2015

Annual Progress Report

Agricultural Science Center at Tucumcari
6502 Quay Road AM.5

NOTICE TO USERS OF THIS REPORT

This report has been prepared to aid Science Center staff in analyzing results of the various research projects from the past year and to record data for future reference. These are not formal Agricultural Experiment Station Report research results.

Information in this report represents only one year's research. The reader is cautioned against drawing conclusions or making recommendations as a result of data in this report. In many instances, data represents only one of several years results that will constitute the final formal report. It should be pointed out, that staff members have made every effort to check the accuracy of the data presented.

This report was not prepared as a formal release. None of the data are authorized for release or publication, without the written prior approval of the New Mexico Agricultural Experiment Station.

Dr. David Thompson, Associate Dean and
Director Agricultural Experiment Station

2015

ANNUAL PROGRESS REPORT

New Mexico State University
Agricultural Science Center at Tucumcari
6502 Quay Road AM.5
Tucumcari, NM 88401-9661

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Acknowledgements

Several individuals and companies donated products and services to the Agricultural Science Center at Tucumcari during 2015. Appreciation is expressed to the following persons and organizations for their contributions.

Agricultural Science Center Advisory Committee

Mr. Phillip Box, Chairman
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Mr. Robert Lopez, Vice-Chairman
Ms. Marie Nava
Mr. Cedar Rush
Mr. Tom Sidwell

Arch Hurley Conservancy District – Franklin McCasland
Tucumcari, NM ..... Field Day Meal

Avenger Organics
Buford, GA ..... 2 gallons Avenger Weed Killer Concentrate

Box Insurance Agency – Phillip Box
Tucumcari, NM ..... Field Day Meal

Box Irrigation – Phillip Box
Tucumcari, NM ..... Field Day Meal

Brandt-Monterey
Fresno, CA ..... 2 gallons Monterey herbicidal soap

Canadian River SWCD – Tommy Wallace
Tucumcari, NM ..... Field Day Meal

Citizen's Bank – Cooper Glover
Tucumcari, NM ..... Field Day Meal

Deer Creek Seed – Kristi Schraufnagel
Windsor, WI ..... 20 lbs. Austrian winter peas and inoculant

Dickinson Implement - Dwight Haller
Tucumcari, NM ..... Field Day Meal

Eastern Colorado Seed
Clovis, NM ..... 50 lbs. Wonderleaf pearl millet seed

Everyone's Federal Credit Union – Andi Baum
Tucumcari, NM ..... Field Day Meal

Farm Credit Services – Will Cantrell
Tucumcari, NM ..... Field Day Meal

Farmers' Electric Cooperative, Inc. – Lance Adkins
Clovis, NM ..... Field Day Meal

First Title Service LLC – Rex & Cyndie Kirksey
Tucumcari, NM ..... Field Day Meal

FNB New Mexico – Corbey Mackey
Tucumcari, NM ..... Field Day Meal

Gayland Ward Seed - Gayland Ward
Hereford, TX ..... 125 lbs. TAM 111 winter wheat seed

Gowan Chemical Company – Ray Obosky
Yuma, AZ ..... 2 gallons of Scythe herbicide

Green Cover Seed Company - Keith Berns
Bladen, NE ..... 10 lbs. of pre-inoculated Balady berseem clover seed

Verdesian Life Sciences, LLC – Kurt Seever
Elkhorn, NE ..... Chickpea inoculant

JH Biotech – Connie Guest
Ventura, CA ..... 2 gallons of Weed Zap

Meridian Seed Company – Andy Draeger
Casselton, ND ..... 50 lbs. CDC Frontier chickpea seed

Monsanto / Dekalb – Kyle Lawles and Chris Gerber
St. Louis, MO ..... 15 lbs. DKW45-25 Round-up Ready Winter Canola seed

Natural Organic Warehouse
O'Fallon, MO ..... 4 gallons of 20% Acetic acid

Tree World Plant Acre Products Inc. – Richard Getzkow
St. Joseph, MO ..... Paddle Mixer, 1 qt. Elimino defoaming agent, 1 quart Vestis wetting agent

Tucumcari/Quay County Chamber of Commerce – Patsy Gresham
Tucumcari, NM ..... Field Day Meal

Tucumcari Federal Savings & Loan – Bobby Alarcon
Tucumcari, NM ..... Field Day Meal

Tucumcari LP Gas and Oil – Randy
Tucumcari, NM ..... Field Day Meal

Tucumcari General Insurance – C.J. Wiegel
Tucumcari, NM ..... Field Day Meal

Valent USA Corporation – SDW - John Dantzler
Leland, MS ..... XenTari DF Insecticide

Valent USA Corporation – Chris Meador
Leland, MS ..... Unrestricted donation for Forage Testing

Watkins Products – Kathleen Box
Tucumcari, NM ..... Field Day Meal

Wells Fargo Bank NA – Cindy Lingle
Tucumcari, NM ..... Field Day Meal

Young Insurance Agency – Larry Young
Tucumcari, NM ..... Field Day Meal

Introduction

The New Mexico State University Agricultural Science Center at Tucumcari is located on U.S. Highway 54 three miles northeast of Tucumcari and Interstate 40, Exit 333. The center consists of 464 acres, with 170.9 acres having Arch Hurley Conservancy District water rights. In operation since 1912, the center is New Mexico State University's oldest continuously operating off-campus research facility. Home of the annual Tucumcari Bull Test (also known as Tucumcari Feed Efficiency Test, LLC, TFET), which helps producers improve their beef herds, the center's mission also includes developing forage and grazing systems for irrigated lands in the western USA and the evaluation of crops for local adaptation and semi-arid irrigated and dryland cropping systems. Historical research at the center evaluated trees for windbreak and farmstead plantings, which led to the establishment of over 50 species of trees and shrubs on the center grounds, making it an oasis of trees in a sea of native grassland.

Significant events at the Agricultural Science Center in 2015 included: (1) the hiring of Ashley Cunningham, MS, as an Agricultural Research Assistant to provide support to Murali Darapuneni's semiarid cropping system program and other projects, (2) an investment by the TFET to install a GrowSafe Feed Efficiency Testing System at the bull testing facility, (3) the upgrading of a Laborer, Sr. position to Lab Tech, Research in recognition of additional duties pertaining to installation of the GrowSafe System, and (4) Jason Box receiving the Distinguished Professional Staff Off-Campus Award. These and other activities hosted or participated in by the staff at the Agricultural Science Center at Tucumcari along with the ongoing projects are described in this publication, which is available online at http://tucumcarisc.nmsu.edu/projects--results.html.

Outreach Events, Productivity and Activities

Bull Performance Testing

The 54th Annual Tucumcari Bull Test ended with the Performance Tested Bull Sale at the center on Saturday, March 14, 2015. Sixty bulls representing three breeds (Angus, Charolais, and Hereford) entered by 13 cooperators completed the test gaining an average of 3.65 pounds per day. Average sale price was $4800 for Herefords (high $5500) and $5700 for Angus (high $9500).

During the spring, TFET was formed by test cooperators for the purpose of purchasing and managing a GrowSafe Feed Efficiency Testing System that would allow for collection of individual animal intake, which in turn, could allow for evaluation of individual animal feed conversion efficiency. The system was installed over the summer with considerable renovation of the current pens to allow for two large pens and several small pens. Total investment in livestock testing at the center by TFET, LLC for this upgrade was over $93,500.

It is anticipated that at least two 60-day tests will be added to the current 120-day test. These 60-day tests could be directed toward heifers or other classes of livestock and will utilize the facility for 240 or more days each year necessitating a change in responsibilities for the lead livestock feeder.

The 2015-16 Tucumcari Bull Test began on October 19, 2015, with the delivery of 143 bulls representing the Angus and Hereford breeds entered by 15 cooperators. The test, which is the first test to use the GrowSafe System, will conclude with the Annual Performance Tested Bull Sale on Saturday, March 12, 2016. Students from the Mesalands Community College Animal and Plant Sciences Classes supervised by Staci Stanbrough assisted with data collection. Information on the feed efficiency testing program is available from the NMSU Cooperative Extension Service's Bull Session publication, on the Internet

(http://aces.nmsu.edu/beefperformancetest), and from Dr. Marcy Ward.

Field Day

The center hosted its Annual Field Day on August 6, 2015. The program, held in the Bull Test Sale Barn, included dinner, sponsored by local businesses and catered by the Tumbleweeds 4-H Club in Logan, NM, preceded by a presentation by NMSU College of Agricultural, Consumer and Environmental Sciences Dean Emeritus, Dr. Lowell Catlett who was introduced by Dr. Dave Thompson, Associate Dean of the College of Agricultural, Consumer and Environmental Sciences and Director of the Agricultural Experiment Station.

The field tour went to the center's North Farm and included the following presentations:

- John Heckendorn, Tucumcari Feed Efficiency Test, LLC: The GrowSafe System.
- John Idowu, NMSU Extension Agronomist: Tillage systems in corn silage production.
- Murali Darapuneni, NMSU Semiarid Cropping Systems Specialist: Manure applications in a strip-tilled system.
- Mark Marsalis, NMSU Extension Forage Specialist: Perennial cereal rye for forage.
- Jane Pierce, NMSU Extension Entomologist: Glandless cotton.

Dinner and refreshments were sponsored by the local businesses listed on page iii.

Other Public Programs Hosted by the Agricultural Science Center

On March 20, 2015, the center hosted a Quay County Fair steer and heifer tagging day.

The center hosted the 2015 Tucumcari Invitation FFA Livestock Judging Evaluation on March 21, 2015.

An Earth Day community service project was held on May 15, 2015 (postponed due to scheduling conflict at the school) for members of Tucumcari High School FFA Chapter with sponsor Kandy Hutchins.

The center hosted a Farm Day event for the Tucumcari Elementary School fourth and fifth grades on September 24, 2015. Presentation topics included:

- 4-H (Joyce Runyan, Quay County Cooperative Extension Service)
- Is it a weed? (Ashley Cunningham, Agricultural Research Assistant, Agricultural Science Center)
- Horse care (Staci Stanbrough and students from Mesalands Community College)
- Monocots and dicots (Murali Darapuneni)
- Plants that attract beneficial insects (Leonard Lauriault)

The center also remained open for tours of the Eastern New Mexico Outdoor Arboretum. More details about these activities are given elsewhere in this report.

Quay County Cotton Boll Weevil Control District

The Agricultural Science Center at Tucumcari continued to assist the Quay County Cotton Boll Weevil Control District (QCCBWCD) with its activities in 2015. The only cotton grown in the county was at the Agricultural Science Center. Jason Lamb, Quay County Cooperative Extension Service Agent for Agriculture, scouted for boll weevil and pink bollworm using traps with no captures. Activities by QCCBWCD were mostly limited to maintaining an active organization so as to maintain a record of boll weevil activity in the area, in preparation for future cotton production in the area.

Advisory Committee

The Advisory Committee to the Agricultural Science Center at Tucumcari met April 10, 2015 at the Pow Wow Restaurant. Minutes of the meeting are available upon request at the center's office.

At that meeting, Dr. Dave Thompson, Director of the New Mexico Agricultural Experiment Station gave an update on the University and the recent legislative session. Leonard Lauriault gave an update on the wastewater reuse project, his current research projects at the center, and the enhancement initiative. Murali Darapuneni gave an update on his current and proposed research programs.

Personnel and Facilities

Personnel

Ashley Cunningham began as an Agricultural Research Assistant to Murali Darapuneni on January 20, 2015, and Hubert Eugene "Geno" Roberts resigned as Laborer, Sr. effective March 27, 2015. That open position was reclassified as a Lab Tech, Research and filled by Shane Jennings on September 16, 2015, leaving his former Laborer, Sr. position open for the remainder of the year.

A list of temporary employees at the center in 2014 is shown below:

Name	Job Title	Dates of Employment
Alice Johnson	Custodian	01/01/2015 – 12/31/2014
Dustin Lopez	Laborer	05/05/2015 – 10/05/2015
Stephen Smith	Laborer	07/15/2015 – 09/18/2015

Internal and External Connections

Several College of Agricultural, Consumer and Environmental Sciences personnel from other locations worked cooperatively with staff at the Tucumcari center in 2015. These individuals included: Sangu Angadi, Sultan Begna, Jane Breen-Pierce, Owen Burney, Kenneth C. Carroll, Shad Cox, Tom Dominguez, David DuBois, Robert Flynn, Rajan Ghimere, Kulbhushan Grover, Steve Guldan, Robert Hagevoort, Omar Holguin, Mike Hubbert, John Idowu, Jason Lamb, Bernd Leinauer, Kevin Lombard, Clint Loest, Steve Loring, Mark Marsalis, Abdel Mesbah, John Mexal, Mick O'Neill, Curtis Owen, Chris Pierce, Tom Place, Gino Picchioni, Rich Pratt, Naveen Puppala, Ian Ray, Joyce Runyan, Aaron Scott, Eric Scholljegerdes, Brian Schutte, Manoj Shukla, Gerald Sims, Carol Sutherland, Dave Thompson, April Ulery, Marcy Ward, Margaret West, Pei Xu, Shengrui Yao, and Jinfa Zhang.

Individuals from outside the NMSU College of Agricultural, Consumer and Environmental Sciences, who worked cooperatively with center staff in 2015 were:

New Mexico:
Canadian River Soil and Water Conservation District: Supervisors, Lou Briscoe, and Chelsea Muncy
City of Tucumcari: Jared Langenegger, Doug Powers, City Commission, and Calvin Henson
Greater Tucumcari Economic Development Corporation, Patrick Vanderpool and Board of Directors
Mesalands Community College: Staci Stanbrough and students of Animal and Plant Science Classes
NMDA: Cary Hamilton
Quay County Government: County Commission, Larry Moore, and Richard Primrose
Quay County Sun: Thomas Garcia and Steve Hansen (retired, but still actively writing)
Tucumcari Feed Efficiency Test, LLC dba Tucumcari Bull Test: Leadership and Members
Tucumcari Public Schools: Kandi Hutchins, Jan Klinger and Tonya Hodges
USDA: Kenneth Alcon (NRCS, Las Vegas, NM) and David Dreesen (NRCS PMC Los Lunas, NM)

USA:
Oregon State University: David Hannaway and Mylen Bohle
Texas AgriLife Research and Extension: Jerry Michels (Amarillo), G. Ray Smith (Overton), and Calvin Trostle (Lubbock)
Texas Boll Weevil Eradication Foundation: Lyn Vandiver
Texas Tech University: Sanjit Deb, David Doerfert, and Venkatesh Uddameri
University of California – Riverside: Ariel Dinar and Laosheng Wu
University of Nebraska, Scottsbluff: Gary Hergert and Cody Creech
University of Wisconsin – Madison: Francisco Contreras-Govea

University of Wisconsin – River Falls: Yoana Newman
University of Wyoming: Jonathan Brant
USDA: N.A. Cole and Prasanna Gowda (ARS, Bushland, TX), Aaron Miller (APHIS, Abilene, TX), and Blair Waldron (ARS, Logan, UT)
West Texas A&M University, Canyon: Bob Stewart

India:
University of Agricultural Sciences, Raichur: M.R. Umesh
Tamil Nadu Agriculture University, Kumulur, Tiruchirappalli: K. Annadurai

Israel:
Agricultural Research Organization – Volcani Center: Alon Ben Gal

Mexico:
INIFAP, Sonora: Alejandro Suárez and Luis Tamayo
SENASICA: Mexico City: Gustavo Torres
Universidad Autónoma de Baja California: Leonel Avendaño-Reyes, David Calderon-Mendoza, Francisco Loya-Olguín, and Rafael Villa-Angulo

Buildings, Grounds, and Facilities

The Eastern New Mexico Outdoor Arboretum at the Agricultural Science Center at Tucumcari remained relatively unchanged in 2015. While no trees were removed, more trees died due to the lack of irrigation and a few fell. Fallen trees were removed for firewood with smaller limbs chipped for mulch.

For the Earth Day community service project on May 15, 2015, the Tucumcari High School FFA chapter cleaned out the flower beds in front of the office, removed dead material from the pollinator project, cleaned weeds from the weather yard, and picked up trash along the center's US 54 road frontage.

Other alterations and improvements to the grounds and facilities included replacement of the water line to the office and a new phone line to shop, in addition to the feed efficiency testing facility already described.

Irrigation Water

The annual Arch Hurley Conservancy District assessment for 2015 was $13.00 per water right acre. The center retained a credit of $519.26 for pre-paid water from 2014. The total allocation for 2015 was 15 in/A or 213.63 acre-feet for the center, 61.29 acre-feet of which was delivered at $10/acre-foot. Water was first released into the canal on April 1, 2015, and turned off on October 31. The center retained a credit of $1523.35 for pre-paid water from 2015.

Delivery of treated wastewater from the City of Tucumcari Wastewater Treatment Facility for irrigation was continuous in 2015 and total of 131.9 acre-feet were applied from January through December through the three center pivots. The total amount paid by the center to the City for that water was $14,030, including $9,000 for the water, under a 20-year contract for 300 acre-feet/year, and $5,030 in electricity for pumping and labor to read the meters. Net returns from commercial hay production in 2015 that was possible due to the availability of this water was sufficient to cover the cost of this water. Also in 2015, the Agricultural Experiment Station provided $5,317.84 to upgrade the wastewater delivery system to allow for greater storage capacity at the treatment plant. Every six months a semi-annual report is submitted to NMED showing monthly water use, meter inspection, and amount of nitrogen applied to the water use area. That report is available from the center upon request.

Sustainability and Environmental Stewardship

Continuing with sustainability through recycling in 2015, staff at the Agricultural Science Center at Tucumcari recycled 139.4 lb plastic; 40.6 lb tin cans; 39.8 lb glass; 52 ink or toner cartridges; and 681 lb paper and other fiber products. Purchased paper totaled 149.4 lb for 2015. Additionally, 146.5 gal of non-fuel petroleum lubricants were purchased in 2015 while none were recycled.

Productivity

Peer-Reviewed Publications

Journal Articles

Angadi, S., Umesh, M. R., Contreras-Govea, F., Annadurai, K., Begna, S. B., Marsalis, M. A., Cole, A., Gowda, P. H., Hagevoort, G. R., **Lauriault, L. M.** (corresponding author) (in press). In search of annual legumes to improve forage sorghum yield and nutritive value in the Southern High Plains. *To appear in Crop, Forage, & Turfgrass Management*. Accepted: December 2, 2015.

Darapuneni, M. K., Morgan, G. D., Shaffer, O. J. Effect of Planting Date on Distribution of Seasonal Forage Yields in Dual Purpose Wheat, Oats, and Ryegrass Crops (In Press). *Crop, Forage, Turfgrass*. Accepted: December 8, 2015.

Darapuneni, M. K., Morgan, G. D., Ibrahim, A., Duncan, R. (2015). Evaluation of flax genotypes for cold tolerance and yield in south-east Texas. *Journal of Agronomy and Crop Science, 201*, 128-137.

Schutte, B. J., **Lauriault, L. M.** (2015). Nutritive value of field bindweed (*Convolvulus arvensis*) roots as a potential livestock feed and the effect of *Aceria malherbae* on root components. *Weed Technology, 29*, 329-334.

Schutte, B. J., **Cunningham, A. E.**, (2015). Tall morningglory (*Ipomea purpurea*) seedbank density effects on pendimethalin control outcomes. *Weed Technology, 29*, 844-853.

Experiment Station Publications

Begna, S. B., Angadi, S., Marsalis, M. A., **Lauriault, L. M.** (2015). *Bulletin 808, Yield of diverse ultra short to early season crops grown under limited irrigation in the Southern Great Plains of the USA*. Las Cruces, NM: Agricultural Experiment Station and Cooperative Extension Service, New Mexico State University. http://aces.nmsu.edu/pubs/research/agronomy/BL808.pdf.

Non-Peer-Reviewed Publications

Experiment Station Publications

Lauriault, L. M., Ray, I., Pierce, C., Burney, O., Flynn, R. P., Marsalis, M. A., O'Neill, M. K., West, M. (2015). *The 2015 New Mexico Alfalfa Variety Test Report*. Las Cruces, NM: Agricultural Experiment Station and Cooperative Extension Service, New Mexico State University. http://aces.nmsu.edu/pubs/variety_trials/AVT15.pdf.

Marsalis, M. A., Flynn, R. P., **Lauriault, L. M.**, Mesbah, A., O'Neill, M. K. (2015). *New Mexico 2014 Corn and Sorghum Performance Tests*. Las Cruces, NM: Agricultural Experiment Station and Cooperative Extension Service, New Mexico State University. http://aces.nmsu.edu/pubs/variety_trials/14CornSorghumRpt.pdf.

