AGRICULTURAL EXPERIMENT STATION OVERVIEW

2022

The College of Agricultural, Consumer, and Environmental Sciences (ACES) is an engine for economic and community development in New Mexico, improving the lives of New Mexicans through research, teaching and extension.

A Letter from the Director

Dear Agricultural Experiment Station Supporters,

It is my privilege to share with you a review of our efforts from the past year. The Agricultural Experiment Station (AES) system has continued to progress in 2022. As we reflect on the past year, some of our exciting highlights include the reorganization of the AES Leadership Office to allow for greater support to our researchers, students, and staff (365 FTEs). The 2021 pilot program was formalized and implemented system-wide to elevate our farm and ranch managers at each of our 12 Agricultural Science Centers to empower them with budgetary and production agriculture oversight which in turn allows the researchers at these units to focus solely on elevating research across the AES system.

NMSU ACES continued to lead the university for the fifth consecutive year in grants sought and secured $24.3 million in FY22. The AES system was selected to receive two Congressional Direct Spending projects to include Ziamet Weather Stations in the amount of $1.8 Million and Carbon Management in the amount of $995,000. AES researchers also submitted 19 impacts to the National Impact Database (four were selected for national highlight), and we completed a 5-year assessment of all AES impacts in comparison to the College of ACES critical issue pillars to allow us to determine areas of greater support needed in New Mexico. This has also assisted us with a better understanding of our AES system needs and gaps.

Lastly, we are pleased to announce that we have completed seven renovation projects this year and have more projects in progress.

Completed Projects

- Alcalde office renovation
- Artesia shop reroof and building stabilization
- Clayton boiler purchase and install and office renovation
- College Ranch condemned caretakers residence demolished
- Corona dormitory construction
- Farmington greenhouse construction
- Tucumcari water infrastructure replacement

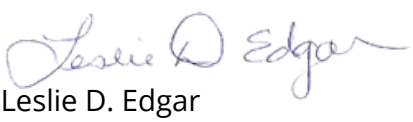
Projects in Progress

- Clayton processing barn renovation and feed mill renovation
- Corona care takers and north camp residence renovation
- Farmington care takes residence renovation
- Leyendecker irrigation upgrade
- Los Lunas headhouse lab renovation

**This summary does not include Agricultural Science Center projects statewide requests that were presented at the 2022 Summer Hearings which are currently being reviewed.*

We are extremely appreciative of our state, federal, and stakeholder support. Thank you for your continued support of our research enterprise.

Sincerely,



Leslie D. Edgar
Associate Dean of Research and AES Director

TABLE OF CONTENTS

1 INTRODUCTION

2 AES FY24 LEGISLATIVE REQUEST

4 AES SYSTEM

5 AES FUNDING

6 AES SUSTAINABILITY INITIATIVES

7 AGRICULTURAL SCIENCE CENTERS

8-31 ASC IMPACT REPORTS

32 AES RESEARCH DEPARTMENTS

33-48 RESEARCH DEPARTMENT IMPACT REPORTS

49 AES CONTACT INFORMATION

AES MISSION

The Agricultural Experiment Station system supports fundamental and applied science and technology research to benefit New Mexico's citizens in the economic, social, and cultural aspects of agriculture, natural resources management and family issues.

INTRODUCTION

The Agricultural Experiment Station (AES) is the principal research unit of ACES. The AES system consists of scientists who work on facilities at the NMSU main campus in eight academic departments and at twelve agricultural science and research centers throughout the state. The AES system supports fundamental and applied science and technology research to benefit New Mexico's citizens in the economic, social, and cultural aspects of agriculture, natural resource management, and family issues. AES scientists develop research programs that address key needs identified by advisory committees and local stakeholders. Each Agricultural Science Center (ASC) responds to specific research needs under New Mexico's varied geographical and environmental conditions. These research efforts sustain and support New Mexico's diverse environment, farms, ranches, forests, and rural and urban communities.

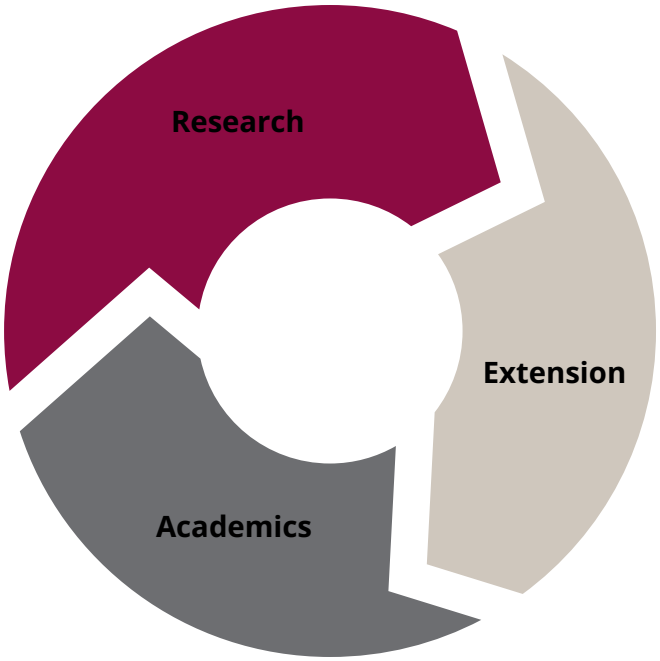


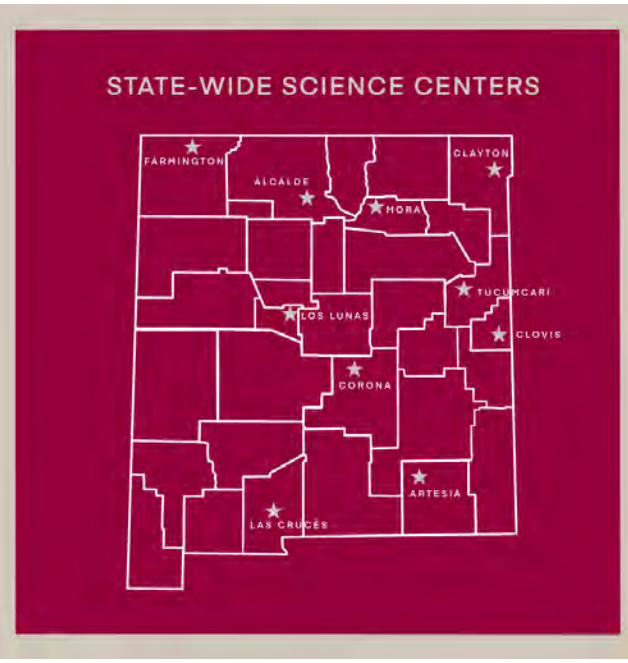
FIGURE 1: AES IS PART OF THE NMSU LAND-GRANT TRIPARTITE SYSTEM WITH A MISSION TO TEACH, CONDUCT RESEARCH, AND PROVIDE EXTENSION AND OUTREACH TO COMMUNITIES.

Agricultural Experiment Station

College of Agricultural, Consumer, and Environmental Sciences
BE BOLD. Shape the Future.

Current Appropriation: $17,462,000
FY 24 Request: $18,227,000
Change: $765,000

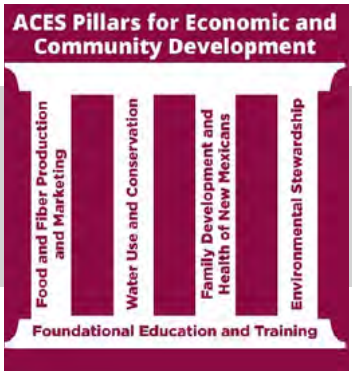
Mission: NMSU's Agricultural Experiment Station (AES) is the principal research unit of the College of Agricultural, Consumer, and Environmental Sciences. The AES system supports fundamental and applied science and technology research to benefit New Mexico's citizens in the economic, social, and cultural aspects of agriculture, natural resource management, and family issues. The AES system consists of scientists who work on NMSU's main campus and at off-campus Agricultural Science Centers (ASCs) around the state.



The research efforts in AES provide a major source of hands-on learning opportunities for undergraduate students while addressing the needs of the agricultural communities throughout the state. As water scarcity and the need for renewable natural resources have increased over the past decade, AES has been ahead of the curve in responding to this need.

AES is requesting a budget increase to fund four faculty positions:

- **Forest Tree Ecophysiology Assc. Professor**: Housed at the J.T. Harrington Forestry Research Center at Mora, this position will focus on tree ecophysiology to help solve the challenges of identifying forest species and tree production systems suitable for drought and fire-prone forest ecosystems. This research position will operate from a systems perspective on the integral responses of woody plants to naturally occurring and modified environmental factors such as radiation, temperature, precipitation, and carbon dioxide.
- **Climate Smart Agriculture Assc. Professor**: Housed at the Farmington ASC, this position will develop a research program focused on climate-smart agriculture by increasing agricultural productivity and incomes, adapting and building resilience to climate change, and reducing or removing greenhouse gas emissions from agriculture. This position will interact with scientists and researchers at various ASCs around the state to develop and demonstrate Climate Smart Ag practices suitable for our water-limited environment and applicable to different sectors including crop production, rangeland, forestry, and urban horticulture.
- **Hydrology and Water Resources Assc. Professor**: Housed at the Artesia ASC, this position will focus on efficient irrigation practices and management of critical water resources. Using knowledge of water science and hydrology, this position will develop alternative water resources used for irrigation in New Mexico agriculture. Research will address drought-, heat-, and salt-tolerant crops that will thrive in arid and semi-arid environments, practices used to grow them and identify and evaluate alternative water resources.
- **Integrated Renewable Energy and Agricultural Natural Resources Assc. Professor**: Housed at the Corona Range and Livestock Research Center, this position will focus on integrating the broad field of clean renewable energy into a cohesive research program that would allow producers to better understand land/energy potential. This position will take a strategic approach to building the agricultural energy portfolio and capitalize on emerging initiatives, such as agrivoltaics and public-private partnerships on wind and solar energy. This scientist will interact with all ASCs and other university and state entities to seek opportunities in renewable energy research.



The College of Agricultural, Consumer, and Environmental Sciences is an engine for economic and community development in New Mexico, improving the lives of New Mexicans through academic, research, and Extension programs.

Research Impacts

- NMSU's AES forest and fire research program provided managers and stakeholders with a demonstration area that was supported with over 10 years of data showing how thinning and burning treatments build forest resilience to insects, disease, and wildfire.

- Recently, NM's cattle and calves accounted for 40.5% of all livestock total cash receipts of $2.45 billion – a significant source of income for the state and its ranchers. Drought can impact ranchers' net return. But the impacts were not clearly quantified. Ranch net return data was combined with a new drought monitoring tool to quantify drought impacts on ranch income. NMSU AES findings indicated that the net return of a ranch can increase (or decrease) by $62.29, $60.51, and $64.07 per head if drought increases (or decreases) by one unit in all, large, and medium ranch sizes, respectively.

- Knowing the current weather can make or break our careful planning. The NMSU AES current weather monitoring network provides real-time data for the state. Each station measures air temperature, winds, humidity, solar radiation, and precipitation every 5-minutes. Data from theZiaMet network is being used by farmers for crop irrigation and planting dates. Ranchers regularly use weather data for estimating the intensity of drought. This data is also used by the National Weather Service for improving weather forecasts during critical times such as fires, floods, winter storms, high winds, and dust storms.

