

Annual Results

SW99-056

Developing sustainable dryland cropping systems in SW Colorado and SE Utah using conservation tillage and crop diversification

Location:

Yellow Jacket, Colorado

Funding Period:

Sept 15, 2000-Dec. 31, 2002

Grant Award:

\$142,380

Principle Investigators:

Abdelfettah Berrada
Research Scientist and
Superintendent
Colorado State University
Southwest Colorado Research
Center
16910 County Road Z
P.O. Box 233
Yellow Jacket, CO 81335
(970) 562-4255
aberrada@coop.ext.colostate.edu

Gary Peterson
Professor
C117 Plant Sciences
Department of Soil and Crop
Sciences
Colorado State University
Fort Collins, CO 80523
(970) 491-6804
gpeterso@lamar.colostate.edu

For a list of participants and
cooperators, please scroll to the
bottom of this report.

SUMMARY

This project is designed to maximize economic return and the water-use efficiency from rain and snow and to minimize damage to the environment from effects like soil erosion.

The project team reports that winter wheat yield at Yellow Jacket, Colo., and, to a lesser extent, at Eastland, Utah, was significantly better after a 13-month fallow period than after pinto bean, chickpea, corn, safflower or oat. This was because of earlier wheat seeding and more available soil moisture after fallow than after spring rains. Further, minimum tillage resulted in higher wheat yield than did conventional tillage at Yellow Jacket. Cutworm activity and damage were minimal in the spring of 2002, but high moth counts August through October at Yellow Jacket and Eastland indicate a risk of potential crop damage in 2003.

OBJECTIVES

This project has two research objectives and two education objectives. The research objectives are:

1. Determine the effect of alternative soil and crop management systems on crop yield, soil and water conservation, soil fertility and pest management
2. Evaluate costs and returns of the systems in the context of the whole farm

The education objectives are:

1. Increase grower awareness of alternative soil and crop management systems in the context of the whole-farm enterprise
2. Provide information on alternative cropping systems and how they can be used to enhance the sustainability of dryland cropping systems in the project area

ACCOMPLISHMENTS/MILESTONES

The 2001-02 crop season was one of the driest on record in the Four Corners area and followed two years of below-average precipitation. At Yellow Jacket, precipitation from October 2001 to August 2002 was 3.5 inches, or 24% of normal. While September rainfall was above normal (2.68 inches compared with 1.56) it came too late for most 2002 crops. Overall winter wheat yields at Yellow Jacket average 12.5 bushels per acre. Yields of winter wheat after 13 months of fallow averaged 21 bushels per acre, compared with 4 bushels after pinto bean, chickpea, corn, oat or safflower. The higher yield probably resulted from earlier seeding and more available moisture at planting. The results were similar to those in 2000. In addition, wheat after fallow produced 24.7 bushels per acre under minimum tillage compared with 17.2 bushels per acre under conventional tillage. Again, the likely result was greater available soil moisture with minimum tillage.

Winter wheat yields were even lower at Eastland and Goodman Point, Colo., because of late planting and low moisture availability. At Eastland, wheat after fallow was reseeded twice because of soil crusting and didn't emerge until spring at about the same time as the wheat after pinto beans. Still, the wheat after fallow produced 11.4 bushels per acre compared with only 4.3 bushels for wheat after beans. Winter triticale produced around 6 bushels per acre after pinto beans and less than 1 bushel after corn. Wheat after pinto beans averaged 4.7 bushels per acre at Goodman Point. And wheat after chickpeas produced less than 1 bushel per acre both at Yellow Jacket and Goodman Point. Wheat protein averaged 19% at Goodman Point, 17% at Yellow Jacket and 15% at Eastland.

The oat, safflower, corn chickpea and pinto bean planted in the trials suffered from low moisture, and none of these crops was harvested at any of the experimental sites. Oat, safflower and corn had good emergence and stands, but quickly ran out of water. Chickpeas and pinto beans were planted in dry soil resulting in poor emergence and growth. Had the safflower been harvested, it would have yielded around 150 pounds per acre in the wheat-safflower-fallow rotation and 400 pounds in the triticale-safflower-corn rotation.

The activity of cutworms, which have serious but sporadic outbreaks in the area, was monitored at Yellow Jacket and Eastland as part of the Western Region IPM Cutworm Regional Survey and Forecast Project. Winter wheat and alfalfa are the two main crop targets of two species of concern – the army cutworm and the pale western cutworm. While little activity or damage was recorded at Yellow Jacket and Eastland in late May, high cutworm counts during the 11 weeks from August to October suggest high risk for potential damage from pale western cutworms at both locations in 2003 and high risk at Yellow Jacket and low risk at Eastland for army cutworms.

IMPACTS AND CONTRIBUTIONS/OUTCOMES

Given the results, the project team, in a preliminary assessment, suggests that growing one crop each year in the semi-arid environment of southwestern Colorado and southeastern Utah may not be feasible in the long term. Two- or three-year (and possibly four-year) rotations with one fallow year would be preferable. In addition, soil disturbance should be minimized to enhance storage and conservation of soil water. The team plans to test these and other hypotheses for one more year, at no additional cost to Western SARE, before making recommendations on the feasibility of dryland cropping systems in the area and the future direction of the project. With some luck, and moisture, says the annual report, the team will be able to confirm earlier results and formulate new hypotheses; make meaningful comparisons and inferences regarding the economic feasibility of the cropping systems tested; identify trends and relationships on soil fertility and pest dynamics; and submit a proposal to continue the project.