Extension Publications

Marsalis, M. A., **Lauriault, L. M.** (2014). Forage research program update - Pushing on. In Mark Marsalis (Ed.), *Alfalfa Market News* (1st ed., vol. 133). Las Cruces, NM: Agricultural Experiment Station and Cooperative Extension Service, New Mexico State University. http://aces.nmsu.edu/pubs/haymarketreports/docs/2014/May_2014.pdf

Popular Press and Other Publications

Lauriault, L. M. (2015). *What I learned at a couple of meetings I attended this week and last, Parts 1 & 2*. Self-published email.

Moorman, J. Ward, M. (2015). *NMSU to host 54th Tucumcari performance bull test and sale*. NMSU Press Release. (March2, 2015).

Hansen, S. (2015). *Higher bull prices signal recovery*. Quay County Sun, Tucumcari, NM. (March 18, 2015).

Garcia, T. (2015). *Field Day highlights center's work*. Quay County Sun, Tucumcari, NM. (August 12, 2015).

Garcia, T. (2015). *Field Day snaps*. Multiple color photo spread in Quay County Sun, Tucumcari, NM. (August 12, 2015).

Boehler, K. (2015). *Agricultural Science Centers*. Enchantment Magazine. (September 2015).

Presentations at Public Conferences or Meetings

Darapuneni, M. K., Ag Days Degree Program, NMSU, Clovis, "Principles of Soil Water Relations", (Sep. & Dec. 2015, cancelled).

Lauriault, L. M., Ag Days Degree Program, NMSU, Clovis, "Basic principles and concepts of forage management", (Sep. & Dec. 2015, cancelled).

Lauriault, L. M., (Presenter), Marsalis, M. A., Forage Growers Workshop, NMSU Valencia County Cooperative Extension Service, Los Lunas, "Planting date impacts on long-term alfalfa yield". (December 1, 2015).

Darapuneni, M. K., ASA-CSSA-SSSA International Meetings, Minneapolis, "Crop diversity in semi-arid cropping systems", Poster presentation abstract published in proceedings. (November 2015).

Darapuneni, M. K., ASA-CSSA-SSSA International Meetings, Minneapolis, "Split-plot design with subplot replications: A case Study", Poster presentation abstract published in proceedings. (November 2015).

Darapuneni, M. K., Guest Lecture, Mesalands Community College, Tucumcari, "Cropping system planning and components of soil water relations", (November 3, 2015).

Darapuneni, M. K., Farm day, NMSU Agricultural Science Center, Tucumcari, Tucumcari, "Monocots vs dicots". (September 24, 2015).

Lauriault, L. M., Elementary School Farm Day Event, Agricultural Science Center at Tucumcari, Agricultural Science Center at Tucumcari, "Plants that attract beneficial insects". (September 24, 2015).

Darapuneni, M. K., Field Day, Agricultural Science Center-Tucumcari, Tucumcari, "Dry manure application in strip till zone to improve water use efficiency, soil quality, growth, and yield characteristics of grain sorghum in semi-arid environments". (August 6, 2015).

Lauriault, L. M., 6th Annual Acoma Ag Day, Pueblo of Acoma/NMSU Cooperative Extension Service, Acoma, NM, "Pasture and alfalfa production". (July 24, 2015).

Lauriault, L. M., Annual Meeting of the Western Society of Crop Science, Logan, UT, "Impacts of winter irrigation and summer irrigation termination on alfalfa dry matter yield", published in proceedings. (June 16, 2015).

Lauriault, L. M., W3170 Committee on Beneficial Reuse of Residuals and Reclaimed Water: Impact on Soil Ecosystem and Human Health, USDA, Beltsville, MD, "Update on treated municipal wastewater reuse projects at the Agricultural Science Center at Tucumcari". (June 11, 2015).

Lauriault, L. M., Bindweed Mite Seminar, Valencia County Cooperative Extension Service, Bosque Farms, NM. (May 27, 2015).

Lauriault, L. M., Bindweed Mite Seminar, Sandoval County Cooperative Extension Service, Corrales, NM. (May 27, 2015).

Lauriault, L. M., 3rd Annual Anton Chico Seed Exchange, Guadalupe County CES, Anton Chico, "Basic alfalfa management for the upper Pecos River Valley". (March 7, 2015).

Lauriault, L. M., NM Organic Farming Conference, NMDA/NM Farm to Table/NMSU CES, Albuquerque, NM, "Mighty mites for biological control of field bindweed". (February 21, 2015).

Grants and Contracts

Funded: None

Not Funded

Darapuneni, M. K. (Co-Principal), Netaji Subash-ICAR Fellowship, $72,000.00, Description: Innovative crop rotations to improve the water and nitrogen use efficiency in the semi-arid environments.

Darapuneni, M. K. (Principal), Angadi, S., **Lauriault, L. M.**, "Federal Specialty Block Grant Program," USDA, $82,500.00, Description: Water use efficiency, nitrogen dynamics, and yield potential of edible dry beans in a traditional winter wheat cropping system.

Darapuneni, M. K. (Co-Principal), Carroll, K. C. (Co-Principal), Xu, P. (Co-Principal), Schutte, B. J. (Co-Principal), Sims, G. K. (Co-Principal), Idowu, O. J. (Co-Principal), Grover, K. (Co-Principal), Angadi, S. (Co-Principal), Picchioni, G. (Co-Principal), **Lauriault, L. M.** (Co-Principal), Shukla, M. K. (Principal), Sponsored Research, "RII Track-2 FEC: Infrastructure Development for Enhancing Arid and Semi-Arid Systems (IDEAS) for Food and Water Security", Sponsoring Organization: National Science Foundation, Sponsoring Organization Is: Other, Research Credit: $297,311.15, PI Total Award: $5,946,223.00.

Lauriault, L. M. (Principal), Sponsored Research, "Improving Alfalfa Cultivar Selection by GIS Mapping of Fall Dormancy and Winter Survival Index Zones and Modeling Seasonal and Annual Yield", Sponsoring Organization: Oregon State University, Sponsoring Organization Is: Other, Research Credit: $20,000.00, PI Total Award: $20,000.00.

Schutte, B. J. (Principal), Hagevoort, G. R. (Co-Principal), Marsalis, M. A. (Co-Principal), Picchioni, G. (Co-Principal), **Lauriault, L. M.** (Co-Principal), Sponsored Research, "Pre-Proposal: Determining wastewater-induced changes in vegetation to improve forage crop weed management strategies in the U.S. Southwest", Sponsoring Organization: Water Environment Research Foundation, Sponsoring Organization Is: Other, Research Credit: $15,921.66, PI Total Award: $159,216.65.

Pending:

Darapuneni, M. K. (Co-Principal), "TWAS-CONACYT Postdoctoral Fellowships," TWAS-CONACYT, Description: Partial root-zone drying for enhancing the productivity of wheat-legume cropping system with less water in semi-arid environment.

Darapuneni, M. K. (Co-Principal), Agricultural Production Systems," NIFA, Description: Improving Resource Use Efficiency and Crop Productivity in the Southern High Plains with Innovative Cropping Systems.

Other Proposals

Funded:

Lauriault, L. M. (Principal), "Fee-based alfalfa variety testing, 2015," Multiple seed companies, $6225.00, Description: Entry fees for alfalfa varieties planted in one year and compared for the next three years at various NMSU locations across the state.

Lauriault, L. M. (Principal), "Fee-based alfalfa variety testing, 2014," Multiple seed companies, $5,250.00, Description: Entry fees for alfalfa varieties planted in one year and compared for the next three years at various NMSU locations across the state.

Lauriault, L. M. (Principal), "Fee-based alfalfa variety testing, 2013," Multiple seed companies, $4350.00, Description: Entry fees for alfalfa varieties planted in one year and compared for the next three years at various NMSU locations across the state.

Lauriault, L. M. (Principal), "Fee-based alfalfa variety testing, 2012," Multiple seed companies, $11,700.00, Description: Entry fees for alfalfa varieties planted in one year and compared for the next three years at various NMSU locations across the state.

Marsalis, M. A. (Principal), **Lauriault, L. M.**, et al., "Fee-based sorghum grain and forage variety testing, 2015," Multiple seed companies, $1745.00 for Tucumcari, Description: Entry fees for sorghum grain and forage varieties planted annually and compared at various NMSU locations across the state.

Flynn, R. (Principal), **Lauriault, L. M.**, et al., "Fee-based cotton variety testing, 2015," Multiple seed companies, $375.00, Description: Entry fees for cotton varieties planted annually and compared at various NMSU locations across the state.

Yao, S. (Principal), **Lauriault, L. M.**, et al., "Jujube cultivar evaluation, selection and promotion in New Mexico," USDA Specialty Crop Block Grant (through NMDA), $60,000.00, Description: This project focuses on jujube cultivar selection, evaluation and marketing in New Mexico.

Lauriault, L. M. (Principal), "Capital Outlay," 2014-2016, New Mexico Legislature, $75,000.00.

Lauriault, L. M. (Principal) and **Cunningham, A. E.**, “Forage Research Program Support,” Valent, $3000.00, Description: A gift to the Forage Grass – ASC Tucumcari Foundation account.

Other Activities

Jason Box

Arch Hurley Conservancy District: Attended and participated in monthly meetings whenever possible as an interested party.

New Mexico Environmental Department: Maintained and submitted semi-annual reports for wastewater use at station including total water usage, nitrogen fertilizer applications, and septic tank conditions.

Ashley Cunningham

Responded to and recommended weed management programs to two local residents.

Member of NMSU Entomology, Plant Pathology, and Weed Science Search Committee for an Assistant Professor in Weed Science (2015).

Murali Darapuneni

Co-led Field Trip, Mesalands Community College, Tucumcari, New Mexico. (October 15, 2015).
University of Nebraska, Scottsbluff, Nebraska. (January 2015).
ARS-USDA, Amarillo, Texas. (January 15, 2015).
National Science Foundation, Arlington, Virginia. (June 2015).
Recruitment, Netaji-Subash ICAR, New Delhi, New Delhi. (June 8, 2015).
Texas A&M University, College Station, Texas. (July 2015).
ICRISAT-Ethiopia, Addis Ababa. (September 1, 2015).
Member of Plant and Environmental Sciences Department Undergraduate Student Recruitment and Retention Committee. (August 2015 - Present).
Recruitment, The Islamia University of Bahawalpur, Bahawalpur, Punjab. (September 14, 2015).
Participated in session entitled, "Educating graduate students in various technical and non-technical related issues to enhance their ability to excel in the field of Agriculture". ASA-CSSA-SSSA International Meetings, Minneapolis. (November 15, 2015).
Participated in session entitled, "The role of the mentors is to stimulate conversation and practical networking with graduate students in an informal environment". ASA-CSSA-SSSA International Meetings, Minneapolis. (November 15-18, 2015).
Judged a graduate student oral competition in soil fertility and nutrition. ASA-CSSA-SSSA International Meetings, Minneapolis. (November 16, 2015).
Judged graduate student poster competition in soil carbon and greenhouse gas emissions. ASA-CSSA-SSSA International Meetings, Minneapolis. (November 16-17, 2015).
USDA-NIFA-SBIR, Grant Proposal Reviewer, Washington, DC, USA.
USDA-NIFA-MSP, Proposal Review Panelist, Washington, DC, USA.
Global Center for Food Systems Innovation, Grant Proposal Review Panelist, USAID and Michigan State University.
Reviewed manuscripts for: Agronomy Journal (9), Crop, Forage, & Turfgrass Management (2), Field Crops Research (2), and Valdose Zone Journal (1).

Leonard Lauriault

Attended Southwest Hay and Forage Conference, New Mexico Hay Association, Ruidoso, NM, USA (January 14-15, 2015).
Judged Agricultural Products, Quay County Fair, Tucumcari, NM, USA (August 12, 2015).
Attended Interstate Streams Commission meeting, Tucumcari, NM, USA (August 17, 2015).
Co-led Field Trip, Mesalands Community College Plant Sciences Class, Tucumcari, NM. (August 25, 2015).
Lead tour of the Agricultural Science Center at Tucumcari for Rich Pratt, Plant and Environmental Sciences Department, and visiting faculty from The Ohio State University (October 13, 2015).
Served as internal reviewer for a proposal within the Plant and Environmental Sciences Department.
Reviewed proposal on re-introduction of sainfoin into perennial pastures. Alberta Beef Producers, Calgary, Alberta, Canada.
Reviewed manuscripts for: Agronomy Journal (1), Crop, Forage, & Turfgrass Management (1), Crop Science (5), and Field Crops Research (2)
Coordinated NMSU's statewide alfalfa variety testing program.
Responded to over 75 miscellaneous questions from New Mexico residents, including NMSU NRCS, and FSA personnel, as well as residents and extension personnel in other states.
New Mexico Beef Cattle Performance Association/Tucumcari Feed Efficiency Test, LLC. Assisted with the Tucumcari Bull Test weigh days and sale and mediated a new agreement between NMSU and TFET.
Continued program to distribute forage nitrate toxicity screening test kits to all interested AES and CES personnel in New Mexico.
Distributed bindweed gall mites as a biological control for field bindweed to interested parties throughout New Mexico.
Canadian River Soil and Water Conservation District: Attended and participated in monthly meetings whenever possible as an interested party; supervised maintenance and handled reservations for two seed drills and a tree-planter owned by the District for use by producers; assisted with the development of a rental agreement for two ATV-mounted sprayers.

Set up booth display about the activities of the Agricultural Science Center at the Quay County Fair (Tucumcari, August 12-15, 2015), as well as at the center's Bull Sale (March 8, 2015) and Field Day (August 6, 2015).
Member of Northeastern New Mexico Regional Water Plan Steering Committee.
Member of Ute Reservoir Watershed-Based Planning Committee.
Member of AOSCA C655.4 National Alfalfa & Misc. Legumes Review Board.
Member of ACES Dean Search Committee.
Member of Plant and Environmental Sciences Department, Extension Animal Sciences and Natural Resources Department (College Rank Spring Review), and College of Agricultural, Consumer and Environmental Sciences Promotion and Tenure Committees.

Professional Development Activities and Other Meetings Attended Not Previously Mentioned

Jason Box
Continuing Education, "Quay County Private Applicators Workshop". Tucumcari, NM (December 9, 2015).
Continuing Education, "Amarillo Farm and Ranch Show", Amarillo, TX (December 3, 2015).
Continuing Education, "Quay County Weed Workshop". Tucumcari, NM (March 11, 2015).
Continuing Education, "BQA Program". Tucumcari, NM (February 4, 2015).
Continuing Education, "Texas Southern Panhandle Crop Clinic", Farwell, TX (January 8, 2015).

Ashley Cunningham
Initial Training, "Pre-license Training for Pesticide Applicators", NMSU Pesticide Program, Clovis, NM, USA (December 10, 2015).
Initial Training, "Radiation safety/hazmat training for neutron probe use and maintenance for soil moisture measurements in semi-arid systems research", USDA-ARS, Bushland, Texas. (June 2, 2015).
Initial Training, "Nuclear Gauge Safety and Transportation. NMSU, Las Cruces, NM, USA (March, 26, 2015).

Murali Darapuneni
Continuing Education, "Field Day", Agricultural Science Center-Los Lunas, Los Lunas, NM, USA. (August 12, 2015).
Continuing Education, "Field Day", Agricultural Science Center-Clovis, Clovis, New Mexico, USA. (August 7, 2015).
Initial Training, "Radiation safety/hazmat training for neutron probe use and maintenance for soil moisture measurements in semi-arid systems research", USDA-ARS, Bushland, Texas. (June 2, 2015).

Leonard Lauriault
Continuing Education, "Forage Growers Workshop", NMSU Valencia County Cooperative Extension Service, Los Lunas, NM, USA (December 1, 2015).
Continuing Education, "Field Day", NMSU Clayton Livestock Research Center, Clayton, NM, USA (September 28, 2015).
Continuing Education, "Field Day", NMSU Agricultural Science Center at Clovis, Clovis, NM, USA (August 7, 2015).
Continuing Education, "Quay County Weed Workshop", NMSU Cooperative Extension Service, Tucumcari, NM, USA (March 11, 2015).
Continuing Education, "Employee Evaluation Application for Nonexempt Supervisors", NMSU, Las Cruces, NM, USA (March 3, 2015).
Continuing Education, "Southwest Hay and Forage Conference", New Mexico Hay Association, Ruidoso, NM, USA (January 14-15, 2015).

Memberships

Jason Box
None

Ashley Cunningham
Crop Science Society of America, Scope: National.
American Society of Agronomy, Scope: National.
Soil Science Society of America, Scope: National.

Weed Science Society of America, Scope: National.

Murali Darapuneni
Crop Science Society of America, Scope: International.
American Society of Agronomy, Scope: International.
Soil Science Society of America, Scope: International.
The Association of Agricultural Scientists of Indian Origin, Scope: International.
Sigma-Xi Scientific Society, Scope: International.

Leonard Lauriault
Western Society of Crop Science, Scope: International
Crop Science Society of America, Scope: International.
American Society of Agronomy, Scope: International.
New Mexico Hay Association, Ex-officio Director, Scope: State.
American Forage and Grassland Council, Scope: National.
Sigma-Xi Scientific Society, Scope: International.

Certifications:

Jason Box
New Mexico Beef Quality Assurance Trained Producer, New Mexico Livestock Board.
First Detector Certification, National Plant Diagnostic Network.
Public Pesticide Applicator's License.
Private Pesticide Applicator's License for Rodent Control.
NMSU Assurance of Actual Training, IACUC.
Agricultural Science Center Hazard Communication Standard
Worker Protection Standard, Pesticide Handler (through May 1, 2020).
Forklift Certification, Farm Crew

Ashley Cunningham
NMSU Assurance of Actual Training, IACUC.
Agricultural Science Center Hazard Communication Standard
Worker Protection Standard, Pesticide Handler (through May 1, 2020).
Nuclear Gauge Safety and Use.

Murali Darapuneni
HAZMAT, CPN Neutron Gauge (August, 2014 - Present).
HAZMAT, CPN Neutron Gauge. (August, 2014 - Present).
Nuclear Gauge Safety Certification" CPN. (August 26, 2014 - Present).
Agricultural Science Center Hazard Communication Standard
Worker Protection Standard, Pesticide Handler (through May 1, 2020).

Leonard Lauriault
Preparing Communities for Animal, Plant, and Food Incidents: An Introduction, National Center for Biomedical Research and Training Academy of Counter-Terrorist.
Certified Forage and Grassland Professional, American Forage and Grassland Council (through December 31, 2017).
Public Pesticide Applicator's License.
Private Pesticide Applicator's License for Rodent Control.
NMSU Assurance of Actual Training, IACUC.
Agricultural Science Center Hazard Communication Standard
Worker Protection Standard, Pesticide Handler (through May 1, 2020).

Farm Staff:
NMSU Assurance of Actual Training, IACUC.
Agricultural Science Center Hazard Communication Standard
Worker Protection Standard, Pesticide Handler (through May 1, 2020).

Faculty and Staff Awards and Recognitions:
Jason Box: Distinguished Professional Staff Off-Campus Award (Recognized: April 17, 2015).
Jason Box: NMSU 5 Year Service Award (Anniversary: December 16, 2014; Recognized: April 17, 2015).
Jared Jennings: NMSU 5 Year Service Award (Anniversary December 16, 2014; Recognized: April 17, 2015).

Annual Weather Summary

The first documented weather observations in the Tucumcari area were from a weather station near the Tucumcari Post Office. That station was operational from December 1904 through February 1913. The Agricultural Science Center at Tucumcari began recording daily precipitation in January 1912. Air temperatures were first recorded on May 26 of that year. The weather station at the center has remained in continuous operation since its establishment in 1912. An updated historical summary of weather observations at the Agricultural Science Center at Tucumcari was published as an Agricultural Experiment Station Research Report in early 2003. This report contains summary information relative to weather conditions at the center through 2002. The report is available from the Agricultural Science Center office or online at: http://aces.nmsu.edu/pubs/research/weather_climate/RR751.pdf.

In addition to the precipitation and weather records, the center has maintained records on wind movement since 1918. Above ground pan evaporation has been measured since 1953. Maximum and minimum soil temperatures, at a four-inch depth, have been recorded since 1977. Maximum and minimum water temperatures in the evaporation pan were first recorded in 1981.

Total precipitation for 2015 was 26.52 inches, 9.85 inches more than the long-term average of 16.67 inches (Table 1). There were above average amounts of precipitation recorded in 2015. Record high and low amounts of precipitation, by month, are shown in Table 2. No precipitation records were set in 2015.

The mean maximum temperature for 2015 was 71ºF, which is 5ºF lower than the long-term average and was 7ºF less than 2011 when the record was set (Table 3). Mean monthly maximum temperatures were above normal for the months of March, April, July, September, and November. The monthly mean maximum temperatures for February, June and August tied the long-term averages. Mean minimum temperature for 2015 was 43ºF, which ties the long-term average of 43ºF. Mean monthly minimum temperatures were above normal for the months of March, June, July, August, September, October, and December. Mean minimum temperatures tied with the long term average for January, April, and November. The mean annual temperature for 2015 was 60ºF.

