Cooperative Extension
Colorado State University

DECEMBER 2005
VOLUME 25
ISSUE 2

Colorado State University Cooperative Extension

Putting Knowledge to Work

FROM THE GROUND UP

Agronomy News

Alternative Agriculture

Project aims to improve communication and cooperation with alternative producers.

Over the last couple of years there has been a joint project between CSU and the Colorado Organic Producers Association (COPA) that was funded by the USDA Sustainable Agriculture Research and Education program. The goal of this project was to improve communication and cooperation between the land grant university and organic and alternative producers in Colorado. We have been working towards these goals through four regional Alternative Agriculture Advisory Teams in the East, Front Range, West, and South Central parts of the state. The advisory teams established a dialogue on research and extension needs (both production and marketing), and identified regional priorities within the alternative agriculture arena. Student interns worked on the producer-identified priorities in the summertime in conjunction with a local CSU extension or experiment station faculty member, an on-campus faculty member, and producers.

This issue focuses on the results from the regional alternative agriculture projects, as well as other CSU efforts in alternative agriculture. See the COPA website (www.OrganicColorado.org) to access PowerPoint presentations, enterprise budgets, and factsheets developed as part of this project.

Front Range: Spinach Seed Trials

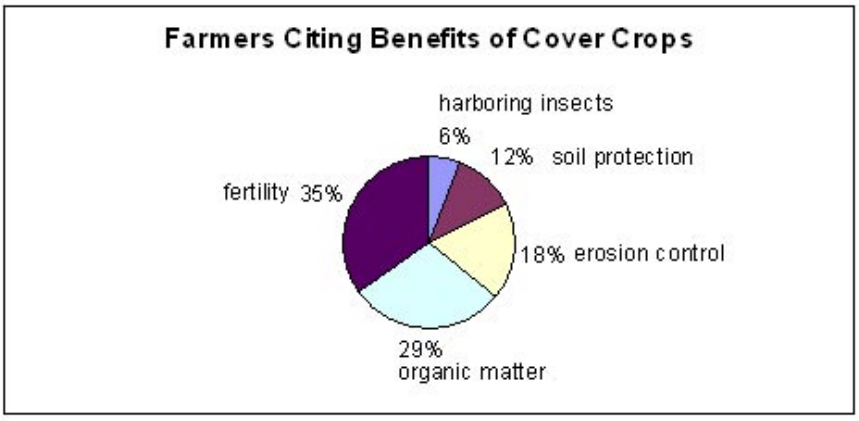
Frank Stonaker of the CSU Specialty Crops Program provided this summary of the Front Range project:
One of the areas of interest and concern indicated by growers attending the Alternative Ag meetings in the Front Range was performance of organic seed compared to conventionally produced seed. USDA organic rules require growers to use organic seed if it is available, but seed companies have been slow to fill this new demand for a number of reasons. Seed quality and variety performance is of course very important to the success of organic growers, and as growers experiment with seed from new sources, or even established sources that are just beginning to move into organic seed, there have been some bumps along the road. Varieties that have performed very well with conventional seed treatment, and conventional production, may not be as well adapted to organic seed production, seed treatment, or organic farm production.

The 2004 planting yielded some preliminary results, but not sufficient to draw definitive conclusions. More varieties were planted as a follow-up in 2005, but disease prevented meaningful results. A Fall 2005 planting is currently planned, and the investigation will continue.

Eastern Plains: Cover Crops, Green Manures, and Crop Residues

The Eastern Plains group identified cover crops, green manures, and crop residues as their project topic. Bob Burris, working with Bruce Bosley of CSU Cooperative Extension, interviewed area producers and compiled the results, summarized here by Bruce:

Twenty-two farmers in Northeastern Colorado were interviewed on their use of and experience with cover crops, green manures, and crop residues. Benefits cited included enhancing soil organic matter, weed suppression, soil erosion protection, harboring beneficial insects, added fertility from green manure, and enhanced crop microclimate. Eighteen farmers used green manures and cover crops while five used crop residues.
The benefits listed by farmers for cover crops were: fertility, organic matter, erosion control, soil protection, and harboring insects (see pie chart). Similarly the disadvantages to cover crops



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FROM THE GROUND UP
Agronomy News is a monthly publication of Cooperative Extension, Department of Soil & Crop Sciences, Colorado State University, Fort Collins, Colorado.

Web Site: http://www.colostate.edu/Depts/SoilCrop/extension/Newsletters/news.html

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were as follows: water use – 9%, rotational difficulties – 9%, time, labor, and field work – 9%, and lack of direct financial return – 5%. Overall, respondents indicated that benefits outweighed the challenges.

