It is stored in the soil until the organic matter is broken down by microorganisms. As the microorganisms respire, carbon dioxide returns to the atmosphere.

In 2002, the United States Environmental Protection Agency claimed that CO₂ was the largest source of U.S. greenhouse gas emissions, accounting for approximately 80 percent of global warming potential weighted emissions. Most of the carbon is put into the atmosphere by burning fossil fuels. Agriculture is only responsible for a small portion of the carbon put into the atmosphere, but agricultural lands can play a significant role in temporarily offsetting greenhouse gas emissions by storing carbon in soil.

"The time during which carbon is stored in soil can vary from a few weeks to thousands of years," says Paustian. The chemical makeup of the soil, the variety of the plant material, climate, and land management can all contribute to how quickly carbon dioxide returns to the atmosphere. Carbon can't be held in the soil indefinitely. Soil sequestration is not a permanent solution to the carbon dioxide problem. "Soil is a holding tank," Paustian stresses, "but the size of the holding tank can be increased through certain land management practices."

Farmers can increase the amount of carbon going into soil by cultivating plants that have greater biomass and by planting cover crops. To slow the process by which carbon leaves the soil, they can seek out plants that have chemical components like high lignin and tannin contents that reduce decomposition rates.

Conservation tillage is another way that farmers can increase the store of carbon in soils. When soil is physically disturbed or mixed by tillage, the activity of microorganisms tends to increase, accelerating the return of carbon dioxide to the air. Conservation tillage is a broad term for a variety of farming methods aimed at reducing the intensity of soil tillage. Taken to the fullest extent, conservation tillage can mean no-till, a planting process that involves no plowing whatsoever.

In some cases, land managers may even choose to convert less profitable (and often highly erodible) croplands to growing trees or grasses. "Perennial grasses have a lot of biomass going into root development, which puts more carbon into soils," Paustian says.

More than a hundred years ago, when large-scale agriculture was introduced to the

Agricultural lands can play a role in offsetting greenhouse gasses by storing carbon in soil.

Colorado State University

Knowledge to Go Places

native prairie, soils in the United States began to lose large amounts of organic matter. "Soils were mined out, plowed, disturbed," Paustian explains. "Most cultivated soils have about half the organic matter they had originally, but in general, we are managing our soils much better than we have in the past."

One of the challenges that Paustian faces in developing carbon dioxide mitigation programs is the variability in the way that soils store carbon. Areas where rainfall is abundant and temperatures are moderate tend to accumulate carbon most rapidly. But the high land prices and the net returns per acre of these lands, which often are also very favorable for traditional agriculture production, mean that higher incentives may be needed to change to land management practices that foster carbon sequestration. Similarly, irrigated land can produce greater plant biomass, which adds large amounts of organic matter to the soil, but the power required for pumping irrigation

wells and the fertilizers added to crops, which can increase amounts of the greenhouse gas nitrous oxide (N₂O), may cancel out any positive impacts on carbon dioxide emissions. Recommended carbon dioxide mitigation programs must benefit the whole environment.

However, many farmers currently are using improved land management practices that promote carbon sequestration without receiving any direct monetary incentives. "Many of these practices just make farmers more competitive and pay for themselves over time," Paustian notes.



In some ways, the manner in which farmers have gone about adopting practices that enhance carbon sequestration in soils mirrors Paustian's own development as a scientist. "I was always interested in understanding what farmers need to know to keep soils healthy," claims Paustian. "It's just coincidental that practices that foster carbon sequestration and healthy soils are also good for the air."

Annual Report, 2004

Agricultural Experiment Station

Colorado State University
16 Administration Building
3001 Campus Delivery
Fort Collins, CO 80523-3001

www.colostate.edu/Depts/AES
Phone: (970) 491-5371
FAX: (970) 491-7396

Hitting the Ground Running

The United States Department of Agriculture estimates that the nation's cropland can sequester about 75-200 million metric tons of atmospheric carbon per year if current best management practices are implemented.

In 2002, the White House announced a plan to reduce the growth of United States greenhouse gas emissions. Part of the plan involves developing incentives for farm and forestland owners and managers to voluntarily adopt land uses and management practices that sequester carbon.

Managing lands to increase carbon storage can only temporarily offset greenhouse gas emissions, but it is possible that the advantages gained by implementing these land management practices can buy time to address the problem of reducing greenhouse gas emissions.



Home-Grown and High-Tech

Plasticulture Consists of Drip Irrigation and Plastic Mulch

It's been 40 years since Dustin Hoffman received the famous advice "Plastics" in the film *The Graduate*, but in agriculture, the advice still rings true. At Colorado State University's Arkansas Valley Research Station, research scientist Mike Bartolo is investigating plasticulture techniques that are transforming the area's vegetable production.

The Lower Arkansas Valley stretches from Pueblo on the west to the Kansas state line. It encompasses Bent, Otero, Prowers, and Pueblo counties as well as some areas in neighboring counties that rely on tributaries of the Arkansas River for irrigation. The major high-value vegetable crops that are grown in the region include peppers, melons, tomatoes, and onions. Many of these crops benefit from the area's natural conditions. The region has a fairly long growing season, and dramatic differences in the Valley's day and night temperatures can cause some vegetable crops to accumulate more sugar, making them extra tasty. Now plasticulture is helping farmers create an even better vegetable product. The area's signature crop, melons, illustrates the benefits of plasticulture technology.