The lowest recorded temperature in 2015 of 3ºF was recorded on February 7th. The highest temperature, 102ºF, was recorded on July 20th. Highest and lowest recorded temperatures and mean temperature extremes are shown in Table 4. A record high was tied on September 14th. (101ºF). No record lows were recorded.

The last spring temperature of 32ºF in 2015 was recorded on April 6th (Table 5). The first temperature of 32ºF in fall was recorded on November 6th. Normal last spring and first fall freeze dates are April 4th and October 14th, respectively. The 2015 growing season was 210 days, 16 days longer than the long-term average of 194 days. The longest and shortest growing seasons on record are 222 and 136 days, which were recorded in 1989 and 1945, respectively.

The last snowfall in spring 2015 was recorded on March 5th. The first snowfall in winter 2015 was recorded on December 13th. Total snowfall in 2015 was 9.45 inches. The last snowfall in spring has occurred as late as May 18th in 1935 and 1980. The first snowfall in winter has been recorded as early as October 8th in 1970.

Summaries of pan evaporation and wind run at the center are shown in Table 6. Daily evaporation was near the long-term average, but somewhat less than recent years and season total was well below the record set in 2011 (92.44 inches). Wind speeds were below average, but well below the record of 7.7 mph April to September and 7.2 annually set in 1918 (contrary to recent annual reports stating that this record had been broken). May and June were considerably windier than average. June was the windiest for that month since 1954 (6.7 mph), but well below the 1947 record of 7.5 mph.

Table 1. Summary of monthly precipitation amounts (inches) recorded at the NMSU Agricultural Science Center at Tucumcari, 1905-2015.

Month	2015	2014	2013	2012	2011	Average
January	1.44	0.01	0.40	0.00	0.00	0.39
February	0.89	0.03	0.88	0.22	0.39	0.50
March	0.38	0.22	0.00	0.09	0.73	0.77
April	1.93	0.21	0.01	0.18	0.10	1.16
May	4.02	2.42	0.82	1.51	0.03	1.98
June	2.07	4.00	1.13	0.93	0.18	1.99
July	7.56	2.54	1.23	0.33	1.42	2.79
August	2.03	0.82	0.92	0.97	1.21	2.82
September	1.31	2.73	4.28	1.42	2.71	1.63
October	0.81	0.19	0.26	0.38	0.81	1.33
November	1.23	0.37	0.43	0.00	0.01	0.67
December	2.85	0.38	0.11	0.50	1.81	0.64
Total	26.52	13.92	10.47	6.53	9.40	16.67

Table 2. Highest and lowest monthly precipitation amounts recorded at the Agricultural Science Center at Tucumcari 1905-2015.

Month	Maximum (inches)	Year	Minimum (inches)	Year
January	1.68	1999	0.00	2012
February	2.40	1912	0.00	2000
March	3.69	1919	0.00	2013
April	4.89	1997	0.00	1996
May	8.72	1921	0.00	1927
June	6.39	1919	0.00	1947
July	11.28	1950	0.24	1987
August	8.38	1933	0.12	1951
September	7.23	1941	0.00	1948
October	7.51	1923	0.00	1975
November	4.00	1905	0.00	2012
December	4.27	1959	0.00	1976

Note: Where minimum records are shared by more than one year, only the most recent year is listed.

Table 3. Summary of mean monthly temperatures at the NMSU Agricultural Science Center at Tucumcari , 1905-2015.

Date	2015	2014	2013	2012	2011	Average 1905-2015
			Mean Maximum Temperature (°F)			
January	49	56	52	60	57	53
February	57	56	57	57	55	57
March	65	66	57	71	70	64
April	75	75	71	81	77	73
May	75	82	81	86	84	81
June	91	91	96	98	99	91
July	94	93	94	97	101	93
August	92	93	95	96	100	92 *
September	91	82	85	88	86	85 *
October	73	79	74	75	77	75 **
November	63	61	60	70	64	62 **
December	55	55	51	58	45	53 *
Annual	71	71	74	73	78	76 **
			Mean Minimum Temperature (°F)			
January	24	22	24	28	22	24
February	26	26	28	29	23	27
March	35	32	31	39	35	33
April	42	42	38	48	42	42
May	49	51	52	55	47	51
June	62	62	64	65	64	61
July	66	64	66	69	68	65
August	64	64	66	66	67	63
September	62	58	61	57	55	56
October	49	47	42	44	41	44 *
November	33	30	34	36	32	33 *
December	28	25	24	27	24	25
Annual	43	44	44	47	43	43
			Mean Temperature (°F)			
January	36	39	38	44	39	38
February	42	42	43	43	39	42
March	50	49	44	55	53	49
April	58	58	54	64	60	58
May	62	66	66	70	65	66
June	76	76	80	82	81	76
July	80	79	80	83	85	79
August	78	79	80	81	84	77 *
September	76	70	73	72	70	71 *
October	61	63	58	59	59	59 **
November	48	45	47	53	48	47 **
December	49	40	38	43	35	39
Annual	57	59	58	62	60	60 *

Note: *Indicates 1 year of missing data
**Indicates 2 years of missing data
Some records from previous years have been corrected.

Table 4. Highest and lowest recorded temperatures (°F) and mean temperatures (°F), by month, at the NMSU Agricultural Science Center at Tucumcari, 1905-2015.

	Daily Record Extremes (1913-2015)				Monthly Mean Extremes (1905-2015)			
	Highest		Lowest		Highest		Lowest	
Month	Temp	Year	Temp	Year	Max	Year	Min	Year
January	80	1974	-22	1963	62	2006	12	1963
February	83	2002	-16	1933	67	1976	17	1929
March	92	1989	-3	1948	75	1974	24	1965
April	97	2012	12	1920	81	2012	37	1983
May	103	2000	25	1917	90	1996	46	1983
June	109	2013	37	1919	99	2011	55	1983
July	107	2011	52	1995	101	2011	61	1967
August	108	2007	49	1988	100	2011	57	1965
September	105	2011	30	1970	92	2010	51	2006
October	97	2000	12	1993	82	1979	39	2009
November	90	2006	-2	1976	71	1999	26	1929
December	82	1980	-18	1918	66	1980	17	1983
Annual					79	2011	41	1963

Note: Where records are shared by more than one year, only the most recent year is listed.

Table 5. Summary of last spring and first fall temperature of 32°F and 28°F and growing season at the NMSU Agricultural Science Center at Tucumcari 1913-2015.

	2015	2014	2013	2012	2011	Average 1913-2015	Record Extremes			
							Earliest	Year	Latest	Year
32°F or less										
Last in Spring	26-Mar	15-Apr	24-Apr	4-Apr	2-May	4-Apr	24-Mar	1943	15-May	1945
First in Fall	6-Nov	11-Nov	19-Oct	27-Oct	18-Oct	14-Oct	17-Sep	1965	19-Nov	1989
Growing Season (Days)	225	210	169	207	169	194	136	1945	222	1989
28°F or less (Killing Frost)										
Last in Spring	6-Mar	15-Apr	3-May	4-Apr	2-May	26-Mar	6-Mar	2015**	6-May	1917
First in Fall	12-Nov	11-Nov	6-Nov	27-Oct	18-Oct	25-Oct	8-Oct	1970	27-Nov	2001*
Number of Killing Frost Free Days	251	210	187	206	169	213	169	1917	256	2001

*Also in 1965 & 1923

**Also in 1935

Table 6. Summary of pan evaporation (inches) and wind run (average miles per hour) at the NMSU Agricultural Science Center at Tucumcari, 1918-2015.

	Pan Evaporation				Wind Run	
	2015		1953 - 2015		2015	1918-2015
Month	Total	Daily Average	Monthly Average	Daily Average	Daily Average	Daily Average
	……inches……				mph	mph
April	11.06	0.36	10.76	0.36	5.1	5.7
May	11.00	0.37	12.56	0.41	5.6	5.1
June	11.23	0.37	13.97	0.47	6.5	4.8
July	11.08	0.37	13.44	0.43	3.5	3.9
August	11.21	0.37	11.59	0.37	2.9	3.5
September	10.88	0.36	9.24	0.31	3.6	3.8
	66.46	0.37	71.50	0.39	4.52	4.47

Operational Revenues and Expenditures

The Agricultural Science Center at Tucumcari received $102,441.00 in operational funds in FY 2014-2015. (Table1). This includes $50,000.00 in start-up funds for Dr. Darapuneni.

The center billed itself $42,110.00 for vehicle and equipment use based on established mileage rates and hourly charges for vehicles, tractors, and other equipment.

The alfalfa variety testing program generated $4,425.00, the sorghum variety test generated $745.00 and the cotton variety test generated $375.00 in FY 2014-2015.

The center's operational expenditures in fiscal year 2014-2015 totaled $200,675.00 (Table 1). Tractor and Vehicle use was the largest expenditure ($38,850 for the Tractor/Vehicle Index (101507). Although Tractor/Vehicle Use is in the expenditure category of Table 1, it is a revenue source for the Tractor/Vehicle Index (101507). The second largest expenditure was for Irrigation Services ($33,079.00), which included payments to the City of Tucumcari and the Arch Hurley Conservancy District. Furniture and repairs or upgrades. Domestic Travel in the amount of $18,927.00 was the third largest expenditure of 2014-2015 (Table 1).

Expenditures for Non-office Supplies totaled $5,648.00 in FY 2014-2015, which was $1,828.00 lower than the previous year. Total for chemicals purchased is $4,973.00.00, which included $520.00 spent for herbicides, $3,670.00 for fertilizer, $18.00 for insecticides, $533.00 for pest control supplies, and $232.00 for adjuvants.

Major purchases during the 2014-2015 Fiscal Year include a Hustler Raptor Mower ($4,499.00), Pivotal Fencing System ($1,199.99), parts to repair the John Deere Swather/Shredder and the John Deere Planter ($4,093.38), a New Holland Stack Wagon ($11,400.00) and a Header for the John Deere Chopper (950.00) a Giddings Coring Machine (2,048.20), conduit for the Neutron probe tubes ($749.50), Desk and chair for Dr. Darapuneni ($.1,424.11), replacement Nelson valve for the west pivot ($1,245.38) and a computer and two monitors for Dr. Darapuneni (1,773.36) . Annual charge for the effluent treated wastewater, including electricity to deliver effluent wastewater and payment for a city meter reader totaled $1,896.28, while payments to the Arch Hurley Conservancy District for the annual assessment and water delivery totaled $2,221.70. These major purchases are listed in Table 2.

Table 1. NMSU Agricultural Science Center at Tucumcari, Approximate Expenditures by Index and Account Codes FY 2014-2015.

Item	Admin Plan 121851	Station Sales 120435	Forage Mgmt. 121771	Dryland Cropping 124581	Tucumcari Pastures 123736	Tractor/ Vehicle 101507	Renewal & Replacement 107346	Field Day 902395	Murali Start-up 124497	Bull Test 120176	Irrigation 120592	Capital Outlay 124129	Grand Total
REVENUE													
Appropriation	72,441		15,000	15,000					50,000				152,441
2014-2015 Carryover		26,356			601	25,087	-10,755	598		0	7,088	75,000	123,975
Sales/Fees Generated	286	32,116											32,401
Private Gifts								1,275					1,275
Cattle Gain					1,423								1,423
Irrigation Usage											22,414		22,414
Vehicle/Tractor Usage						42,110							42,110
Transfer of Funds						-20,972	20,972						0
TOTAL REVENUES	72,727	58,471	15000	15,000	2,025	46,226	10,217	1,873	50,000	0	29,502	75,000	283,509
EXPENDITURES													
Personnel													0
Temporary/ Term Salary	7,439	569											8,008
Temporary/Term Fringes	1,862	99											1,961
TRAVEL													0
Domestic Travel	3,175	250	4,401	6,748					4,353				18,927
Foreign Travel	55								2,615				2,670
SUPPLIES													0
Automotive Supplies						67							67
Tires & Batteries	51					1,265							1,316
Fuels & Lubricants	1,351	72	15	41		991							2,470
Tractor/Hvy Equip. Supplies						150			2,265				2,415
Office Supplies	1,558		531	47									2,136
Computer Supplies	407		-360	467									514
Non Office Supplies	2,818	1,488	170	413		168		101	750	-260			5,648
Pest Control Supplies	533												533
Irrigation Supplies	77										72		149
Cleaning/Janitorial Supplies	634												634
Safety Supplies	597			26									622
Feed/Seed/Grain	1,778	2,856											4,634
Other Concentrate	232												232
Herbicide	244	200			77								520
Insecticide	18												18
Fertilizer	2,295	410	250		715								3,670
Business Meals/Food Items	1,743		60					197					2,000
Dues/Fees/Taxes	374	37	300	391							2,229		3,331
Books/Publications	180												180
Furn/Office Equip<=$5000	1,389			3,264		5,204							9,857
Small Tools	933	461		281		20							1,694
Bldg. Repair & Maint Parts	-86												-86

Table 1. (continued) NMSU Agricultural Science Center at Tucumcari, Approximate Expenditures by Index and Account Codes, FY 2014-2015.

Item	Admin Plan 121851	Station Sales 120435	Forage Mgmt. 121771	Dryland Cropping 124581	Tucumcari Pastures 123736	Tractor/ Vehicle 101507	Renewal & Replacement 107346	Field Day 902395	Darapuneni Start-up 124497	Bull Test 120176	Irrigation 120592	Capital Outlay 124129	Grand Total
Painting Supplies	57												57
Plumbing Supplies	116										4		120
Heating/Cooling Supplies	30												30
Equip. Repair/Maintenance	8,198												8,198
Electrical Supplies	223												223
Veh. Repair/Maint. Parts						3,899							3,899
Awards										260			260
Wireless Supplies	1,059												1,059
Irrigation Supplies													0
TOTAL SUPPLIES & MATERIALS	39,339	6,442	5,367	11,678	792	11,763	0	299	9,983	0	2,305	0	87,967
SERVICES													
Postage	541	73	65	79						48	12		819
Telephone	1,491												1,491
Cellular Expense	960												960
Internet	1,725												1,725
Printing/Reproduction			283	61									343
Repair/Maint. Bldg													0
Repair/Maint. Electric											279		279
Repair/Maint.Equipment	1,132												1,132
Repair/Heating-Cooling	245												245
Utilities - Electric	5,427										7,212		12,639
Utilities - Fuel	1,524		46										1,571
Trash Hauling	493												493
Seminar/Training	241		90	129					400				860
Vehicle Insurance						862							862
Advertising				139				294					433
Sales Tax	15												15
Prof/Contract Services	144				24								168
Lab Analysis	72	1,947	489	1,392	20						44		3,965
Farm/Ranch Services	14,337	18,388	5,645	480									38,850
Irrigation Services	6,350	14,370	2,920		440						9,000		33,079
Freight	22		59										81
UPS/FedEx	14	105	102	22					59				303
Computer Software			50	1,036									1,086
TOTAL SERVICES	34,734	34,883	9,748	3,338	484	862	0	294	459	48	16,547	0	101,398
Equip. & Capital Outlay												11,400	11,400
TOTAL EQUIP. & CAP. OUTLAY												11,400	11,400
TOTAL EXPENSES	74,073	41,325	15,115	15,016	1,275	12,625	0	593	10,442	48	18,852	11,400	200,765
ENDING BALANCE	-1,347	17,146	-115	-16	750	33,600	10,217	1,280	39,558	-48	10,650	63,600	175,275

Table 2. Listing of major purchases paid for during FY 2014-2015, NMSU Agricultural Science Center at Tucumcari.

Index	Description		Cost
101507	Profitt's Lawn & Leisure Hustler Raptor Mower		$4,499.00
120435	Pivotal Fencing Systems Fencing with Flexible Posts for Cross-fencing		$1,199.99
121851	Ray Lee Equipment Parts to repair the John Deere Swather/Shredder		$2,165.38
121851	Yetter Manufacturing Parts to repair the John Deere Planter		$1,928.00
	City of Tucumcari		$15,896.28
120592	Delivery of wastewater, electricity and	$14,000.00	
121851	Meter reader	$1,896.28	
121851	AG Services Replacement Nelson valve for west pivot		$1,245.38
124129	Roeder Implement Inc. New Holland Stack Wagon		$11,400.00
121851	Roeder Implement Inc. Header for the John Deere Chopper		$950.00
124497	Giddings Machine Co. Coring Machine		$2,048.00
124497	True Value Lumber (Tucumcari Lumber Co.) Conduit for Neutron Probe Tubes		$749.50
124581	Worthington Direct Desk/Chair		$1,424.11
124581	Lenovo Ltd. Lenovo Think Station Computer		$1,341.36
124581	HP Direct (2) Monitors		$432.00
120592	Arch Hurley Conservancy District Annual Irrigation Water Assessment		$2,221.70
	Total		$47,500.70

Alternate Crops in Winter Wheat Based Cropping System

Investigator(s):

M. Darapuneni[1], A.E. Cunnigham[1], L.M. Lauriault[1], P.L. Cooksey[1], J. Box[1], J. Jennings[1], S. Jennings[1] D. Lopez[1], and S. Smith[1]
[1]New Mexico State University, Agricultural Science Center at Tucumcari, NM 88401

Introduction:

Under dryland conditions of the Southern Great Plains, the production capacity of traditional winter wheat cropping systems (wheat-fallow and wheat-sorghum-fallow rotations) has stagnated. The scope of crop intensification in the rotation to improve the overall productivity of dryland cropping systems is extremely limited by the availability of soil moisture in the growing season. Considering the unpredictable weather and erratic precipitation patterns, supplementing nitrogen and other inputs under rainfed conditions is often a risky and an unprofitable management decision for most of the existing winter wheat cropping systems. In addition, the peak summer fallow period of the traditional winter wheat cropping system allows considerable amount of nutrient loss from the top soil due to lack of cover. Keeping the disadvantages of existing cropping system in view, devising a new strategy is necessary for efficient utilization of stored soil moisture and to conserve the finite resources of soil while maintaining the production sustainability.

In reality, the replacement of the fallow period in wheat-fallow rotation with any alternative crop will affect the soil water content and yields of the following cash crop. At the same time, leaving fallow in the rotation will inevitably result in unproductive evaporation losses of soil moisture, making the system more vulnerable and inefficient. Introducing an alternative crop in the fallow period will have several advantages in terms of productivity per each drop of water, soil quality, and sustainability. Optimizing crop rotation benefits in traditional winter wheat systems by introducing diversity is necessary for sustainable crop production in semi-arid environments. The effects of alternative crops in the rotation sequence in terms of productivity, water availability, and nutrient use efficiency should be evaluated before making any practical recommendations to producers.

Method(s):

To evaluate alternate crops in winter wheat based cropping systems, under dryland conditions, a study was established in 2014 using six rotation crop treatments. The crop rotation options with winter wheat included chickpea, berseem clover, Austrian winter pea, pearl millet, winter canola, tepary beans, and grain sorghum. Winter wheat, winter canola, berseem clover, and Austrian winter pea are winter crops; whereas chickpea, tepary bean, pearl millet, and grain sorghum are summer grown crops. The experiment was established on a 15 year old stand of predominantly warm-season grasses and is a randomized block design with three replications in which plots are 30x40 ft. To maximize the data generation capacity, each rotation will be continually planted in three sequential segments during spring/fall season until one cycle of the rotation is complete within a given year.

Winter crops planted in 2014 failed to establish a stand (see the 2014 Annual Report for more information: http://tucumcarisc.nmsu.edu/documents/2014-annual-report.pdf). At the beginning of the 2015 summer planting season, initial incremental soil sampling was conducted on the soil profile to a depth of 24in to determine the nutrient status and soil moisture content. The soil type is Canez fine sandy loam (Fine-loamy, mixed, super active, thermic Ustic Haplargids). Residual nitrogen in most plots was 15lb/A with few exceptions and soil moisture content was about 7%, at spring planting. Spring crops were planted on May 27th and 28th. The seeding rates for spring planted crops were chickpea: 200 lb/A PLS (pure live seed); tepary bean: 25 lb/A; pearl millet: 6lb/A; and grain sorghum: 3.715lb/A. Germination tests were performed by the seed distributor to ensure seed quality for each species prior to planting. The test was planted with a John Deer row crop planter equipped with no-till coulters on a toolbar preceding the planter units and a no-till Tye drill with appropriate seed boxes and planting adjustments for each crops' seeding rate as established by manufacturer. The planting depths for chickpea, tepary bean,

pearl millet, grain sorghum were 1.5, 1.5, 0.75, and 1 in., respectively. The row spacing was 30 in in general, with an exception of 15 in. in pearl millet. The study was maintained under rainfed conditions and pest problems were managed using appropriate management tools as shown in Table 1. Plant stand counts were taken 2 to 3 weeks after spring crop planting.