In a continuing effort, Bruce Bosley continues to provide education to and partnering with crop producers on no-till crop rotation farming systems. Many dryland crop producers have realized the advantage to these systems that maintain crop residues on the soil surface. The advantages to no-till crop rotations include increasing precipitation capture and retention, improving soil health especially soil organic matter and soil structure, providing more stable income through diversifying crop enterprises, and a higher annual percentage of harvestable acres.

Western Slope: Organic Weed Management

The Western Slope group settled on organic weed management options as its project focus. The idea was to compile information on organic methods that could be used to control several of the most troublesome weeds in Western Colorado. The draft factsheets were then reviewed by several local producers and agents.

Fact sheets were developed by Sarah Doyle, Micaela Morgan, and Sandra McDonald for the following weeds:
Canada Thistle
Diffuse Knapweed
Hoary Cress
Field Bindweed
Quackgrass
Russian Knapweed

After a description of the weeds' impacts, propagation, and habits, control methods are addressed including: hand weeding; mechanical techniques, such as cultivation and mowing; biological controls; cultural practices such as steam weeding, competitive plantings, and grazing; and organic herbicides. The six Organic Weed Management factsheets are located on the Colorado State University Colorado Environmental Pesticide Education Program website found at this address: http://www.colostate.edu/Depts/SoilCrop/extension/CEPEP/organic.htm

San Luis Valley: Enterprise Budgets for Grass-fed Cattle

The San Luis Valley group decided to work on marketing and production of grass-fed beef that is becoming increasingly popular with growers in that area. Dawn Thilmany, Extension Marketing Specialist, supervised grad student, Josh Wilson, in conducting the analysis. Their work is reported in a CSU Extension publication: "Enterprise Budgeting: An Application to San Luis Valley Grass-Fed Cattle Operations," which makes the following points:

1) assessing the stage of production that secures the greatest returns is one possible outcome from budget planning,
2) the San Luis Valley region

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For past issues of the Agronomy News on agricultural topics such as:

- Colorado Pesticide Issues
- Bio-Pharming
- Wheat Variety Trial Results
- Drought
- Forages
- Beans
- Sensors in Agriculture
- Anitbiotics in the Envrionment
- Carbon Sequestration
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has a comparative advantage at the cow-calf stage of production, and

3) enterprise budgeting is a necessary step in production and market planning.

The report is available in full on the internet at: http://dare.agsci.colostate.edu/csuagecon/extension/documents/PFM-05-01.pdf

In order to start addressing the group's questions about the marketing of grass-fed beef, pertinent questions were added to a survey that was part of an ongoing natural beef study. Once the regional group has a chance to review the results of this and similar studies being conducted by Dawn Thilmany, they should be in a position to indicate what questions remain about how they can successfully pursue grass-fed beef enterprises in the Valley.

Jim Dyer, Colorado Organic Producers Association
and
Jessica Davis, Extension Soil Specialist, CSU

Specialty Crops Program

Program awards grants to farmers and marketing organizations.

The Specialty Crops Program (SCP) at CSU came to life in 2001 when a USDA Block grant of $1.5 million was routed through the Colorado Department of Agriculture and awarded to the Department of Horticulture and Landscape Architecture. The program objective to increase opportunities for Colorado growers has been approached from a number of angles.

Grower Research and Education Grants have allowed Colorado farmers and marketing organizations to receive grants to explore new crops, improve production methods, and develop marketing strategies. To date, 53 grants have been awarded, totaling over $400,000. Grant recipients receive technical support from the SCP office and CSU affiliates who act as project technical advisors.

The Rocky Mountain Small Organic Farm Project (RMSOFP) was initiated at CSU's Horticulture Field Research Center last year to provide growers with examples of production systems appropriate for this region, and develop research projects reflecting the needs of this growing segment of the agricultural community. An out-growth of RMSOFP has been a CSA (community supported agriculture) which provides students with internship opportunities in intensive organic vegetable production and marketing, and provides 50 families of CSU faculty and staff with weekly deliveries of fruit, flowers and vegetables from May through October.

The USDA recently funded a multiyear project titled "Differentiating Small Farm Produce Offerings through Nutritionally Superior Cultivars, Marketing, and Extension Programs" in which 10 cultivars each of 7 vegetables grown under organic and conventional production methods are being evaluated for nutritional differences

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with the premise that nutritionally superior cultivars should provide producers with a market advantage. Cecil Stushnoff (Horticulture), Dawn Thilmany (Agricultural and Resource Economics), Pat Kendal (Food Science and Human Nutrition), and Frank Stonaker (Horticulture) are collaborating on this project.

The SCP program also provides technical assistance for the development of production standards for the Beneficial Farm and Ranch Collaborative, a trade association made up of family farmers and ranchers, retail stores, and individuals in Colorado and New Mexico. Participating farms and ranches are small, family operations located in the Arkansas, Rio Grande and Colorado River watersheds of New Mexico and Colorado.