For decades, the Arkansas Valley has been known for its delicious and juicy cantaloupes and watermelons. The town of Rocky Ford proudly declares itself the Melon Capital of the World and celebrates Watermelon Days along with the Arkansas Valley Fair in August, but the area is by no means the nation's biggest grower of the crop. "Areas in California and Texas outproduce us, but no one can top our quality," Bartolo says, and plasticulture makes the Rocky Ford melon industry more competitive.

"Plasticulture," Bartolo explains, "is a term that encompasses using plastic in various aspects of agriculture. In Colorado's Arkansas Valley, plasticulture primarily consists of drip irrigation systems and in some cases plastic mulch." In drip irrigation, small plastic hoses are used to deliver water directly to the root zone of plants, minimizing water lost to evaporation. In the Valley, the water that is used in drip irrigation is both well and surface water. Thus, equipment for pumping and filtering water also is needed to keep drip irrigation working properly. When cultivating melons or other crops, drip irrigation can ensure that the right amount of water is reaching a crop and little water is wasted. Also, fertilizers can be delivered directly through the drip system. "We're researching different aspects of drip systems now," Bartolo says. "Timing of the water applications is really important in maximizing yield and quality."

As for plastic mulch, "Melons love plastic mulch," Bartolo says. Plastic mulch helps with weed control, conserves water, and improves the quality of a crop that grows prone on the ground like melons. Best of all, plastic mulches warm the ground and extend the period during which a crop can be marketed. "Usually, the earlier in a season that we can get a crop to market, the more produce buyers are willing to pay for it. Growers can dramatically improve their yields, anywhere from 50-100 percent, by using plasticulture," Bartolo claims.

Of course, plasticulture and growing high-value crops involves enormous expense and huge risk for farmer. "There are some cost share incentives available from the United States Department of Agriculture for

Growers can dramatically improve their yields by using plasticulture such as plastic mulch.

Colorado State
University

Knowledge to Go Places

installing drip systems because they improve the region's water quality," Bartolo says, "but many farmers are just opting to make the change to plasticulture on their own. They see it as a way to stay competitive. These growers are very progressive: converting from furrow irrigation, looking at which crops work best, and using their limited water most wisely." Bartolo asserts that this forward-looking atmosphere makes the Valley an exciting place for research.

When asked about the specific problems confronting vegetable growers in the region, Bartolo has no problem reeling off a list of seven challenges: maintaining competitiveness in the face of increasing globalization and mobilization, labor issues, maintaining quality, pest management, hail storms, water shortages, and quality of water.



The latter refers to the area's problem with extremely saline water, an issue which Bartolo and his colleagues are researching with special attention to plasticulture. However,

despite the trials in the area, including recent drought and water sales, Bartolo feels that the Arkansas Valley is a hopeful place. "There's a lot of potential out there," he says.

Bartolo should know: he's a native of the region. He grew up on a small truck farm on the St. Charles Mesa east of Pueblo. "A feeling of kinship for the place and the people tie me to the area," Bartolo claims. He is happy

that his affinities for agriculture and science have allowed him to work on projects that might benefit the region. "The Arkansas Valley might not be the most classically scenic place in the world, but it grows on you," Bartolo says.

Annual Report, 2004

Agricultural Experiment Station

Colorado State University
16 Administration Building
3001 Campus Delivery
Fort Collins, CO 80523-3001

www.colostate.edu/Depts/AES

Phone: (970) 491-5371

FAX: (970) 491-7396

Colorado-Grown

Increasingly, consumers are seeking out locally grown products. The Colorado Department of Agriculture's program *Colorado Proud*, now in its sixth year, is one way that consumers can be made aware of locally grown, raised, and processed products and learn about the benefits of purchasing these products.

Colorado Proud members include farmers, ranchers, growers, and processors. Apples, milk, beef, melons, and wine are just some of the products labeled with the mountain and sun *Colorado Proud* logo. Grocery stores, notably Safeway and Whole Foods, have devoted special advertising campaigns to *Colorado Proud*, and a growing list of restaurants around the state are serving locally grown and raised food.

By selecting Colorado-grown products, consumers can help the state's economy, enjoy high-quality fresh foods, and help keep agricultural lands a part of the Colorado landscape.

For more information, see <http://www.ag.state.co.us/mkt/COProud/CO Proud Program.html>.



Teamwork Pays Off

Extension, Experiment Stations Merge Strengths to Meet Market Demands

When consumers in western Colorado shuck an ear of sweet corn and delight in the clean, bright kernels, they're witnessing the benefits of partnerships between Cooperative Extension and Agricultural Experiment Station (AES) at Colorado State University. That's because corn that's picture-perfect, disease- and insect-free, sweet, and delicious doesn't happen by accident. Rather, it's because of a long-standing and deliberate effort to prevent the corn from environmental hazards and to create optimum conditions for the highest-quality product possible.

