

2022

ANNUAL REPORT

AGRICULTURAL SCIENCE
CENTER AT LOS LUNAS

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Notice to Users of this Report

This report has been prepared to aid Science Center staff in analyzing the results of various research projects from the past year and to record data for future reference. These are not formal Agricultural Experiment Station Report research results. The reader is cautioned against drawing conclusions or making recommendations as a result of the data in this report. In many instances, data represents only one of several years' results that will ultimately constitute the final formal report. Although 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.

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Agricultural Science Center Locations Map

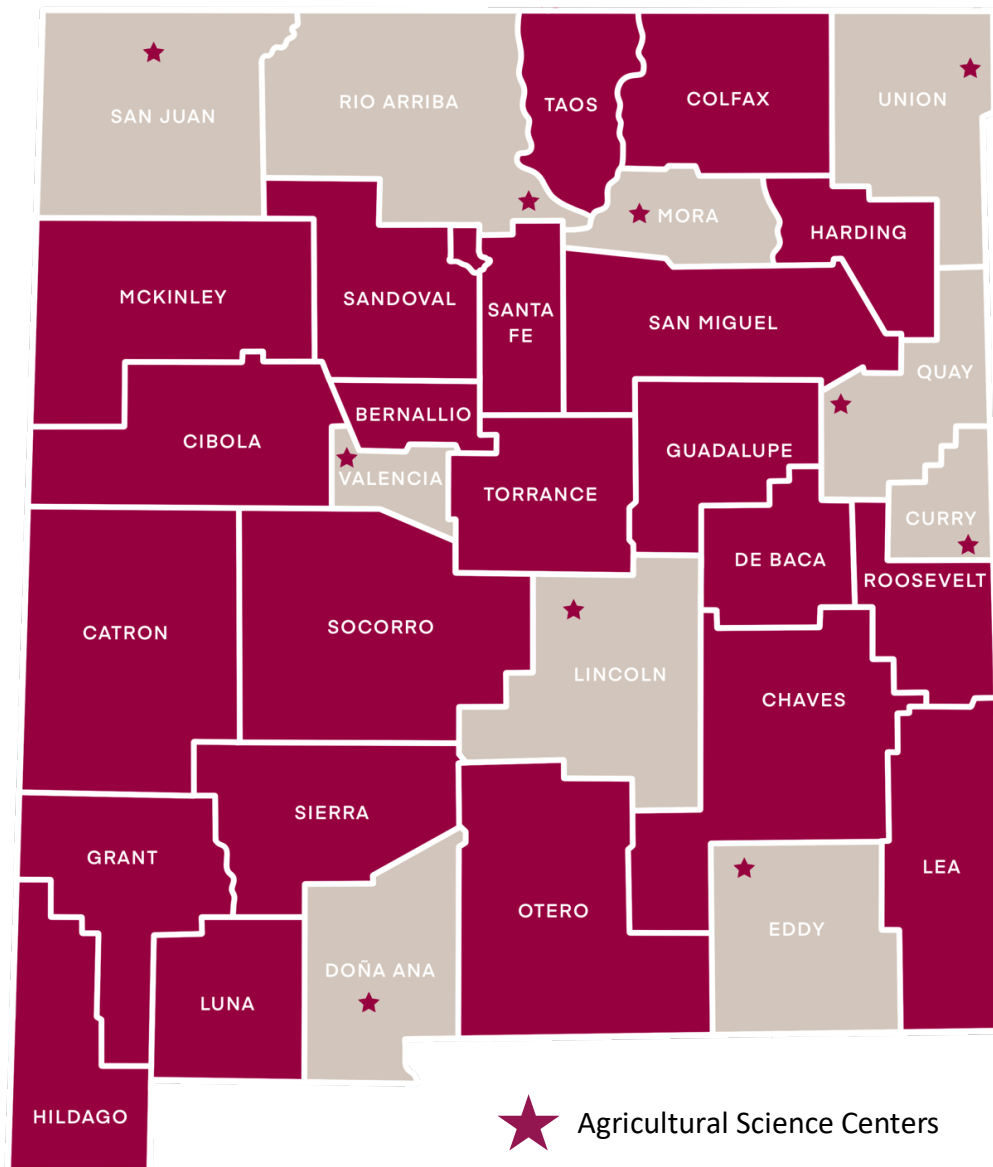


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Executive Summary

Established in 1957, the 204-acre research farm began as a joint resource conservation venture with the USDA-Natural Resources Conservation Service, Plant Materials Center. Initial NMSU research efforts were placed on forage and vegetable crops. Research has expanded to include different crops, including alfalfa, corn, sorghum, grapes (wine and table), pasture grasses, chile and other vegetables, turf grass, native plants, fruit trees, and ornamental plantings. In addition, efforts have been broadened to include insect (both beneficial and pest) and weed control studies. The multi-faceted programming at the ASC has produced significant improvements in species and variety selection, plant and water management, beneficial insects and pollinators, integrated pest management (IPM), and urban landscapes. Programs address the needs of small- to medium-acreage farmers located on the 50,000+ irrigated acres of the Middle Rio Grande Valley and urban gardeners in the largest urban region of the state, reaching thousands of people each year.