The SCP has been actively involved in outreach efforts including short courses, field days, and participation with regional producer and Cooperative Extension sponsored conferences. The SCP web site (http://www.specialtycrops.colostate.edu) provides updates on SCP projects, an event calendar and other links that may be useful for specialty crops producers, marketers and researchers.

Frank Stonaker was hired to coordinate the program, and he is assisted by Debra Guenther. Frank may be reached at 970-491-7068 or Frank.Stonaker@colostate.edu.

Frank Stonaker,
Dept. of Horticulture

The Rocky Mountain Organics Council Works Hand in Hand with CSU

Compost Classification system developed.

Composting isn't just for home gardeners anymore. It is the basis for Colorado's expanding soil amendment industry that produces large quantities of compost from organic materials that would otherwise be considered "waste" products. This diverts materials from landfills, prolonging landfill life. Organic material, when landfilled, breaks down anaerobically, producing methane. The diversion of organic by-products reduces the production of methane, a greenhouse gas. Composting is good for the environment in other ways as well. Compost, when added to soil, can increase its water holding capacity, which results in lower irrigation requirements. Compost also beneficially affects water infiltration, and is a good source of slow-release nutrients for plants.

The Rocky Mountain Organics Council (RMOC) is evolving as the voice of professional composters in Colorado. It was developed by composters to provide guidelines for compost standards, as a clearinghouse for information about composting, and to support research. It draws members from the Rocky Mountain Region, who represent commercial composters, livestock producers, consultants, and employees of municipalities and universities. RMOC is incorporated as a committee of the Colorado Association for Recycling (CAFR), whose Web site is http://www.cafr.org.

The RMOC promotes sustainable utilization of organic resources in the Rocky Mountain region. The council focuses on production of quality organic products, developing markets for those products, and educating customers in the proper use and application of composts and mulches. This compost producer, marketer, and user organization meets regularly to network and discuss opportunities and barriers to the composting industry.

Members of the RMOC agree to use the Rocky Mountain Compost Classification System. To classify a compost, it is sampled and analyzed according to standardized methods developed specifically for composts, called Test Methods for the Evaluation of Compost and Composting (http://tmecc.org/). Composts are then assigned to four classes, which each have recommendations for use. Testing and classifying composts leads to better purchasing decisions, applying compost at agronomic rates, and the ability to compare composts both economically and with regard to quality.

In 2005, the RMOC supported the compost industry in the following ways. In February the RMOC co-sponsored a workshop with Colorado

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State University about the Rocky Mountain Compost Classification system. Speakers from CSU and the compost industry presented information about the parameters used to classify composts to about 35 participants. In June, at CAFR's annual Summit Meeting in Breckenridge the RMOC presented an update about national compost research, as well as focused on CSU's compost research program.

In addition, Colorado State University Department of Soil and Crop Sciences Research Associate Adriane (Addy) Elliott facilitated an interactive workshop in Breckenridge for 25 compost enthusiasts to develop a list of goals for the Colorado compost industry. This process stimulated a wide spectrum of ideas. After synthesizing the list we came up with five primary goals for the industry to focus on: consumer education, producer education, research, marketing, and political leadership.

Each of these major goals had a list of sub-categories that better defined the goal and the intended outcome. For example, the consumer education goal was broken into three sub-categories. First, compost advocates want to promote the local compost industry within the state through education. For every allotment of compost that is bought from a local compost producer, dollars return to the local economy and infrastructure that supports our own waste recycling organizations. Secondly, composters aim to reduce the volume of contaminants that enter into the recycling stream by educating waste producers and haulers. Compost producers recognize the degradation of their compost quality when plastics and metals are introduced into their compostable stock. The last subcategory that composters want to focus on, under the goal of consumer education, is to reduce landfilling of organic materials. Landfill tipping fees are relatively inexpensive in this region and remain an economic alternative to composting. However, compost buffs see the value in recycling the nutrients and organic matter for land application. This last goal focuses on developing an infrastructure that will provide an economically viable opportunity for diverting organic material from the landfill to a composter.
In September, CSU and the RMOC met again in Fairplay to examine the barriers to achieving the aforementioned goals. After identifying perceived barriers, we focused on brainstorming specific actions that the industry could take to march toward its goals. We decided to meet one more time to finalize this process.

Thirty-two compost enthusiasts met in October at the Adams County Fairgrounds to organize the actions that had been agreed upon. The group prioritized the action items, and working groups were formed with spearheads to lead the charge. A large-scale compost listerve was also created after this meeting in order to keep participants informed. If you are interested in joining this listserve to stay informed about composting issues and workshops in the state, email Addy at aelliott@lamar.colostate.edu.