While both Extension and AES may have similar expertise and knowledge, they fulfill different roles. Extension agents work in the field, side-by-side with farmers and ranchers to help identify any problems they may be having or to determine what problems might be developing that haven't yet materialized. Likewise, AES provides the scientists, equipment, and facilities necessary to conduct long-term controlled studies in response to data collected by the field agent. As they study pests, diseases, moisture, temperature, and soils under controlled conditions, they are able to discern the best herbicides, spraying practices, harvest times, packing methods, and more.

An example of the positive impact of these partnerships was recently played out in Mesa County. In 2001, a corn-loving pest called a sap beetle infested about 400 acres of sweet corn, wreaking havoc on the crops and adding up to a harvest loss of about \$500,000. Extension entomologist Bob Hammon, along with AES research scientist, Rick Zimmerman (Rogers Mesa), Fred Judson

(Fruita), and John Wilhelm (Orchard Mesa) began studying the beetle in controlled plots to learn how it caused the damage and how it could be controlled.

Within one year, they discovered that a change in the timing of chemical spraying could greatly reduce the impact of the beetle, and subsequently, thousands of acres of sweet corn were saved in future harvests.

Studies on how best to combat the sap beetle are ongoing, but even what the agents have gleaned so far has helped and given growers encouragement.

Olathe resident John Harold grows 1,400 acres of sweet corn, onions, and feed. "The folks at CSU have put a tremendous amount of research into insects and managing water and soil pH levels. They've also helped with EPA training and labor. What they do for us is so beneficial that if they weren't around, we wouldn't have half the success that we do."

Extension agronomist Wayne Cooley, with John Murray of the Natural Resource Conservation Service, recently put together growers, Extension agents, and scientists to help treat the pH levels in the soils and irrigation water around the Uncompahgre Valley where Harold farms. According to Rogers Mesa Experiment Station research scientist Ron Godin, high soil pH levels prevent plants from taking up adequate nutrition, so he is conducting the first year of a three-year study to remedy the problem by adding sulfur and compost to the soil and acidifying the irrigation water. Harold appreciates how the cooperative efforts between Extension, research station scientists, and other agencies are proactive, thus preventing future problems from occurring.

Growers,
researchers,
and Extension
agents work
collaboratively
to address
current
problems.

**Colorado
State**
University

Knowledge to Go Places

Sweet corn growers aren't the only people who benefit from this type of collaborative research. Studies are being conducted across the state to learn more about onions, alfalfa, canola, field corn, dry beans, mountain meadows, and small grains.



The small and controlled plots at AES research centers are excellent sites for many of the studies, but researchers also need multi-acre plots necessary for pesticide trials. In that scenario, area growers provide parcels of their own farmland for the projects. Pesticide studies are conducted to answer both immediate and long-term concerns so researchers can evaluate environmental impacts; how weather patterns effect the chemicals; the appropriate times and amounts to spray; and when or how pests and diseases develop resistance to the formulas.

In the end, the data gathered from these studies is communicated to pesticide manufacturers to help them create more effective pesticides; to chemical applicators for more efficient spraying; and to the producers themselves so they can yield the best possible crops and, therefore, reap the highest profits. With their involvement, producers become yet another partner in the efforts toward successfully managing agricultural lands and producing affordable and attractive food.

Similar partnerships abound involving a variety of projects which ensure that our food, environment, and backyards are healthy and beautiful. A sample of the kinds of work being conducted between Extension and AES agents include:

- offering technical training and hands-on pruning workshops for Colorado master gardeners,
- reclamation work on mill tailings in Leadville,
- training migrant workers for pesticide use and to understand worker protection standards, and
- educating ranchers on feed and pasture issues during times of drought.

In most cases, the team of agents and scientists from the different arms of the University relies heavily on producers, industry-related businesses, and even retailers. This promises that the tax dollars paying for the work will give farmers the greatest return on their investment and consumers the best, safest, and most affordable products and services.

– Leigh Fortson

Pictured on front: Brad Koch, Raj Khosla, and Bruce Bosley inspect corn near Brush, Colorado.

Annual Report, 2004

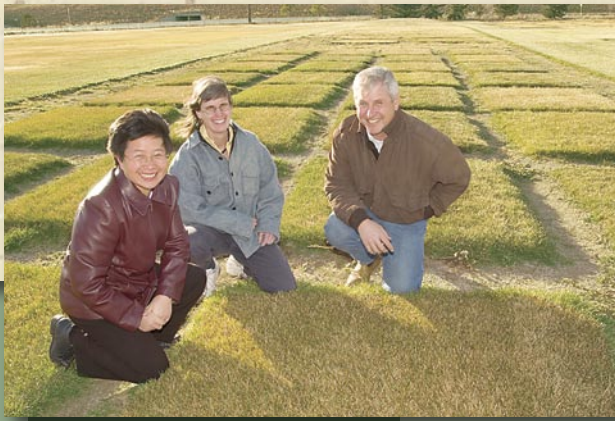
Cooperative Extension
Colorado State University
01 Administration Building
4040 Campus Delivery
Fort Collins, CO 80523-4040

www.ext.colostate.edu
Phone: (970) 491-6281
FAX: (970) 491-6208

Agricultural Experiment
Station
Colorado State University
16 Administration Building
3001 Campus Delivery
Fort Collins, CO 80523-3001
www.colostate.edu/Depts/AES
Phone: (970) 491-5371
FAX: (970) 491-7396