Table 1. Applications made to winter wheat cropping system study at Tucumcari, NM in 2015.

Brand Name	Rate	Crop Plot	Application Date
Glystar	2%	All plots	4/30/2015
Brimstone	2pts/100gal	All plots	4/30/2015
Clethodim 2E	6floz/A	Tepary/Chickpea	6/9/2015
Crop Oil Concentrate	1qt/A	Tepary/Chickpea	6/9/2015
Detonate	4floz/A	GS/PM	6/9/2015
Clethodim 2E	6floz/A	Unplanted Plots	6/14/2015
Crop Oil Concentrate	1qt/A	Unplanted Plots	6/14/2015
Base Camp LV6	1 1/3pt/A	Unplanted Plots	6/14/2015
Glystar	2.50%	Shielded GS	7/2/2015
Brimstone	2pts/100gal	Shielded GS	7/2/2015
Prevathon	10 oz/A	All plots	7/22/2015
Methylated Seed Oil	1gal/100gal	All plots	7/22/2015
Clethodim 2E	6 oz/A	Tepary/Chickpea	9/11/2015
Crop Oil Concentrate	1qt/A	Tepary/Chickpea	9/11/2015
28-0-0-5	1qt/A	Tepary/Chickpea	9/11/2015
Glystar	3%	Unplanted plots	9/11/2015
Brimstone	2qts/100gal	Unplanted plots	9/11/2015
28-0-0-5	2%	Unplanted Plots	9/11/2015

Gravimetric soil samples were collected from test plots every two weeks to assess soil moisture utilization under planted and fallow conditions. The samples were collected using an AMS Replaceable Tip Soil probe (AMS, Inc., American Falls, Idaho) with 12-in. hammer head cross handle. Spring-planted plots were sampled individually to assess water use throughout the season. Summer fallow plots were grouped together to make small block based on the soil heterogeneity within each replication to estimate the water use. Soil samples were collected at 0-6in., 6-12in., and 12-24in. increments. A composite of three random samples from each increment was collected from each plot and placed in a paper bag and wrapped in a plastic produce bag to prevent moisture loss until the sample could be weighed. Fresh weights were measured, samples were dried for 24 hours at 105°C after the plastic bag was removed, and then dry weights were recorded. Water balance for each plot was estimated using the initial and final soil moisture contents, precipitation received in the growing season, and losses from deep percolation and runoff. For practical purposes, the losses from runoff and deep percolation were assumed to be zero.

Summer crops were harvested September 21, 2015. Sampling area was determined by laying out a 10ft by 2-row area. Seed heads were clipped from all stalks in the sampling area and stored in paper bags while remaining above ground biomass was clipped and put into polybags. Harvested samples were dried at 140°F for two days and over all dry weights were measured. Seed heads were thrashed using a plot combine. Data were used to estimate yield characteristics per acre and test weight.

Fall crops were planted on September 16 and 17, 2015,and average initial soil moisture content was about 5% at the time of planting as determined using the procedure previously described. The seeding rates for the various crops were: winter wheat: 40lb/A; winter canola: 5 lb/A; berseem clover: 20 lb/A; and Austrian winter pea: 80 lb/A. Germination tests were conducted by seed distributing companies to ensure seed quality of each crop. The test was planted using a John Deer row crop planter with appropriate planting adjustments for each established seeding rate and depth. The planting depths for winter wheat, winter canola, berseem clover, and Austrian winter pea were 1.0, 0.5, 0.5, and 1.5in, respectively. Stand counts were taken 2 to 3 weeks after seedling emergence in each crop. Soil samples were collected as previously described throughout the fall/winter growing season until the first hard frost (28°F) on November 12, 2015. A final sample for 2015 was collected on December 22, 2015. Further samples will be collected when ground temperatures begin to warm to resume early spring growth in 2016. Access tube installation took place on October 13 and14, 2015, so that a CPN 503DR Hydroprobe can be used to measure soil moisture content beginning in spring2016.

Results:

Results for spring/summer crops are discussed in this publication while the fall trial is still in progress at the time of this publication. Total precipitation received during 2015 growing season was 11.9 inches, which was approximately 2.5 inches higher than long-term average (1905-2015;see Table 1. in the annual weather summary on page 12).Soil volumetric water contents (% vol, in/in) of sorghum, pearl millet, and fallow are presented in Figure 1. The peaks in each graph represented the coincidence of precipitation events. The last peak at 0-6 inch in each graph was a result of several prior light precipitation events.

Decent moisture conditions at the time of germination ensured good stand establishment by all rotation crops. But at the early stages of plant growth, wildlife (rabbit and deer) damaged the legumes (chickpea and tepary bean) beyond their survival and, as a result, no yield data was collected for these two crops (Figure 2).

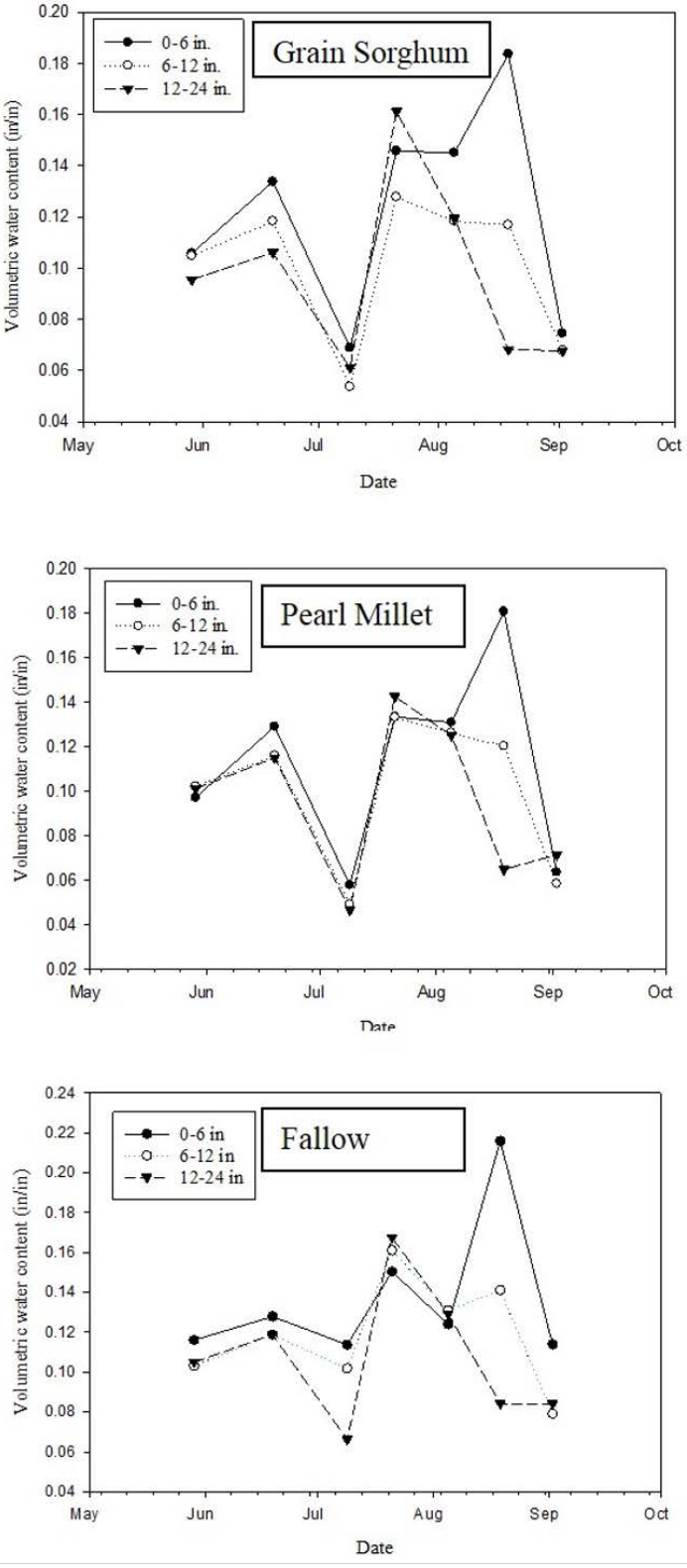

Figure 1: Volumetric water content (in/in) of tested crops in winter wheat based rotations at Tucumcari in 2015 growing season.

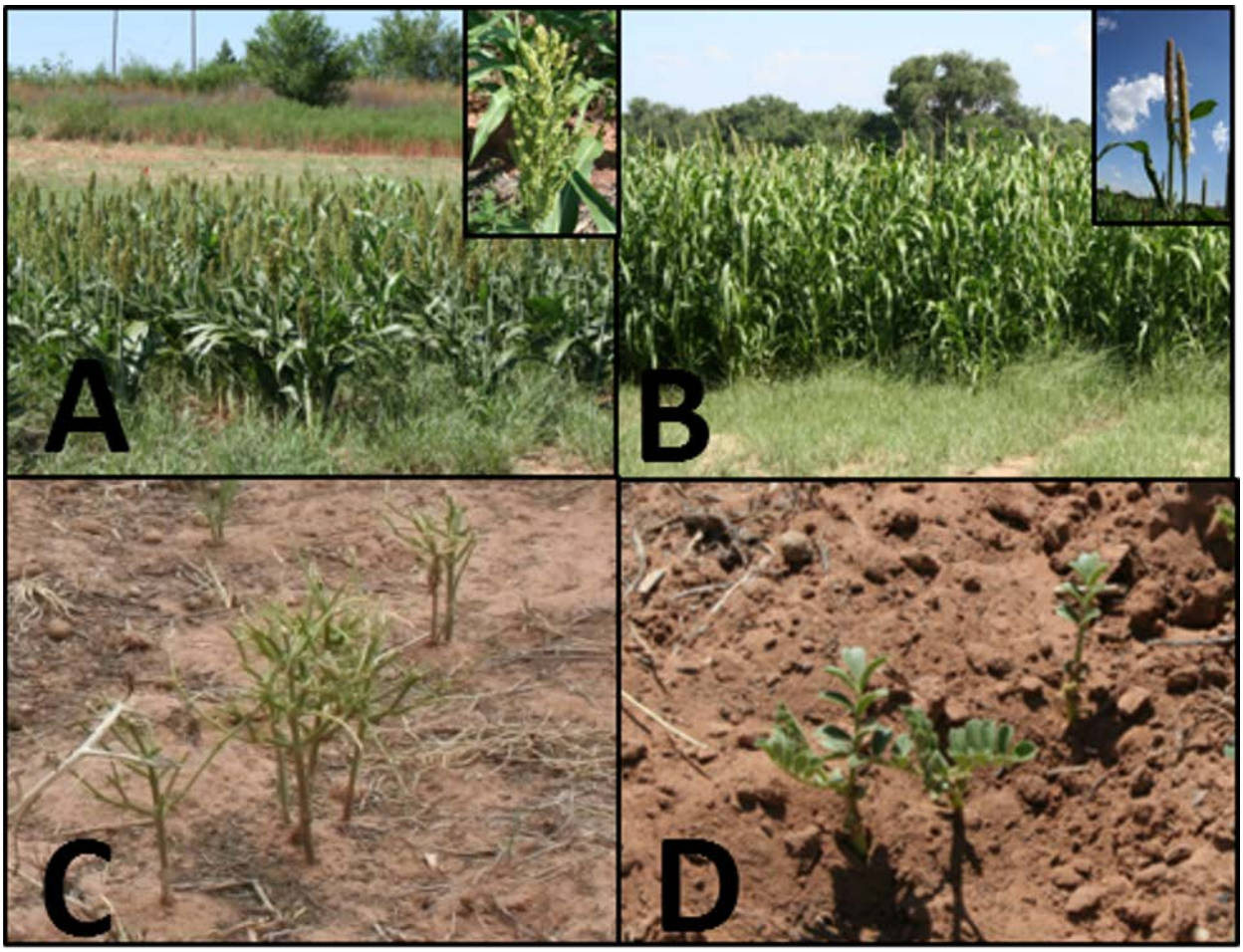

Figure 2: Winter wheat rotation crops at Tucumcari in 2015.Panes A & B show grain sorghum and pearl millet production, respectively, and panes C & D show rabbit and deer damage to tepary beans and chickpea, respectively.

Yield characteristics and water use dynamics of grain sorghum, pearl millet and fallow are presented in Table 2. Pearl millet exhibited superior yield characteristics compared to grain sorghum in 2015. The pearl millet produced statistically similar grain yield and more than twice the biomass compared to grain sorghum. However, a confounding factor in comparing the yields of sorghum and pearl millet in this trial was different row spacing. The pearl millet was planted at 15 inch row spacing as compared to 30 inch in grain sorghum. Although row spacing was different for both crops, the total water use and water use efficiency were statistically similar at 5% probability level (Table 2).

This reflects the fact that with the similar soil moisture conditions, pearl millet performed better with higher grain yield (numerically) and biomass (statistically) compared to grain sorghum. Fallow rotation used just as much water as other crops to evapotranspiration, which confirms the inefficiency of fallow over cover crop during summer months. More long-term data is needed to verify the potential of pearl millet as a rotation crop in a winter wheat cropping system.

Table 2: Yield characteristics and water use efficiency (WUE) of grain sorghum and pearl millet and water use of fallow in various winter wheat cropping systems at Tucumcari, NM, in 2015.

Crop	Grain yield (lb ac^{-1})	Biomass (lb ac^{-1})	Test Wt. (lb bu^{-1})	Water Use (in.)	WUE (lb ac-in^{-1})
Grain Sorghum	1806	7704	52	12.7	145
Pearl Millet	1946	16198	55	12.8	152
Chemical Fallow	--	--	--	12.3	--
$LSD_{(0.05)}$	NS	2200	NS	NS	NS
CV (%)	10.0	5.5	0.9	2.0	12.0
P-value	0.4023	0.0040	0.1257	0.6784	0.3641

Means within a column having a difference equal to or greater than the $LSD_{0.05}$ in that column are considered to be significantly different based on the requirement that the P-value at the bottom of the column is <0.05 (a 5% likelihood that a difference does not exist). NS indicates a lack of any difference at the 5% level.

Data for tepary beans and chickpea were not collected due to rabbit and deer predation.

Manure Incorporation in Strip Tillage Systems

Investigator(s):

M. Darapuneni[1], A.E. Cunningham[1], L.M. Lauriault[1], J. Box[1], P.L. Cooksey[1], J. Jennings[1], S. Jennings[1], D. Lopez[1], and S. Smith[1]

[1]New Mexico State University, Agricultural Science Center at Tucumcari, NM 88401

Objective(s):

To evaluate manure rate and incorporation effects on water dynamics, nutrient availability, and yield characteristics of grain sorghum in strip tillage systems under dryland conditions.

Method(s):

A study was established in 2015 into an area of 8 in. tall triticale stubble that had been previously strip-tilled using an Orthman 1tRIPr strip tillage machine. The treatment combinations included an application of 0, 5, or 10 ton/A of manure (0T, 5T, and 10T, respectively) applied at the surface of the strip-tilled band that was either left at the surface or incorporated to a 6-8 inch depth by a second pass of the strip-till machine. The experiment was a split block design with 4 replications. Each experimental unit was a 30x10 ft.

The soil at the experimental site was Canez fine sandy loam with an initial moisture content of about 5%. Each plot contained four rows on 30-in. row spacing. Manure application rates were calculated on %w/w basis and applications were made manually on June 11, 2015. Before applying the manure, a composite sample from three random samples was collected from a manure pile and sent to Ward Laboratories, Kearney, NE, for chemical analysis. Grain sorghum was sown at 43,344 seeds/A on June 11, 2015, with a John Deer row crop planter. Metolachlor (1.33 pt/A) and glyphosate (2%) were applied with Brimestone (3 pt/100 gal) on June 14, 2015, before planting to provide residual weed control. Prevathon (10 oz/A) and methylated seed oil (1 gal/100 gal) were applied together on July 22 to control grasshopper problems. No irrigations were applied.

At two-week intervals from immediate pre-planting to immediate post-harvest, soil moisture samples were collected to a 30-in. depth from two locations each from the strip-tilled row adjacent to the plants and from the wheel track between rows in each plot using an AMS Replaceable Tip Soil probe with a 12-in. Hammer Head Cross Handle (AMS, Inc., American Falls, Idaho). Initial soil samples were collected on June 18. Upon collection, samples were divided into 6-in. increments. Incremental samples from same soil depth within plot were stored in a paper bag and wrapped in a plastic produce bag then weighed. The samples were then dried at 221°F for 24 hours and reweighed to determine the gravimetric weight (%w/w). Initial plant population counts were counted on July 7, 2015.

On October 15, 2015, 10-ft.of the center two rows of each plot were harvested to assess grain and stalk yield characteristics and plant chemical composition. Sub-samples for both grain and biomass were collected and sent to Ward laboratories, Kearney, NE, for tissue nutrient analysis.

Soil moisture data from the strip-tilled row and grain and biomass data were analyzed using SAS software (SAS Institute Inc., Cary, NC, 2013.)

Results:

Total precipitation received during the tested period from planting to harvesting was 12.94 inches. Decent moisture conditions at the time of planting ensured good germination and stand establishment. Chemical characteristics of manure used in the study are presented in the Table 1. Based on the chemical analysis, the manure is a good source of N, P, and Fe. Each ton of manure provided 17.4 lb total N, 15 lb of P2O5, and 9.3 lb of Fe on dry basis. This manure also supplemented significant amounts of other macro and micro nutrients. The maximum rate of 10T manure application in the study provided 174 lb of total N, 150

lb of P_2O_5, and 93 lb of Fe. Approximately 50% of these nutrients are available for plant growth and development in the first year of manure application and the remaining 50% will be available in the subsequent years through mineralization.

Table 1: Chemical characteristics of the manure used in the study conducted at Tucumcari, NM, during 2015.

Moisture (%)	14.62	Calcium (%)	1.77
pH	8.1	Magnesium (%)	0.37
Soluble Salts (mmhos/cm)	30.13	Sodium (%)	0.35
Total Nitrogen (%)	0.87	Sulfur (%)	0.24
Organic Nitrogen (%)	0.86	Zinc (ppm)	106
NH_4-N (%)	0.009	Iron (ppm)	4664
NO_3-N (%)	0.004	Manganese (%)	145
Phosphorus (P_2O_5) %	0.75	Copper (%)	20
Potassium (K_2O)%	1.32		

Water dynamics and water use efficiency are presented in the Figures 1 and 2. Total plant water use and average change in the gravimetric content were not influenced by either manure rate or incorporation method (Figure 1). However, water use efficiency was affected by manure application rate and incorporation method. Surface application of 5T and 10T manure rate increased the grain water use efficiency compared to incorporated manure and the control (Figure 2). Hence, producers can save a significant amount of resources by surface application of manure in their farms. Manure rate appeared to have no effect on water use efficiency (Figure 2).However, multiple years of data are needed to confirm these results.

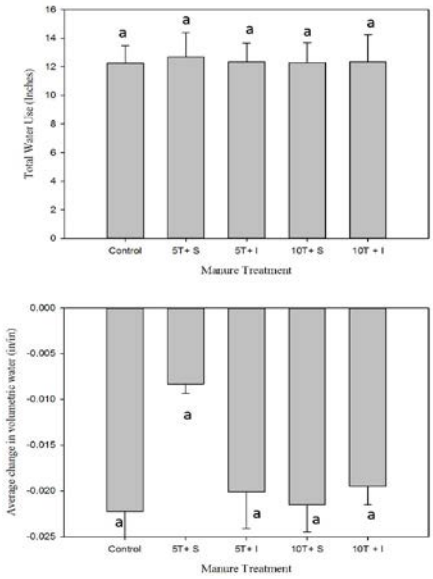

Figure 1: Total plant water use (top) and average change in soil volumetric water content (bottom) of manure treatments from planting to harvesting in strip-till planted row at Tucumcari, NM, in 2015 (5T+S, 5T+I, 10T+S, and 10T+I signify 5 tons manure/A applied at the surface or incorporated and 10 tons manure/A applied at the surface or incorporated, respectively).

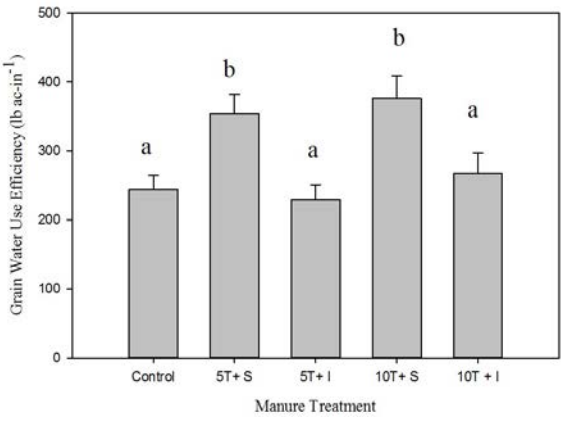

Figure 2: Sorghum grain water use efficiency of manure treatments tested in strip-tillage at Tucumcari, NM, during 2015 (5T+S, 5T+I, 10T+S, and 10T+I signify 5 tons manure/A applied at the surface or incorporated and 10 tons manure/A applied at the surface or incorporated, respectively).