Sustainability Initiatives

Creation of New Mexico Reforestation Center (NMRC)

John T. Harrington Forestry Research Center at Mora has the largest forest nursery and seed bank in the southwestern US with a growing capacity of 300,000 seedlings per year using over 35 different native tree species. Additionally, the research program at the research center is one of only five programs in the United States dedicated to investigating the entire "reforestation pipeline" (from seed to nursery to tree planting), especially as it relates to post-fire reforestation.

Corona Energy Initiatives–Wind Turbines and Commercial-Scale 2mw Solar Array with Battery Storage

39 wind turbines are in full operation at NMSU's Corona Range and Livestock Research Center (CRLRC) as part of Pattern Energy's Western Spirit Transmission area project. Additionally, we are investigating opportunities for a public/private partnership to develop a solar array that benefits central NM renewable energy needs within proximity to the wind farm.

Ongoing Research

- Agricultural water use efficiency
- Carbon Management
- Climate Change
- Cattle genetics to improve grazing
- Improve forage quality/ range management
- Endangered/ sensitive species management
- Food safety and nutrition
- Improved crop selection
- Product development and value-added agricultural products
- Reforestation
- Soil-borne disease prevention
- Sustainable natural resources
- Water quality and treatment

AES scientists develop research programs that respond to key needs identified by advisory committees and local stakeholders. Agricultural Science Centers, located strategically throughout the state, provide research results that sustain and support New Mexico's diverse environmental farms, ranches, forests, and communities.

aces.nmsu.edu/aes • (575) 646-3125

New Mexico State University is an equal opportunity / affirmative action employer and educator. NMSU and the U.S. Department of Agriculture cooperating.

AGRICULTURAL EXPERIMENT STATION SYSTEM

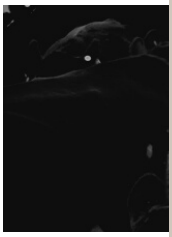
Agricultural Science Centers

- Alcalde Sustainable Agricultural Science Center
- Artesia Agricultural Science Center
- Chihuahuan Desert Rangeland Research Center
- Clayton Livestock Research Center
- Clovis Agricultural Science Center
- Corona Range and Livestock Research Center
- Fabian Garcia Research Center
- Farmington Agricultural Science Center
- Leyendecker Plant Science Center
- Los Lunas Agricultural Science Center
- John T. Harrington Forestry Research Center at Mora
- Rex E. Kirksey Agricultural Science Center at Tucumcari

Research Departments

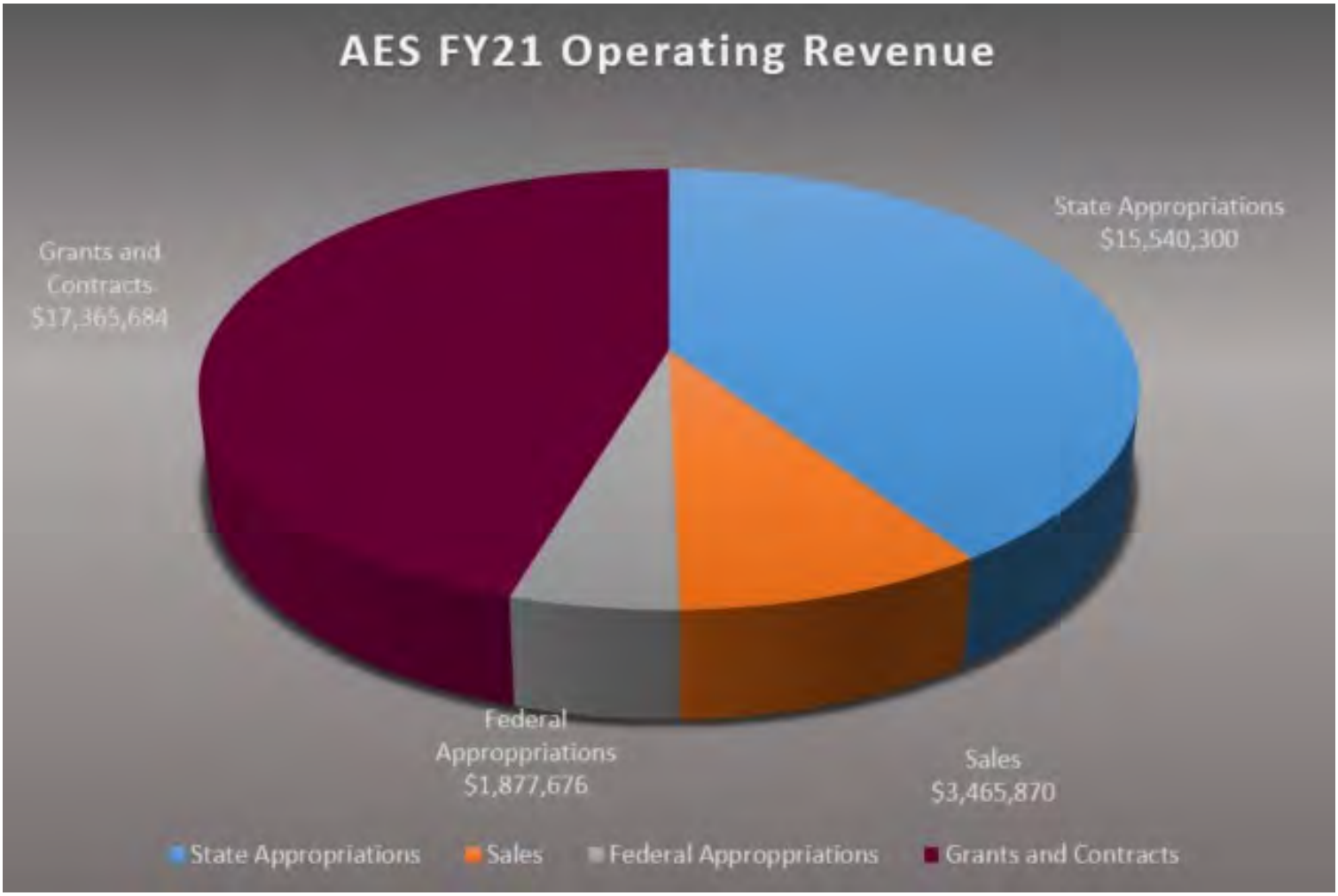
- Agricultural and Extension Education
- Agricultural Economics & Agricultural Business
- Animal & Range Sciences
- Entomology, Plant Pathology, & Weed Science
- Family and Consumer Sciences
- Fish, Wildlife & Conservation Ecology
- Plant and Environmental Sciences
- School of Hotel, Restaurant, & Tourism Management

NMSU AES consists of 12 agricultural research and science centers and eight academic departments within ACES.



AES FUNDING

AES WAS CREATED BY THE FEDERAL HATCH ACT OF 1887 AND WAS CONSTITUTIONALLY MANDATED IN NEW MEXICO IN 1915.



In 2021, the AES total amount of operating revenue was $38.2 million. The College of ACES continues to lead NMSU in grants awarded and expended; ACES faculty, staff, and students work hard to ensure New Mexico's investment in AES is matched by more than a 1:1 ratio.

AES SUSTAINABILITY INITIATIVES

Creation of Center for Dryland Resilience: This Center was submitted as part of the Established Program to Stimulate Competitive Research (EPSCoR) and would transform understanding and management of natural capital in drylands under environmental change, a critical challenge at the interface of science and society. This initiative for a Center of Drylands Resilience was sponsored as a bill in the 2022 state legislative session and would allow for research on and promotion of the sustainability of New Mexico's ecosystems through enhanced monitoring efforts, data mobilization, and sustainable solutions that improve the resilience of ecosystems statewide while training the next generation of environmental and data science professionals.

Creation of New Mexico Reforestation Center (NMRC): This Center will help meet reforestation needs by producing five million seedlings per year, establishing programs to support the reforestation pipeline (from seed collection to planting), and helping to develop and support forest-based economic growth. The NMRC will also support climate-smart tree planting projects in urban environments to assist with carbon management, air quality, provision of shade to cool urban surfaces, as well as support education, research, and outreach activities regarding reforestation.

Corona Energy Initiative: Wind Turbines and commercial-scale 2MW Solar Array with battery storage: In January 2022, 39 wind turbines were moved into full operation at NMSU's Corona Range and Livestock Research Center (CRLRC) as part of Pattern Energy's Western Spirit Transmission area project, which consists of 377 turbines, or a total of 1,050 megawatts. Additionally, opportunities for public/private partnerships are being investigated to develop a solar array that benefits central NM renewable energy needs within close proximity to the wind farm at Corona.

Digital Agriculture: Preparing farms/ranches for the future: US agriculture and ranching systems are on the cusp of major changes driven by climate, socioeconomic, and demographic changes in rural communities. Our goal is to increase agricultural efficiency using multiple-source digital information (MSDI), data science, sensor development, and artificial intelligence (AI). Building capacity in drone development, as well as utilization and optimization for agriculture, is one of our focus areas.

Heritage Farm, the Path toward the Future: Increasing agricultural literacy and hands-on learning are combined in this initiative to develop an on-campus platform that connects communities of learners to the modern agricultural enterprise. This initiative will develop on-campus lands to engage the public in the origin of their food through curated demonstrations of the many facets of agriculture while providing students with the opportunity to engage in emerging agricultural technologies.

AGRICULTURAL SCIENCE CENTERS

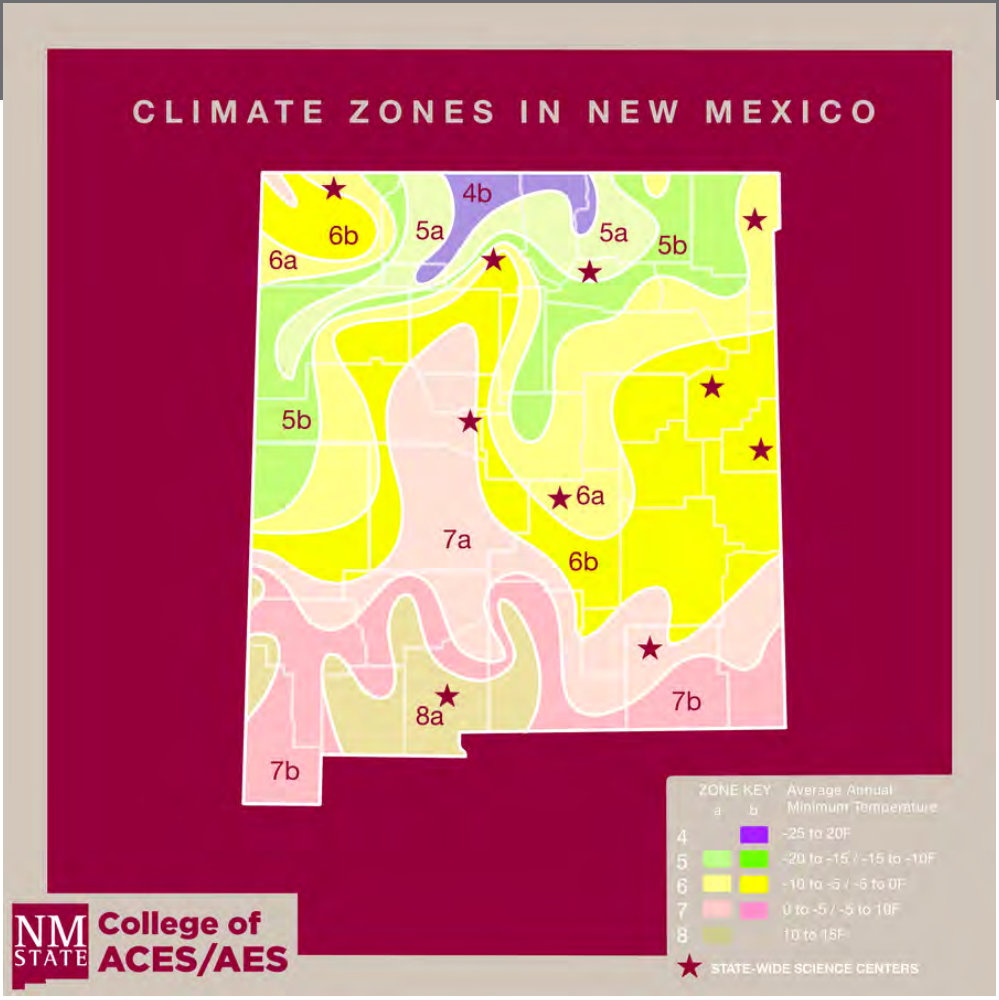


Figure 4: Diversity of geography in New Mexico.