A workshop Feb. 20, 2002, in conjunction with the Southwestern Colorado Research Annual Advisory Committee meeting, discussed the project to date and explored new avenues for research and education, including organic farming and crop rotations involving a cover crop. Principle investigator Abdelfettah Berrada later visited with several farmers and current and prospective cooperators and made presentations during soil conservation district meetings at Monticello, Utah, and Dove Creek and Cortez, Colo., discussing results of the project and its continuation beyond 2003. Tours of the experiments were canceled in 2002 because of the drought. Despite the drought-induced setbacks, Berrada remains optimistic.

“Farmers in the project have appreciated the fact that we are doing research and education that addresses dryland farming concerns in this area and not working only on irrigated agriculture, where the results can be more immediate,” he says. “The project, in addition to providing research-based information, has served as a catalyst for discussion and exchange of ideas relating to dryland cropping sustainability.”

Major Participants

Paul Ayers, Professor and Extension Agricultural Engineer
Department of Chemical and Bioresources Engineering
Colorado State University
Fort Collins, CO 80523
(970) 491-0584
payers@engr.colostate.edu

Robert Hammon, Regional Entomologist
Colorado State University
Fruit Research Center
1910 L Road
Fruita, CO 81521
(970) 858-3629
rhammon@coop.ext.colostate.edu

Duane Johnson, Associate Professor

C20 Plant Sciences
Department of Soil and Crop Sciences
Fort Collins, CO 80523
(970) 491-6438
djohnso@ceres.agsci.colostate.edu
Robert Newhall, Extension Research Associate
Western Sustainable Agriculture Research and Education
Department of Plants, Soils and Biometeorology
Utah State University
Logan, UT 84322
(435) 797-2183
bohn@ext.usu.edu

Calvin Pearson, Professor
Colorado State University
Fruita Research Center
1910 L Road
Fruita, CO 81521
(970) 858-3629
cpearson@coop.ext.colostate.edu

Rodney Sharp, Agricultural and Business Management Economist
Colorado State University Cooperative Extension
2764 Compass Dr., Suite 236
Grand Junction, CO 81506
(970) 245-9149
frmgj@coop.ext.colostate.edu

Cooperators

Phillip Chapman, Associate Professor and Experiment Station Statistician
Statistics Department
Colorado State University
Fort Collins, CO 80523
(970) 491-7261
pchapman@stat.colostate.edu

Scott Nissen, Associate Professor and Integrated Weed Management Specialist
Department of Bioagricultural Sciences and Pest Management
Colorado State University
115 Weed Research Lab
Fort Collins, CO 80523
(970) 491-3489
snissen@lamar.colostate.edu

Thomas Hooten, Research Associate
Southwest Colorado Research Center
Colorado State University
Yellow Jacket, CO 81335
(970) 562-4255

Mark Stack, Research Associate
Southwest Colorado Research Center
Colorado State University
Yellow Jacket, CO 81335
(970) 562-4255

Dolores SCD
Bob Wright, President of the Board of Supervisors
628 West, Fifth Street
Cortez, CO 81321
(970) 565-9045
Dove Creek SCD
Doug Stowe, President of the Board of Supervisors
P.O. Box 10
Dove Creek, CO 81324
(970) 677-2229

San Juan SCD
Robert Barry, Chairman
32 S 1 E
P.O. Box 520
Monticello, UT 84535
(435) 587-2481

David Fernandez, County Extension Director
Dolores County
P.O. Box 527
Dove Creek, CO 81324
(970) 677-2283
Dolores@coop.ext.colostate.edu

Jim Keyes, Cooperative Extension Director
San Juan County
P.O. Box 549
Monticello, UT 84353
(435) 587-3239
jimk@ext.usu.edu

Jan Sennhenn, County Extension Director
Montezuma County
Cortez, CO 81321
jsennhen@coop.ext.colostate.edu

Kenneth Smith
Cooperative Extension
Cortez, CO 81321
(970) 565-3123
montezum@coop.ext.colostate.edu

Don Andrews, Soil Conservationist
USDA-NRCS
Monticello Field Office
32 S 1 E, P.O. Box 520
Monticello, UT 84353
(435) 587-2481

John Lestina, Resource Conservationist
Dove Creek Field Office
USDA-NRCS
628 West 5th Street
Cortez, CO 81321
(970) 565-9045

Richard Sparks, Area Resource Conservationist
1590 12th Street
Alamosa, CO 81101
(719) 589-6649

Basin COOP Inc., Steve Trudeau
16032 Hwy 666 North
Cortez, CO 81321
(970) 882-8780

Carhart Seed & Feed Co.
Dean Knuckles, Manager
P.O. Box 55
Dove Creek, CO 81324
(970) 677-2233

Martin's Dove Creek Implements
Cecil Martin, Owner
P.O. Box 546
Dove Creek, CO 81324
(970) 677-2274

Midland Bean
Rod Tanner, Owner
P.O. Box 484
Dove Creek, CO 81324
(970) 677-2215