The Los Lunas ASC is fulfilling the missions of AES, ACES, and NMSU by being a very active research, Extension, and Outreach arm of the university. The faculty and staff at the station conduct numerous critical research projects and host numerous Extension and public Outreach events each year. The combined programs of Viticulture, Forage, Integrated Pest Management, and Urban Horticulture lead to tens of thousands of contacts each year.

In addition to the major crops grown in the region, researchers will continue to explore more minor and/or niche crop opportunities for research on emerging themes (e.g., agrivoltaics, high-value grain crops) which may provide alternative opportunities for the evolving agricultural landscape and broad range of stakeholders served by the LL ASC. In addition, faculty will continue to increase horticulture and landscape research and education programs aimed at reducing water in urban landscape and gardening systems. A major focus of research and Extension will be in the area of carbon sequestration and soil health. Multiple projects are underway to investigate how both forage and urban landscape systems contribute to carbon and soil health dynamics.

Research Projects

Jujube cultivar trial at Los Lunas – Investigators: Shengrui Yao

Cover crops and soil carbon sequestration- Investigators: Rajan Ghimire, Mark A. Marsalis, and Jarai Mon

Statewide alfalfa variety testing - Investigators: M.A. Marsalis, L.M. Lauriault, I. Ray, C. Pierce

Habitat enhancement for IPM in New Mexico vineyards - Investigators: Miranda Kersten, Maryel Lopez, and Gill Giese

Easy destemming potential and fruit morphology of New Mexican Chile peppers - Investigators: Dennis N. Lozada and Ehtisham Khokhar

Initial hemp variety trials across New Mexico environments - Investigators: Catherine Brewer and Rebecca Creamer

Allelopathic cover crops for pest suppression in chile pepper in the Southwest - Investigators: Schutte, B. J., Lehnhoff, E. A., Acharya, R., Creamer, R. J., Bundy, C. S. (Co-Principal), Sanogo, S.

Evaluation of the efficacy of Saflufenacil tank-mixes and sequential applications applied in early fall for the control of plantain (*Plantago* spp.) and field bindweed (*Concolculus arvensis*) in alfalfa fields
- Investigators: PI: Leslie Beck; Co-PIs: Mark Marsalis; Leonard Lariault

Field evaluation and marketability table grape varieties for New Mexico - Investigators: Maryel Lopez, Gill Giese, Kevin Lombard, and Shengrui Yao

Smother crops for improving land productivity and forage opportunities - Investigators: M.A. Marsalis, Jarai Mon, and Richard Strait

Pasture demonstration on tribal lands - Investigators: M.A. Marsalis, S. Gomez (graduate student), R. Strait

Undercover tomato study, part 2 – benefits & connoption fits - Investigators: Marisa Thompson; Dawn VanLeeuwen; Stephanie Walker; Charles Havlik

Field evaluation of 4 hybrid winegrapes - Investigator: Gill Giese

Field evaluation of 4 hybrid sustainable bioeconomy for arid regions: Guar Production - Investigators: John Idowu and Mohammed Omer

Effects of urban landscape ground covers on soil moisture & temperature, weed control, and tree establishment - Investigator: Marisa Thompson

Jujube cultivar trial at Los Lunas

Investigator: Shengrui Yao (yaos@nmsu.edu)

Project Overview: This long-term jujube cultivar trial is one of the three sites in New Mexico, and these trials are the first formal jujube cultivar trial in the U.S. There were 35+ cultivars at each site, and they all grew and produced well in 2022 especially in southern and central New Mexico. The average yield/tree in 2022 for Los Lunas site was 40 lb/tree, similar to the yield of trees at Leyendecker and higher than Alcalde. The tree performance data collected from those cultivar trials benefit not only growers in New Mexico but all growers nationwide.

Meeting the Needs of New Mexico: Late frost is the #1 issue challenging fruit production in New Mexico. We have tested different alternative crops for fruit growers to diversify their operations and reduce late frost damage. Jujube is the only tree crop that can avoid late frost and produce a reliable crop with nutritious fruit. After 13 years of research, jujube has proven to be a good alternative crop, and growers can grow it commercially, especially in southern and central New Mexico.

Impact: After 13 years of research, jujube grew and produced reliable crops each year in New Mexico. We have recommended jujube cultivars for each region in New Mexico. Growers start to adopt jujube in their operations. Once the recommended cultivars are adopted, they would have \$1-2/lb premium over dominant commercial cultivar Li. The data collected from those cultivar trials will impact growers nationwide.