- **Sustainable Agricultural Science Center at Alcalde**
- **Artesia Agricultural Science Center**
- **Chihuahuan Desert Rangeland Research Center**
- **Clayton Livestock Research Center**
- **Clovis Agricultural Science Center**
- **Corona Range and Livestock Research Center**
- **Agricultural Science Center at Farmington**
- **Fabian Garcia Research Center**
- **Leyendecker Plant Science Center**
- **Agricultural Science Center at Los Lunas**
- **John T. Harrington Forestry Research Center at Mora**
- **Rex E. Kirksey Agricultural Science Center at Tucumcari**

Each AES Agricultural Science Center (ASC) is strategically located throughout the state to conduct research in various climate zones (ASCs denoted as stars in Figure 4). New Mexico is unique, with three crop production regions, 10 plant hardiness zones, 5 defined watersheds, and 126 distinct soil types. Therefore, agricultural production varies from north to south and east to west. Each ASC produces research that provides best practices and advancements specific to agricultural producers in their climate zone.

Agricultural Experiment Station
Sustainable Agricultural Science Center at Alcalde

alcaldesc.nmsu.edu • 505-852-4241

MISSION

The mission of the Alcalde Sustainable Agriculture Science Center (SASC) is to conduct agricultural and natural resource research to benefit small-scale family farms and ranches of north-central New Mexico.

Six acres of the station are certified organic, and recent certified crops include apple, peach, pear, plum, sweet and sour cherry, and cucumbers.

Jujube's have been growing at the SASC at Alcalde since 2011, with cultivar trials ongoing since 2015.

Numerous high tunnels are used in which we explore season extension, frost protection, and year-round cultivation.

Value Added to New Mexico

- Historical Property
- High-Value Crops
- Acequia Research
- Small Farmers

Through testing of different crops, varieties, and production techniques, the goal is to provide new information that producers can adapt to their operations for greater productivity and profitability. The Center was the first ASC to carry out research on certified organic land and hold an organic certification.

Ongoing Research

- Table grapes are a popular fruit among consumers. In New Mexico, there is potential to expand production and direct-market in farmers' markets, schools, and grocery stores. However, there is a lack of information on appropriate table grape varieties that producers can grow in northern New Mexico. New table grape varieties offer advantages in cold hardiness, cluster architecture, Phylloxera tolerance, and staggered ripening/timing in addition to improved taste/aroma and texture characteristics. Research at SASC is part of a statewide effort to evaluate 15 cultivars for suitability to New Mexico's unique edaphic and climatic growing conditions. Testing of each cultivar in comparison to current market standard cultivars will gauge and quantify consumer acceptance of locally produced table grapes. Table grapes offer a potential economic outlet for NM commercial grape producers, provide small and local market farmers an avenue of income diversification, and can increase the healthfulness of local diets, especially with regards to increasing the consumption of fresh fruit by children aged 6 to 12.

The College of Agricultural, Consumer, and Environmental Sciences is an engine for economic and community development in New Mexico, improving the lives of New Mexicans through academic, research and Extension programs.

Ongoing Research (cont.)

- The USDA imported various lines/varieties of jujubes in the early 1900s. Some breeding and line development took place at the USDA Chico, CA, research station. These and other jujube lines/varieties have become dispersed throughout the U.S., but their identities are unclear and there has not been much genetic or molecular work on jujubes for cultivar classification and grouping in the U.S. Researchers at SASC are working with scientists at the USDA Beltsville, Maryland who focus on genotyping to identify and group jujube germplasm that exists in the U.S. This essential work on cultivar classification will allow effective and efficient research on jujubes in the future. Producers will benefit by having reliable information on jujube cultivars and their characteristics.

Recent Impacts

- The NM hemp industry is faced with challenges entering this new industry and expanding hemp production. Research at SASC aims to find industrial varieties that are suitable for production in the state, evaluate the potential for establishing hemp market use outside of CBD, and identify pests that are common to hemp fields. Trials of CBD, grain and fiber varieties of hemp are being conducted at three Agricultural Science Centers (Alcalde, Los Lunas and Leyendecker) to evaluate the suitability of different varieties to the unique climatic areas throughout the state and provide initial opportunities for scouting pests and diseases. The potential impacts of this research include developing recommendations for hemp farmers based on their location within the state, identifying the most relevant downstream uses for the biomass that is produced in NM, and establishing pest management guidelines for the different regions of the state.

Community Outreach

- A collaboration with Taos Land Trust and the Youth Conservation Corp led to involving students in apple and jujube fruit harvest at the Station, and subsequent donation of fruit to schools, and food banks in Taos and Abiquiu. The center plans to expand the program to include not only harvest, but also training on pruning, thinning, high tunnel maintenance and repair, and irrigation.

- Field bindweed is a serious problem in New Mexico's cultivated land. Its roots can reduce soil moisture below the wilting point of many crop plants. Besides competing for nutrients and water, field bindweed can pull plants to the ground and smother them completely. The Bindweed mite program uses a biological mite to help control this weed. Bindweed mites were distributed at the Alcalde Field Day, and by appointment with Del Jimenez.

- The center hosts a variety of virtual and in-person presentations and workshops for Northern New Mexico growers on topics such as lab and field soil test options, compost and vermicompost, grafting and the growing habits and pruning of fruit trees, including Jujubes.

Sustainable Agricultural Science Center at Alcalde
New Mexico State University
371 Alcalde St., County Road 40, Alcalde N.M. 87511
Phone: 505-852-4241
Email: alcalde@nmsu.edu

New Mexico State University is an equal opportunity / affirmative action employer and educator. NMSU and the U.S. Department of Agriculture cooperating.

Agricultural Experiment Station
Agricultural Science Center at Artesia

artesiasc.nmsu.edu • 575-748-1228

MISSION

The Agricultural Science Center at Artesia (ASC-Artesia) faculty conduct research and extension programs in soil, water, crop, and entomological sciences to enhance the agricultural, economic, environmental, and social well-being of southeastern New Mexico.

The ASC Artesia entomology group continues to address resistance to Bt genes as it is an issue for control of bollworm in corn and cotton.

Center researchers examine the prevalence of different species of kissing bugs as 64% in Southeastern NM are infected with a parasite (T. Cruzi).

Approximately 75 acres are currently under cultivation, using sprinkler, drip and gated pipe irrigation systems supplied by an Artesian well.

Value Added to New Mexico

- Oil and Gas Wells

Artesia ASC faculty collaborate in local, regional, national, and international research and extension efforts, and are often asked to bring their expertise to colleagues and clientele across the U.S. and in foreign countries. The Center's goal is to be the premier off-campus center for novel research and extension programming in integrated pest management, water management, soil health, soil fertility and remediation, and the evaluation of new crop genetic material.

Ongoing Research

- Manure Management: New Mexico's 325,000 dairy cows produce ~6.825 million tons of manure. Most is land applied along with wastewater. New Mexico's Water Quality Commission requires groundwater monitoring. However, about two- thirds of all groundwater monitoring wells near dairies exceed state the state standard of 10 ppm NO3-N. Exceedances must be treated as mandated by the Groundwater Protection Act. Anion exchange remediation treatments cost $32,000 per acre-inch of water. Yearly water treatment for a 2000-head dairy would approach 112AF/year ($43M per year). Our soil test software optimizes nutrient rates from various sources to reduce potential nitrogen contamination and avoid extreme remediation expenses
- Monitoring Resistance to Insecticides: Resistance to pyrethroids in bollworm and alfalfa weevil in cotton and alfalfa hay in New Mexico.
- BT Resistance: Development of IPM tools to Control Bollworm
- Variety Trials: Direct farmers toward higher yielding or better-quality varieties that use less water be less susceptible to pests or reduce losses to salinity. Includes 12 varieties of cotton, 18 varieties of Sorghum, 2 varieties of corn
- Developing Pest Management Tools for Controlling Insect Pests in Cotton: Effect of Okra leaf Cotton on Cotton Bollworm
- Biological Control of key pests: Pecan nut casebearer and pecan weevil, in pecan, alfalfa weevil in hay and bollworm in cotton
- A field experiment was conducted at the Artesia, NM Agricultural Science Center to test the effect of saline irrigation water on several bioenergy crops.

The College of Agricultural, Consumer, and Environmental Sciences is an engine for economic and community development in New Mexico, improving the lives of New Mexicans through academic, research and Extension programs.

Recent Impacts

- Pest Management of Bollworm in the face of resistance to Bt Genes Widespread resistance to Bt genes prompted research to address this issue. Field and lab trials continue to evaluate the level of resistance in New Mexico populations of bollworm. Insect populations in Clovis were evaluated for resistance to pyrethorids in 2021 and populations in Artesia, Farmington and Las Cruces are being evaluated in 2022. Population dynamics of bollworm are being studied in Artesia and Las Cruces. Other potential tools to control insect pests are being evaluated. Okra leaf cotton, for example, has significantly lower survival of cotton bollworm, while maintaining the same population of beneficial arthropods.
- Kissing Bugs and potential health risks in NM: Faculty, staff and students determined that 64% of kissing bugs in SE New Mexico are infected with T. cruzi the parasite that causes Chagas disease. This is much higher than the 4% rate determined in the 1960s. Since rates of infection and species are likely to vary throughout NM, we are now collecting kissing bugs throughout New Mexico. In 2022, we have collected almost 500 kissing bugs that are being analyzed to determine species, rate of parasite infection and identification of blood meal host. While transmission of Chagas is expected to be low there is significant risk of allergic reactions in humans and some transmission of Chagas to dogs that are housed outdoors. This research will allow us to inform the public of any potential risk from kissing bugs and mitigation efforts, if needed, in various parts of New Mexico.
- Improving crops for the needs of New Mexico farmers through yield and crop quality Alfalfa is an excellent source of fiber and high in quality protein needed for most dairy cow diets. However, traits such as lignin, an indigestible phenolic compound in alfalfa cell walls that provides structure to the plant, but it is not digestible. The trait that is introduced into the genetics of alfalfa can increase fiber digestibility by 10% and decrease manure by 2.8M tons per year. Our mission is to assist breeders from campus and private companies to determine whether their genetics are applicable to NM growing conditions and soils. Alfalfa alone in NM garnered $1.4 billion dollars in cash receipts in 2019. (NMDA 2019 Agricultural Statistics Bulletin).
- Biological Control of Insect Pests in Cotton, Pecan and Alfalfa High Value Crops Increased acreage in SE New Mexico prompted research to reduce insecticide applications on pecan nut case bearer with biological control by predators. Ghost spiders were identified as a key predator controlling up to 73% of insect pests in pecan orchards in the Pecos Valley. Control of pecan nut casebearer could save NM growers $2.2 million per year. We are now conducting trials to look at the impact of predation on pecan weevil which is a key pest in Texas that continues to make incursions into New Mexico orchards. Damage by alfalfa weevil has increased in recent years in many areas of New Mexico. The ASC farm at Artesia has maintained good control of alfalfa weevil with biological control for 20 years.