Chemical analysis of soil samples at the end of the study showed no influence of manure rate or incorporation treatment on soil pH or organic matter (Table 2). There was a significant increase in nitrate-N and Olsen-P contents at the top 6 inches of the surface manure applications compared to the control and incorporation treatments, but these differences were not measurable below the 6-inch increment (Table 2).

Table 2: Effect of manure treatments on chemical characteristics of soil at the end of the strip-tillage - manure study at Tucumcari, NM, during 2015.

	Depth Increment				
Manure Treatment[a]	**0-6"**	**6-12"**	**12-18"**	**18-24"**	**24-30"**
	pH				
Control	8.1	8.3	8.4	8.4	8.3
5T+ S	8.3	8.4	8.5	8.4	8.3
5T+ I	8.2	8.4	8.4	8.3	8.3
10T+ S	8.1	8.4	8.4	8.6	8.4
10T + I	8.3	8.3	8.5	8.3	8.4
P-value	0.3382	0.4298	0.8446	0.1274	0.8226
	Organic Matter (%)				
Control	0.84	0.76	0.68	0.51	0.40
5T+ S	0.83	0.73	0.65	0.48	0.38
5T+ I	0.83	0.73	0.65	0.45	0.38
10T+ S	0.78	0.65	0.60	0.50	0.40
10T + I	0.80	0.85	0.70	0.48	0.38
P-value	0.7818	0.1091	0.3422	0.6471	0.9562
	NO_3-N (ppm)				
Control	0.63	0.38	0.34	0.28	0.29
5T+ S	1.27	0.42	0.40	0.33	0.28
5T+ I	0.58	0.38	0.35	0.35	0.25
10T+ S	1.77	0.87	0.53	0.33	0.33
10T + I	0.90	1.22	0.33	0.33	0.23
P-value	0.0125	0.1506	0.2895	0.9261	0.4255
	Olsen-P (ppm)				
Control	14.72	6.36	2.62	2.30	1.82
5T+ S	19.93	6.83	2.38	2.07	1.99
5T+ I	15.65	6.95	3.03	2.38	2.05
10T+ S	21.55	6.73	3.40	2.30	2.15
10T + I	18.85	7.72	2.85	2.23	2.30
P-value	0.0105	0.8880	0.4963	0.8861	0.3039

[a]5T+S, 5T+I, 10T+S, and 10T+I signify 5 tons manure/A applied at the surface or incorporated and 10 tons manure/A applied at the surface or incorporated, respectively.

Grain yield of sorghum was significantly affected by manure treatments such that manure applications at the surface improved the grain yield of sorghum over manure incorporated treatments or control (Table 3).

Table 3: Effect of manure treatments on yield characteristics and composition of grain sorghum tested in strip-till at Tucumcari, NM, during 2015

Manure Treatment[a]	Biomass (lb/A)	Grain (lb/A)	Test wt. (lb/bu)	Grain N (%)	Grain P (%)	Biomass N (%)	Biomass P (%)
Control	13774	2989	56.1	1.19	0.3	0.53	0.13
5T+ S	13935	4492	55.6	1.08	0.28	0.42	0.11
5T+ I	13352	2836	55.5	1.12	0.31	0.49	0.13
10T+ S	15475	4630	55.7	1.07	0.29	0.4	0.1
10T + I	13574	3311	55.9	1.16	0.31	0.47	0.13
P-value	0.4456	0.0265	0.9913	0.4506	0.5321	0.3517	0.1640
CV (%)	14.0	25.0	2.9	7.9	8.1	18.0	13.5

[a]5T+S, 5T+I, 10T+S, and 10T+I signify 5 tons manure/A applied at the surface or incorporated and 10 tons manure/A applied at the surface or incorporated, respectively.

Biomass, test weight, and tissue elemental composition of grain sorghum were not impacted by any manure or incorporation treatments in the study (P>0.05). Although not statistically significant, there was evidence of slightly elevated N and P levels of the tissue (both grain and biomass) in the incorporated manure treatments over surface applications.

These results are not consistent to expectations and the cause is not well understood at this time

Reduced Tillage in Corn

Investigator(s):

M. Darapuneni[1], J. Idowu[2], A.E. Cunningham[1], J. Box[1], L.M. Lauriault[1], P.L. Cooksey[1], J. Jennings[1], S. Jennings[1], D. Lopez[1], and S. Smith[1]
[1]New Mexico State University, Agricultural Science Center at Tucumcari, NM 88401
[2]New Mexico State University, Extension Plant Sciences Department, Las Cruces, NM 88003

Introduction:

In New Mexico, soil degradation is a common problem. An indicator of this problem is accelerated soil erosion by wind and water on cropland. One way to address soil degradation is by reducing tillage in agricultural soils, which will aid in rebuilding soil quality levels. Both strip-till and no-till systems have been shown to lead to soil improvement in terms of organic matter build up and moisture conservation. The benefits of strip-till and no-till systems have been demonstrated for many parts of the United States. However, the impacts of these tillage systems in the semi-arid and arid Southwest have not been well documented. To make reduced tillage systems attractive to farmers in the region, multi-locational trials testing these tillage systems are needed.

Method(s):

As a part of multi-location trial, a study was planted in Tucumcari on June 17, 2015, to evaluate the impacts of tillage method and nitrogen rate (N-rate) on crop yields and soil quality in the semi-arid environment of eastern New Mexico. The study was designed in a split-plot with tillage method as a main plot and N-rate as a sub-plot. Three tillage methods tested in the study were: conventional-, no-, and strip- till. Two N-rates were 175 and 275 lb ac^{-1}. The treatments were assigned in a randomized block with 4 replications. The soil type is Canez fine sandy loam (Fine-loamy, mixed, super active, thermic Ustic Haplargids). Soil moisture content at the time of planting was about 6.5%. The study was established in 8-in. tall triticale stubble. Plots were prepared using an Orthman 1tRIPr strip-tillage machine and a conventional-till rototiller. The plot dimensions were 20x30 ft. Within each split plot, there was a total of four planted rows and the center two rows were harvested for analysis. Corn (Dyna-Gro 1716779) was planted using a John Deer row crop planter set on 30-in. row spacing with the appropriate settings based on manufacturer instructions. The seeding rate was 80,000 seeds/A. No-till coulters were installed on a toolbar in front of the planter units to accommodate that treatment. It was assumed that these coulters would have no impact on the conventional-till and strip-till treatments. An initial application of nitrogen fertilizer was applied on June 25, 2015, at 30 lb/A on all plots and remaining N was applied on July 28, 2015, according to the N-rate treatment. Plant populations were counted on July 15, 2015. Plots were watered as frequently as every two weeks based on precipitation, applying 11.5 in of irrigation to supplement 15.3 in precipitation. Grasshopper infestations were treated on July 22 using Prevathon (10oz/A) and methylated seed oil (1gal/100gal). One herbicide treatment of AIM EC (2floz/A) and a non-ionoic surfactant (2pt/100gal) were applied using a shielded backpack sprayer to treat problematic weeds on August 4, 2015. The areas between rows were also mowed using a rotary push mower on August 3 and September 2 to reduce weed problems (Figure 1).

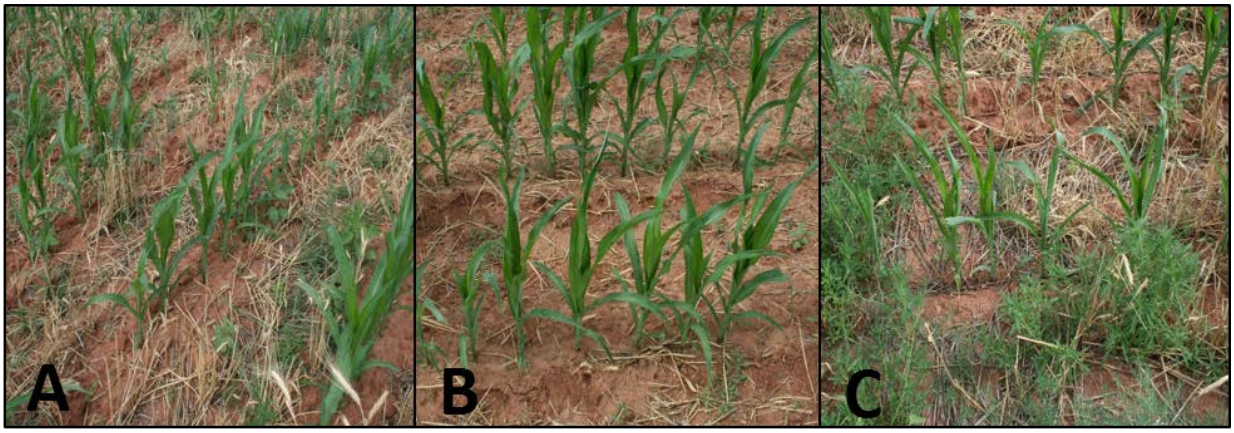

Figure 1. Corn plantings in three tillage types. Panel A shows corn planted into strip-till plots with 8-in triticale stubble with minimal weed pressure; panel B shows corn growing in conventional tillage plots with little to no weeds, and panel C shows corn growing in no-till plots and the greater amounts of weed pressure present.

Soil samples from two sites from within each plot were collected at the beginning and conclusion of the study in 12-in increments to a depth of 24 in. using an AMS Replaceable Tip Soil Probe (AMS, Inc., American Falls, Idaho) with a 12-in. hammer head cross handle. Samples from each increment depth within a plot were composited, placed in paper bags, and wrapped in a plastic produce bag. Samples were then weighed, dried in an oven for 24 hours at 221°F and weighed again to estimate gravimetric soil moisture.

Every two weeks after plant emergence, the number of leaves, ears, and plant height were recorded until harvest, which took place on October 27, 2015. The sample area in each plot was two rows of 10 ft length each and the yields were estimated on acre-basis. From the sampling area, ears and above-ground biomass were harvested separately and weighed. A representative sample of stalk and ear (3 each) were collected and placed in a polybag for further processing. Initial weight of the ears was recorded, husked, and shelled. Weights of the husk and cobs together were collected and grain weight was measured. All non-grain biomass (stalk, cob, and husk) were shredded together and weighed. Samples were dried for two days at 140°F and re-weighed before being sent for tissue N analysis by Combustion with a LECO TruMac.

Results:

Data and results of statistical tests evaluating the effects of tillage, N-rate, and their interactions on yield characteristics and composition of corn are presented in the Table 1. There was no interaction between the tillage and N-rate in regard to yield characteristics and water dynamics. So, the means of main effects were reported. Grain yield was not significantly affected by tillage method or N-rate. Nonetheless, strip tillage had a 1,073 lbs/A seed yield advantage over conventional tillage and a 3,723 lbs/A yield advantage over the no-tillage treatment. Higher weed populations appeared to have impacted the yield results of the no-till treatment to a greater extent (Figure 1). Vegetative yields were significantly impacted by tillage method. Conventional tillage had statistically higher vegetative yields compared to strip- and no-tillage practices. When water is not a limiting factor, which was the case in this irrigated trial, conventional tillage has a clear advantage over other two tillage practices. Grain and vegetative components of corn were not affected by nitrogen rate, although 275 lb N/A had a numerical seed yield advantage over the 175 lb N/A rate. Test weight was not affected by tillage method but the higher N rate had greater test weight compared to the lower N rate. Tissue N concentrations of both grain and the vegetative component were affected by both tillage method and N-rate treatments (Table 1). Grain N was higher in the conventional tillage whereas vegetative N was higher in the no-tillage treatment. Higher N rate improved the N uptake of plants and thus there were higher concentrations of N in both grain and vegetative components.

Table 1. Effects of tillage and N-rate on yield characteristics and composition of corn at Tucumcari, NM in 2015

Treatment	Grain Yield, lb/A	Vegetative Yield, lb/A	Test Wt., lb/bu	Grain N, %	Vegetative, N, %
Tillage					
Conventional	12088	13464	56.3	1.47	0.70
Strip-tillage	13161	9307	56.4	1.32	0.64
No-tillage	9438	4770	54.5	1.34	0.82
LSD $_{(0.05)}$	NS	3217	NS	0.08	0.12
N-rate (lb ac^{-1})					
175	10155	10245	53.8	1.29	0.61
275	13936	10175	57.7	1.47	0.83
P-value	0.2449	0.5916	0.0235	<.0001	0.0002
Tillage*N-rate					
P-value	0.1215	0.8250	0.2291	0.5000	0.0525
CV (%)	25	27	7	12.9	4.8

LSD and CV signify the least significant difference, which is the between two means within that column required to indicate a difference, and the coefficient of variation, which indicates the amount of variability in the data [small CV's (<20) are considered good]. The *P*-value, when multiplied by 100, is the likelihood that no difference exists between any means in the column. A <5% likelihood is required in this table to say that a difference existed between at least two means in the column.

Alfalfa Planting Date Evaluation

Investigator(s):

L.M. Lauriault[1], A.E. Cunningham[1], P.L. Cooksey[1], J. Box[1], J. Jennings[1], S. Jennings[1], and D. Lopz[1]

[1]New Mexico State University, Agricultural Science Center at Tucumcari, NM 88401

Method(s):

The Advisory Committee to the Agricultural Science Center at Tucumcari requested an evaluation of the effects of earlier than recommended planting due to first delivery of water in mid- to late May and the availability of Roundup Ready® varieties as a summer weed control option during establishment. Consequently, WL 454HQ.RR alfalfa was planted on June 5 & 26, July 17, August 7 & 28, and September 18 in 2013 and 2014 in adjacent studies under the highway center pivot irrigation system, in the field fronting US 54. The test area (Redona/Canez fine sandy loam) was conventionally tilled and formed into a flat seedbed for each study. Plots were sown using a disk drill fitted with a seed-metering cone at 20 lb inoculated seed/A in a Randomized Complete Block design with 3 replications. It was assumed that slight cultivation by the disks on the planter would be sufficient to freshen the seedbed on subsequent planting dates. After the first planting, irrigations with Class 1B treated municipal wastewater were applied approximately twice weekly to the test area to supplement precipitation, including plots not yet planted. Irrigation prior to planting was considered to have a negligible effect on establishment and yield as the soil was well-drained and maintained at field capacity.

Plots for the 2013 planting were 5 ft x 30 ft of which the center 5 ft x 25 ft were harvested for yield using a self-propelled forage plot harvester equipped with a weighing system. In 2014, plots were 5 ft x 20 ft of which the center 5 ft x 15 ft were harvested using the same equipment. For each study, in the seeding year, the first harvest was taken as soon as possible after 80 days after planting with any subsequent harvest approximately 35 days after that, unless that interfered with a 42 day rest period between planting and the anticipated first hard freeze (about November 5) to allow for root carbohydrate storage or it was estimated that yields were not feasibly harvestable as hay. Harvest dates in the seedling year of each study varied by treatment as did irrigation amounts after planting. The first two planting dates were harvested twice, the middle two harvest dates were harvested once just prior to the anticipated hard freeze, and the last two planting dates fell within or past the recommended late summer/autumn planting window and were not harvested at all, which also is recommended to maintain top growth for winter protection. The 2013 planting was harvested on May 29, June 25, July 17, Aug. 14, Sep. 16, and Oct. 27 in 2014. In 2015, both plantings were harvested on May 11, June 8, July 13, Aug. 18, Sep. 15, and Nov. 3.

In 2015, 1 pt/A Lorsban was applied on April 26 to control a significant population of alfalfa weevil. On July 29, Prevathon (10 oz/A) was applied to control grasshoppers. Fertilizer (18-60-0-15 lb N-P-K-S/A) was applied on July 27, 2015. Irrigations from November 2014 through October 2015 totaled 14.0 inches and supplemented 24.7 inches of precipitation.

Total annual and cumulative yields from both studies were subjected to SAS MIXED procedures for tests of significance and means separation using an alpha level of $P < 0.05$ when a significant difference was found.

Results:

Planting date yield differences and rankings for seeding year, first production year, or 2-year total yields were not different between the 2013 and 2014 plantings leading to nonsignificant year x date interactions (Table 1). There also were no differences between tests for yields from stands of the same age (i.e.,

seeding year, first production year, or 2-year total). With two years of data, when comparing the first production year yield of the June 5 planting date with those of the Aug. 28 planting date, which falls in the middle of the currently recommended planting window of mid-August to mid-September, there was a 2.92 ton/A yield difference (Table 1). After two production years for the 2013 test, there was a 5.99 ton/A yield difference between the June 5 and Aug. 28 plantings.

Table 1. Planting date effects on alfalfa yields (tons/A) in the seeding and subsequent years at Tucumcari, NM. Data are the means of 3 replicates within each test.

	2013 & 2014 Tests			2013 Test Only	
Date	**Seeding year**	**1st Year**	**2-Year Total**	**2nd Year**	**3-Year Total**
5-Jun	1.90A	5.98A	7.88A	5.70A	13.80A
26-Jun	1.38B	4.85B	6.23B	4.94AB	10.65AB
17-Jul	0.48C	4.07BC	4.55C	4.70ABC	8.95BC
7-Aug	0.50C	4.64B	5.14BC	4.99AB	10.30B
28-Aug	0.00D	3.06CD	3.06D	4.45BC	7.81BC
18-Sep	0.00D	2.73D	2.73D	3.86C	5.95C

Means within a column followed by the same letter are not different based on the protected 5% LSD.

Consequently, producers could plant on June 5 instead of August 28 and harvest twice in the seeding year to increase yields in the first production year by nearly as much as the total for the Aug. 28 planting. Alternatively, if production costs for planting in early June are so high as to not be recovered by a 4.82 ton/ac yield difference in the seeding year and first production year (June 5, 2-year yield – Aug. 7, 2-year yield in Table 1) or, if the spring planting window is missed, planting could be done in early August with the opportunity to harvest higher yields than a later planting in the first production year to help recover establishment costs. If yields of an early August planting are not great enough to mechanically harvest in the seeding year, grazing would not be recommended; however, the stand could be harvested at first flower in the following spring rather than at 25% bloom as is recommended for later plantings.

Because it appears as though the planting date effect is not as dramatic after the first production year, harvesting of these studies will continue indefinitely.

Alfalfa Winter Irrigation Demonstration

Investigator(s):

L.M. Lauriault[1], A. Cunningham[1], P.L. Cooksey[1], J. Box[1], J. Jennings[1], S. Jennings[1], and D. Lopez[1]

[1]New Mexico State University, Agricultural Science Center at Tucumcari, NM 88401

Method(s):

The Advisory Committee to the Agricultural Science Center at Tucumcari requested an evaluation of the effects of winter irrigation on alfalfa yields. Consequently, a demonstration was established in an area of WL 454HQ.RR alfalfa under the highway center pivot irrigation system, in the field fronting US 54. The test area (Canez fine sandy loam) was conventionally tilled and formed into a flat seedbed and planted on Nov. 17, 2012. Roundup (1 qt/A) was applied on Dec. 18, 2012. On March 13, 2013, Pursuit (4 oz/A) was applied and on Aug. 19, 2013, 5 oz Raptor/A was applied. The field was fertilized with 19 lb N and 63 lb P/A on Dec. 5, 2013. On Feb. 12, 2014, 20 lb N and 94 lb P/A were applied to the entire demonstration area and on July 27, 2015, 18-60-0-15 lb N-P-K-S/A were broadcast. No herbicides were applied in 2015; however, Lorsban 4E (1 pt/A) was applied on April 26, 2015 to control alfalfa weevil after an exceptionally early and heavy infestation and Prevathon (10 oz /A) was applied on July 29, 2015, to protect against grasshoppers.

The demonstration area included the entire inside span of the east half of the pivot with treatments imposed following the last harvest of 2013 with the outer half of that span irrigated throughout the winter when the ground was not frozen and the inner half irrigated only when water was available from the Arch Hurley Conservancy District (AHCD; April 22 until November 3, 2014, and April 1 until October 31, 2015). All irrigations were with Class 1B treated municipal wastewater applied approximately twice weekly. Note that when AHCD is referred from this point forward in this article as an irrigation scheduling treatment, it does not refer to the water source because treated municipal wastewater was always the source. That is, it refers to the time period during which AHCD water is typically available. Irrigation was terminated on the north half of the demonstration area after the fourth harvest (Aug. 14, 2014 and Aug. 18, 2015; limited irrigation). The south half of the demonstration area continued to be irrigated with the inner part of the span terminated when water was no longer available from AHCD (AHCD full). Each treatment received approximately 12 more inches of applied water (precipitation + irrigation) in 2014 than in 2015. On average, the winter full section received 43.5 inches of applied water in 2014 and 2015, while the winter limited received 38.5 inches, AHCD full received 38.4, and AHCD limited received 33.5 inches.