Cooperative Extension, Agricultural Experiment Station, and Growers Collaborate

It's not enough to plant a crop and hope for the best. Colorado State University capitalizes on Extension's ability to network and bring growers together with the scientists. With this union, Extension and Agricultural Experiment Station can look at how best to resolve the high pH levels in soils and irrigation water around the Uncompahgre Valley that prevent plants from taking up adequate nutrition. This kind of collaboration is being considered for studies with onions, alfalfa, canola, field corn, dry beans, mountain meadows, and small grains.



The Grass is Always Greener

Manure Generated by Cattle Enhances Gardens and Landscapes

Sunny and dry Colorado offers a great environment for raising cattle but can be a challenging place for growing a lawn. Colorado State University professor of soil science and Cooperative Extension soil specialist Jessica Davis, associate professor of turfgrass science and management Yaling Qian, and professor of animal science and Extension feedlot specialist Tim Stanton are working together to show exactly how the manure generated by cattle can enhance suburban gardens and landscapes. (Pictured from left are Qian, Davis, and Stanton.)

Nearly 89,000 acres of agricultural land are developed along Colorado's Front Range annually, and about one-third of this area, or 29,653 acres, is estimated to be planted with turf every year. Front Range soils naturally tend to be heavy and clayey, and are easily compacted during construction. They also tend to lose their topsoil, making them very difficult to landscape or garden. Compost can help restore these soils. "Composted manure is great for landscaping," Davis says. "Turf represents one potential high-value use for composted manure."

Davis and Qian, along with graduate student Grant Johnson, are studying the benefits of using manure as top dressing on turfgrass. They have concluded that compost application at a rate of 35 cubic yards per acre improved turf quality and increased clipping yield over no treatment at all, and two annual applications of manure at this level eliminated the need for synthetic fertilizer to maintain a good-looking lawn. As manure and compost are the best natural, organic sources of phosphorus for Colorado's high pH (basic) soils, applying composted manure rather than chemical fertilizers could be a very attractive

lawn care option for consumers interested in organic products.

The research team also is investigating how turfgrass top-dressed with composted manure responds to drought. A dry period was imposed on the turfgrass test plots. One week after the dry period had started, plots treated with 35 cubic yards per acre of compost had higher levels of soil moisture and lower turfgrass canopy temperature than untreated plots. The compost increased soil water-holding capacity and reduced drought stress on established turf. The compost treatments even helped one variety of turf, a drought-sensitive bluegrass, to maintain its quality during the simulated dry spell. "These beneficial results have important implications in Colorado, where water conservation is of critical importance," Davis says. "Homeowners and turf managers can conserve water and save money on their water bills."

To make manure safe for use in the landscape, it must be composted. "Composting is a managed microbial process," Davis explains. "The microbes need carbon, nitrogen, water, and oxygen in order to compost well. When the composting process proceeds correctly, temperatures will rise to 140 to 150 degrees Fahrenheit. These high temperatures kill pathogens and weed seeds in the manure. The entire composting process can take up to six months, depending on the intensity of the management."

However, even when composted correctly, some manure sources are better than others. Due to the diets of some animals in feedlots, some composts have relatively high levels of salt that can hinder seed germination and slow plant growth. The Colorado State University research team is addressing the problems

Homeowners
and turf
managers can
conserve water
and save money
on their water
bills.

**Colorado
State
University**

Knowledge to Go Places

posed by salts in manure. Stanton uses his role as Extension feedlot specialist to explore methods of reducing the amount of sodium in manure by changing the diets of cattle in the feedlot. The industry standard is to supplement the food of feedlot cattle with 0.25 percent sodium chloride. Stanton and the team compared cattle treated in this standard way with cattle that were given no sodium chloride, cattle that were offered free access to a salt block, and cattle that were given a 0.125 percent sodium chloride supplement. After feeding on these diets for six months, the cattle were harvested, and their carcasses were evaluated. The cattle with the different amounts of sodium chloride in their diets performed the same as the cattle fed the standard supplement when evaluated by average daily gain, feed intake, and feed efficiency. However, the sodium levels in the manure were significantly reduced by lowering the sodium chloride levels in the food fed to



the cattle. Therefore, removing salt from the rations of feedlot cattle could reduce sodium levels in manure and increase the horticultural value of manure without having detrimental impacts on cattle performance.

As the benefits of composted manure are proven to homeowners and landscape professionals, it is Davis' hope that the market for compost may rise, giving feedlot operators and small-acreage horse owners an incentive to compost manure. Manure shouldn't be a disposal problem as it sometimes is now, particularly when it has such high potential to keep urban and suburban landscapes beautiful.