For more information about RMOC, contact chair Chris Merkl at 720-371-6607 (rkymoc@gmail.com), treasurer Robert Tardy at 303-423-4100 (RTACompost@cs.com) or visit RMOC's Web site at http://cafr.ort/membership/rmoc.htm.

Kathy Doesken, Addy Elliott, and Jessica Davis
Soil Science Research Associates and Professor, CSU

An Organic Producers' Resource Guide to the Four Corners States

Guide provides organic farming information online.

The Southwest Marketing Network (SWMN) is proud to announce the publication of an Organic Producers' Resource Guide to the Four Corners States. The SWMN works with farmers, ranchers, food and fiber processors, and agricultural organizations in Arizona, Colorado, New Mexico, and Utah. Its goals are to ensure that new, existing, and prospective Southwest agricultural producers, especially small-scale, alternative, and minority producers, connect to others by having access to risk management tools, business and marketing strategies, technical and financial assistance, crop insurance information and assistance, and peer examples needed to improve their marketing success.

In 2005, inspired by requests from farmers, ranchers, and service organizations in the Four Corners Region, the SWMN proposed the creation of a guide that could help provide organic producers, and those interested in transitioning to organic agriculture, with contacts and other resources relative to organic production in each of the Four Corners States. The guide, created in collaboration with Colorado State University and the National Center for Appropriate Technology, contains the latest information on the United States Department of Agriculture's National Organic Program; how to get started in and/or transition to organic production; links to regional organic producer organizations; a list of regional inspection agencies; reasons to become certified; some of the costs and benefits of being organic; organic educational, marketing, and business resources; testimonials and stories from organic farmers and ranchers in the SWMN; listings of analytical labs and services; appropriate extension and other publications; and contact information for Land Grant University faculty with expertise and or interest in the production and marketing of organics.

The resource guide is available on the SWMN's website: www.swmarketing.ncat.org.

Katy Pepinsky, recent M.Ag. graduate in Extension Education

What Is SARE??

Grants program encourages the adoption of sustainable farming systems.

Since 1988, the Sustainable Agriculture Research & Education (SARE) program has encouraged the adoption of farming systems which are profitable, environmentally sound and good for communities. A research and education grants program is used to motivate producers and other agricultural professionals to pursue these goals. The program is headquartered in USDA with local partnerships involving land grant universities in four regions of the country. The Western SARE (WSARE) office is located at Utah State University.

All WSARE grants are competitive and fund projects in four primary categories. They are Research & Education, Farmer/Rancher, Agricultural Professional and Producer, and Professional Development. A new category for Graduate Students has recently been added as a fifth category. Grants range in size from $1,000 to $200,000 depending on the category. For more information on these grant opportunities, see the WSARE web site (http://wsare.usu.edu/grants/). Deadlines are fast approaching, so do not hesitate if you are interested.

In recent years, Colorado has been quite successful in obtaining grants from WSARE. For example, this year Colorado received more

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than $29,000 in farmer/rancher grants; $60,000 in professional development; and $144,000 in research and education grants. Overall, the WSARE funded 44 projects across the West for $2.25 million. Projects range from increasing shrimp production in Arizona, to educating producers about alternative energy in California, analyzing market opportunities and barriers for organic producers in the Four Corners states, and extending the growing season for raspberries in Utah. Phil Rasmussen, WSARE coordinator, states that, "These grants enable scientists and producers to test innovative practices that can have profound impacts on agriculture."

As our state sustainable agriculture coordinator for Cooperative Extension, some of my duties are to make sure these grant opportunities are publicized to the public and to assist investigators in the review of their proposals before submission. Hence, if you need assistance, do not hesitate to contact me at 970-491-2074 or Dennis.Lamm@colostate.edu. Also, check out our new "Sustaining Agriculture in Colorado" web site at http://www.coopext.colostate.edu/sustag/. We hope this is a good resource for you, and your comments are always welcome.

Dennis Lamm, Professor of Extension Education

Soil Salinity: Assessment and Remediation

Salinity challenging to irrigated growers.

Soil salinity affects conventional and alternative producers alike. Sources of soil salinity are either native or introduced. Most arable soils in Colorado have native soil salinity because ancient shallow seas occupied much of what is now Colorado and deposited large amounts of salts onto the seabed that is now our farmland. In addition, introduced salinity comes from irrigation water containing soluble salts. A third source of soil salinity is upward percolation of water and its accompanying salts from shallow water tables. Evaporation of fresh water from the soil surface and/or uptake by plants leaves salts in the soil to accumulate over time. Soil salts hold on to water very tightly making it extremely difficult for plants to take up water and nutrients and resulting in reduced plant vigor and growth.