Immediately prior to swathing the whole field, 3 replications (5 ft x measured length) were harvested from each of the four areas of the demonstration (Picture) for yield using a self-propelled forage plot harvester equipped with a weighing system. Harvest dates were May 29, June 25, July 17, Aug. 14, Sep. 16, and Oct. 27 in 2014, and May 11, June 8, July 13, Aug. 18, Sep. 15, and Nov. 3 in 2015. Drainage from upslope into the innermost portion of the span led to the exclusion of that area from measurements (Picture).

Individual harvest and total yield data were subjected to SAS Mixed procedures as a strip plot with 3 replications for tests of significance and means separation using an alpha level of $P < 0.05$ when a significant difference was found. Rep x treatment (winter irrigated or AHCD + full or limited irrigation) was considered random and used as the denominator for tests of significance.

Results:

The main effect of irrigation schedule treatment was significant for each cutting and season total yield as was the year effect (Table 1). Generally, terminating irrigation after the fourth harvest reduced yields compared to season-long irrigation, whether or not the alfalfa had been winter-irrigated, although the AHCD limited treatment did have significantly lower yields than the winter limited treatment form most harvests. For treatments receiving the same amount of water, but during different timeframes (winter limited and AHCD full), there was little difference in yield (Table 1). That being said, in 2014, the winter limited treatment had greater yields than the AHCD full treatment and equal yields to the winter full treatment (3.95, 4.58, 2.21, and 3.30 t/A for the winter limited, winter full, AHCD limited, and AHCD full treatments in 2014, respectively, and 4.02, 4.61, 3.62, and 4.42 t/A in 2015, respectively). Additionally, both winter irrigated treatments had more consistent yields across years than either AHCD treatment.

Table 1. The effect of irrigation schedule on dry matter yields of alfalfa in 2014 and 2015. Irrigation schedule treatments were: (1) winter limited: irrigated throughout the winter and terminated after the fourth harvest; (2) winter full: irrigated throughout the winter and seasonlong; (3) AHCD[1] limited: irrigated after canal water became available in April and terminated after the fourth harvest; and (4) AHCD full: irrigated seasonlong after canal water became available) Data are the lsmeans of 3 replicates within each of the four irrigation schedule treatments.

Irrigation schedule Treatment (Trt)	Harvest yields[2]						
	First	Second	Third	Fourth	Fifth	Sixth	Total yield
Winter limited	0.96 AB	1.08 A	0.50 A	0.92 AB	0.43 B	0.10 B	3.99 B
Winter full	1.13 A	1.04 A	0.56 A	0.96 A	0.57 A	0.35 A	4.60 A
AHCD limited	0.69 B	0.72 B	0.31 B	0.77 C	0.32 C	0.10 B	2.91 C
AHCD full	1.00 A	0.73 B	0.47 A	0.81 BC	0.52 AB	0.33 A	3.86 B
				***P*-values**			
Trt	0.0486	0.0001	0.0007	0.0288	0.0003	0.0001	0.0001
Year	0.0009	0.0921	0.0001	0.0001	0.0001	0.0148	0.0003
Trt x Year	0.3116	0.0001	0.0529	0.0487	0.0007	0.0350	0.0056

[1]AHCD signifies Arch Hurley Conservancy District and pertains to when water was delivered by the organization. Treated municipal wastewater was the only source of irrigation.
[2]Harvest dates were May 29, June 25, July 17, Aug. 14, Sep. 16, and Oct. 27 in 2014, and May 11, June 8, July 13, Aug. 18, Sep. 15, and Nov. 3 in 2015.
Lsmeans within a column followed by the same letter are not different based on a 5% LSD protected by a *P*-value for treatment of 0.05 or less.

Yields in 2014 were lower than in 2015 despite the greater amount of total applied water in 2014 (3.51 vs. 4.17 t/A in 2014 and 2015, respectively). This may be attributed to greater precipitation and lesser application of the treated municipal wastewater in 2015 (24.7 inches annual precipitation and 11.8 inches irrigation averaged across treatments) compared to 2014 (13.2 inches annual precipitation and 32.8 inches irrigation averaged across treatments). Low yields overall in the study may be due to the very late planting date as indicated in a report on a planting date study presented on page 33 of this annual report.

Treatment x year interactions are mainly due to differences in magnitude between years within treatments or changes in rank across years for the winter limited and AHCD full treatments, which received nearly equal amounts of applied water each year.

At any rate, it is beneficial to irrigate alfalfa whenever possible and feasible throughout the winter using sprinkler irrigation and to not terminate irrigation. Therefore, if irrigation was available from the Arch Hurley Conservancy District in winter, producers should consider which of the following three options would be more profitable: (1) to winter irrigate fewer acres of alfalfa when the supply is limited, but would likely be available until the end of the growing season, (2) to fully irrigate more acres throughout the winter and terminate when the water is depleted, or (3) to fully irrigate more acres only when water is traditionally available from the Arch Hurley Conservancy District.

Effect of Valent Product AB-1880 on Alfalfa Growth

Investigator(s):

L.M. Lauriault[1], A.E. Cunningham[1], P.L. Cooksey[1], J. Box[1], J. Jennings[1], S. Jennings[1], and D. Lopez[1]

[1]New Mexico State University, Agricultural Science Center at Tucumcari, NM 88401

Objective(s):

To determine if Valent Product AB-1880 would increase alfalfa yield when applied to early growth after the second, third, and fifth harvests (third, fourth, and sixth growth periods).

Method(s):

The test area was located in alfalfa sown September 28, 2012, using a disk drill at 20 lb inoculated seed/A in the field fronting US 54 (Redona fine sandy loam). The field had been conventionally tilled and formed into a flat seedbed for sprinkler irrigation. Irrigations with treated municipal wastewater were applied as needed to supplement precipitation. In 2015, 18-60-0-15 lb N-P-K-S/A were broadcast on July 27th. No herbicides were applied in 2015; however, 1 pt/A Lorsban 4E was applied on April 26th to control alfalfa weevil and 10 oz Prevathon/A were applied on July 29th to protect against grasshoppers. Plots (10 ft x 30 ft) for three separate studies, one for each of the third, fourth, and sixth growth periods, were laid out in a Randomized Complete Block design with 4 replications. Treatments included untreated control (0) with 0.25 or 0.50 oz AB-1880/A applied on June 30, July 24, and Sep. 29, 2015, after hay had been swathed on June 15, July 14, and Sep. 17, respectively. For each growth period, a 22.6 gallon/A solution of the 0.25 oz AB-1880/A rate with 1 qt/100 gal nonionic surfactant was prepared. One pass was made over all treated plots using the 0.25oz/A solution and then a second pass was made over plots designated as 0.50oz.A.

Seven days following the application of AB-1880, phytotoxicity was observed. Immediately prior to canopy height was measured at five points within each plot and internode lengths were measured above the top node (topnode), the next internode (second internode), and for the third internode. Yields were measured using a self-propelled forage plot harvester equipped with a weighing system at first flower from the center 5 ft x 16 ft for the particular growth period (July 13, Aug. 20, and Nov. 10 for the third, fourth, and sixth growth periods, respectively) and the next growth period (Aug. 20 and Sep. 17 for the third and fourth growth period, respectively). A subsample of harvested material from each plot was collected and dried to determine dry matter concentration and yield and then ground to pass a 1-mm screen for nutritive value analysis by near-infrared spectroscopy.

Dry matter yield and nutritive value data were analyzed using SAS Proc MIXED to compare growth periods, AB-1880 rates (0, 0.25, and 0.50 oz/A), and their interaction. The first harvest only was analyzed for the fourth and sixth growth periods. The second harvest was included in the analysis for the third growth period because the application was made late in the growth cycle and yields were low. When an F-test was significant ($P < 0.05$) lsmeans were separated using least significant difference.

Results:

No phytotoxicity was observed. Differences ($P < 0.05$) among growth periods existed for all variables. Differences among AB-1880 rates were few, but a significant trend ($0.05 < P < 0.10$) also was evident as were several nonsignificant trends. Yield and nutritive value data collected in 2015 and results of tests of significance and means separation and are presented in Table 1 for variables not having a significant growth period x AB-1880 rate interaction, without regard to the main effect of AB-1880 rate, and in Table 2 for variables for which the period x AB-1880 rate was significant, but the main effect of AB-1880 rate was not.

There was a difference among AB-1880 rates for length of the second internode that was indicative of a trend for the other internode measurements (Table 1). That is, the 0.25 oz/A rate increased internode length compared to the untreated control (0) and the 0.50 rate. Otherwise, there was a trend ($0.05 < P < 0.10$) toward increased yield at the 0.5 oz AB-1880/A rate.

Table 1. Effect of Valent product AB-1880 rates (TRT) on alfalfa yield and nutritive value components from three growth periods (GP) at Tucumcari in 2015 for which there was no GP x TRT interaction. Data are the lsmeans of three GP and four replicates.

TRT	Canopy height	Top internode	Second internode	Third internode	Dry matter yield	NDFD
	inches	inches	inches	inches	Tons/A	% of NDF
0	18.6	0.33	0.45 B	0.67	2.02 B	48.5
0.25	18.0	0.41	0.54 A	0.69	1.99 B	49.3
0.5	18.8	0.37	0.43 B	0.65	2.44 A	48.6
			P-values			
GP	<.0001	<.0001	0.0238	<.0001	<.0001	<.0001
TRT	0.6209	0.6455	0.0326	0.5616	0.0511	0.4196
GP*TRT	0.7093	0.2615	0.5520	0.6363	0.6516	0.1960

NDFD signifies neutral detergent fiber (NDF) digestibility.
Columns of lsmeans having no associated letters are not significantly different because the *p*-value for TRT is >0.05.
Lsmeans within the column for second internode followed by the same letter are not significantly different based on a 5% LSD protected by a *p*-value of <0.05 for TRT.
Lsmeans within the column for dry matter yield followed by different letters are significantly different according to an unprotected LSD because the *p*-value for TRT is >0.05, but a trend in yield is indicated because the p-value is <0.10.

For the growth period x AB-1880 rate interaction there was a general improvement in nutritive value when AB-1880 was applied to the fourth growth period, but there was a decline when it was applied to the sixth growth period (Table 2). Improved nutritive value is indicated by increased crude protein and reduced fiber, the latter of which leads to higher total digestible nutrients, net energy for lactation, and relative forage quality. Reduced nutritive value is indicated by the converse.

Because of mixed results in 2015, further testing is needed with applications to all growth periods. This will take place in 2016.

Table 2. The growth period (GP) x treatment (TRT; oz/A) interaction of Valent product AB-1880 on alfalfa nutritive value components from three application dates at Tucumcari in 2015 for which there was no main effect of treatment (TRT). Data are the lsmeans of four replicates.

	Growth period		
	Third	Fourth	Sixth
TRT	AB-1880 applied 6/30/15; Alfalfa harvested 8/20/15[1]	AB-1880 applied 7/24/5; Alfalfa harvested 8/20/15	AB-1880 applied 9/29/15; Alfalfa harvested 11/10/15
	Crude protein, GP x TRT $P < 0.0221$		
0	22.50	20.45 D	31.38 A
0.25	22.08	22.68 C	29.90 AB
0.5	21.28	22.33 C	29.35 B
	Acid detergent fiber, GP x TRT $P < 0.0008$		
0.0	32.8 BCD	35.3 AB	15.5 F
0.3	34.0 ABC	30.4 D	17.8 E
0.5	35.4 A	31.5 CD	17.9 E
	Neutral detergent fiber, GP x TRT $P < 0.0007$		
0.0	37.3 BC	40.7 A	16.8
0.3	39.1 AB	34.6 C	19.1
0.5	40.0 AB	36.8 BC	18.9
	Total digestible nutrients, GP x TRT $P < 0.0003$		
0	63.6 CDE	61.0 EF	80.8 A
0.25	62.3 DEF	66.2 C	78.6 B
0.5	60.8 F	65.0 CD	78.5 B
	Net energy for lactation, GP x TRT $P < 0.0003$		
0	0.6537 CDE	0.6248 EF	0.8447 A
0.25	0.6390 DEF	0.6825 C	0.8204 AB
0.5	0.6228 F	0.6691 CD	0.8198 B
	Relative forage quality, GP x TRT P < 0.0033		
0	170	149	486 A
0.25	162	191	426 B
0.5	158	172	419 B

[1]The test was harvested on July 13, only 2 weeks after application. Yields were low and no differences existed among treatment. Consequently, this data is from the second cutting after application.

Columns of lsmeans having no associated letters are not significantly different because the *p*-value for TRT is >0.05.

Lsmeans within the column for second internode followed by the same letter are not significantly different based on a 5% LSD protected by a *p*-value of <0.05 for TRT.

Lsmeans within the column for dry matter yield followed by different letters are significantly different according to an unprotected LSD because the *p*-value for TRT is >0.05, but a trend in yield is indicated because the p-value is <0.10.

Kochia Variety, Site, and Planting Date Evaluation

Investigator(s):

B. Waldron[1], L.M. Lauriault[2], P.L. Cooksey[2], J. Box[2], J. Jennings[2], S. Jennings[2], and D. Lopez[2]

[1]USDA-ARS Forage and Range Lab, Logan, UT 84322
[2]New Mexico State University, Agricultural Science Center at Tucumcari, NM 88401

Method(s):

The Advisory Committee to the Agricultural Science Center at Tucumcari requested a local evaluation of perennial forage Kochia (*Kochia prostrata*). Consequently, four entries [subsp. *virescens* "Immigrant" (late maturing and high winter forage value) and "PustC2" (early maturing experimental) and subsp. *grisea* "Snowstorm" (late maturing and tall enhanced winter forage value) and ", KZ6xC2" (early maturing and salt tolerant experimental)] were acquired from the USDA-ARS Forage and Range Lab. Immigrant is the long-time standard and the only available variety until 2013. Snowstorm was released by the USDA in 2013.

The test is a strip (site: cropland irrigated with Class 1B treated municipal wastewater or rainfed range) – split (planting date: a winter seeding accompanied by snow and a spring seeding accompanied by rain) – split (variety) plot treatment arrangement with four randomized complete blocks within each site. The soil at both sites was Canez fine sandy loam. The range area was a very thin stand of perennial warm-season native grasses that had been encroached by Russian thistle. The irrigated area had a winter cereal rye cover crop with about 6 inches of growth. Details about planting and management in 2014 are given in the 2014 Annual Report of the Agricultural Science Center at Tucumcari (http://tucumcarisc.nmsu.edu/documents/2014-annual-report.pdf).

In 2015, Prowl H2O was applied on May 15 for pre-emergent weed control. High precipitation that month limited the residual effect of control. Consequently, top growth was removed on September 8.

Results:

No data were collected in 2015; however, the test site was visited by Earl Creech, Utah State University Extension Agronomist, who confirmed establishment.

Alfalfa Variety Testing in the Tucumcari Irrigation Project

Investigator(s):

L.M. Lauriault[1], A.E. Cunningham[1], P.L. Cooksey[1], J. Box[1], J. Jennings[1], S. Jennings[1], and D. Lopez[1]

[1]New Mexico State University, Agricultural Science Center at Tucumcari, NM 88401

Method(s):

With the availability of treated wastewater for irrigation in 2012, a standard alfalfa variety test and a Roundup Ready® variety test, each with 19 entries, were planted September 26, 2012, in the field fronting US 54. The test area (Redona fine sandy loam) was conventionally tilled and formed into a flat seedbed for sprinkler irrigation. Plots were sown using a disk drill fitted with a seed-metering cone at 20 lb inoculated seed/Are in a Randomized Complete Block design with 4 replications set up for nearest neighbor analysis. Plots are 5 ft x 30 ft of which the center 5 ft x 16 ft were harvested for yield six times in 2015 after 14-ft borders were swathed and baled. The 2012 Annual Report of the Agricultural Science Center at Tucumcari (http://tucumcarisc.nmsu.edu/documents/2012-annual-report.pdf) provides more details about establishment. Prior to the last harvest, irrigations with treated municipal wastewater totaling 14.0 inches were applied to supplement 24.7 inches of pre-growing season and growing season precipitation (November 2014 through October 2015). In 2015, 18-60-0-15 lb N-P-K-S/A were broadcast on July 27th. No herbicides were applied in 2015; however, 1 pt/A Lorsban 4E was applied on April 26th to control alfalfa weevil and 10 oz Prevathon/A were applied on July 29th to protect against grasshoppers.

Another test was planted May 12, 2015, in the same field but in Canez fine sandy loam soil. Plot size for this study is 20 ft x 5 ft (4 ft planted), with the center 15 x 5 ft harvested. Despite the early planting, high precipitation that encouraged weed growth and prevented harvesting persisted for most of the growing season (see Table 12 in the weather article of this annual report). Nonetheless the standing plant material was removed twice in 2015 to control weeds.

Results:

Yield data from the 2012 tests collected in 2015 were subjected to SAS GLM procedures for tests of significance and means separation and are presented in Table 1 for the standard test and Table 2 for the Roundup Ready® test with varieties arranged in each table by descending total yield.

Reports giving results from statewide testing in 2015 and previous years are available at the New Mexico State University College of Agricultural, Consumer and Environmental Sciences' Publications and Videos Variety Test Reports webpage (http://Aes.nmsu.edu/pubs/variety_trials/welcome.html#alfalfa) as well as from the Agricultural Science Center at Tucumcari and county Cooperative Extension Service offices.

Table 1. Dry matter yields (tons/Are) of alfalfa varieties sown September 26, 2012, at NMSU's Agricultural Science Center at Tucumcari and sprinkler-irrigated twice per week with treated municipal wastewater†.

			2015 Harvests							
Variety Name	2013 Total	2014 Total	14-May	13-Jun	14-Jul	19-Aug	17-Sep	10-Nov	2015 Total	3-Yr Average
Mallard	3.26	5.62*	1.14*	1.47**	0.25	1.46**	0.47*	0.35	5.13*	4.74**
56S82	3.90**	5.82*	1.28*	1.44*	0.24	1.33*	0.51*	0.49**	5.29**	4.71*
Malone	3.90**	6.26*	0.83	1.39*	0.47**	1.46**	0.34	0.40*	4.88*	4.69*
Integra 8400	3.00	5.98*	1.16*	1.31*	0.14	1.34*	0.42*	0.36*	4.72	4.66*
NM Common	3.20	5.80*	0.92	1.25*	0.40*	1.28*	0.54*	0.46*	4.84*	4.64*
NuMex Bill Melton	3.45*	6.28**	1.05	1.34*	0.25	1.43*	0.30	0.39*	4.76	4.61*
WL 454HQ.RR	3.23	5.87*	1.07	1.28*	0.17	1.30*	0.35*	0.43*	4.59	4.57*
Roadrunner	3.52*	6.06*	1.33**	1.39*	0.24	1.37*	0.56*	0.19	5.07*	4.52*
55Q27	2.93	5.53*	1.01	1.17*	0.13	1.35*	0.68**	0.37*	4.70	4.43*
Wilson	2.95	4.98	1.01	1.21*	0.21	1.28*	0.50*	0.46*	4.66	4.39*
Bluejay HR	2.88	5.86*	1.20*	1.33*	0.15	1.35*	0.18	0.13	4.33	4.36*
6422Q	2.72	5.66*	0.93	1.37*	0.15	1.29*	0.34	0.27	4.33	4.29*
54VR03	2.52	5.00	1.03	1.18*	0.10	1.16*	0.38*	0.32	4.16	4.27*
African Common	3.18	5.92*	0.85	1.22*	0.32	1.45*	0.34	0.40*	4.59	4.27*
Meadowlark	2.67	5.73*	1.21*	1.21*	0.11	1.39*	0.18	0.21	4.30	4.22*
Dona Ana	3.28	4.87	0.83	1.25*	0.21	1.29*	0.46*	0.44*	4.49	4.22*
HybriForce-2400	2.27	5.04	1.30*	1.27*	0.14	1.27*	0.35*	0.21	4.54	4.15*
54QR04	3.12	5.57*	0.90	1.23*	0.11	1.27*	0.29	0.28	4.08	4.13*
Bluejay 2	2.76	4.66	1.13*	1.11*	0.10	1.38*	0.25	0.16	4.13	3.88*
Mean	3.09	5.60	1.06	1.28	0.20	1.34	0.39	0.33	4.61	4.41
LSD (0.05)	0.60	0.91	0.23	NS	0.15	NS	0.34	0.14	0.70	NS
CV%	13.69	11.40	15.60	17.31	53.57	11.61	61.64	29.19	10.78	10.80

†Data for 2013 and 2014 were detrended using nearest neighbor analysis, and analyzed using analysis of variance; 2015 data were analyzed using analysis of variance only.