– Leslie Patterson

Annual Report, 2004

Cooperative Extension
Colorado State University
01 Administration Building
4040 Campus Delivery
Fort Collins, CO 80523-4040

www.ext.colostate.edu
Phone: (970) 491-6281
FAX: (970) 491-6208

Agricultural Experiment
Station

Colorado State University
16 Administration Building
3001 Campus Delivery
Fort Collins, CO 80523-3001

www.colostate.edu/Depts/AES
Phone: (970) 491-5371
FAX: (970) 491-7396

Colorado State University Collaborates with Composters

In the past year, a group of local composters has joined together to form the Rocky Mountain Organics Council (RMOC). Their first order of business has been to develop compost quality standards to help consumers evaluate a compost and its potential uses.

Salinity levels are one of the key factors in evaluating compost quality. When salinity levels are too high, the RMOC recommends that compost not be used on salt-sensitive plants, like ornamentals. Another factor that contributes to compost quality is compost maturity, which is measured through both carbon to nitrogen ratio and germination tests.

Colorado State University has been at the table with RMOC aiding in the development of the quality grades from the start. In addition, research associate Kathy Doesken has just finished drafting a fact sheet on the compost grading system for consumers, and research associate Addy Elliott is planning a workshop to train composters and agricultural professionals in February. Colorado State and RMOC also are working together to seek funding for additional research in the area of compost quality and use. The relationship between Colorado State and RMOC is just one example of how the University supports partnerships to encourage local businesses and agricultural sustainability.

For more information on RMOC, visit the Web site at <http://www.cafr.org/membership/rmoc.htm>.



Hanging Pathogens Out to Dry

Getting the Word Out on Food Safety with SafeFood Rapid Response and Information Network

Pat Kendall, Cooperative Extension specialist and professor of food science and human nutrition (pictured, left), has always been interested in health and food, but her research on food safety has also made her very familiar with the language of pathogens and viruses. *Escherichia coli* (*E. coli*) O157:H7, *Listeria monocytogenes*, *Salmonella enteritidis*, *Salmonella typhimurium*, and Norwalk virus (norovirus) are all essential words in her vocabulary. Fortunately, Kendall doesn't expect everyone to be able to pronounce these pathogens, but she does want everyone to know how to avoid an illness from them.

Food safety is a major problem in the United States. Although it's estimated that only one in 10 food-borne illnesses is documented, Centers for Disease Control and Prevention (CDC) statistics indicate that 76 million people in the United States are adversely affected by food-borne pathogens in any year, resulting in 325,000 hospitalizations and 5,000 deaths. These illnesses are particularly dangerous to the elderly, young children, and those with compromised immune systems.

Food-borne illnesses can be linked to contaminated beef, poultry, seafood, eggs, and produce. "Outbreaks associated with meat may get more publicity because of large recalls, but produce-related outbreaks almost match the number of illnesses linked to contaminated beef, poultry, seafood, and eggs," Kendall says. In fact, in 2000, there were 3,981 reported illnesses associated with contaminated produce and 4,025 linked to the other foods mentioned.

Pathogens appear in surprising places, like home-dried foods. For years, it was assumed that the low moisture content in dried foods precluded the growth of microbes, but research has shown that *E. coli* O157:H7 and *Salmonella* can survive basic drying methods. Kendall, along with professor of animal sciences John Sofos (pictured, right) and Ph.D. candidate Patricia DiPersio, has developed some procedures for safely drying foods. They appear in a new Extension publication entitled *Drying Foods: Dehydrating Fruits, Vegetables, Leathers, and Jerkies*.

"The recommendations in the publication concern how foods that are about to be dried can be pre-treated to enhance the destruction of pathogens," Kendall says. The research team tried various pre-treatment methods including blanching, immersing in salt solutions, and immersing in acidic solutions. By examining the vegetables, fruit, and jerkies about a month after they had been dried, Kendall and other investigators came to several conclusions. For both fruits and vegetables, pre-treating them with an acidic solution enhances the destruction of potentially harmful microorganisms during dehydration. For vegetables, water blanching in a solution that contains ½ teaspoon of citric acid per quart of water is recommended to increase pathogen death and improve general quality. A vinegar dip or ascorbic acid treatment should be used on meat prior to marinating for jerky. Safely drying foods involves pre-treatment, sufficiently heating the food to draw out moisture, exposing the food to dry air to absorb moisture, and allowing for proper air circulation to carry off moisture. These processes provide multiple hurdles that together enhance microbe destruction.

Produce-related outbreaks nearly match the number of all other contaminated food illnesses combined.

Colorado State University

Knowledge to Go Places



Publications are only one way Kendall gets the word out on food safety. She also writes a weekly column that appears in 22 newspapers, co-edits the *SafeFood News* online newsletter, oversees a subscription-only listserv that sends out food alerts, and provides training for Extension agents, master food preservers, and the Women, Infants, and Children (WIC) program. She has also been instrumental in developing a Web-based, multimedia continuing education program for nurses, dietitians, and Extension agents on food safety issues for high-risk audiences.