Collaborating Agricultural Science Centers: NMSU Alcalde Center, NMSU Leyendecker Center.

Funding Acknowledgement: Specialty Crop Block Grant through New Mexico Department of Agriculture



Cover crops and soil carbon sequestration

Investigators: Rajan Ghimire (rghimire@nmsu.edu), Mark A. Marsalis, and Jarai Mon

Project Overview: In 2022, a cover crops study was established in Los Lunas. This study has nine treatments (three cover crops x 3 termination strategies) and three replications. Researchers evaluate soil organic carbon and nitrogen cycling with diverse cover cropping practices. The first-year soil samples were collected from 0-20, 20-40, and 40-60 cm depths of each plot and analyzed for labile C and N components as well as soil organic C and N.

Meeting the Needs of New Mexico: This project supports the NMSU soil health and carbon management initiative and helps improve the sustainability of agriculture in dry regions by improving soil health.

Impact: Soil health degradation has been a major issue worldwide. Climate change has further exacerbated agricultural sustainability challenges. Cover cropping could support sustainable crop production by regenerating soil and landscape.



Statewide alfalfa variety testing

Investigators: M.A. Marsalis (marsalis@nmsu.edu), L.M. Lauriault, I. Ray, C. Pierce

Project Overview: As part of a statewide program coordinated by the Tucumcari and Leyendecker ASCs, 15 entries were planted locally in 2019 to be harvested multiple times each year through 2023.

Meeting the Needs of New Mexico: Alfalfa is New Mexico's #1 or #2 cash field crop annually. Producers need information to select the best variety for their circumstances, and varieties need to be tested at various locations in New Mexico.

Impact: Crop variety testing is an important statewide program in New Mexico. Crops tested include alfalfa, corn, sorghum, wheat, and cotton. NMSU variety trials have shown that there is an average 25% higher yield associated with improved varieties, which translates into as much as \$115M in additional annual earnings statewide if superior crop varieties are selected. More accurate recommendations can be made when varieties are tested in varying, unique environments across the state.



Collaborating Agricultural Science Centers: Leyendecker, Artesia, Farmington

Funding Acknowledgement: Company entry fees

Habitat enhancement for IPM in New Mexico vineyards

Investigators: Miranda Kersten (mkersten@nmsu.edu), Maryel Lopez, Gill Giese

Project Overview: Conducted trial plantings at NMSU ASCs and privately-owned commercial vineyards to evaluate the effect of various cover crops/ground covers on native pollinator habitat enhancement.

Meeting the Needs of New Mexico: New Mexico has been underserved in vineyard research despite the growth of the region's grape growing industry. This work verified several native and introduced plant species that can thrive in this region as vineyard cover crops, to accomplish two of SARE's program goals: 1) increasing native habitat to encourage stewardship of natural resources, specifically native pollinator insects and 2) providing sustainable methods that reduce the amount of pesticides used for weed and pest control.

Impact(s): The project produced educational and outreach products after ~25 on-site consultations. There were 2 published articles (1 press article and 1 Extension publication). Three travel scholarships were provided to present work results at conferences. Guest speakers were hosted at NM Winegrowers and Extension meetings (approximately 400 total participants), along with 4 Workshop field days and a YouTube video produced for the Western SARE website.

Collaborating Agricultural Science Centers:
Fabian Garcia Agriculture Science Center, Las Cruces

Funding Acknowledgement: USDA-NIFA-
WesternSARE



Easy destemming potential and fruit morphology of New Mexican Chile peppers

Investigators: Dennis N. Lozada (dlozada@nmsu.edu) and Ehtisham Khokhar (Co-PI)

Project Overview: The easy destemming potential and fruit morphology of New Mexican chile peppers were examined for the 2022 growing season at the Los Lunas ASC using a diverse population of chile peppers. Measurements using a torque meter were done to quantify the force needed to separate the stem from the fruit. A high-throughput technique was also implemented to measure fruit morphology-related traits. Variation in terms of easy destemming fruit morphology traits was observed for mature chile pepper fruit samples. Results benefit the selection and genetic improvement of machine harvestability and fruit quality traits for New Mexican chile pepper cultivars.

Meeting the Needs of New Mexico: Chile peppers remain an important cultural and economic crop in the state of New Mexico. In recent years, the costs associated with manual harvesting and the lower yields of current cultivars have been among the major constraints for chile pepper production in New Mexico. Using different high-throughput methods to collect phenotypic information related to easy destemming and fruit morphology can facilitate breeding and selection of cultivars with improved machine harvestability and increased yield and yield potential. Overall, genetic improvement through breeding for these traits can help New Mexican growers deal with the different issues facing production.