Community Outreach

Every year the center conducts research and events that involve and serve the community. During the annual field day, this free event brings together the community to interact and share ideas about ongoing agricultural research projects. The Center also hosts the Entomology and Soils Workshop for 6th-grade STEM students allows participants to sweep alfalfa hay for insect pests. They also learn about soil types and identify insect pests in the field. Other events include:

- 4H Entomology insect collection workshops
- Park Jr. High School Ag Career Day
  - Two presentations were given by center employees on the Overview of Soils in New Mexico and the Importance of Soil Testing and Insects in our World and Careers in Entomology.
- New Mexico Ag Leadership (Leadership Discovery)

Agricultural Science Center at Artesia
New Mexico State University
67 E. Four Dinkus Rd, Artesia, NM 88210
Phone: 575-748-1228
Email: artesia@nmsu.edu

New Mexico State University is an equal opportunity / affirmative action employer and educator. NMSU and the U.S. Department of Agriculture cooperating.

Agricultural Experiment Station
Chihuahuan Desert Rangeland Research Center

chihuahuansc.nmsu.edu • 575-646-3125

MISSION

The Chihuahuan Desert Rangeland Research Center (CDRRC) conducts educational, demonstrative, and experimental development with livestock, grazing methods, and range forage, including the investigation of the sustainability and management of natural resources and environmental ecosystems.

The 100 square-mile CDRRC hosts one of the longest running vegetation and grazing monitoring efforts in the southwestern US.

Faculty and graduate students from multiple NMSU departments, including the Department of Animal and Range Sciences, conduct research at the center.

Much of the research is in conjunction with the Long-Term Ecological Research program, which is part of a nationwide program funded by the National Science Foundation.

Value Added to New Mexico

- Solar and Geothermal Resources

The New Mexico State University Chihuahuan Desert Rangeland Research Center (CDRRC) is a cardinal research station within the New Mexico Agriculture Experiment Station system. The CDRRC (or more colloquially the "College Ranch") serves as a model of sustainable ranch and rangeland research, teaching, and extension, composed of a robust working group of scientific collaborators whose goals are to identify sustainable management protocols for managing New Mexico rangelands.

Ongoing Research

- Digital Ranching Research at the Chihuahuan Desert Rangeland Research Center, NMSU. The Sustainable Southwest Beef Coordinated project, funded under the initiative for Sustainable Agricultural Systems (USDA - National Institute of Food and Agriculture, Grant #2019-69012-29853), is developing Digital Ranching tools at the Chihuahuan Desert Rangeland Research Center that can improve ranch operational efficiencies and rangeland resilience in the Southwestern, United States. Information from high throughput sensors, including multi-sensor platforms mounted on herds of Heritage Criollo, Angus, Brahman, and Brangus cattle, field rain gauges, cattle drinking troughs, and water storage tanks is being monitored over 300 sq. miles of desert rangelands using Long Range Wide Area Network communication technology.

The College of Agricultural, Consumer, and Environmental Sciences is an engine for economic and community development in New Mexico, improving the lives of New Mexicans through academic, research and Extension programs.

- Oryx are an exotic antelope that have the potential to affect range use of livestock and other wildlife, through competition and possibly aggressive behavior. They are also a highly valued hunting trophy in New Mexico. Oryx studies on the CDRRC thus have 2 primary goals, first, to understand how co-distribution of oryx and cattle varies spatially and temporally at an ecologically meaningful scale (i.e., ranch or landscape scales). This includes interactions at key resources such as water sites, as well as identifying other influences that may affect distribution of large herbivores. Second, to develop monitoring protocols to assess oryx abundance or trend, distribution, and sustainable harvest to benefit wildlife enterprises. These vary from intensive approaches (e.g., aerial surveys) to more extensive camera-based techniques (e.g., mark-resight population estimation; photographs/camera-day trend indices; etc.). By validating a range of monitoring options, landowners can choose a method appropriate to the time and resources they desire to allocate to oryx management.

- Virtual Fencing instrumentation, a novel multi-sensor platform for livestock herding and tracking, has been incorporated recently to help ranchers and managers meet livestock grazing distribution needs or achieve land conservation management goals in desert rangelands. Virtual herding is a livestock management concept that ranchers can implement to prescribe precision grazing interventions on heterogeneous rangeland while relying on real-time information of animal behavior to monitor cattle performance and rangeland utilization. New innovations have taken virtual herding to a near commercial scale economically.

Recent Impacts

- Historic research at the CDRRC established sustainable cattle stocking levels, grazing systems, and weaning weight adjustment protocols, which have been adopted by federal agencies including the US Forest Service and Bureau of Land Management, and stakeholder groups such as the Beef Improvement Federation.

- Several genetic and behavioral studies conducted at the CDRRC have identified cattle breed performance under varying stocking levels and forage regimes, and current research is aimed at evaluating ecological effects and production performance of heritage versus conventional cattle breeds

Potential Impact(s)

- Precision Livestock and Digital Ranching technologies could help improve the sustainability of ranching and beef systems in New Mexico and across the Southwestern United States. Ability to monitor livestock, drinking water, forage, and rainfall in real-time could improve ranch planning significantly through a faster and better adaptation to increasingly variable climates, lower ranch monitoring costs and efforts, improved animal wellbeing and performance, and likely reducing the carbon footprint of ranching.

Community Outreach

Teachers, researchers, and students from across campus benefit from the center. The CDRRC hosts field days to highlight research and provide information to a variety of stakeholders. Additionally, the CDRRC was a co- host for the Sustainable Southwest Beef annual meeting.

As an esteemed research facility, the CDRRC has become part of several notable partnerships including the USDA-ARS's Long-term Agroecosystem Research Network (LTAR) and the Long-Term Ecological Research program (LTER), as well as the Sustainable Southwest Beef Coordinated Agricultural Project, and the Pan-American Heritage versus Conventional Cattle Genetics Grazing study, in addition to others. These collaborative efforts have contributed to an integrative research program with a diverse set of research questions and goals which are all aimed at providing stakeholders with a toolbox for sustainable management.

Chihuahuan Desert Rangeland Research Center
New Mexico State University
Location: State University Ranch Headquarters (Type in Google Maps)
Phone: 575-646-3125

Agricultural Experiment Station
Clayton Livestock Research Center

claytonsc.nmsu.edu • 575-374-2566

MISSION

To provide science-based research to improve the health and performance of newly received cattle, and to support the Agricultural Experiment Station in providing premier programs to those we serve by focusing on education, research, and outreach.

One of a few university feeding research centers of its size, and services the industry nation-wide.

Improvements to the Center are ongoing with recent renovations to the front office, as well as, current renovations to the feed mill, processing barn and shop, and construction of improved commodity storage.

The installation of nine SmartFeed nodules and 3 SmartWeigh systems this past year will measure feeding behavior and individual real-time weight of animals in the feedlot.

Value Added to New Mexico

- Feedmill

The Clayton Livestock Research Center (CLRC) was established on 320 acres of Kiowa National Grassland, Cibola National Forest, and located 7 miles east of Clayton, NM on Highway 56/64/412. Plans for the CLRC began in 1972 with construction commencing in 1975. Research is focused on improving health of newly received lightweight calves that may or may not originate in New Mexico but are utilized for stocker operations grazing New Mexico rangelands, as well as, the health of New Mexico range calves shipped outside the state for placement on grass or into feed yards.

Ongoing Research

The focus of the CLRC is the health and performance of newly received beef cattle. Several receiving studies were conducted including sponsored projects evaluating products that potentially may impact performance.

Research on the evaluation of different bunk management and roughage levels for finishing beef cattle can validate a nutritional recommendation for finishing cattle. In 2021, the CLRC was used to demonstrate that roughage levels should be adjusted according to the bunk management to optimize intake and rumen fermentation characteristics of finishing beef cattle.

The College of Agricultural, Consumer, and Environmental Sciences is an engine for economic and community development in New Mexico, improving the lives of New Mexicans through academic, research and Extension programs.

Research is continuing to evaluate the performance and carcass characteristics of Raramuri Criollo cattle crossed with Angus, Red Angus or Brangus cattle. Currently, in year 2 (of a 3-year project), cattle are in the feed yard and will be finished in late Fall 2022. The objective is to evaluate the performance of the crossbred cattle on pasture and feedlot performance, and carcass characteristics.

Recent Impacts

Supplemental or additional water availability upon calf arrival to the feed yard may be an important factor upon the health and performance during the receiving period. Increased water and feed intake were observed for those calves provided supplemental water sources and both are an important component of maintaining a high level of immune function. Developing strategies to maintain a healthy immune system will reduce morbidity and increase net income.

A recently completed study has shown that feeding 3.5% yellow grease as supplemental fat during the receiving phase increased feed efficiency and decreased overall morbidity rate. Further validation could provide a new tool to reduce morbidity, and decrease antimicrobial use, therefore increasing overall profitability when introducing calves to the feeding phase.

Community Outreach

The Clayton Livestock Research Center hosts field days to highlight completed and ongoing research projects, familiarize the community with the center facilities, and increase confidence in how research is conducted so that they may apply the resulting protocols and practices to increase the financial sustainability of their livestock operations.

Internships are an important component of the CLRC mission as a tool to introduce the feeding segment to interested young scholars. Recently, interns from Brazil have had the opportunity to learn all facets of the industry, including ration formulation, mill operation, bunk reading, animal observations, treatment, etc.

Clayton Livestock Research Center
New Mexico State University
15 NMSU Lane, Clayton, NM 88415
Phone: 575-374-2566

New Mexico State University is an equal opportunity / affirmative action employer and educator. NMSU and the U.S. Department of Agriculture cooperating.

Agricultural Experiment Station
Agricultural Science Center at Clovis

clovissc.nmsu.edu • 575-985-2292

MISSION

The mission of the Agricultural Science Center at Clovis is to conduct crop and cropping systems research and disseminate viable strategies that benefit New Mexico's citizens and agricultural production. Anticipate challenges, solve problems, build relationships, and secure funding. Clovis serves as the hub for Agricultural Experiment Station activities focused on Soil Health and Carbon Management.

The Clovis ASC is the only peanut breeding center located off-campus and developing Valencia peanuts.