Kendall's message may become even more imperative. "We didn't worry about Norwalk virus three years ago," Kendall says, referring to a pathogen that recently sickened diners at a Fort Collins steakhouse and that has generated news stories concerning outbreaks on cruise ships and care facilities. "The symptoms of Norwalk, vomiting and diarrhea, aren't particularly long-lasting, but an infected person can still be a carrier of the virus even three days after the symptoms disappear." This prolonged infectious period, Kendall explains, can be particularly problematic in a restaurant situation, in which the employer wants to keep

the restaurant staffed, the employee wants to earn a paycheck, and outbreaks potentially can spread to a far greater number of people than is possible in a home kitchen situation.

Norwalk virus may seem particularly dangerous because it can land on any surface, but even a microbe like *E. coli*, whose original source may be in the gut of an animal, can easily cross-contaminate non-meat items without proper sanitary practices. "Furthermore, there is evidence that several strains of pathogens are becoming more virulent," Kendall warns. "Microbes like *E. coli* O157:H7 are learning to survive in severe environments."

Fortunately, Kendall and Sofos are committed to researching food-related health risks. Simple practices like hand washing, washing all produce with cold water before eating, keeping things refrigerated, and cleaning cutting boards, utensils, and refrigerators can significantly help protect health.

– Leslie Patterson

Annual Report, 2004

Cooperative Extension
Colorado State University
01 Administration Building
4040 Campus Delivery
Fort Collins, CO 80523-4040

www.ext.colostate.edu
Phone: (970) 491-6281
FAX: (970) 491-6208

Agricultural Experiment
Station
Colorado State University
16 Administration Building
3001 Campus Delivery
Fort Collins, CO 80523-3001
www.colostate.edu/Depts/AES
Phone: (970) 491-5371
FAX: (970) 491-7396

SafeFood: From Farm to Fork

Are free-range chickens safer to eat? At what temperature should a refrigerator be kept? Is there any truth in the five-second rule? Some fascinating and fun questions are asked and answered by *SafeFood News* (<http://www.colostate.edu/Orgs/safefood/NEWSLTR/menunews.html>), the online newsletter produced quarterly by Colorado State University Cooperative Extension.

SafeFood News is part of the SafeFood Rapid Response and Information Network, a Web site designed to help consumers and producers make informed decisions by providing objective, research-based information about food production and safety issues. In an entertaining, down-to-earth style, the newsletter explores topics ranging from Food and Drug Administration warnings to urban legends surrounding food.

The Fall 2004 newsletter described an investigation in which a Georgia researcher discovered that 25 percent of the 100 free-range chickens he examined tested positive for Salmonella, matching the rate of conventionally raised chickens. An article in the Winter 2004 issue on food storage said that refrigerator temperature should be between 35 and 40 degrees Fahrenheit. And in Spring 2004, research was described on the five-second rule – a piece of folklore that holds that if something is dropped on the floor it is still safe to eat if it is retrieved within five seconds. In this case, a high schooler doing an apprenticeship at Hans Blaschek's University of Illinois laboratory, examined cookies and gummy bears dropped on tiled floors. Under a high-power microscope, she discovered that food could become contaminated with only five seconds of contact with inoculated tiles.



Market-Fresh

Growers Embrace Value-Added Products, Niche-Marketing, and Direct Marketing

Dawn Thilmany (pictured, left), associate professor of agricultural and resource economics at Colorado State University, is dedicated to taking a fresh look at marketing foods. Thilmany grew up on a big but financially struggling farm in Iowa. There, she learned a model of agriculture where the producer didn't have much control over marketing. "But there are other models," she says. "Growers can choose to take control over their destiny by investing more in marketing." Her research and Extension activities show that there is more than one way to market food.

Thilmany stresses that the traditional, big business model of agriculture is not bad in itself, but it's always good to have choice. She feels that her work can help small producers gain access to markets. "It's become a pretty concentrated agricultural industry in the United States, and if you're not a big producer, it can be difficult getting into certain wholesale markets," Thilmany says. "If we can do research that investigates how to gain access to different markets, what share of the market wants to buy products differentiated in a certain manner, and what kind of premium consumers are willing to pay for the product, growers can determine whether they will pay to invest in new enterprises or change current enterprises to include different production practices." Some of the practices that growers might choose to invest in include processed value-added products, niche-marketing, and direct marketing.

Most people think of value-added products as an actual change in the product, such as turning apples into apple juice,

but Thilmany points out that a value-added product can be anything that is done to a product that increases its market value. For instance, getting an eco-label or organic designation on a product or having a product labeled as Colorado-grown might increase its value.

With niche marketing, the grower capitalizes on the unique aspects of a product to appeal directly to certain consumers. Probably the dominant niche-market is organics. But in addition to organic certification, Thilmany predicts that consumers may soon see a variety of certifications – for instance, a certification for humane treatment of animals and an American Viticultural Area (AVA) designation for Western Slope wines. AVAs are geographic locations where the climate, soil, and elevation are assumed to give wines a certain characteristic. Although an AVA does not indicate anything about the quality of a wine, Western Slope grape growers should benefit from having an officially designated AVA.

Growers cut out the middle person when they market their products directly to consumers. The farmers market is a classic example of direct marketing. Thilmany's colleague Adrian Card (pictured, right), Extension agent for Boulder County, claims that Colorado has experienced a higher growth rate in the number of farmers markets than other regions of the country. There are now more than 80 farmers markets in the state. However, Thilmany wants to be sure that growers who choose to direct market are aware of the challenges involved.