Impact: The development of high-yielding, machine harvestable chile pepper cultivars is important for New Mexican growers due to the issues related to manual labor and the presence of different production constraints. The current study is looking at the genetics of machine harvestability and yield-related traits using novel genomic techniques. The information gained from this research can help facilitate successful selection and breeding for these traits for the development of cultivars with improved machine harvestability and yield. New economic opportunities can arise from these cultivars developed through genomics-assisted breeding. Developing chile peppers that are amenable to mechanical harvesting will allow the New Mexico chile pepper industry to be more competitive in the global market.

Collaborating Agricultural Science Centers: Leyendecker Plant Science Research Center, Las Cruces, NM

Funding Acknowledgement: USDA-Hatch Capacity Grant; New Mexico Chile Association; USDA-NIFA



Figure 1. Ehtisham Khokhar, PhD student, and Shahab Nourbakhsh, Research Specialist, collecting easy destemming (EDS) data for chile peppers at the NMSU Los Lunas ASC (Top photos). EDS is a major trait related to machine harvestability in chiles. Undergraduate students Zachary Edwards and Riley Robertson harvesting fruit samples for EDS trait (Bottom image).

Initial hemp variety trials across New Mexico environments

Investigators: Catherine Brewer (cbrewer@nmsu.edu) and Rebecca Creamer

Project Overview: This project established a two-year variety trial at three NMSU ASC locations to study the cultivation of different hemp types throughout the state. The primary goal of the project was to investigate the suitability of cannabidiol (CBD), grain, and fiber hemp types for NM production. Data was collected to compare how the yields and chemical profiles of the hemp varieties change when grown under conditions different than those of the locations where the varieties were bred to perform.

Meeting the Needs of New Mexico: The main purpose of this project is to strengthen the NM hemp industry, which experienced financial losses and difficulties entering the market during the first two years of legal hemp production in NM. Challenges plaguing stakeholders across the supply chain have included instability of variety genetics, risk of crops exceeding legal tetrahydrocannabinol (THC) limits, issues with manufacturing quality control, and a lack of infrastructure. NM producers have described an overwhelming need for understanding how local environments interact with hemp genetics in order to identify varieties that are successful in the region.

Impact: The underlying impact across all investigations has been to develop hemp variety recommendations for NM hemp farmers based on their location. Other impacts generated by this project include establishment of procedures for university researchers to receive state licensure for hemp production, dissemination of treatments of interest to increase crop yields, and identification of crop residues with potential for value-added products. This work further generated educational impacts by expanding the experience and knowledge of university faculty and staff that can be used to create university course and training materials.

Collaborating Agricultural Science Centers: Leyendecker Plant Science Center and Agricultural Science Center at Los Lunas and Sustainable Agriculture Science Center at Alcalde

Funding Acknowledgement: This material is based upon work that is supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, through the Western Sustainable Agriculture Research and Education program under project number GW21-220. USDA is an equal opportunity employer and service provider. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture.



Allelopathic cover crops for pest suppression in chile pepper in the Southwest

Investigators: Schutte, B. J. (Principal, bschutte@nmsu.edu), Lehnhoff, E. A. (Co-Principal), Acharya, R. (Co-Principal), Creamer, R. J. (Co-Principal), Bundy, C. S. (Co-Principal), Sanogo, S. (Co-Principal)

Project Overview: High costs for weed control and yield loss from soil-borne diseases are severe threats to chile pepper production in the United States Southwest. To address these threats to chile pepper, we are developing ecologically-based tactics that target both weeds and soil-borne pathogens. Specifically, we are establishing optimum management practices for barley and mustard cover crops that are incorporated into soil shortly before chile pepper seeding. Based on our preliminary studies and reports in literature, we expect mustard and barley cover crops will suppress weeds, reduce requirements for hand hoeing, and inhibit infection on chile pepper plants by soil-borne pathogens.

Meeting the Needs of New Mexico: In 2021, chile pepper was planted on 8,700 acres in New Mexico and provided approximately \$44.9 million cash receipts to growers. Although chile pepper is an important component of the agricultural economy in New Mexico, continued production of this crop in this state is threatened by both reliance on hand hoeing and soil-borne diseases that reduce crop yield. This project is developing non-pesticidal tactics for reducing hand hoeing and incidences of soil-borne diseases in chile pepper. By reducing needs for both labor and pesticides, tactics derived from this project are expected to enhance farmer incomes and preserve natural resources in New Mexico.