There are three salts of concern to Colorado growers: calcium (Ca), magnesium (Mg) and sodium (Na). These salts are also plant nutrients. However, each of these salts, in and of themselves, can cause problems if the soil contains excess concentrations. Soils with excess Ca and/or Mg (known as saline soils) restrict water and nutrient uptake by plants. Soils with excess Na (known as sodic soils), along with restricting uptake, growth and vigor, also experience a breakdown of soil structure. Hydrated Na disperses soil particles, destroying the aggregation and the associated channels where water and air enter and exit in a healthy soil. In a sodic soil, water and air cannot enter soil freely, and hence plants cannot grow well.

Visual indications of salinity are stunted plant growth, poor fruit size and quality, patchy growth in pastures and/or a white crust on the soil surface when the soil dries. Soil sampling and testing is the only economical means of assessing soil salt concentrations. Two simple tests for salinity/sodicity are pH and EC (electrical conductivity). A pH test determines acidity or alkalinity of a soil, and the EC determines salinity. If soil pH

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is above 8.5, then an additional chemical analysis for salt concentrations known as sodium adsorption ratio (SAR) is required. The SAR of a soil is the amount of Na in the soil with respect to the amounts of Ca and/or Mg and can indicate whether a soil is saline, sodic or saline-sodic (see table below). It is critical to know which salt(s) are in excess in the soil in order to perform the correct remediation. You should consult a qualified soil professional PRIOR to attempting remediation. (see table)

It is critical to know which salt(s) are in excess in the soil PRIOR to attempting remediation, since remediation techniques for saline soils differ from remediation techniques for sodic soils. In order to remediate either soil problem, you must have adequate soil drainage, or there is nowhere for the salts to go. In some cases, tile drains may need to be installed to insure adequate drainage. In order to remediate a saline soil, leaching of the soil with excess irrigation water is required to 'push' the salts below the crop root zone. A rule of thumb for reduction of salinity is that six inches of excess irrigation water will remove 50% of the salts from the top foot of soil, and twelve inches of excess irrigation water will remove 80% of the salts from the top foot of soil. A qualified soil professional should be consulted before attempting remediation, as leaching will also remove nitrogen and other nutrients critical to good crop growth, and this must be taken into consideration.

In order to remediate sodic soil, gypsum must be added and incorporated into the soil PRIOR to leaching. If these steps are not adhered to, the problem will become much worse! The amount of gypsum required is dependent on the concentrations of the individual salts and the SAR and should be calculated by a qualified soil professional. Soils should be tested following leaching to determine if the desired effects have been achieved or if further action is required. Farmland with salinity or sodicity problems due to shallow water tables can be remediated with the installation of tile drains. Your soil professional can help you determine the amount, spacing and depth of tile drain for proper remediation.

If salinity is an ongoing problem, for example, due to the salinity of irrigation water, the addition of organic matter to the soil can help mitigate the problem to a degree, but close monitoring of soil salinity/sodicity is still a must. Another avenue to help mitigate ongoing salinity problems is to add excess irrigation water at every irrigation in order to keep salts moving below the crop root zone. The excess irrigation application is called a leaching fraction. The salt content of the irrigation water and the soil and the crop you intend to grow combine to determine the leaching fraction you'll need to apply. A qualified soil professional can help you determine the correct leaching fraction for your particular situation. Regular soil testing for salinity, sodicity and pH is a must to insure that soil salt levels do not exceed thresholds for good crop production.

Ron Godin,
Western Colorado Research Center

Classification of Soils for Salinity/Sodicity.

Soil Class	**EC**	**pH**	**SAR or (ESP)***	**Physical Condition**
Normal	< 4	< 8.5	< 15	Normal
Saline	> 4	< 8.5	< 15	Normal
Sodic	< 4	> 8.5	> 15	Poor
Saline-Sodic	> 4	> 8.5	> 15	Poor to normal

* ESP (Exchangeable sodium percentage) and SAR both give similar readings, and different soil testing labs have different preference on which they report depending on their soil testing equipment.

Organic Controls for Canada Thistle

On-farm research evaluates weed control strategies.

Boulder County Cooperative Extension has teamed up with CU Boulder and Boulder County Parks and Open Space to fight Canada thistle. They are conducting on-farm research comparing control strategies that are approved for certified organic use.

Adrian Card, Extension Agent with CSU Cooperative Extension in Boulder County, initiated this research after discussions with organic farmers, indicating a need for improved control measures for Canada thistle on their farms. Ewell Culbertson, Pachamama Farm near Hygiene, offered a section of his land, containing a high population of Canada thistle for use in on-farm research.