"If you're going to market directly as a large part of your marketing plan, you have to be as serious about investing in marketing and

Growers can choose to take control over their destiny by investing more in marketing.

Colorado State University

Knowledge to Go Places

communication resources as you are about production,” Thilmany warns in the speeches she delivers around the state through Cooperative Extension.

“Many people get into careers in agriculture because they love the production aspect of farming,” says Thilmany, but for success in direct marketing, they need to bring the same enthusiasm and work ethic to developing business plans. For his part, Card feels that producers are hearing Thilmany’s message: “I see more farmers approaching their work by looking at the marketing side first and working backwards, and that’s good.”

Thilmany and Card are anxious to let farmers know that there are lots of marketing choices out there. There are diverse reasons customers buy a certain product. For instance, there is no one group of consumers that buys organic food. People choose to buy organic for different reasons. Some formulate their choice based on environmental ideas, others on health concerns. Many parents make the decision to buy organic in order to promote nutrition in their childrens’ diets.

Similarly, Card explains all consumers who buy locally don’t do it for the same reason. Some customers want to buy locally produced foods because they want to keep agriculture and open space in their



communities. Others want the benefits of the dollar they’ve spent to stay in their neighborhoods. Still others derive comfort and satisfaction from talking face-to-face with the farmer from whom they are buying their food. Then there are the “foodies” (self-proclaimed fans of the Food Network) and proponents of the Slow Food movement that agriculture is a culture: Food and agriculture are things that can enhance their quality of life just like art.

Thilmany hopes to market to all of these reasons by helping farmers create good business plans. Choice can make happy producers and consumers. With an agricultural system that makes room for a variety of different ways to market food, consumers are satisfied because they can make an informed choice about the foods they buy, and producers are happy because they can charge a fair price for a product they produce using techniques they believe in.

– Leslie Patterson

Annual Report, 2004

Cooperative Extension
Colorado State University
OI Administration Building
4040 Campus Delivery
Fort Collins, CO 80523-4040

www.ext.colostate.edu
Phone: (970) 491-6281
FAX: (970) 491-6208

Agricultural Experiment
Station
Colorado State University
I6 Administration Building
300I Campus Delivery
Fort Collins, CO 80523-3001

www.colostate.edu/Depts/AES
Phone: (970) 491-5371
FAX: (970) 491-7396

From Crop to Cuisine

Colorado Crop to Cuisine (CCC) is designed to connect farmers with restaurant chefs and increase market opportunities for local producers of fruits, vegetables, herbs, artisanal produce, and lightly processed foods. The Colorado Proud program, which received a 2002 Governor’s Award for marketing, acquaints agricultural producers with Colorado chefs and coordinates orders and delivery of locally grown products to restaurants. No particular attributes about the product are advertised except that it is locally grown and that there is a 24-hour turnaround between harvest and delivery to the restaurant.

Yet the program is a boon to growers, chefs, and consumers alike. By joining CCC, farmers are able to easily diversify their marketing portfolio; chefs get to work with the freshest products and advertise menu items as locally grown; and consumers get to enjoy fresh tastes and become familiar with foods they might not have tried before. Certainly, even a short list of foods available through the program – raspberries, tomatoes, herbs, onions, peppers, natural pork, and peas – is enough to make any food lover’s mouth water. (For more information on CCC, visit <http://www.geocities.com/coloradocrop>.)

Colorado Agricultural Research System

Colorado Agricultural Experiment Station Contributors

Research Centers

ARDEC (Agricultural Research,
Development, and Education Center)

ARDEC Plant Science Programs

Reg Koll, Manager
(970) 491-2405
4616 NE Frontage Road
Fort Collins, CO 80524

ARDEC Animal Science Programs

Mike Hays, Manager
(970) 491-7928
4482 E. County Road 56
Fort Collins, CO 80524

Arkansas Valley Research Center

Mike Bartolo, Manager
(719) 254-6312
27901 Road 21
Rocky Ford, CO 81067

Eastern Colorado Research Center

David Schutz, Manager
(970) 345-6402
26204 County Road 57
Akron, CO 80720

Plainsman Research Center

Kevin Larson, Manager
(719) 324-5643
P.O. Box 477/42790 HWY I60
Walsh, CO 81090

San Juan Basin Research Center

Douglas Zalesky, Manager
(970) 385-4574
18683 State Highway 140
Hesperus, CO 81326

San Luis Valley Research Center

(719) 754-3594
0249 E. Road 9 North
Center, CO 81125

Southwestern Colorado Research Center

Mark Stack, Manager
(970) 562-4255
16910 County Road Z
P.O. Box 233
Yellow Jacket, CO 81335

Western Colorado Research Center (WCRC)

Frank Kelsey, Manager
(970) 434-3264
3168 B .5 Road
Grand Junction, CO 81503-9621

WCRC at Fruita:

(970) 858-3629
1910 "L" Road
Fruita, CO 81521

WCRC at Orchard Mesa:

3168 B .5 Road
Grand Junction, CO 81503-9621

WCRC at Rogers Mesa:

(970) 872-3387
3060 Highway 92
Hotchkiss, CO 81419

The Colorado Agricultural Experiment Station 2004 Annual Report was produced by Agricultural Experiment Station, Cooperative Extension, and University Relations at Colorado State University.