Impact: Weeds and soil-borne diseases reduce farm profits by diminishing crop yields and increasing production costs. To address weeds and soil-borne diseases in chile pepper production, we are developing ecologically-based tactics that target both weeds and soil-borne diseases. Specifically, we are developing best management practices for cover crops that reduce weeds and diseases in chile pepper. Our initial results revealed optimal strategies for obtaining pest suppression from cover crops and clarified circumstances where cover crops have no consequence on weeds and soil-borne diseases. By determining conditions that cause cover crops to suppress chile pepper, we generated information that allows New Mexico farmers to make appropriate decisions on adopting an ecological technique for pest management.

Collaborating Agricultural Science Centers: Leyendecker Plant Science Research Center

Funding Acknowledgement: US Department of Agriculture/National Institute of Food and Agriculture
NIFA

Evaluation of the efficacy of Saflufenacil tank-mixes and sequential applications applied in early fall for the control of plantain (*Plantago* spp.) and field bindweed (*Concolculus arvensis*) in alfalfa fields

Investigators: PI: Leslie Beck (lebeck@nmsu.edu); Co-PIs: Mark Marsalis; Leonard Lariault

Project Overview: As demand for quality alfalfa continues to increase, managing difficult-to-control perennial weeds like plantain and field bindweed remains a critical and ever-present component of successful production. Even with traditional herbicide applications, the hardy taproot and overall survivability of these plants to recover and continue to impact alfalfa yield and quality continue to complicate management efforts. This research aims to evaluate the efficacy of different application timings of an herbicide with a recent label for application in dormant season alfalfa, saflufenacil (Sharpen), tank-mixed with commercially available broadleaf herbicides labeled for use in alfalfa for improved control of plantain and field bindweed.

Meeting the Needs of New Mexico: Weed management continues to be one of the leading issues in management of quality agronomic crops in New Mexico. Alfalfa production is no different with potential for significant decreases in both quality and yield of forage crops, which not only impacts the producer themselves but other agricultural commodities that depend on the availability of high-quality forage (e.g., livestock, dairy, personal livestock uses, rangeland, etc.).

Impact: As of 2021, alfalfa hay remains the most valuable cash crop in New Mexico, with an estimated annual gross of \$187 million. There are currently very limited options for herbicide management of late-season perennial weeds, like plantain and field bindweed, that provide adequate control with limited crop injury. Our 2022 research indicated that sequential applications, along with tank mixes of herbicide active ingredients applied initially during the fall season (following final seasonal harvest) can increase injury of plantain and field bindweed compared to single applications at other timings during the year. If long-term control can be achieved using this methodology, it will be groundbreaking to the alfalfa industry. This research will continue through 2023 as replicated field studies.

Collaborating Agricultural Science Centers:
Leyendecker Plant Science Center

Funding Acknowledgement: National Alfalfa & Forage Alliance: US Alfalfa Farmer Research Initiative Grant



Field evaluation and marketability table grape varieties for New Mexico

Investigators: Maryel Lopez, Gill Giese (ggiese@nmsu.edu), Kevin Lombard, Shengrui Yao,

Project Overview: New Mexico imports ~ 8 lbs./capita of table grapes annually. However, local grape production can offer a nutritious, secure food supply, supplemental farm income, and contribute to economically sustainable land stewardship. The project (1) evaluated 15 grape cultivars performance and (2) verified their acceptance by New Mexico consumers.

Meeting the Needs of New Mexico: New Mexico has a viable wine grape economy, with approximately 1,000 acres statewide. Table grapes offer a potential economic alternative for the state's commercial grape producers and small market farmers, as well as local options to support a diverse, healthy diet for New Mexicans. It is crucial to identify suitable varieties adapted to local conditions based on local research results.

Impact: The project evaluated 15 cultivars at four sites and completed two consumer acceptance surveys of the table grape fruit compared to an industry standard. One of these surveys consisted of male and female consumers 18 years of age or less, and the other survey was of consumers aged 18 to 75 years. Table grape growth and yield data was presented at workshops with a total of 80 participants and 3 ASC field days with approximately 400 total participants, five master gardener trainings and table grape planting established at Albuquerque, NM school/community garden in 2021.

Collaborating Agricultural Science Centers:
Fabian Garcia Agriculture Science Center, Las Cruces, Alcalde ASC, Alcalde, NM, Farmington Agriculture Science Center, Farmington

Funding Acknowledgement: NMDA



Smother crops for improving land productivity and forage opportunities

Investigators: M.A. Marsalis (marsalis@nmsu.edu), Jarai Mon, Richard Strait

Project Overview: New Mexico soils are largely depleted of organic matter and nutrients necessary for sustainable and profitable crop production. Smother/cover crops have the ability to improve overall soil health, sequester carbon, and can be utilized for forage purposes.

Meeting the Needs of New Mexico: Finding a crop that provides a balance of soil-improving qualities and adequate forage yield and quality can maximize soil health efforts in the state while giving producers an acceptable alternative for profitability. New Mexico producers will have more crop options and a better understanding of utilization of forages for use in alternative soil-health driven situations.