2013 Harvest dates: 5-Jun, 25-Jun, 1-Aug, 23-Sep, and 6-Nov.

2014 Harvests: 21-May, 1-Jul, 21-Jul, 19-Aug, 16-Sep, and 31-Oct.

**Highest numerical value in the column.

*Not significantly different from the highest numerical value in the column based on the 5% LSD.

NS means that there were no significant differences between the varieties within that column at the 5% level.

Table 2. Dry matter yields (tons/Are) of Roundup Ready® alfalfa varieties sown September 26, 2012, at NMSU's Agricultural Science Center at Tucumcari and sprinkler-irrigated twice per week with treated municipal wastewater†.

			2015 Harvests							
Variety Name	2013 Total	2014 Total	14-May	13-Jun	14-Jul	19-Aug	17-Sep	10-Nov	2015 Total	3-Yr Average
6829R	4.00**	8.78**	1.13	1.81*	0.93**	1.52	0.62*	0.47*	6.48*	6.42**
R65BD278	3.77*	8.66*	1.29*	1.95**	0.78*	1.74*	0.59*	0.46*	6.80**	6.41*
R58HG236	3.22	8.59*	1.20*	1.82*	0.81*	1.63*	0.72**	0.44*	6.61*	6.14*
R78T823	3.72*	8.24*	1.21*	1.85*	0.79*	1.44	0.70*	0.47*	6.45*	6.14*
R66BX312	3.81*	8.28*	1.23*	1.68	0.84*	1.35	0.60*	0.49*	6.19	6.09*
R66BX320	3.45*	8.60*	1.09	1.75*	0.80*	1.40	0.65*	0.53**	6.20	6.08*
R57K138	2.96	8.59*	1.37*	1.83*	0.81*	1.61*	0.50	0.45*	6.57*	6.04*
R57OK217	2.71	8.56*	1.28*	1.73	0.79*	1.73*	0.59*	0.43	6.55*	5.94*
R57A136	3.39*	8.04*	1.28*	1.69	0.72*	1.57	0.62*	0.34	6.21	5.88*
R57W213	2.77	8.50*	1.29*	1.69	0.69*	1.46	0.58*	0.50*	6.21	5.82
RR57K337	3.43*	8.12*	1.23*	1.59	0.77*	1.41	0.52	0.35	5.86	5.80
R66BX311	3.29	7.97*	1.08	1.74	0.86*	1.35	0.65*	0.48*	6.15	5.80
R57OK216	2.64	8.46*	1.38**	1.77*	0.81*	1.36	0.58*	0.37	6.27	5.79
54QR04	2.57	8.26*	1.38**	1.91*	0.75*	1.43	0.59*	0.39	6.43*	5.76
R65BD277	3.18	7.89*	1.08	1.71	0.79*	1.54	0.55	0.46*	6.12	5.73
R65BD279	2.94	7.90*	1.19*	1.66	0.77*	1.63*	0.45	0.49*	6.19	5.68
R86X214	2.24	8.01*	1.28*	1.77*	0.76*	1.82**	0.54	0.40	6.56*	5.60
54VR03	2.81	7.27	1.31*	1.56	0.69*	1.59	0.51	0.39	6.05	5.38
Mean	3.07	8.18	1.23	1.74	0.78	1.52	0.58	0.43	6.27	5.84
LSD (0.05)	0.71	1.06	0.20	0.21	NS	0.23	0.15	0.10	0.45	0.57
CV%	16.31	9.14	11.62	8.50	16.86	10.80	17.99	15.63	5.01	11.93

†Data were detrended using nearest neighbor analysis, and analyzed using analysis of variance.
2013 Harvest dates: 5-Jun, 25-Jun, 1-Aug, 23-Sep, and 6-Nov.
2014 Harvests: 21-May, 1-Jul, 21-Jul, 19-Aug, 16-Sep, and 31-Oct.
**Highest numerical value in the column.
*Not significantly different from the highest numerical value in the column based on the 5% LSD.
NS means that there were no significant differences between the varieties within that column at the 5% level.

Performance of Late-Planted Cotton in the Tucumcari Irrigation Project

Investigator(s):

L.M. Lauriault[1], A.E. Cunningham[1], R.P. Flynn[2], J. Zhang[3], J. Idowu[4], P.L. Cooksey[1], J. Box[1], J. Jennings[1], S. Jennings[1], and D. Lopez[1]

[1]New Mexico State University, Agricultural Science Center at Tucumcari, NM 88401
[2]New Mexico State University, Agricultural Science Center at Artesia, NM 88210
[3]New Mexico State University, Plant and Environmental Sciences Department, Las Cruces, NM 88003
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Method(s):

A cotton variety test was planted into a strip-tilled flat seedbed at the North Farm (Canez fine sandy loam) on June 5, 2015, using a plot planter with a single seed-metering cone set to plant 2, 30-inch rows. Plots were 25 x 5 ft with a 10 ft unplanted alley between plots to facilitate harvesting. The seeding rate was 5 seed/ft in a randomized complete block design with 4 replications. Varieties and lines tested were commercial cultivars and experimental lines developed at NMSU. The soil moisture profile was excellent at planting due to precipitation and no preplant irrigation was needed. Fertilizer (80 lb N/A) was applied on June 25th. Irrigations were applied approximately twice weekly until the end of October for a growing season total of 17.2 inches to supplement 16.0 inches of precipitation from planting through harvest time. Weather and equipment failures prevented application of any pre-emergent or in-season herbicides. Glyphosate was not used because not all entries were resistant. Consequently, weed control and competition was an issue throughout the growing season. In fields region-wide where pre-emergent herbicides were used, herbicide efficacy was greatly reduced by leaching from the high precipitation. Using strip tillage instead of conventional tillage likely exacerbated the problem. Inter-row spaces were hand-hoed and rotary mowed to reduce competition. Def 6 (1 pt/A) and Prep (1 qt/A) were applied on October 28 to defoliate the cotton and open bolls.

Harvesting took place on November 20, 2015, using a John Deere model 484 cotton stripper modified to harvest two rows and to catch harvested material in a trash can. Two-row borders surrounding the test were stripped prior to harvesting the plots. Also prior to harvest, 25 bolls were collected with the aid of students from the Mesalands Community College Animal and Plant Sciences Classes supervised by Staci Stanbrough. After stripping, plants were counted, and the total length of skips (>12 inches) in the planted row was estimated for each plot. Boll samples were shipped to NMSU's Agricultural Science at Artesia for ginning and turnout calculations after which lint samples were sent to a lab at Louisiana State University for fiber quality analysis. Individual plot weights were adjusted to lint yields based on the average seedcotton to trash ratio of ginned samples of the harvested material from randomly selected plots. Lint yield and quality data were analyzed by SAS Proc GLM with means separated by protected 5% LSD.

Results:

Soil moisture at planting was good and strictly supplied by precipitation; consequently, use of treated wastewater should not have impacted results due to poor emergence as it may have in the past. In the 2015 test, there was little yield differences among varieties (Table 1), but there were differences in fiber quality (Table 2). Yields were slightly higher on average than in 2014, possibly due to higher plant populations, but yields were still low compared to 2013, despite lower plant populations in that year. Lower yields, therefore, may be attributed to the later planting, which impacted the ability of some entries to produce mature bolls. For information about how several of these commercially available varieties would perform comparatively to each other when planted within the optimum planting window, see the 2013 Annual Progress Report of the Agricultural Science Center at Tucumcari (http://tucumcarisc.nmsu.edu/documents/2013-annual-report.pdf).

Table 1. Lint yield components from the wastewater-irrigated commercial cotton performance test at NMSU's Agricultural Science Center at Tucumcari in 2015.

Brand/Company	Hybrid/Variety	Population	seed-cotton	Lint		Turnout	bollwt
		Plants/ac	lb/a	lb/a	bales/a	%	g
NMSU	Acala1517-08	23784	1071	440	0.92	40.93	4.33
Monsanto	DP1212B2RF	23958	874	391	0.82	44.50	4.90
Monsanto	DP1518B2XF	25701	645	284	0.59	43.53	4.64
Americot	NG1511B2RF	20038	120	56	0.12	46.20	4.96
Americot	NG3406B2XF	31886	1301	591	1.23	44.80	5.00
Americot	NG4111RF	12632	344	149	0.31	43.28	4.70
NMSU Experimental	NM13G1007	38768	754	316	0.66	42.23	4.70
NMSU Experimental	NM13G1018	24742	481	214	0.45	43.83	4.54
NMSU Experimental	NM13G1019	23349	743	321	0.67	42.60	4.39
NMSU Experimental	NM13G2019	21867	700	313	0.65	44.60	4.56
NMSU Experimental	NM13G3002	34064	1104	473	0.99	42.83	5.02
Phytogen	PHY222WRF	45738	1421	619	1.29	43.85	4.61
Phytogen	PHY312WRF	31799	1006	433	0.90	43.48	5.16
Phytogen	PHY333WRF	37200	1760	799	1.67	45.68	5.11
Phytogen	PHY339WRF	20038	721	330	0.69	44.68	4.23
Phytogen	PHY367WRF	21345	896	402	0.84	44.15	4.38
Phytogen	PHY375WRF	17163	1224	544	1.13	44.70	4.89
	Trial Mean	26710	892	392	0.82	43.87	4.71
	LSD, 0.05	9641	NS	NS	NS	1.52	NS
	CV	25.4	73.6	73.3	73.3	2.4	10.1
	Prob>F	0.0001	0.1294	0.1094	0.1096	0.0001	0.1529

NS signifies not significant at P < 0.0500 based on the Prob>F at the bottom of the column. Consequently, no LSD value is published.

Table 2. Lint quality and economic data from the wastewater-irrigated commercial cotton performance test at NMSU's Agricultural Science Center at Tucumcari in 2015.

Hybrid/Variety	Length	Unif	SFI	Str	Elg	Mic	Maturity	Gross returns	Loan price
								$/ac	Cents
Acala1517-08	1.20	85.8	6.9	34.6	6.9	3.6	78.8	1002	56.75
DP1212B2RF	1.20	84.9	7.5	35.2	8.4	4.5	80.3	823	57.46
DP1518B2XF	1.21	85.9	7.6	31.0	7.4	4.3	80.3	607	57.53
NG1511B2RF	1.13	85.0	7.4	34.2	9.7	4.6	79.5	165	56.88
NG3406B2XF	1.18	85.6	6.9	34.6	9.6	4.4	79.0	920	57.65
NG4111RF	1.16	84.8	7.4	34.9	7.5	4.0	79.5	243	57.50
NM13G1007	1.19	85.0	7.5	32.1	8.1	4.0	79.0	532	57.61
NM13G1018	1.18	84.4	7.6	31.5	7.9	3.8	78.8	681	57.10
NM13G1019	1.19	83.6	7.4	33.2	8.0	3.8	78.7	1051	56.88
NM13G2019	1.20	84.6	7.7	33.7	7.5	3.9	79.0	660	57.19
NM13G3002	1.21	86.1	6.9	35.4	8.2	4.2	79.5	781	57.65
PHY222WRF	1.19	85.8	7.0	35.3	9.9	4.7	79.3	993	56.31
PHY312WRF	1.18	85.5	7.5	32.5	8.6	4.4	79.8	948	57.58
PHY333WRF	1.16	84.9	8.1	31.6	7.6	4.5	80.5	1242	57.50
PHY339WRF	1.18	85.4	7.3	33.9	8.8	4.3	79.7	679	57.67
PHY367WRF	1.14	84.4	7.9	31.0	9.0	4.0	78.3	842	55.94
PHY375WRF	1.16	85.2	7.3	31.4	8.2	4.6	80.3	865	57.45
	1.18	85.1	7.0	33.3	8.3	4.2	79.4	778	57.21
	0.04	NS	NS	2.5	0.7	0.6	1.3	NS	NS
	2.6	1.2	8.2	5.3	5.9	9.4	1.2	54.5	1.7
	0.0214	0.1120	0.2514	0.0007	0.0001	0.0024	0.0325	0.2431	0.4837

There was insufficient lint to analyze for trash, trash code, count, rd, yellowing, grade or leaf grade, the latter two of which are necessary for calculating the loan price. Consequently, a value of 31 was set for grade and a value of 1 was set for leaf to make the loan price calculation.
NS signifies not significant at P < 0.0500 based on the Prob>F at the bottom of the column. Consequently, no LSD value is published.

Performance of Late-Planted Glandless Cotton with Two Nitrogen Rates in the Tucumcari Irrigation Project

Investigator(s):

L.M. Lauriault[1], A.E. Cunningham[1], R.P. Flynn[2], J. Zhang[3], J. Idowu[4], P.L. Cooksey[1], J. Box[1], J. Jennings[1], S. Jennings[1], and D. Lopez[1]

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Method(s):

This study was part of a larger cotton performance evaluation that was planted into a strip-tilled flat seedbed at the North Farm (Canez fine sandy loam) on June 5, 2015, using a plot planter with a single seed-metering cone set to plant 2 30-inch rows. Plots were 25 x 5 with a 10-ft unplanted alley between plots to facilitate harvesting. The seeding rate was 5 seed/ft in a randomized complete block design with 4 replications. The soil moisture profile was excellent at planting due to precipitation and no preplant irrigation was needed. Fertilizer (80 or 160 lb N/A) was applied on June 25th. Irrigations were applied approximately twice weekly until the end of October for a growing season total of 17.2 inches to supplement 16.0 inches of precipitation from planting through harvest time. Weather and equipment failures prevented application of any pre-emergent or in-season herbicides. Consequently, weed control and competition was an issue throughout the growing season. In fields region-wide where pre-emergent herbicides were used, herbicide efficacy was greatly reduced by leaching from the high precipitation. Using strip-tillage instead of conventional tillage may have exacerbated the problem. Inter-row spaces were hand-hoed and rotary mowed to reduce competition. Def 6 (1 pt/A) and Prep (1 qt/A) were applied on October 28 to defoliate the cotton and open bolls.

Harvesting took place on November 20, 2015, using a John Deere model 484 cotton stripper modified to harvest two rows and to catch harvested material in a trash can. Two-row borders surrounding the test were stripped prior to harvesting the plots. Also prior to harvest, 25 bolls were collected with the aid of students from the Mesalands Community College Animal and Plant Sciences Classes supervised by Staci Stanbrough. After stripping, plants were counted, and the total length of skips (>12 inches) in the planted row was estimated for each plot. Boll samples were shipped to NMSU's Agricultural Science at Artesia for ginning and turnout calculations after which lint samples were sent to a lab at Louisiana State University for fiber quality analysis. Individual plot weights were adjusted to lint yields based on the average seedcotton to trash ratio of ginned samples of the harvested material from randomly selected plots. Lint yield and quality data were analyzed by SAS Proc MIXED with means separated by protected 5% LSD using PDMIX800.

Results:

Soil moisture at planting was strictly supplied by precipitation; however, emergence was spottier for these glandless entries, possibly because untreated seed was used. Results of statistical analyses and treatment means for main effects are presented in Table 1 and significant interactions for seedcotton, lint yield, and Str are presented in Table 2. Plant populations (Table 1) were impacted by nitrogen treatment and variety in addition to the lack of seed treatment. The higher nitrogen rate also reduced yield overall, but the interaction was significant indicating that the glanded Acala1517-08 was more affected by the N rate increase than the other varieties because of greater yields at the 80 lb N/A rate (Table 2). Only a few of the quality variables were impacted by nitrogen treatment, but most were variety-dependent (Table 1). The interaction for Str was significant because STVGLS had an increase for that variable with the increase in nitrogen level while no other variety did (Table 2).

Table 1. Lint yield and quality from the wastewater-irrigated glandless cotton varieties receiving two nitrogen levels at NMSU's Agricultural Science Center at Tucumcari in 2015.

Treatment	PlantPop	Seedcotton, lbac	lint, lbac	Turnout, %	Boll wt, g	Length	Unif	SFI	Str	Elg	Mic	Maturity
					Nitrogen level							
80 lb/ac	17003	377	153	40.63	4.36	1.16	84.4	8.0	33.6	7.0	3.7	78.9
160 lb/ac	7420	85	34	40.42	4.67	1.17	84.8	7.1	34.3	7.6	3.4	78.0
P-Value	0.01	0.02	0.02	0.61	0.23	0.44	0.46	0.03	0.43	0.03	0.16	0.11
					Variety							
13P1088GLS	13155	372	148	39.51 CD	4.50 B	1.17 B	85.3 AB	6.6 C	37.1 A	7.8 AB	3.8	78.6
13P1115GLS	7579	8	3	39.24 D	4.27 B	1.17 B	83.9 B	8.1 AB	33.5 B	8.6 A	3.6	77.6
13P1117GLS	11935	193	80	42.57 A	4.08 B	1.09 C	83.1 C	9.1 A	30.0 C	7.2 BC	3.5	78.2
Acala1517-08	14288	536	220	40.95 B	4.47 B	1.19 AB	85.5 AB	6.9 BC	34.6 AB	6.9 C	3.4	78.5
AcalaGLS	17729	16	6	40.87 BC	5.67 A	1.21 A	86.2 A	6.6 C	36.8 A	6.1 D	3.4	79.3
STVGLS	8581	262	106	40.00 BC	4.08 B	1.17 B	84.0 B	8.1 AB	32.0 BC	7.0 BC	3.5	78.7
P-value	0.09	0.09	0.09	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.76	0.64
Interaction P-value	0.12	0.03	0.03	0.92	0.40	0.24	0.72	0.34	0.04	0.71	0.28	0.62

Means within a column within the nitrogen level treatment category are considered different if the P-value is <0.05. Means within a column within the variety treatment category followed by the same letter are not significantly different based on the requirement that the P-value at the bottom of the column within that treatment category is <0.05 (a 5% likelihood that a difference does not exist). Data for significant interactions are summarized in table 2.

Table 2.The impact of nitrogen level and variety on lint yield and quality from the wastewater-irrigated glandless cotton irrigated with treated

Tucumcari in 2015.

Variety	80 lb N/ac	160 lb N/ac
	Seedcotton, lb/ac	
13P1088GLS	656 AB	87 BC
13P1115GLS	11 C	5 C
13P1117GLS	66 C	320 BC
Acala1517-08	1071 A	0 C
AcalaGLS	33 C	0 C
STVGLS	426 BC	98 BC
	Lint, lb/ac	
13P1088GLS	263 AB	33 BC
13P1115GLS	4 C	2 C
13P1117GLS	28 C	131 BC
Acala1517-08	440 A	0 C
AcalaGLS	13 C	0 C
STVGLS	172 BC	40 BC
	Str	
13P1088GLS	38.0 A	36.2 AB
13P1115GLS	33.1 BC	33.8 ABC
13P1117GLS	30.6 CD	29.3 CD
Acala1517-08	34.6 B	34.5 AB
AcalaGLS	37.9 A	35.6 AB
STVGLS	27.6 D	36.4 AB

Means within a column within a variable followed by the same letter are not significantly different at the 5% probability level.

Performance of Treated Municipal Wastewater-Irrigated (Limited Irrigation and Dryland) Grain Sorghum in the Tucumcari Irrigation Project

Investigator(s):

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Method(s):

To evaluate grain yield of grain sorghum varieties under limited irrigation and irrigated only at planting, if necessary, to bring the soil to field capacity, tests were planted into a conventionally tilled flat seedbeds in areas designated for limited irrigation applications and dryland cropping. Each test was a Randomized Complete Block design with 4 replicates. Individual plots were 20 x 5 ft (two, 30inch rows), all of which were to be harvested after photoperiod sensitive sorghum x sudangrass borders surrounding each test were swathed. Plots were planted June 3, 2015, using a plot planter with a single seed-metering cone and set to plant 2, 30inch rows. A 5ft unplanted alley was left between plots to facilitate harvesting. The seeding rate for the fully irrigated test was 85,000 seeds/A and for the limited irrigation test it was 29,000 seeds/A. Carryover N was 23 lb/A. No fertilizer or pesticides were applied. The dryland test received 7.20 inches of treated municipal wastewater (Class 1B) pre-planting (January through May) to bring the upper 3 ft of soil to field capacity. Otherwise, irrigations with treated municipal wastewater were applied approximately twice weekly to the limited irrigation test and the surrounding area for a January through October total of 14.9 inches. Irrigations supplemented 24.0 inches of pre-growing season and growing season precipitation.

Results and Discussion:

Good stands established for both tests and borders surrounding the tests were sufficient to prevent predation by deer that had happened in the past. Heading was uniform; however, pollination was not successful. After heading, all plants in a large number of plots of both tests were girdled at ground level, likely by a species of vole, and there was little regrowth. In the remaining plots, a second heading took place that was too late to produce measurable grain. Entries included in the limited irrigation and dryland tests are presented in Tables 1 & 2, respectively.