E-mail: aes@coop.ext.colostate.edu

Writer: Leslie Patterson

Photography: Bill Cotton

Editors: Barbara Dennis

Web: <http://www.colostate.edu/depts/AES>

Design: Terry Nash

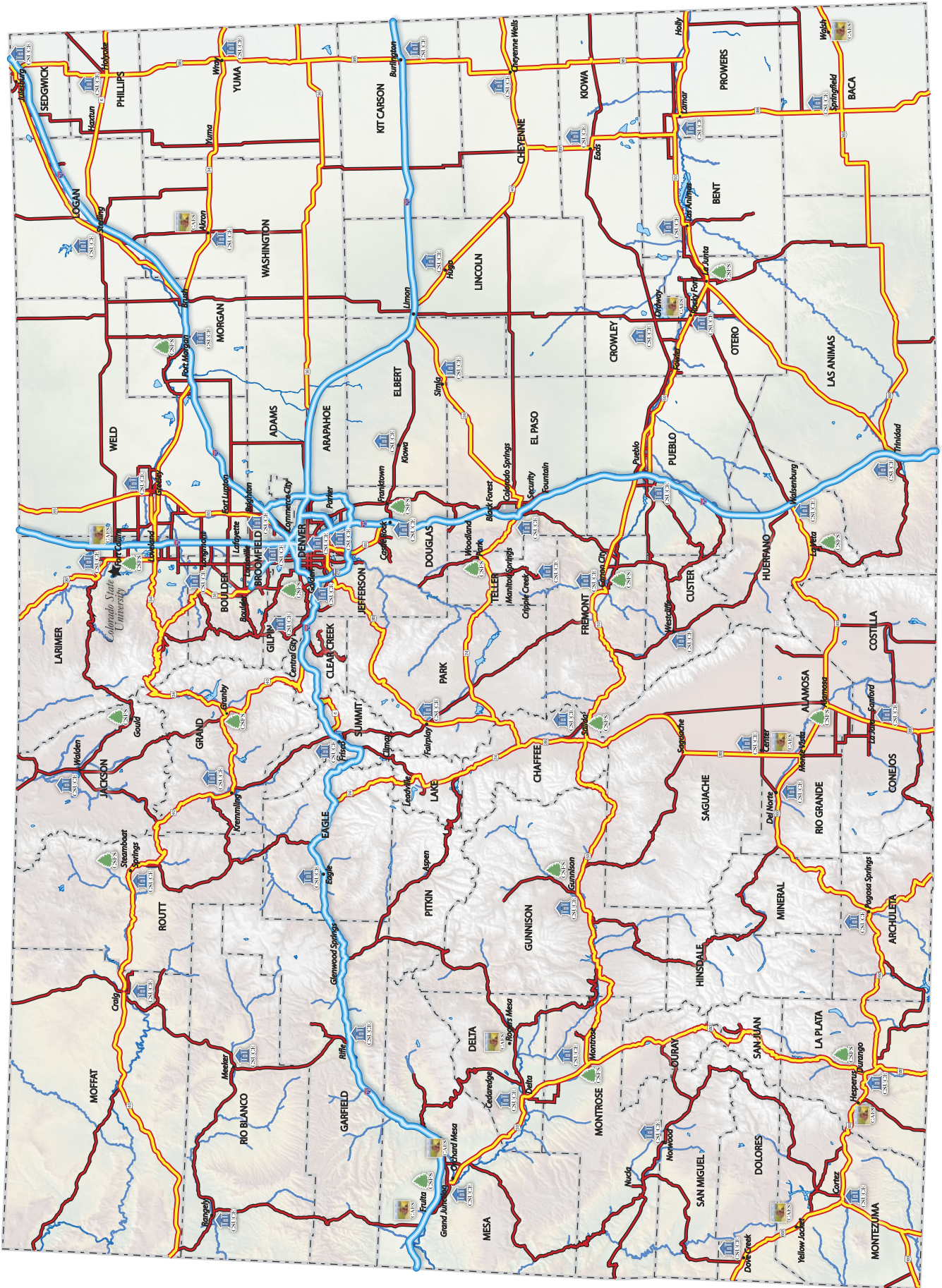
Production: Lisa Schmitz, Jeannine Kline



Knowledge to Go Places

Colorado State University is an equal opportunity/affirmative action institution and complies with all Federal and Colorado State laws, regulations, and executive orders regarding affirmative action requirements in all programs. The office of Equal Opportunity is located in 101 Student Services. In order to assist Colorado State University in meeting its affirmative action responsibilities, ethnic minorities, women, and other protected class members are encouraged to apply and to so identify themselves.

Colorado State University – Agency Office Locations



Colorado Agricultural
Experiment Station



Colorado State Forest Service



Colorado State University
Cooperative Extension