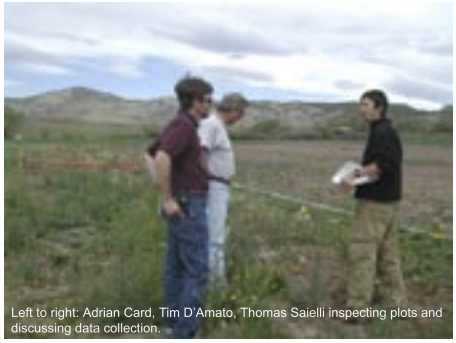
Tim Seastedt, University of Colorado Professor in the Department of Ecology and Evolution Biology, who conducts biological weed control research in Boulder County and his student, Thomas Saielli, conducted the research and data collection of pre- and post-treatment biomass percent. Boulder County Parks and Open Space Weed Coordinator, Tim D'Amato, also provided guidance.

The treatments have used several commercially available, organically approved liquid herbicides. Burnout II and Matran 2 are clove oil based and Deadeye and AllDown are acetic acid (vinegar) based herbicides. Other spray treatments were made by diluting 30% acetic acid (kitchen vinegar is 5%) to 10%, 15%, and 20% tank mixes with the addition of a yucca based surfactant to increase spray adhesion, dispersion, and penetration of the Canada thistle leaf cuticle. The remaining treatments utilized hoeing, hand pulling, and flame weeding.

Working with three replicated plots, these 10 treatments were applied every other week, every month, and every other month. Research design was intended to find the most effective treatment and frequency of application for organic farmers.

Research findings will be available in February 2006. Contact Adrian Card at acard@co.boulder.co.us

Adrian Card, Boulder County Agriculture Agent



Left to right: Adrian Card, Tim D'Amato, Thomas Saielli inspecting plots and discussing data collection.

Thomas Saielli flame-weeding with a multi-burner propane flamer.

Effect of Season-Long Flaming Followed by a Grass Cover Crop on Canada Thistle Biomass in Organic Strawberry Production

Flaming reduces competitiveness of Canada thistle.

Perennial weeds are a chronic problem associated with organic strawberry production in Colorado. Crop rotation, mechanical cultivation, hand weeding and hoeing typically are used to manage these weeds. The use of thermal (flame) weed control systems addresses this problem and is an alternative to mechanical cultivation and herbicides for controlling weeds. The purpose of this study was to examine the effect of multiple flame applications on Canada thistle biomass in a fallow strawberry field. The 2.5 acre strawberry field was located at Berry Patch Farms, a certified organic farm near Brighton, Colorado.

Weeds were flamed using the Flame Engineering TD-12 LPS Alfalfa Field Flamer. The Alfalfa Field Flamer utilizes liquid spray flaming that creates combustion at the base of the plant to produce 2000 degrees Fahrenheit. The cost was $1800, and the flamer consumed 35 gallons of propane per acre at a cost of $40 per acre. This machine is ten feet wide and produces a wall of flame. The propane tank holds 200 gallons of propane and can treat

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approximately 6 acres depending on travel speed and the ambient air temperature at time of application. The speed of application (tractor speed) was approximately 3 mph.

Five flame applications were used during the 2004 growing season. The aboveground portion of the plant was harvested and weighed within 3 to 5 days after each flame application. Good control was seen immediately after the flame treatment on Canada thistle; however, rapid re-growth continued throughout the summer, thus requiring multiple flame applications. Aboveground fresh weight of Canada thistle foliage treated with just one flame application averaged a 63.3% reduction when compared to the untreated check. Five days after the fifth and final flame application, the above ground fresh weight of Canada thistle foliage averaged 88.6% less than the untreated check. At this time root mass was harvested and weighed. Root biomass comparisons revealed a 55% reduction in fresh root weight following five flame applications.

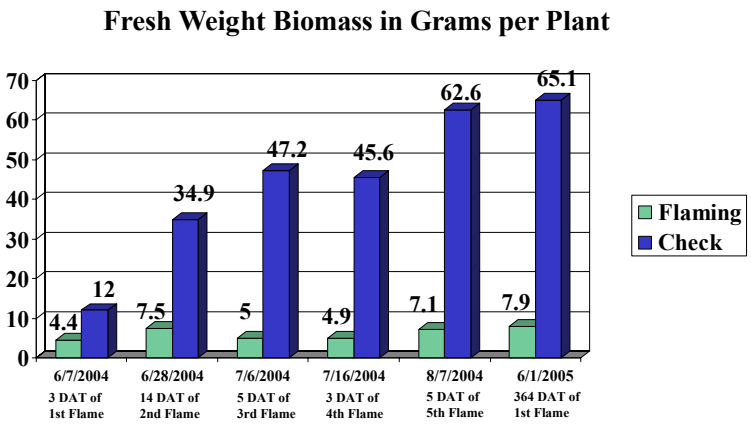
In August 2004, the field was disked, beds were established using black plastic mulch, and strawberries were planted. Then the rows between the strawberry beds were planted with crested wheatgrass, intermediate wheatgrass, and pubescent wheatgrass cover crops. On June 1, 2005, a full year after the first flame application, the above ground fresh weight of Canada thistle foliage averaged 87.8% less than the untreated check. Root biomass comparisons revealed a 62.4% reduction in fresh root weight. Canada thistle plant population density fell from 37.3 plants per square meter to 2.05.