Impact: Soil health plays a crucial role in enhancing farm productivity and profitability in the long run. Soil cover reduces soil erosion, conserves moisture, reduces soil temperature, suppresses weeds, and provides habitat for soil biota. A combination of practices such as no-till, cover cropping, and crop rotation generates synergistic effects that benefit soil health. We expect this study will demonstrate that cover crops can be planted to gain soil health benefits (e.g., carbon sequestration, increased organic matter, reduced erosion) without an excessive disruption in forage production, as well as help us improve cover crop and tillage recommendations.



Collaborating Agricultural Science Centers: USDA-NRCS Plant Materials Center (Los Lunas)

Pasture demonstration on tribal lands

Investigators: M.A. Marsalis (marsalis@nmsu.edu), S. Gomez (graduate student), R. Strait

Project Overview: Investigation of various species of improved and native grasses potentially adapted to the northern 2/3 of New Mexico (especially on tribal land) for improving grazing and haying systems, increasing land output, and stimulating local economies. Testing of multiple species at various locations, including tribal lands.

Meeting the Needs of New Mexico: The most appropriate pasture grass species have yet to be researched for adaptability, yield, and forage quality in northern New Mexico. New and improved forages have been developed that have potential for high yields and high feed value for livestock. Educational programs targeting irrigated forage production is lacking on tribal lands, and information is lacking on adaptability of new/improved forages in much of New Mexico.

Impact: Finding forage crops that improve the yield and quality of grazing pastures in northern New Mexico (especially Native American tribal lands) will positively impact the livelihoods of producers on small- to medium-sized operations, thereby sustaining these communities while putting dilapidated land back into production. Otherwise unutilized land will be put back into production when new species can be shown to produce valuable forage and profitability from farming these lands.

Collaborating Agricultural Science Centers: USDA-NRCS Plant Materials Center (Los Lunas); Ohkay Owingeh Pueblo, Isleta Pueblo

Funding Acknowledgement: List primary funding source(s) for project: USDA-NRCS



Undercover tomato study, benefits & connoisseur fits

Investigators: Marisa Thompson (risi@nmsu.edu); Dawn VanLeeuwen; Stephanie Walker; Charles Havlik

Project Overview: In this 2-year, ongoing (2022-2023) undercover tomato study at the NMSU Los Lunas ASC, treatments include 'Big Beef Plus' (indeterminate, hybrid) and 'San Marzano II' (indeterminate, heirloom) tomato plants covered with either 1) white 15% shade cloth, 2) white 30% shade cloth, 3) black 60% shade cloth. Uncovered tomatoes of both varieties are designated as control groups. Along with mortality rates from suspected curly top virus infection, dependent variables included canopy temperature, yield, fruit quality (e.g., percentage with side-splits and shoulder cracks), plant size, and plot weediness. Research in 2022 was conducted with the help of a robust squad of volunteers. They're ready to face the 2023 season head-on.

Meeting the Needs of New Mexico: From larger-scale production to tiny backyard gardens, tomatoes are grown by many New Mexicans. Indeed, NMSU County Extension Agents report that tomato-related problems are among the topmost frequently asked questions—often concerning heat stress, water stress, and the dreaded curly top virus. Although tomatoes need adequate sunlight, NM's high light intensity is often too great and can result in fruit disorders associated with plant stress and water needs. Can shade cover reduce tomato plant stress and disease prevalence to the point of increased yield and improved fruit quality?

Impact: Abiotic and biotic stressors limit tomato production in commercial and residential settings in the Southwest and beyond. Results from a preliminary shaded tomato study (2020-2021) suggest multiple benefits of shade cloth, including the possibility of improved fruit quality, reduced water requirements, and perhaps even exclusion of the vector of curly top: the beet leafhopper. The current study builds on this previous work.

Los Lunas ASC volunteers contributed over 700 hours of service in 2022, and volunteer hours in 2023 may be even higher. Engaging studies like these can be used to grab public attention, share sustainable methods, and, ultimately, improve agricultural literacy in the urban sector.

Funding Acknowledgement: This work is supported by the Crop Protection and Pest Management Program (grant no. 2021-70006-35765) project accession no. 1027442 from the National Institute of Food and Agriculture.



Field evaluation of 4 hybrid winegrapes

Investigator: Gill Giese

Project Overview: 4 hybrid cultivars were planted at the Los Lunas ASC in 2017 with the first harvest in 2021 and anticipated subsequent annual harvests.

Meeting the Needs of New Mexico: Hybrid winegrapes offer resistance to the root louse phylloxera without grafting to rootstocks, greater cold-hardiness and yield per acre with comparable berry compositional quality.

Impact: New Mexico winegrowers can reduce production costs and risks with adoption of proven hybrid cultivars.