Reports giving results from statewide testing in 2015 and previous years are available at the New Mexico State University College of Agricultural, Consumer and Environmental Sciences' Publications and Videos Variety Test Reports webpage (http://aces.nmsu.edu/pubs/variety_trials/welcome.html#corn) as well as from the Agricultural Science Center at Tucumcari and county Cooperative Extension Service offices

Table 1. Varieties included in the New Mexico 2015 limited irrigation (wastewater) grain sorghum performance test at NMSU's Agricultural Science Center at Tucumcari.

Brand/Company Name	Hybrid/Variety Name
Advanta US Inc./Alta Seeds	AG-1203
Advanta US Inc./Alta Seeds	AG-2103
Advanta US Inc./Alta Seeds	AG-2105
Advanta US Inc./Alta Seeds	AG-3101
Advanta US Inc./Alta Seeds	AG-3201
Gayland Ward Seed	GW1160
Chromatin Inc./Sorghum Partners	KS585
Chromatin Inc./Sorghum Partners	NK7633
Chromatin Inc./Sorghum Partners	SPX15714

Notes:
All but 1 plot in each of reps 3 & 4 were girdled by a rodent (likely a vole) just after heading. This also happened to 1 plot in rep 1 and 2 plots in rep 3. All reps of GW1160 were affected.
All ungirdled plots headed, but there was no grain production.
A second heading, or an attempt at it, took place on most ungirdled plots, but there was insufficient time for grain filling.
No data was collected.

Table 2. Varieties included in the New Mexico 2015 dryland (irrigated up to planting with wastewater) grain sorghum performance test at NMSU's Agricultural Science Center at Tucumcari.

Brand/Company Name	Hybrid/Variety Name
Advanta US Inc./Alta Seeds	AG-1201
Advanta US Inc./Alta Seeds	AG-1203
Advanta US Inc./Alta Seeds	AG-2105
Gayland Ward Seed	AG-2115
Gayland Ward Seed	GW9417
Gayland Ward Seed	GW9460
Chromatin Inc./Sorghum Partners	KS585
Chromatin Inc./Sorghum Partners	SP3425
Chromatin Inc./Sorghum Partners	SPX11814

Notes:
Several plots were randomly girdled by a rodent (likely a vole) just after heading.
All ungirdled plots headed, but there was no grain production.
A second heading, or an attempt at it, took place on most ungirdled plots, but there was insufficient time for grain filling.
No data was collected.

Performance of Irrigated Forage Sorghum under a Single-cut Silage System in the Tucumcari Irrigation Project

Investigator(s):

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Method(s):

To evaluate yield and nutritive value of forage sorghum for silage, a test was planted into a conventionally tilled flat seedbed in the field fronting US 54. Plots were planted June 3, 2015, using a small plot row crop planter with a single seed-metering cone and set to plant 2 30-inch rows. The seeding rate was 90,000 seed/A. Photoperiod sensitive sorghum x sudangrass was sown around the test as a border. There were 23 lb N/A of carryover nitrogen. No fertilizer or pesticides were applied other than Prevathon (10 oz/A) to control grasshoppers on July 29. Individual plots were 20 x 5 ft, all of which were harvested. A 5-ft unplanted alley was left between plots to facilitate harvesting. The test was a Randomized Complete Block design with 4 replicates. Irrigations with treated municipal wastewater were applied approximately twice weekly for a May through October total of 14.9 inches to supplement 24.0 inches of pre-growing season and growing season (January through October) precipitation.

After the surrounding sorghum x sudangrass hay was swathed, standing forage from each plot was harvested on October 29 with a Case-IH model 8750 forage harvester with a row-crop head, leaving 6-inch stubble. Chopped material from individual plots was collected in a garbage can and immediately weighed. Prior to dumping the garbage can, a sample from each plot was placed in a labeled paper bag and sealed in a plastic bag. Immediately after harvesting was complete these samples were weighed, removed from the plastic bag, dried at 150°F for 48 hours, and reweighed to determine harvest moisture and to convert fresh field weights to dry matter yield.

Dried samples were ground to pass through a 1-mm screen and submitted to the University of Wisconsin Forage Lab for forage nutritive value analysis by wet chemistry for crude protein (CP), neutral detergent fiber (NDF), 48-h neutral detergent fiber digestibility (NDFD), starch, ash, total digestible nutrients (TDN), and net energy for lactation (NE_l). Milk per ton and milk per acre were calculated by the lab.

Dry and green forage yield, harvest moisture, and nutritive value data were analyzed using SAS PROC GLM procedures to determine where differences between varieties existed. Means were separated by protected least significant difference ($P < 0.05$).

Results and Discussion:

Results of statistical analysis for yield and nutritive value data are presented in Table 1. Reports giving results from statewide testing in 2015 and previous years are available at the New Mexico State University College of Agricultural, Consumer and Environmental Sciences' Publications and Videos Variety Test Reports webpage (http://Aes.nmsu.edu/pubs/variety_trials/welcome.html#corn) as well as from the Agricultural Science Center at Tucumcari and county Cooperative Extension Service offices.

Table 1. Yield, nutritive value, and estimated milk production data from the New Mexico 2015 wastewater-irrigated, single-cut forage sorghum performance test at NMSU's Agricultural Science Center at Tucumcari

Brand/Company Name	Hybrid/Variety Name	Dry Forage	Green Forage	Moisture at Harvest	CP	NDF	NDFD 48hr	Starch	Ash	TDN	NE_l	Milk/ Ton	Milk/ Acre
		t/a	t/a	%	%	%	%	%	%	%	Mcal/lb	lb/t	lb/a
Advanta US Inc./Alta Seeds	AF8301	3.7	12.2	69.4	6.5	64.5	63.2	1.6	5.6	56.1	0.569	2484	9311
Chromatin Inc./Sorghum Partners	NK300	2.9	9.4	68.9	6.9	61.5	66.3	1.2	6.1	56.6	0.575	2549	7453
Chromatin Inc./Sorghum Partners	SP1615	7.1	24.2	70.6	7.3	62.8	67.3	4.0	4.6	60.6	0.619	2838	20296
Chromatin Inc./Sorghum Partners	SPX37114	1.7	6.6	73.0	10.3	59.8	69.7	0.7	7.3	61.0	0.623	2886	4770
Chromatin Inc./Sorghum Partners	SS405	8.5	24.1	64.9	6.9	61.5	62.2	6.0	4.2	57.9	0.590	2609	22145
	Trial Mean	4.8	15.3	69.3	7.6	62.0	65.7	2.7	5.6	58.4	0.595	2763	12795
	LSD P < 0.05	0.8	3.1	4.4	1.8	2.8	3.0	1.6	0.9	3.2	0.036	251	3149
	CV	11.5	13.1	4.1	15.3	3.0	3.0	38.7	10.2	3.6	3.9	6.1	16.0
	F Test	0.0001	0.0001	0.0228	0.0034	0.0378	0.0010	0.0001	0.0001	0.0182	0.0178	0.0151	0.0001

CP, NDF, NDFD, TDN, and NE_l signify crude protein, neutral detergent fiber, NDF digestibility, total digestible nutrients, and net energy for lactation, respectively.
LSD and CV signify the least significant difference, which is the between two means within that column required to say that they are truly different, and the coefficient of variation, which indicates the amount of variability in the data [small CV's (<20) are considered good].
The F Test at the bottom of the column, when multiplied by 100, is the likelihood that no difference exists between any means in the column. A <5% likelihood is required in this table to say that a difference existed between at least two means in the column.

Other entries planted included Advanta US Inc./Alta Seeds AF7102, AF7202, AF7301, and AF7401 and Gayland Ward Seed SiloPro BMR Dwarf. While these established reasonable stands, they were not harvested because all stems had been selectively girdled by rodents, likely a species of field rat, and regrowth was not sufficient for harvest being <8 inches tall. Yields of SPX37114 are low due to height, which was only about 3 ft.

Performance of Irrigated Sorghum x Sudangrass Hybrids and Forage Sorghum under a Multiple-cut Hay System in the Tucumcari Irrigation Project

Investigator(s):

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Method(s):

To evaluate yield and nutritive value of sorghum x sudangrass and forage sorghum in a two-cut system for hay, a test was planted into a conventionally tilled flat seedbed in the field fronting US 54 and managed as a drilled hay crop. Plots were planted June 3, 2015, using a plot drill with a seed-metering cone and set to plant 8 6-inch rows. The seeding rate was 25 lb/A. A 5-ft alley was left unplanted between plots to facilitate harvesting. Photoperiod sensitive sorghum x sudangrass was sown around the test as a border. There were 23 lb N/A of carryover nitrogen. No fertilizer or pesticides were applied other than Prevathon (10 oz/A) to control grasshoppers on July 29. Individual plots were 20 x 5 ft, of which 20 x 4 ft were planted and harvested. The test was a Randomized Complete Block design with 4 replicates Irrigations with treated municipal wastewater were applied approximately twice weekly for a May through October total of 14.9 inches to supplement 24.0 inches of pre-growing season and growing season (January through October) precipitation.

After the surrounding sorghum x sudangrass hay was swathed, standing forage from each plot was swathed and harvested on July 20 and October 29 with a Case-IH model 8750 forage harvester with a hay pickup head, leaving 6-inch stubble. Chopped material from individual plots was collected in a garbage can and immediately weighed. Prior to dumping the garbage can, a sample from each plot was placed in a labeled paper bag and sealed in a plastic bag. Immediately after harvesting was complete these samples were weighed, removed from the plastic bag, dried at 150°F for 48 hours, and reweighed to determine harvest moisture and to convert fresh field weights to dry matter yield.

Dried samples were ground to pass through a 1mm screen and submitted to the University of Wisconsin Forage Lab for forage nutritive value analysis by wet chemistry for crude protein (CP), neutral detergent fiber (NDF), 48-hr neutral detergent fiber digestibility (NDFD), starch, ash, total digestible nutrients (TDN), and net energy for lactation (NE_l). Milk per ton and milk per acre were calculated by the lab.

Dry and green forage yield, harvest moisture, and nutritive value data were analyzed using SAS PROC GLM procedures to determine where differences between varieties existed. Means were separated by protected least significant difference ($P < 0.05$).

Results and Discussion:

Results of statistical analysis for yield and nutritive value data are presented in Tables 1 & 2. Reports giving results from statewide testing in 2015 and previous years are available at the New Mexico State University College of Agricultural, Consumer and Environmental Sciences' Publications and Videos Variety Test Reports webpage (http://aces.nmsu.edu/pubs/variety_trials/welcome.html#corn) as well as from the Agricultural Science Center at Tucumcari and county Cooperative Extension Service offices.

Table 1. Forage yield and estimated milk production data from the New Mexico 2015 wastewater-irrigated, twice-cut sorghum x Sudangrass performance test at NMSU's Agricultural Science Center at Tucumcari.

			Harvest 1					Harvest 2					Total	
Brand/Company Name	Hybrid/Variety Name	Type	Dry Forage	Green Forage	Harvest Moisture	Milk/ Ton	Milk/ Acre	Dry Forage	Green Forage	Harvest Moisture	Milk/ Ton	Milk/ Acre	Dry Forage	Milk/ Acre
			t/a	t/a	%	lb/t	lb/a	t/a	t/a	%	lb/t	lb/a	t/a	lb/a
Advanta US Inc./Alta Seeds	AS5201	SxS	1.9	8.1	76.5	3103	5875	2.5	26.8	59.9	2674	6618	4.4	8549
Advanta US Inc./Alta Seeds	AS6201	SxS	1.8	8.6	78.7	3111	5723	1.9	21.0	57.3	2646	4936	3.7	8370
Advanta US Inc./Alta Seeds	AS6401	SxS	1.8	8.4	79.1	3226	5650	1.6	19.2	67.3	3016	4810	3.4	8665
Advanta US Inc./Alta Seeds	AS6402	SxS	2.0	9.1	77.7	3229	6478	2.0	18.2	65.6	2849	5656	4	9327
Advanta US Inc./Alta Seeds	AS9302	SxS	1.7	7.5	76.3	3194	5559	1.7	20.9	61.0	2929	5041	3.5	8488
Chromatin Inc./Sorghum Partners	NK300	FS	1.8	7.6	76.7	3216	5713	1.7	19.5	63.4	2616	4514	3.5	8329
Chromatin Inc./Sorghum Partners	SP1615	FS	1.8	7.3	75.8	3151	5521	2.9	20.1	69.2	2917	8493	4.7	8438
Chromatin Inc./Sorghum Partners	SPX37114	FS	1.3	5.1	74.2	3164	4163	1.4	18.7	63.9	2731	3802	2.7	6893
Chromatin Inc./Sorghum Partners	SS405	FS	2.1	10.1	79.6	3104	6389	3.0	19.4	70.8	2788	8255	5.1	9178
Gayland Ward Seed	SuperSugarDM	SxS	1.7	7.5	77.3	3010	5110	2.8	26.2	65.8	2733	7554	4.5	7843
Gayland Ward Seed	SweetSixBMR	SxS	2.5	10.3	76.1	3148	7800	2.1	21.0	60.8	2809	5869	4.6	10609
		Trial Mean	1.8	8.1	77.1	3150	5616	2.1	21.0	64.1	2792	5959	4.0	8608
		LSD P < 0.05	0.4	1.6	2.5	NS	1193	0.8	3.4	4.1	188	2190	0.9	1208
		CV	14.6	13.5	2.3	3.2	14.2	26.8	11.2	4.4	4.7	25.4	14.8	9.7
		F Test	0.0007	0.0001	0.0048	0.1126	0.0004	0.0002	0.0001	0.0001	0.0021	0.0009	0.0001	0.0003

SxS and FS signify sorghum x sudangrass and forage sorghum, respectively.

LSD and CV signify the least significant difference, which is the between two means within that column required to say that they are truly different, and the coefficient of variation, which indicates the amount of variability in the data [small CV's (<20) are considered good].

The F Test at the bottom of the column, when multiplied by 100, is the likelihood that no difference exists between any means in the column. A <5% likelihood is required in this table to say that a difference existed between at least two means in the column.

Table 2. Forage nutritive value data from the New Mexico 2015 wastewater-irrigated, twice-cut sorghum x Sudangrass performance test at NMSU's Agricultural Science Center at Tucumcari.

Hybrid/Variety Name	Harvest 1							Harvest 2						
	CP	NDF	NDFD 48hr	Starch	Ash	TDN	NE_l	CP	NDF	NDFD 48hr	Starch	Ash	TDN	NE_l
	%	%	%	%	%	%	Mcal/lb	%	%	%	%	%	%	Mcal/lb
AS5201	11.5	58	72.8	2.4	7.2	63.7	0.653	5.7	60.4	67.2	4.9	5.7	58.3	0.593
AS6201	12.4	55.6	73.9	2.5	7.6	63.7	0.653	6.3	59	69	2.8	6.8	57.7	0.587
AS6401	12.8	55.4	75.3	2.9	7.9	65.1	0.669	7.2	60.8	75	1.7	7.4	62.2	0.637
AS6402	13.2	56.8	74.1	2.3	8.2	65.3	0.671	7.5	59.6	72.3	1.5	6.9	60.2	0.614
AS9302	12.5	56.4	75.4	1.3	7.9	64.7	0.664	6.1	62.3	73.2	1.4	6.9	61.2	0.626
NK300	12.1	60	72.2	2.5	7.3	65.3	0.671	6	61.6	67.4	2.2	6.5	57.4	0.584
SP1615	11.8	57.9	72.1	3.5	7.4	64.4	0.661	6.7	58.7	72.7	4.6	5.8	61.1	0.624
SPX37114	13.3	55.7	73	2.9	7.9	64.5	0.662	8.3	59.8	68.8	2	6.4	58.9	0.6
SS405	12	58.4	72.2	2.1	7.5	63.7	0.654	7.4	56.6	69.8	5.6	5.4	59.6	0.608
SuperSugarDM	12	57.2	71.1	2.4	7.7	62.6	0.641	5.5	60.3	68.7	4.9	5.6	58.9	0.601
SweetSixBMR	11.8	57.1	73.9	2.6	7.3	64.2	0.659	5.9	61.3	71.7	1.9	7	59.7	0.609
Trial Mean	12.3	57.1	73.3	2.5	7.6	64.3	0.660	6.6	60.0	70.5	3.1	6.4	59.6	0.608
LSD P < 0.05	0.8	2.5	2.0	0.9	0.4	NS	NS	0.8	2.5	3.1	1.9	0.8	2.3	0.0
CV	4.7	3.0	1.9	25.8	4.1	2.0	2.2	8.7	2.9	3.0	43.2	9.0	2.7	2.9
F Test	0.0012	0.0203	0.0200	0.0101	0.0007	0.1286	0.1287	0.0001	0.0056	0.0126	0.0001	0.0003	0.0035	0.0034

CP, NDF, NDFD, TDN, and NEl signify crude protein, neutral detergent fiber, NDF digestibility, total digestible nutrients, and net energy for lactation, respectively.

LSD, CV, and NS signify the least significant difference, which is the between two means within that column required to say that they are truly different; the coefficient of variation, which indicates the amount of variability in the data [small CV's (<20) are considered good]; and not significantly different based on the F Test at the bottom of the column, which, when multiplied by 100, is the likelihood that no difference exists between any means in the column. A <5% likelihood is required in this table to say that a difference existed between at least two means in the column.

Tepary Bean Evaluations for Forage in the Tucumcari Irrigation Project

Investigator(s):

L.M. Lauriault[1], R.C. Pratt[2], L. Grant[2], A.E. Cunningham[1], P.L. Cooksey[1], J. Box[1], J. Jennings[1], S. Jennings[1], and D. Lopez[1]

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Objective:

Heat and drought-tolerant tepary beans are a relative of common dry beans (e.g. pinto beans) that were cultivated by early farmers from as far south as Central America to as far north as the Four Corners area of the United States for edible dry beans. While the potential as a forage crop has been preliminarily evaluated of eight lines at Tucumcari concurrent with grain production, the objective of this study is to test a more broad range of lines under forage management for hay.

Method(s):

The test with 30 entries was planted June 17, 2015, under the center's North Farm center pivot irrigation system. The test area (Canez fine sandy loam) was conventionally tilled and formed into a flat seedbed. Plots were sown using a disk drill fitted with a seed-metering cone at 57 lb uninoculated seed/A in a Randomized Complete Block design with four replications. There were 8 lb of carryover N/A and another 80 lb N/A were applied on June 25, 2015, followed by a 0.5-inch irrigation with treated municipal wastewater. July precipitation totaled 7.56 inches; however, it was not uniformly distributed throughout the month with one event of over 4 inches. Consequently, 2 inches of irrigation with treated municipal wastewater supplemented precipitation.

The tepary beans in this study did not emerge as they had in the previous years in grain studies in the same soil type in another field using the same irrigation water source. Because test for grain had been planted in the same field on July 1 that also failed, the cause for these stand failures is not well-understood.

Tepary Bean Evaluations for Grain in the Tucumcari Irrigation Project

Investigator(s):

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Introduction:

Heat and drought-tolerant tepary beans are a relative of common dry beans (e.g. pinto beans) that were selected by early farmers before the arrival of European settlers. They were cultivated from as far south as Central America to as far north as the Four Corners area of the United States. Tepary beans are commercially produced on a small scale and have the potential to become a more important crop in hot, dry environments. Selections arising from the northern area of cultivation (Arizona; Maricopa selections), and from the southern area (Chiapas, Mexico) were chosen to compare with modern varieties recently released by Colorado State University and by the USDA/ARS Tropical Agriculture Research Station in Puerto Rico (TARS 22 and TARS 32). The objective was to evaluate the relative performance of these varieties in southern New Mexico (Las Cruces) and in northern New Mexico. Additionally, their potential as a forage crop was evaluated at Tucumcari.

Method(s):

To evaluate the local performance of tepary bean varieties at Tucumcari as part of the multi-location study, a test with 8 entries was planted July 1, 2015, under the center's North Farm center pivot irrigation system. The test area (Canez fine sandy loam) was conventionally tilled and formed into a flat seedbed. There were 8 lb of carryover N/A and another 80 lb N/A were applied on June 25, 2015, followed by a 0.5-inch irrigation with treated municipal wastewater that kept the soil near field capacity until planting. Plots (5 ft x 15 ft with a 5-ft alley) were arranged in a Randomized Complete Block design with two replications. Seed were sown by hand spaced 6 inches apart in a single row down the center of the plot. July precipitation totaled 7.56 inches; however, it was not uniformly distributed throughout the month with one event of over 4 inches. Consequently, 2 inches of irrigation with treated municipal wastewater supplemented precipitation.