Based on results experienced in this study, flaming weeds using the Flame Engineering Alfalfa Flamer provided excellent activity on small annual weeds and good to fair activity on deep-rooted perennial weeds. Multiple applications are needed to provide season long management of weeds.

The reduction in the population and biomass of Canada thistle cannot be attributed to flaming alone, but rather the multiple cultural and mechanical weed management tactics used during the one-year period. Five flame applications reduced the competitiveness of the Canada thistle. This allowed the fall-seeded grasses to become adequately established to displace the Canada thistle populations in 2005. Mowing, hoeing, hand weeding and steaming at the plastic bed and grass row interface will be the only weed management tactics utilized during the remaining life of this strawberry field.

Thaddeus Gourd, Extension Agent (Agriculture), Adams County, and Tim Ferrell, Berry Patch Farms

Effect of Multiple Applications of Flaming on Above Ground Canada Thistle Biomass



Flame Applications occurred on 6/4/04, 6/14/04, 7/1/04, 7/13/04 and 8/2/04

Long-Term Organic Farming Impacts on Soil Fertility

Manure and cover crop systems increase soil P.

Very few long-term organic farming studies exist, especially in the central Great Plains. Annual soil test data were gathered from Grant Family Farms (GFF), the largest organic mixed crop farm in Colorado. The objective of this research project was to assess the impact of the transition of what is currently named GFF from a conventional to an organic farm. The land that now makes up GFF was purchased in the early 1970s, and sustainable agricultural practices were used until the mid-1980s when organic farming practices were implemented. GFF uses dairy manure and leguminous cover crops as their only fertility inputs. Crop rotations among over twenty different vegetable and other crops are standard practice.

Soil test data from twelve fields, 17 to 50 acres in size, were compiled and analyzed for changes over time in soil chemical properties for ten soil fertility components: pH, electrical conductivity (EC), soil organic matter (SOM), nitrate (NO_3-N), phosphorus (P), potassium (K), zinc (Zn), iron (Fe), manganese (Mn), and copper (Cu). The number of years of data per field ranges from 5 to 12 over the period of 1985 to 2000.

Four of the GFF fields showed a significant decrease in pH. Baseline pH levels before organic practices began ranged from 7.9-8.1; these numbers changed to 7.6-7.9 in the last year analyzed. The four fields that showed significant decreases ($p<0.05$) in pH also increased significantly in available P, K, and Fe.

EC increased in two fields but still remained within the satisfactory levels for most field crops, although ECs occasionally reached detrimental levels for sensitive vegetable crops like lettuce, onions, carrots, and beans, all of which GFF cultivates.

According to previous studies, SOM increases very slowly and may take several years to detect change. For four of the fields, soil testing revealed a very slight increase of SOM (<0.10 % per year in organic production).

Available P (AB-DTPA) levels increased significantly over time in 11 of the 12 fields to high (12-15 ppm) and very high levels (>15 ppm) for crop production. In the 1970's, Fields 2-6 level ratings were very low (0-3) to low (4-7 ppm), but they increased to very high (>15 ppm) after conversion to organic production.

Soil test P levels in Field #1 as a function of years in organic production.

Levels of available K also increased significantly in eight fields. Clay soils in Colorado are not prone to K deficiencies, but additions of dairy manure and green manure to the soil may be used to replace K that is depleted by crop use.

Soil Zn and Fe levels increased significantly in 5 out of 12 fields evaluated at GFF. Many micronutrients are least available in basic soils. However, dairy manure can contain substantial amounts of Zn and Fe. Zinc and iron deficiencies occur mostly in basic soils, and solubility can increase 100-fold for each unit that pH is lowered. The micronutrient content of the manure and the drop in pH are likely explanations for the significant increases in available Zn and Fe.

Nitrate levels fluctuate radically throughout a growing season and are highly dependent on the crop grown that season prior to fall soil sampling.

In summary, annual soil tests revealed a significant increase ($p<0.05$) in P, K, SOM, Zn, and Fe and a significant decrease in pH levels in ≥ 33% of the fields with time in organic production. The GFF approach to organic soil fertility (a combination of livestock and green manures) reduces soil pH, increases OM, and enhances P, Zn, and Fe availability while having little impact on soil salinity.

Jami Daniel, Jessica Davis, and Lew Grant
Former graduate student and extension soil specialist, Colorado State University and Grant Family Farms

CSU Unveils New Program in Organic Agriculture

Interdisplinary program in organic agriculture to start in Fall 2006.