The Olton clay loam soil at the center is representative of a vast area of the High Plains of New Mexico and the Texas Panhandle.

The Clovis ASC is the only research center focusing on sustaining the Ogallala Aquifer in the state.

Value Added to New Mexico

- Soil Health and Water
- Dairy
- Corn and Wheat
- Sorghum and Peanuts

The NMSU Agricultural Science Center at Clovis is centrally located in the largest crop production area of New Mexico and is uniquely qualified to conduct agricultural research and producer outreach (Extension) activities aimed at efficiently managing the area's limited water resources and increasing the economic viability and sustainability of agricultural production. The efforts to address current challenges faced by reduced irrigation or dryland agriculture and preparing for future challenges will be extremely important as temperatures continue to rise and water becomes more limited.

Ongoing Research

The ASC Clovis has positioned itself as the carbon management and soil health research center with significant activity on soil carbon sequestration, soil health assessment and management, and greenhouse gas mitigation. The carbon management program has attracted national and international collaboration.

- Cropping systems and soil management program has been studying soil-plant-environment interactions in arid and semi-arid regions. Key research projects include:
  - Establishing a soil health framework for water-limited environments
  - Climate resilience through carbon sequestration and soil health
  - Monitoring greenhouse gas emissions in diverse cropping systems
  - Conservation tillage management in dryland agroecosystems

The College of Agricultural, Consumer, and Environmental Sciences is an engine for economic and community development in New Mexico, improving the lives of New Mexicans through academic, research and Extension programs.

- Perennial and pasture cropping for dryland sustainability
- Enhancing the Breeding Potential of Valencia Peanut for Drought and Disease resistance in New Mexico. Also, studying the effect of organic treatments in Valencia Peanut.
- Weed management in corn, sorghum, and small grain
- Improving soil health and ecosystem services through circular grass buffer strips
- Conducting variety trials in corn, sorghum, and small grain

Recent Impacts

Climate smart agriculture that integrates multiple conservation and regenerative farming practices has been emphasized to increase soil carbon sequestration and mitigate anthropogenic GHG emissions. Research at ASC Clovis We demonstrated cover cropping as a climate smart strategy for agriculture in the semi- arid region because of its potential to increase soil organic carbon sequestration and mitigate greenhouse gas emissions. Promoting cover cropping with no-tillage management can increase soil organic carbon sequestration while maintaining net zero or negative GHG emissions.

In 2021, advanced cultivars released by NMSU, the peanut breeding program (New Mexico 308, 309, 310, M6 and M7 varieties) accounted for 72.2% of the total acreage cultivated in New Mexico and west Texas regions.

Community Outreach

The center plays a major role in connecting the rural agricultural producers in this region with expertise for more efficient and higher yield farming practices. Every year, the ASC at Clovis hosts multiple community outreach events to inform industry partners, youth, and local farmers about various projects and their results.

Field Day: The purpose of this free event is to bring producers and researchers together to visit/interact with each other and share ideas/ opinions about different cultural practices. This is the perfect opportunity for producers to tour and see the research projects that are being conducted at the Center and also to ask questions and get answers in a one-on-one setting.

Cultivating Young Minds: This is an annual event targeting 5th grade student from Clovis Elementary Schools. The students have a chance to visit the Center and learn about plants and plant parts. At the end of their visit, students can go to the center's pumpkin field and pick a pumpkin or two to take home. In 2021, About 675 students from 15 schools attended the event. (Pictured: bottom right)

Agricultural Science Center at Clovis
New Mexico State University
2346 State Road 288, Clovis, NM 88101
Phone: 575-985-2292
Email: clovis@nmsu.edu

New Mexico State University is an equal opportunity / affirmative action employer and educator. NMSU and the U.S. Department of Agriculture cooperating.

Agricultural Experiment Station
Corona Range and Livestock Research Center

coronasc.nmsu.edu • 575-849-1015

MISSION

The primary mission of the Corona Range and Livestock Research Center (CRLRC) is to enhance the understanding of woody brush invasion, hydrology, cow-calf production, and big game management and to discover innovative solutions to improve economic development in rangeland-bound communities. The addition of 39 wind turbines provides an opportunity to study the intersection of renewable energy and agriculture in rangeland environments.

The pure-bred Angus cattle raised at the CRLRC are in the top 0.5% of the Angus breed for calving ease bulls and dollars savings on feed.

Research conducted at CRLRC is among the first to study the impact of cow vaccinations on subsequent offspring health, growth and productivity in extensive rangelands.

CRLRC is developing collaborative projects with faculty, departments and colleges within the University, that will include Carbon, Water and Energy on large rangeland landscapes.

Value Added to New Mexico

- Sustainability Initiatives, including wind and solar energy
- Cattle and Sheep Production
- Rangeland Research
- Wildlife Preservation

Established in 1980, the CRLRC is a 27,886-acre working ranch laboratory located near the center of the state of New Mexico, just east of the village of Corona. Land within the research center is characterized by rolling hills alternating with undulating to flat areas with elevation ranging from 5,720 to 6,700 feet. A transitional area runs the length of the ranch with the southern half predominately pinon-juniper woodland and the northern half described as short grass prairie. Research programs, as well as graduate student studies, are a major part of the CRLRC and are incorporated into the normal production cycle of the cattle and sheep commercial operations.

Ongoing Research

The CRLRC cow herd is part of an ongoing, long-term study evaluating the use of different vaccination protocols on cattle performance over time in the herd. Researchers have evaluated herd health, herd retention, reproductive and nutritional efficiency, and calf growth and development pre- and postweaning. This work provides best practice recommendations for animal health programs for beef producers developing animals in extensive rangeland in NM. This project represents a multi-year, multi-disciplinary research program with local, federal, and industry funding to support graduate students and research efforts.

New research has been initiated at the CRLRC that focuses on the Pinyon Jay. This is a bird of strong conservation concern across the west, including New Mexico due to declining populations. Typically, they forage in large flocks (sometimes 100-200 individuals), on the Corona ranch the largest flock observed has been 85 individuals. Pinyon jays feed pinyon nuts and arthropods. Preliminary data suggest that arthropod abundance has a positive influence on pinyon jay foraging site selection (ie the jays cue in on areas with higher arthropod abundance) and they select foraging areas at lower elevations within suitable habitats compared to random locations.

Beef cows that naturally maintain a lower body condition score year after year as compared to their contemporaries will continually raise lighter calves throughout their lifetime. Therefore, monitoring body condition score at weaning should be considered when making culling decisions.

The College of Agricultural, Consumer, and Environmental Sciences is an engine for economic and community development in New Mexico, improving the lives of New Mexicans through academic, research and Extension programs.

Wind Turbines and commercial-scale 2MW Solar Array with battery storage: In January 2022, 39 wind turbines were moved into full operation at the CRLRC as part of Pattern Energy's Western Spirit Transmission area project, which consists of 377 turbines, or a total of 1,050 megawatts. Additionally, we are investigating opportunities for a public/private partnership to develop a solar array that benefits central NM renewable energy needs within proximity to the wind farm at Corona, complementing outreach programming in renewable energy at the Southwest Center for Rangeland Sustainability.

Recent Impacts

- Application of a mild growth-promoting implant at branding or weaning to beef heifers does not negatively impact the development of the ovary and therefore, does not alter reproductive rates. However, implants administered at branding can increase heifer weaning weight by up to 20 lbs. Today, the cost of an implant is less than $1.50 and would easily increase the value of the heifer if sold at weaning.
- Culling cows that consistently maintain a lower body condition score year after year can yield an increase in calf weaning weight of 14 pounds.
- The Pinyon Jay forages on cache pinon nuts and as a result are an important driver of the pinon juniper woodlands as they are linked with regeneration of pinon pines.

Community Outreach

The CRLRC hosts a week-long program for senior undergraduate and graduate students in Animal Sciences and Veterinary students from throughout the United States. This program is called the US Beef Academy (USBA) and it is an opportunity to expose students to leaders in the beef industry. The USBA provides daily instruction and hands-on learning in the areas of marketing, nutrition, health, reproduction, and meats. The USBA provides exposure to the robust beef production system of New Mexico all while making lasting relationships between students and professionals.

The CRLRC has hosted a number of community engagement programs that focus on drought and renewable energy. The Legislative Interim Water and Natural Resources Committee met at the CRLRC to discuss the impact of drought on animals and the economic resiliency of ranching in New Mexico. This provided a great opportunity for legislators to learn how drought can be dealt with and how CRLRC staff and faculty work to address these challenges. The CRLRC and SWCRS also hosted the Dedication ceremony for the Corona Area Wind Project, which included guests from all over the United States.

CRLRC Field Day: This event brings together producers and research to share recent research findings and discuss possible opportunities for enhancing research capacity at the center.

Corona Range and Livestock Research Center
New Mexico State University
PO Box 392, Corona, NM 88318
Phone: 575-849-1015
Email: corona@nmsu.edu

New Mexico State University is an equal opportunity / affirmative action employer and educator. NMSU and the U.S. Department of Agriculture cooperating.

Agricultural Experiment Station
Fabian Garcia Science Center

fabiangarciasc.nmsu.edu • 575-646-2729

MISSION

The mission of the Fabian Garcia Science Center is to improve the lives of New Mexicans, the nation, and the world through research, teaching and Extension. The center is oriented towards horticultural research.

Fabian Garcia, professor of Horticulture from 1906 to 1945, was named the first director of the State Agricultural Experiment Station in 1913.

The NMSU Onion Breeding program is one of the only two active, public onion breeding programs in the U.S. that is releasing cultivars and germplasm lines.

The NMSU Alfalfa Breeding and Genetics program currently maintains 500+ greenhouse plants at the Fabian Garcia Science Center.

Value Added to New Mexico

- Chile
- Onion
- Cotton

The first deed for Fabian Garcia Science Center was signed in 1906 and today the center has 41.1 acres of land. The center not only houses the Chili Pepper Institute, but includes, and is not limited to research plots and greenhouses supporting alfalfa breeding and genetics, viticulture, cotton, horticulture, nematology, micro-plot, turf grass water management, IR-4, and onion research. Another greenhouse project occurring is the phytoremediation of contaminated soils.

Ongoing Research

- Contaminated surface soil needs to be remediated. Plants may provide a means to extract metals and radionuclides while furnishing cover to reduce erosion and providing bioenergy fuel as oil or biomass. Greenhouse studies were conducted to evaluate the potential of selected (oil)seed crops to extract radionuclides from contaminated soil collected from a former mining site in NM. Researchers found that phytoremediation of radium from soil is possible over long-time scales using canola, hemp, guar, and sunflower with radionuclides partitioned into the seed meal, not the oil.

- Onion stakeholders have identified Fusarium basal rot (FBR) as a serious disease threat to onion yield and economic sustainability. Onion germplasm is being developed and evaluated at the Fabian Garcia Agricultural Science Center that is less impacted by Fusarium basal rot. When inoculated with the disease-causing pathogen, these breeding lines exhibit a lower Fusarium basal rot (FBR) incidence and severity than a commercial FBR-resistant cultivar.

The College of Agricultural, Consumer, and Environmental Sciences is an engine for economic and community development in New Mexico, improving the lives of New Mexicans through academic, research and Extension programs.