Field evaluation of 4 hybrid sustainable bioeconomy for arid regions: guar production

Investigators: John Idowu and Mohammed Omer

Project Overview: Guar is an alternative crop that is well adapted to the arid and semiarid climate. Guar is an annual legume that has low nutrient requirements compared to many other field crops. Therefore, guar is a potential alternative crop that producers in NM can grow to diversify their cropping systems for resiliency.

Meeting the Needs of New Mexico: Crop production is under pressure in New Mexico due to increases in input prices and non-commensurate increases in product prices. For NM farmers to remain viable, there is a necessity to engage in the production of alternative crops such as guar. Guar can serve as an alternative industrial crop due to the guar gum that is extracted from guar beans. To optimize the yields of guar beans, agronomic trials were conducted in NM across different locations.

Impact: Information on agronomic conditions necessary for growing guar is now available for different production regions of New Mexico. Growing guar in NM can help farmers diversify their cropping systems by producing high-value industrial crops, consequently improving their farm profit.

Effects of urban landscape ground covers on soil moisture & temperature, weed control, and tree establishment

Investigator: Marisa Thompson

Project Overview: Research has confirmed the benefits of fibrous, woody mulch on soil moisture retention, weed control, soil health, plant health (root establishment, reduced water stress) in other regions. Until now, this work has not been done on the landscape scale in New Mexico.

Meeting the Needs of New Mexico: In our semi-arid climate, soils are exposed to extreme temperatures, minimal precipitation, and high winds. Protecting those soils is imperative to maintain soil and plant health. For this study, we are investigating the impact of different mulch treatments on tree and soil health. Encouraging the use of cultural practices that improve soil health and water retention is imperative to maintaining healthy plants, which in turn minimizes pest populations. In other regions, research has confirmed the benefits of fibrous, woody mulch on IPM-related horticultural issues (e.g., weedy species control and improving soil health by encouraging beneficial organisms), but this work has not been done on the landscape scale in New Mexico soils.

Impact: **1.** Compare tree, weed, and soil responses to three treatments: woodchip mulch, rock mulch, and bare ground. **2.** With additional research, develop recommendations for increased sustainability of landscape practices in New Mexico. **3.** Demonstrate research practices using scientific measurement devices, data sharing, and implementation of IPM techniques in the public Learning Garden at the NMSU Agricultural Science Center at Los Lunas.

Grants and Contracts

- Lozada, D. N. and Guzman, I. “ Enhancing Nutritional Quality and Yield of New Mexican Chile Peppers using Genomics-assisted Breeding”; Amount: \$477,074; Sponsor: US Department of Agriculture-National Institute of Food and Agriculture (USDA-NIFA) (Funded, Ongoing project)
- Lozada, D. N., Walker, S., Tonnessen, B., Coon, D. “Genomics-assisted breeding for the development of machine harvestable chile peppers in New Mexico.” Amount: \$342,250; Sponsor: New Mexico Chile Association (Funded, Ongoing project)
- Lozada, D.N., Nunez, G., Coon, D., Lujan, P., Dura, S., Sanogo, S. "Genomics-assisted Breeding for the Improvement of Chile Peppers (Capsicum spp.) in New Mexico,". Amount: \$12,000.00; Sponsor: USDA HATCH Capacity Grant (Funded, Ongoing project)
- Western Sustainable Agriculture: \$37,000; field trial component complete; lab component will continue through December 2023
- Allelopathic cover crops for pest suppression in chile pepper in the Southwest. USDA NIFA Crop Protection and Pest Management Program, September 2021-September 2024, \$191,173. (Funded & Active)

Research Publications

- Yao, S., Heyduck, R. 2022. Early performance of jujube cultivars in the southwestern United States. *Acta Horticulturae*, 1350: 7-13.
- Khokhar, E., Lozada, D.N., Nankar, A., Hernandez, S., Nourbakhsh, S., Coon, D. High-throughput digital tool characterized fruit phenotypic diversity among New Mexican chile pepper, *HortScience*. <https://doi.org/10.21273/HORTSCI16815-22> .
- Lozada, D N., Barchenger, D.W., Coon, D., Bosland, P.W. Multi-locus association mapping uncovers the genetic basis of yield and agronomic traits in chile pepper (*Capsicum* spp.). *Crop Breeding, Genetics, and Genomics* 2022;4(2):e220002; <https://doi.org/10.20900/cbagg20220002>. (in collaboration with Leyendecker PSRC)
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Cooperators and Collaborators