CSU will be enrolling students in an Interdisciplinary Program in Organic Agriculture starting in Fall 2006. This program is designed for students with an interest in alternative agricultural production approaches. The focus of the program is on the science of organic agricultural production. It builds on a base of fundamental agricultural sciences with additional courses specifically focused on organic agriculture production techniques, business management, marketing, and decision-making. Lecture, discussion, lab, and internship experiences will involve experiential learning at many levels.

This program is a cooperative effort of four departments: Agricultural and Resource Economics, Bioagricultural Sciences and Pest Management, Horticulture and Landscape Architecture, and Soil and Crop Sciences. Although participating students will take courses from all four departments, they will receive their degree from their home department, and completion of requirements for the interdisciplinary studies program will be noted on their transcript.

It is of critical importance that CSU be tightly linked with organic producers in order to have a successful program in organic agriculture. Students will need internship opportunities, and we plan to use guest speakers to put flesh onto theory in our classes. There will be student projects that involve on-farm research and development of extension materials. Therefore, we need producer feedback and ideas to nurture this connection between the Colorado land-grant university and organic producers and marketers in Colorado and surrounding states. Please email Jessica.Davis@Colostate.edu with your ideas.

Jessica Davis and Harrison Hughes
Professors, Depts. of Soil & Crop Sciences
and Horticulture and Landscape Architecture

Meet the Faculty

Adrian Card is an Extension Agent in Boulder County. An Alabama native, Adrian moved to Colorado in 1993 to work with the first Community Supported Agriculture (CSA) Farm in Colorado, Happy Heart Farm in Ft. Collins. For three years he learned small-scale, intensive, high-value organic vegetable crop production.

In 1998, he collaborated with food crops students from the Department of Horticulture to transform the vegetable garden space at the Plant Environmental Research Center (PERC) on campus from strictly a trial garden to a student run organic garden. The garden continued vegetable trials but with a new focus on experiential learning. The 9000 square foot student organic garden is now in its 7th season of experiential learning and produce stand sales.

Adrian graduated from CSU in Agricultural Education in 1996 and worked as assistant to the manager of the Department of Horticulture and Landscape Architecture's Field Research Center (the Hort farm), growing the first organic sweet corn, melons, and winter squash at the Hort farm. Although Dana Christensen helped him with his tractor driving skills, he still can't drive a straight row! Adrian received his Master of Agriculture degree in Extension Education in 1999 from CSU.

In 2003, Adrian joined North Carolina State University as the Education and Marketing Coordinator for the student organic farm at the Center for Environmental Farming Systems. Adrian is currently the CSU-CE Agriculture/4-H Agent for Boulder County. In his current position, Adrian focuses on small acreage management and small farm production and marketing issues. He lives in Ft. Collins, farms a 300 square foot garden in the suburbs, and sells vermi-compost in local nurseries.

Ron Godin received a B.S. and M.S. in Soil and Water Science from the University of Arizona. He obtained his doctorate from CSU in Soil and Crop Sciences with an emphasis in soil fertility and crop nutrition.

After obtaining his PhD, Ron joined Western Farm Service as an agronomist, advising fruit and vegetable growers in the central, coastal and desert valleys of California on soil fertility and salinity problems. Ron has research experience with corn, organic tree fruit and vegetable crops, and has extensive experience in salinity management.

Ron currently works as research scientist and principle investigator for the Organic/ Sustainable Farming Systems Program for CSU at the Western Colorado Research Center - Rogers Mesa near Hotchkiss.

Some of his current projects include organic weed control in vegetables, organic table grape variety trials, and organic fertility management for peaches and native plant seed production. Ron's interests also include cover cropping, composting and reduced tillage in organic farming systems.

Web Resources

www.specialtycrops.colostate.edu
The CSU Specialty Crops website provides updates on research projects, extension events, and other links.

http://wsare.usu.edu/grants/
Grant opportunities are described at the Western Sustainable Agriculture Research and Education Program website.

http://www.coopext.colostate.edu/sustag/
CSU's Sustaining Agriculture in Colorado projects seek solutions to the growing challenges that face Colorado farms and ranches.

www.OrganicColorado.org
Colorado Organic Producers Association provides education, information, and networking services to promote and facilitate the production, distribution, and consumption of Colorado organic food products.

www.swmarketing.ncat.org
The new Organic Producers' Resource Guide to the Four Corners States is available on the Southwest Marketing Network's website.

www.cafr.org
The Colorado Association for Recycling is a non-profit organization formed as the independent voice of public, private, and citizen recyclers in Colorado.

www.cafr.org/membership/rmoc.htm
The Rocky Mountain Organics Council promotes sustainable utilization of organic resources in the Rocky Mountain region.

http://tmecc.org/
Standardized analytical methods developed specifically for composts are available here at the Test Methods for the Evaluation of Composts and Composting website.