Recent Impacts

- Onion stakeholders have identified onion thrips and Iris yellow spot (IYS) virus as the greatest pest and disease threats to onion yield and economic sustainability. Onion germplasm is being developed and evaluated at Fabian Garcia that is less impacted by onion thrips and Iris yellow spot. Based upon a conducted economic analysis, onion germplasm resistant to onion thrips and/or IYS could increase profits by $1,000 per ha per year when compared with current marketable yields and management practices. Based upon the annual hectarage of onions grown in the US, the promising resistant breeding lines from NMSU could increase grower profits for the US industry by $54 million while also reducing the economic and environmental impact of these production issues and improving the productivity and economic feasibility of this crop for millions of producers worldwide.

- Limited water resources threaten New Mexico's $153 million alfalfa industry. Researchers at NMSU are working to improve agricultural sustainability and water conservation by developing alfalfa cultivars that can remain productive under optimum and deficit irrigation management strategies. The NMSU Alfalfa Breeding and Genetics program currently maintains 500+ greenhouse plants at the Fabian Garcia Research Center. Seed from these plants is used to establish field research studies that are extensively characterized for nutritional value and yield productivity under deficit irrigation management. DNA is also being isolated from the parent plant tissue and used to develop extensive DNA sequence databases. Integrated analysis of the DNA sequence and field-based data are then conducted to help identify genetic factors influencing drought tolerance and forage nutritive value to develop drought-resilient alfalfa cultivars for the arid southwestern U.S.

Community Outreach

An onion field day was held in Summer 2022 that communicated research results to stakeholders. Topics covered included: breeding for Fusarium basal rot and Iris yellow spot resistance in onion, estimating onion yield loss caused by thrips with high-throughput field photography, improving weed control programs for onions, surveying Mexico onion fields for bacterial diseases, and photosynthesis and physiology of New Mexico grown onions.

Fabian Garcia Botanical Gardens

The Fabian Garcia Research Center is also home to botanical gardens and a gazebo. This event venue is available for community use and creates a lovely daytime trip for visitors to the Las Cruces area.

Fabian Garcia Science Center
New Mexico State University
113 W University Ave, Las Cruces, N.M. 88003
Phone: 575-646-2729
Email: fgarcia@nmsu.edu

New Mexico State University is an equal opportunity / affirmative action employer and educator. NMSU and the U.S. Department of Agriculture cooperating.

Agricultural Experiment Station
Agricultural Science Center at Farmington

farmingtonsc.nmsu.edu • 505-960-7757

MISSION

The mission of the Farmington Agricultural Science Center (ASC) is to conduct research, demonstration, and educational programs that will best fill the needs of the Agricultural community of San Juan County, and the Navajo Nation in particular, and the State of New Mexico, Four Corners Region, and Nation in general.

Founded in 1968, we are the only 1862 Land-grant University to reside on sovereign First Nations Land, the Navajo Nation.

The Farmington ASC is home to the Yeego Gardening Project which gives the surrounding community access to a community garden.

Weather conditions in the Four Corners region are variable and influence crop growing periods across the region with late spring fronts and early fall frosts.

Value Added to New Mexico

- Center Pivots
- Potatoes
- Alfalfa

The NMSU Farmington ASC is part of the larger Agricultural Experiment Station (AES) system supporting fundamental and applied science and technology research to benefit New Mexico's citizens in the economic, social, and cultural aspects of agriculture, natural resource management, and family issues.

The Farmington ASC consists of two faculty and several staff with core competencies in Horticulture, Soil Quality Monitoring, Irrigation Management, and Cropping Systems. With our collaborators, we conduct soil and crop evaluations and their intersects with community wellness, economic development potential, water conservation and environmental stewardship in support of the 4 Pillars of Economic and Community Development outlined by ACES. Undergraduate and graduate students are integral to the research process.

Ongoing Research

- Corn response to nitrogen fertilizer following 4–5-year alfalfa production
  - Take advantage of the nitrogen credit of alfalfa
  - Develop nitrogen fertilizer recommendation for corn following alfalfa production
  - Within that particular cropping system under sandy loam soil
  - Reduce nitrogen fertilizer input
  - Reduce the production cost and increase revenue
  - Reduce a potential soil and water pollution by the nitrates
- Potato response to irrigation and nitrogen fertilizer
  - Develop the response function of two potato cultivars to nitrogen fertilizer under three irrigation regimes
  - Investigate the interaction of irrigation strategies and nitrogen fertilizer rates on physiological parameters of potato plants
  - Explore the best intervals of water and nitrogen input to ensure water and fertilizer conservation while maintaining high yield, quality, and improving crop water productivity

The College of Agricultural, Consumer, and Environmental Sciences is an engine for economic and community development in New Mexico, improving the lives of New Mexicans through academic, research and Extension programs.

Recent Impacts

- The Center's outreach research on the Navajo Nation tested the efficacy of an integrated garden/nutrition curriculum among 3rd and 4th-grade elementary schools and shows the potential for modest increases of healthy foods in the diet. The prevalence of diabetes among the American Indian and Alaska Native populations (15.9%) is more than double the rates compared to the non-Hispanic/Caucasian population (7.6%; National Diabetes Statistics Report, 2014). Six schools participated in this randomized controlled study with the aim of increasing children's and their parent's confidence to garden and eat healthier foods. This project is currently in the write-up phase.

- Cropping systems research. We are conducting crop evaluations to focus on improving soil and crop management practices utilizing center pivot and drip irrigation technologies that enhance efficiency, profitability, and environmental quality in the face of increasing water limitation and climate change. Crops under evaluation include wheat, barley, grapes, hops, potato, corn (including specialty corn), fruit trees, and perennial cereal crops in collaboration with the Land Institute. Perennial crops offer advantages of reduced tillage and increased soil health. Soil moisture probes are being used along with weather station data to aid in making more informed decisions on when and how much to irrigate crops. NMSU-ASC Farmington is participating in multi-site trials investigating transitioning to certified organic production cropping systems through the USDA Organic Agriculture Research and Extension Initiative.

- In 2021, New Mexico State University ASC Farmington joined the Transformation Network (TN) under a $15 million, 5-year award to the University of New Mexico. The Transformation Network is a multi-institutional, multi-disciplinary aims to build resilient communities and ecosystems throughout the Intermountain Western United States through convergent research, including agriculture.

Community Outreach

Farmington ASC community engagement occurs at multiple scales. From backyard gardens to center pivot field production. Field days and farmer visits form the basis for traditional place-based outreach with impacts related to adopting a new crop to adopting a new water conserving practice. Since 2009, Farmington ASC faculty have been partnering with Public Health researchers from the Fred Hutchinson Cancer Research Center to examine the transects of horticulture and diabetes risk reduction. This outreach oriented research is enabling Farmington ASC faculty to work with communities to address solutions that promote both gardening and healthy eating among Navajo elementary school children and their families with the ultimate goal of impacting public policy across the Navajo Nation. Community oriented research takes dedication of time to build trusting relationships. The Farmington ASC continues to assist farmers with understanding the impacts of the Gold King Mine spill of 2015. The impact of this work is aiding a broader effort in San Juan County, New Mexico to reduce the stigma of the spill and build up the agricultural economy of Northwest, NM.

Selected Partnerships

- Four Corners Local Businesses
- Fred Hutchinson Cancer Research Center San Juan County (NM), Montezuma County Cooperative Extension, Colorado State University, San Luis Valley and Southwest Colorado Research Centers
- Navajo Agricultural Products Industry (NAPI) Navajo Mesa Farms
- Navajo Nation
- NM Department of Agriculture
- San Juan College, Dine' College, Navajo Technical University, and Fort Lewis College Wilbur Ellis
- San Juan County Soil and Water Conservation District
- San Juan, Animas, and LaPlatta River Irrigated farms
- University of New Mexico Transformation Network
- USDA-NRCS
- Valley Irrigation

Agricultural Science Center at Farmington
New Mexico State University
300 County Road 4063, Farmington, NM
87401 Phone: 505-960-7757
Email: farmingt@nmsu.edu

New Mexico State University is an equal opportunity / affirmative action employer and educator. NMSU and the U.S. Department of Agriculture cooperating.

Agricultural Experiment Station
Leyendecker Plant Science Center

leyendeckrsc.nmsu.edu • 575-646-2281

MISSION

The mission of the Leyendecker Plant Science Research Center is to improve the lives of New Mexicans, the nation, and the world through research, teaching, and Extension. The Leyendecker Plant Science Research Center serves as the outdoor agronomic laboratory for researchers located on the NMSU main campus in Las Cruces. Leyendecker is an emerging hub for the application of digital agriculture tools to southwestern agriculture.

The Seed Certification and Noxious Weed Free Program (SCNWFP) is located at the Leyendecker PSRC.

Early evaluation of breeding and genetic studies for chile pepper varieties use the facilities at the Leyendecker Plant Science Center and the Fabian Garcia Research Center.

The New Mexico Cotton Breeding Program was established in 1926 and has been led by five generations of breeders.

Value Added to New Mexico

- Cotton
- Wind and Solar Energy
- Digital Agriculture
- Pecans

Leyendecker headquarters was purchased by the University in 1969 and consists of 203 acres. Projects occurring at the Leyendecker Plant Science Center include cotton, chile, alfalfa, and onion plant breeding, precision farming, pecan research, drip irrigation research, soil health research, and a multitude of other projects and programs.

Ongoing Research

- The interactive effects of cover crops, compost applications to the soil, and microbial inoculation of soil on the pecan root and rhizosphere microbiome. The results of this study will provide insights into how pecan producers can actively manage their orchard floors to favor populations of beneficial root/rhizosphere microbial species, such as mycorrhiza. This, in turn, is expected to have positive tree health and nut production outcomes for orchards with alkaline soil pH, soil salinity, or other abiotic stress factors. The study is supported by Specialty Crop Block Grant Program.
- Research to assess how a barely cover crop, and the timing of its termination, affects chile emergence and early season weed suppression. Preliminary results indicate that barley cover crops have some efficacy in reducing early-season weed emergence. Chile pepper emergence was not negatively affected by cover crops, regardless of the termination date.
- Research to improve the management of weeds that are difficult to control in chile crops using sorghum as a rotational crop. This involves planting sorghum the year prior to chile to allow a different suite of herbicides to control weeds and reduce the weed seed bank.
- Cotton breeding research program is working on cottonseed oil and its genomic basis, textile quality of new cotton lines, breeding for improvement of cottonseed oil quantity and quality, and resistance to Fusarium wilt race 4. The cotton breeding program is funded by multiple agencies including USDA-NIFA, Cotton Inc., USDA-ARS Crop Genetic Research Unit, and USDA-ARS Southwestern Cotton Ginning Laboratory.

The College of Agricultural, Consumer, and Environmental Sciences is an engine for economic and community development in New Mexico, improving the lives of New Mexicans through academic, research and Extension programs.

Recent Impacts

Soil Health Program

- Reduced tillage and cover crops enhance profitability and environmental sustainability. Sustainable soil management is challenging in arid and semiarid agroecosystems. Major issues affecting the sustainability of arid farming are the frequent, intensive tillage operations for crop production in the region and the lack of cover crops during the period of intense wind erosion in the spring. The intensive tillage operations practiced in the region and wind erosion, normally lead to degradation of soil health, necessitating a yearly increase in production input costs to compensate for the lost productivity. Through applied research, we documented that different reduced tillage practices such as no-tillage and strip tillage, combined with yearly cover crops can maintain field crop yields in southwestern New Mexico and reduce the impacts of wind erosion. The soil health research established that reduced tillage systems can save farmers up to $100 per acre on the cost of tillage practices and with the application of winter grasses as cover crops, sediment loss by wind erosion can be reduced by up to 92%.