Collaborating Main Campus (and other ASC) Faculty

Dr. Leslie Beck (Extension Plant Sciences) – Weed control in alfalfa
Dr. Catherine Brewer (Chemical and Materials Engineering) – Hemp varieties
Dr. John Idowu (Extension Plant Sciences) – Guar production
Dr. Dennis Lozada (Plant & Environmental Sciences) – Chile breeding
Dr. Brian Schutte (Entomology, Plant Pathology, & Weed Science) – Weed control in chile
Dr. Shengrui Yao (Plant & Environmental Sciences; Alcalde ASC) – Jujube varieties

NMSU, University, State, and Federal Collaborations

NMSU Alcalde Science Center
NMSU Artesia Science Center
NMSU Clovis Science Center
NMSU Fabian Garcia Science Center
NMSU Farmington Science Center
NMSU Leyendecker Science Center
NMSU Mora Science Center
NMSU Tucumcari Science Center
NMSU Extension Master Gardeners
NMSU Pesticide Safety Education Program
NMSU Plant Diagnostic Clinic
NM Cooperative Extension Service
NM State Forestry
NM Urban Forest Council
Valencia County Cooperative Extension
University of Arizona
AZ Cooperative Extension Service
Colorado State University
USDA Natural Resource Conservation Service
USFWS Northern New Mexico National Wildlife Refuge Complex

Industry & Tribal

ADAMA Inc.
Amaro, Lescombes and Noisy Water Wineries
Arizona Community Tree Council
BASF
Black Smuggler Winery
Bridgestone Americas Inc.
City of Albuquerque – Bio Park
City of Albuquerque – Open Space Patrol Volunteer Training Program
City of Las Cruces – Tree Stewards Training Program
Curry Chile & Seed Co.
Diam Cork Closures
Double A Nursery
Duarte Nursery
Guar Resources, TX

Jaramillo Vineyards
Jicarilla Nation
Lescombes Vineyard
National Grape Research Alliance
NM Chile Association
NM Chile Commission
NM Farmer's Markets
NM Hay Association
NM Wine Growers Association
Ohkay Owingeh Pueblo
Olam Foods
Pueblo of Santa Ana and Tamaya Resort Inc.
Santa Ana Pueblo Farms & Santa Ana Pueblo Native Plant Nursery
Santa Ana Pueblo Vineyard, Sandoval County
Stahmann's Inc.
Think Trees NM
Tree New Mexico ABC Tree Stewards Training Program
Western Sustainable Agriculture Research and Education (WSARE)
Whole Foods Market, Durango CO and Farmington
Wine Cartel Inc. (winery consultants, Mr. Michael Dominguez), Mr. Michael Leonardelli, climatologist
Wines of the San Juan, Blanco, NM

Outreach Activities

Several events were conducted at the Los Lunas ASC and by ASC faculty in 2022:

- Forage Pest Management Field Workshop: August 30, 2022 – 51 attendees
- Tour for Albuquerque Bernalillo County Tree Stewards class: May 3, 2022 – 30 attendees
- Los Lunas High School Ag Classes visit and tour LLASC: May 6, 2022 – 60 attendees
- Tour of the ASC for the Western Agric. Economists Assoc.: June 28, 2022 – 30 attendees
- Learning Garden Workshop - Irrigation System Maintenance & Report with Tyson Hafler of Southwest Horticulture LLC: April 8, 2022 - 15 attendees
- El Jardin Encanto Garden Club – Met monthly at ASC (10 attendees per month)
- Volunteers worked weekly with the Horticulture Specialist assisting with tomato research, fruit orchard, and Learning Garden activities (40 individuals: over 350 hours in 2022, valued at over \$10,500 in equivalent wages)
- Faculty and staff responded to hundreds of stakeholder requests for information in 2022 via phone calls, emails, office walk-ins, and site visits, including from surrounding states and internationally



Advisory Committee

- Eugene Abeita
- Matthew Aragon
- Tony Black (Vice Chair)
- Mathew Chavez
- Debby Hasse
- Casey Ish
- Zena Kinne (Chair)
- Lin Yeskie
- Vacant (Valencia Co. Agric. Agent)

Personnel

Anthony Gallegos - Ag Science Laborer
Candace Salazar - Administrative Assistant, Assoc.
Carlos Aguirre-Meza - Laborer
Carol Bennefield - Ag Science Laborer
Cathy Casaus - Fiscal Assistant, Inter.
Charles Havlik, Ph.D. - Senior Research Assistant
Danielson Blea - Ag Science Laborer
Dennis Price - Assistant Farm Manager
Heather Abeita - Student Intern
Jose Gonzalez - Laborer
Marisa Thompson, Ph.D. - Extension Urban Horticulture Specialist
Mark Marsalis, Ph.D. Superintendent - Extension Forage Specialist
Max Perea - Laborer
Miranda Kersten - Program Manager, IPM
Ryan Garcia - Farm Ranch Manager
Shengrui Yao, Ph.D. - Extension Fruit Specialist
William Giese, Ph.D. - Extension Viticulture Specialist