- Reduced tillage and cover crops enhance profitability and environmental sustainability. Sustainable soil management is challenging in arid and semiarid agroecosystems. Major issues affecting the sustainability of arid farming are the frequent, intensive tillage operations for crop production in the region and the lack of cover crops during the period of intense wind erosion in the spring. The intensive tillage operations practiced in the region and wind erosion, normally lead to degradation of soil health, necessitating a yearly increase in production input costs to compensate for the lost productivity. Through applied research, we documented that different reduced tillage practices such as no-tillage and strip tillage, combined with yearly cover crops can maintain field crop yields in southwestern New Mexico and reduce the impacts of wind erosion. The soil health research established that reduced tillage systems can save farmers up to $100 per acre on the cost of tillage practices and with the application of winter grasses as cover crops, sediment loss by wind erosion can be reduced by up to 92%.

Community Outreach

Youth/Student Outreach

- Wildlife Habitat Education Program (WHEP) State 4-H contest held at Leyendecker
- Silver City FFA chapter visit to Leyendecker
- Sustainable Production of Agronomic Crops (NMSU Students Field Tour)

Farmer Outreach

- Biochar and Soil Health Field Day
- Cotton Incorporated Growers Meeting and Field Tour

Field Day

The annual field day is a free event for community members. This is the perfect opportunity for producers to tour and see the research projects that are being conducted at Leyendecker and also to ask questions and get answers in a one-on-one setting.

Leyendecker Plant Science Center
New Mexico State University
7200 Plant Science Circle, Las Cruces, N.M. 88003
Phone: 575-646-2281
Email: lyendeck@nmsu.edu

New Mexico State University is an equal opportunity / affirmative action employer and educator. NMSU and the U.S. Department of Agriculture cooperating.

Agricultural Experiment Station
Agricultural Science Center at Los Lunas

loslunassc.nmsu.edu • 505-865-7340

MISSION

The mission of the Agricultural Science Center at Los Lunas is to conduct research on various crops and plant-based systems important to New Mexicans in the Middle Rio Grande Valley (MRGV) and throughout New Mexico. Through a cooperative agreement with the USDA-Natural Resources Conservation Science Los Lunas Plant Materials Center (PMC), the Los Lunas ASC and PMC work together to solve agricultural and conservation issues.

The Los Lunas ASC shares a unique cooperative agreement with the USDA-NRCS Plant Materials Center; both units are housed within the same facility and grounds.

The Los Lunas ASC was instrumental in the testing of mechanical green chile harvesting research, along with the release of the 'NuMex Odyssey' chile pepper.

The Los Lunas Plant Materials Center has released 31 grasses, forbs, shrubs and trees for conservation use.

Value Added to New Mexico

- Hay
- Urban Agriculture and Landscapes
- Alternating Crops

Located on 200+ irrigated acres, four miles south of Los Lunas, the ASC evaluates crop adaptability, performance, and related cultural practices such as irrigation, pest management, plant growth, and propagation techniques. Having a research center centrally located within the state, near the largest metropolitan area, is a major asset and allows for broad rural and urban stakeholder service. Research and demonstration crops include alfalfa and other forage crops, beans, chile, cover crops, fruit trees, wine and table grapes, guar, tomatoes, ornamental landscape plants, and others.

Ongoing Research

- Research is investigating the use of allelopathic cover crops for pest suppression in chile pepper. This is a multi-year evaluation of ecological techniques for suppressing weeds and soil-borne pathogens. Specifically, this project is evaluating winter cover crops, barley, and mustard, for green manures that suppress pests in subsequent chile pepper crops. The end goals are improved yields, reduced pesticide use in chile pepper production, and increased use of winter cover crops, which will enhance agroecosystem biodiversity and promote soil conservation across chile-growing regions in New Mexico.

- Investigations of various cover crop options (e.g., cowpea, corn, sorghum, millet, and sunflower) alone or in combination for improving soil health parameters and forage production capability on sandy soils. New Mexico soils are largely depleted of organic matter and nutrients necessary for sustainable and profitable crop production. Cover crops have the ability to improve overall soil health, and can be utilized for forage purposes prior to the primary cash crop. 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.

- Evaluation of new hybrid table grape and jujube cultivars is ongoing and will provide valuable information for support of local production of these alternative crops while improving diet options.

The College of Agricultural, Consumer, and Environmental Sciences is an engine for economic and community development in New Mexico, improving the lives of New Mexicans through academic, research and Extension programs.

- Tomatoes are the most popular garden vegetable, yet each year many die from curly top virus and environmental stress. Researchers at the ASC are studying strategies for alleviating stress and reducing fatality rates in an effort to increase production and improve the gardening experience. Studies like these can be used to grab public attention, share sustainable methods, and, ultimately, improve agricultural literacy in the urban sector. In 2021, tomato study volunteers helped harvest 5,444 lbs. of tomatoes and our 2022 goal is to surpass 6,000 lbs. before the first frost.

Recent Impacts

- Research has demonstrated positive urban landscape management effects on soil quality and carbon sequestration with select species of climate-ready trees, shrubs, vines, pollinator species, and a variety of landscape mulches. Educational events in the ASC Learning Garden have improved awareness of water-conserving mechanisms used in landscapes, while increasing ecosystem services.

- The Los Lunas ASC was instrumental in the development of a chile cultivar and testing of the mechanical harvesting system of green chiles. 'NuMex Odyssey' was released recently, and this cultivar possesses traditional New Mexican green chile pepper flavor, low heat, and provides a higher percentage of mechanically harvested marketable green chile fruit without mechanical damage compared to current, standard industry NM type green chile pepper cultivars. Much of the machine efficiency and plant architecture evaluations were conducted at the Los Lunas ASC. A seed increase was conducted at the ASC in an isolated field to produce breeder seed for the new 'NuMex Odyssey' release. In addition, genome- wide association mapping is being implemented to dissect the genetic basis of mechanical harvesting traits, including traits related to ideal plant architecture such as plant height, plant width, number of basal branches, and height to first bifurcation.

- Forage programs improve regional production by increasing awareness of hay and pasture species and variety selection, water management, and alternative crop and high-value forage marketing opportunities. University variety trials have shown that there is an average 25% higher yield associated with improved varieties, which translates into as much as $115M additional annual earnings statewide if superior crop varieties are selected over the trial mean.

Community Outreach

The Los Lunas ASC hosts multiple Extension and Outreach events each year. These include several horticultural and fruit educational workshops, forage and chile field days, as well as a large array of online workshops and webinars. A large field day and open house is hosted every other year, where the community is invited to see all of the research projects being conducted at the station. Faculty and staff respond to hundreds of stakeholder requests for information each year via phone calls, emails, office walk-ins, and site visits, including from surrounding states and internationally.

The Los Lunas ASC hosts twice-weekly Outreach workdays for volunteers to help with various horticultural efforts at the center, like fruit tree pruning in winter, maintaining experimental tomato plots and data collection in summer, and perpetual weeding. Events like these provide an opportunity for community participants to learn the basics of plant care and accumulate volunteer service hours (totaling over 650 hours between June 2021 and July 2022, valued at over $19,000 in equivalent wages), while contributing to the maintenance needs of the ASC and expanding opportunities for future Extension workshops and research.

The NMSU Los Lunas Ag Science Center Learning Garden serves as a convenient site for visitors to the station to learn about sustainable gardening and landscaping practices, integrated pest management, and pollinator ecosystem services. The garden is truly a place for 'cultivating' educational experiences.

Los Lunas Agricultural Science Center
New Mexico State University
1036 Miller Road, Los Lunas, New Mexico 87031
Phone: 505-865-5163
Email: llunas@nmsu.edu

Agricultural Experiment Station

John T. Harrington Forestry Research Center

morasc.nmsu.edu • 575-387-2319

MISSION

To advance the understanding of restoration activities on forested areas in New Mexico through multidisciplinary research, education, and stakeholder collaborations.

The Hermits Peak – Calf Canyon Fire started on April 6, 2022 and grew to over 341,700 acres by July, making it the largest fire in the history of New Mexico. The JTH FRC was in the path of the fire and evacuated all personnel on May 1 as the fire approached. The center seed bank was moved prior to the evacuation in preparation for potential evacuation and power outages. Approximately 75,000 seedlings were rescued from the JTH FRC during the time of evacuation and moved to a temporary greenhouse in Santa Fe on May 3 and 5. Return to the center occurred on May 31 after fire lines were considered stable in the area.

Continuing to pursue purchasing the current center property which is leased.

Value Added to New Mexico

- Seedlings

The JTH Forestry Research Center also provides science-based solutions for private, tribal, state, and federal forest managers, who face the threat of catastrophic fires due to overgrown forests and the inability of post-fire forest communities and ecosystems to naturally regenerate after such fires. The center is the only program in the four corner states (NM, UT, AZ, and CO) focusing research efforts along the entire reforestation pipeline. It is located in Mora, New Mexico.

Ongoing Research

- Evaluating vegetation control and animal protection measures in a post-fire restoration environment. Preliminary results show that the use of managed nurse vegetation improves survival.
- Optimizing outplanting strategies in a post-fire environment through seedling size, planting windows, and drought conditioning. Preliminary results show that monsoonal plantings improve the survival of planted trees.
- Using nucleation planting strategies in post-fire environments to improve long-term values such as water resources and forest health. Preliminary results show that high-density nucleation plantings maintain proper stocking levels.
- Exploring natural structures such as logs and snags to improve seedling survival and growth. Implementing Fall 2022
- Determining drought tolerance of *Pinus ponderosa* and *Populus tremuloides* using osmolality. Implementing Fall 2022

The College of Agricultural, Consumer, and Environmental Sciences is an engine for economic and community development in New Mexico, improving the lives of New Mexicans through academic, research and Extension programs.

Recent Impacts

- Accomplished – formation of the New Mexico Reforestation Center which is a partnership of New Mexico State University, University of New Mexico, New Mexico Highlands University, and Forestry Division with EMNRD.

- Accomplished – a string of news articles about NMSU's role in post-fire reforestation (Albuquerque Journal, Santa Fe Reporter, Las Cruces Sun News, Colorado Sun, New York Times, and Washington Post are a few examples).

- Potential – proposal submitted to USDA's "Partnerships in Climate-Smart Commodities" grant in May 2022. This proposal requested approximately $80 million to develop a climate-smart seedling reforestation pipeline for the southwestern US. This project would have funded the construction and initial operation of the New Mexico Reforestation Center. This data-driven reforestation center is designed to increase southwestern US reforestation success by producing climate-smart seedlings, decreasing reforestation costs, continuing applied research activities to keep the reforestation program successful, and ensuring the development of a trained reforestation workforce for the four corners region (Arizona, Colorado, New Mexico, Utah).

Community Outreach

The John T. Harrington Forestry Research Center at Mora offers a unique educational opportunity to learn about forestry research and how important forests are to not only agricultural production in the state of New Mexico but also that forests provide water, wildlife habitats, and so many other benefits to the state. The annual field day is an event open to the public to visit the center and get an up-close look at the seedling nursery and reforestation efforts from the Center.

Traditionally, the Forestry Research Center hosts visits from legislators, community members, and stakeholders. However, with the fires this year, additional visits occurred in 2022. Those visitors included congressional delegates (state and federal), undersecretaries, division chiefs and directors, agency representatives, and other stakeholders. Visits occurred both pre- and post-fire. However, interest and understanding of the importance of reforestation after fires, using the Hermits Peak - Calf Canyon Fire in the backyard as an example has provided an opportunity to discuss in greater detail the needs and importance of the New Mexico Reforestation Center (NMRC). The NMRC would serve to fill the gaps in the reforestation pipeline, emphasizing both scale and urgency, in the southwestern US while serving as a model for other regions. The NMRC is a formal partnership between New Mexico State University (NMSU), New Mexico Highlands University (NMHU), University of New Mexico (UNM), and the Forestry Division of New Mexico's Energy, Minerals, and Natural Resource Department (EMNRD FD).

John T Harrington Forestry Research Center
New Mexico State University
3021 Highway 518 Mora NM 87732
Phone: 575-387-2319
Email: moraasc@nmsu.edu

New Mexico State University is an equal opportunity / affirmative action employer and educator. NMSU and the U.S. Department of Agriculture cooperating.

Agricultural Experiment Station

Rex E. Kirksey Agricultural Science Center at Tucumcari

tucumcarisc.nmsu.edu • 575-461-1620

MISSION

The New Mexico State University Rex E. Kirksey Agricultural Science Center at Tucumcari (REKASCT) conducts locally driven, globally relevant research related to crops (including forages) and livestock production under irrigated and dryland conditions.

The Tucumcari Feed Efficiency Test, LLC (TFET) conducts annual Tucumcari Bull Test and other feed efficiency tests to encourage beef cattle herd improvement.

More than 50 species of trees and shrubs are established at the center.

Only ASC reusing treated municipal water for irrigation, providing a year-round source for irrigated research.

Value Added to New Mexico

- Reclaimed Water
- Dry Beans
- Oldest NMSU Agricultural Science Center- adding historical knowledge and value to the community and state.

The Rex E. Kirksey Agricultural Science Center at Tucumcari is located on U.S. Highway 54, three miles northeast of Tucumcari and Interstate 40, exit 333. The center's property consists of 464 acres, with 170.9 acres having Arch Hurley Conservancy District water rights and a contract for 300 acre-feet annually for treated municipal wastewater to be delivered from the City of Tucumcari Wastewater Treatment Plant.

Efforts at the center focus on: improving the quality, safety, and reliability of food and fiber products, which enhances agricultural profitability; stimulating economic development using natural resources; sustaining the environment and protecting natural resources with sound practices, and improving the quality of life for the people of New Mexico.

Ongoing Research

- Ongoing beef herd improvements have been made for over half a century due to feed efficiency testing leading to an estimated value exceeding $800,000 annually for New Mexico's beef cattle industry. Average feed to gain ratio for the test is 5 lb feed per lb of gain while the national average is 6 lb feed/lb gain.
- Field bindweed is a competitive, summer-active weed that reduces productivity in irrigated pastures. Ongoing results indicate a potential reduction in bindweed biomass and the number of clones in spring and summer by grazing.
- Manure application costs can be cut by up to 60% by applying manure only in the strip-till zone. Additionally, six years after single 10 tons /A manure application with 6-inch incorporation, grain sorghum biomass yield was still greater by 14%, compared to the no manure control.
- Evaluating conditions to improve yield and quality for guar producers. Growing guar domestically would reduce production and importing costs drastically.

The College of Agricultural, Consumer, and Environmental Sciences is an engine for economic and community development in New Mexico, improving the lives of New Mexicans through academic, research and Extension programs.

- Successful identification of crop species or variety in New Mexico to replace the fallow period in semiarid cropping systems will not only help the local farming community to achieve higher resource use efficiency (especially water) and productivity, but also promote state-level infrastructure and broader marketing opportunities in New Mexico. Introduction of resource use efficient crop selection will result in broader diversity in the existing cropping systems. It is anticipated that identifying the water use efficient dry bean/guar will increase the per acre productivity in approximately 380,000 acres by rotating with winter wheat/alternate semi-arid crops in New Mexico.

- Continuing the search for summer annual legumes to grow with summer annual cereal forages and management practices to improve forage yield and nutritive value.

- Began evaluations of dual-purpose (grazing and grain) winter malt barley.

- Continued studying the effects of using treated municipal wastewater for agricultural irrigation on soils and crops.

Recent Impacts

- Producers of the arid southwest can benefit from the current research recommendations about cover crop choices for the summer season in the desert southwest. However, region specific recommendations based on local weather conditions and specific agricultural and economic needs should be carefully considered before practicing these recommendations.

- Using pearl millet rather than sorghum-sudangrass for late summer through autumn pastures for growing cattle offers producers an opportunity to increase returns on the similar investments of establishing and managing warm-season annual forage crops each year and allows more time to stockpile cool-season perennial and annual forages for winter and early spring grazing or to reduce hay feeding.

- Variety selection is key to a highly productive stand of any crop at the same production costs. Differences between the highest- and lowest- yielding alfalfa varieties in irrigated tests statewide ranged from 0.60 to 3.06 tons per acre in 2021. If sold as hay, this translates to a potential difference in returns of $135 to $689 per acre due to variety, or a potential increase of at least $18 million for the industry.

Community Outreach

The Rex E. Kirksey Agricultural Science Center serves as a hub for community support in Tucumcari. By hosting an annual bull sale, 4-H events, field trips for elementary students and other educational events, the center takes pride in offering a space for agricultural research to be accessible to New Mexicans.

Field Day: The purpose of this free event is to bring producers and researchers together to visit/interact with each other and share ideas/opinions about different cultural practices. This is the perfect opportunity for producers to tour and see the research projects that are being conducted at the Center and also to ask questions and get answers in a one-on-one setting.

Rex E. Kirksey Agricultural Science Center
New Mexico State University
6502 Quay Road AM 5, Tucumcari, N.M. 88401
Phone: 575-461-1620
Email: tucumcar@nmsu.edu

AES RESEARCH DEPARTMENTS

- Agricultural and Extension Education
- Agricultural Economics and Agricultural Business
- Animal and Range Sciences
- Entomology, Plant Pathology & Weed Sciences
- Family and Consumer Sciences
- Fish, Wildlife & Conservation Ecology
- Plant and Environmental Sciences
- School of Hotel, Restuarant & Tourism Management

The AES has eight academic research departments that house the on-campus research efforts within ACES. Many of these on-campus researchers utilize the near-campus agricultural science centers as outdoor research laboratories. Some of these research efforts expand across the state to other ASCs, creating trans-departmental connections and strengthening ACES research efforts across the state.

Agricultural Experiment Station

Department of Agricultural and Extension Education

axed.nmsu.edu • 575-646-4511

MISSION

The primary focus of the Department of Agricultural and Extension Education (AXED) is to teach and transform leaders in agriculture. By preparing students to lead in the classroom, community and media, AXED prepares students with real-world experiences to help them thrive as agricultural and Extension educators, communicators, power and structural technicians and community leaders.

Quick Facts

- In 2021, AXED faculty and staff led or collaborated nearly $12 million in awarded research projects.
- Nearly 60% of agricultural educators in New Mexico are AXED alumni.
- Home to the only agricultural communications program in New Mexico and one of the few in the southwest.
- NMSU AXED faculty and students won the outstanding innovative idea and runner-up outstanding research presentations at the National Agricultural Communications Symposium in 2022.

AXED equips students to influence the future. AXED undergraduate and graduate students are prepared for careers in agricultural education, agricultural communications, Extension, government and industry affairs, and international agricultural development. AXED researchers have a holistic approach to applied agricultural research and provide scientific communications in a clear and effective way for multiple audiences.

SELECTED PROGRAM IMPACTS

- **Mechanization allows society to prosper due to its impact on agriculture.** This impact includes the widespread availability of agricultural products. To gain further understanding into this area of inquiry, Dr. Don Edgar designed a study to gauge the impact of male and female instructors in areas of mechanization. The study, which began in the spring of 2021, involves a female instructor who provides data as she leads lectures and lab classes for a designated course. As the need for more STEM career ready professionals has been called for nationally, understanding gender differences associated with these professions is important.

- **The Young Agri-Scientist Program is a collaborative effort with Texas Tech University to recruit future scientists in Agriculture, Food, and Natural Resources (AFNR).** Supervised by Drs. Steve Fraze and Lacey Roberts-Hill, the program was created to provide and evaluate an enhanced undergraduate research experience. Selected students at New Mexico State University will engage in active research with a faculty mentor in the College of ACES. The goal of the program is to increase the number of diverse graduates with critical thinking and research skills to meet the global need for agricultural scientists and science communicators.

- **Preparing students for real-world issues by being stronger communicators.** Employers in the agriculture, food and natural resources industries (AFNR) are continually seeking individuals who can communicate clear messages to their stakeholders through multiple mediums such as print, online and social platforms. As a result, using collaborative efforts from faculty in Agricultural and Extension Education, AXED has created and revamped new courses to build an Agricultural Communications (ACOM) degree. Led by Drs. Shannon Norris-Parish and Lacey Roberts-Hill, AXED's agricultural communication courses include graphic design, agricultural campaigns, agricultural and scientific publications, photography, brand identity, global issues in agricultural communications and communicating agriculture and science to the public.

The College of Agricultural, Consumer, and Environmental Sciences is an engine for economic and community development in New Mexico, improving the lives of New Mexicans through academic, research and Extension programs.

Selected Partnerships and Collaborators

- Café Mayapan
- La Semilla Food Center
- New Mexico Ag Education and FFA
- New Mexico Department of Agriculture
- New Mexico Farm and Livestock Bureau
- New Mexico High Schools
- New Mexico Livestock Board
- New Mexico State 4-H
- NMSU Cooperative Extension Service
- Our Lady of Hope
- Santa Teresa Border Crossing
- U.S. Department of Homeland Security

SELECTED PROGRAM IMPACTS (CONT.)

- **Alumni making a difference in agricultural education and Extension.** Alumni are making a difference in both formal and non-formal education. Agricultural educators and teachers impact students daily in the areas of leadership, career development and agricultural awareness and literacy. NMSU Cooperative Extension Service (CES) agents impact community members and youth daily through agricultural workshops, nutritional programming and youth events. Agricultural and scientific communicators impact communities through messaging, policy development and translating scientific information to the public. Our alumni work with communities to bring life-changing information to families and agriculturists based on university research.

- **Wind Power Technology Center.** Water is an important resource that is in short supply in the U.S. Southwest. Even in today's high-tech world, windmills continue to provide water to farm and ranch operations throughout the country. In Windmill Technology Workshops taught at the Wind Power Technology Center on NMSU's main campus, over 850 participants have learned the fundamentals of using wind and solar applications to pump water where it is needed. NMSU's workshop is the only windmill workshop taught by a university in the United States, and has attracted participants from every part of our country as well as Afghanistan, Brazil, Chile, Nigeria, and Mexico. A single class will often include ranchers, professional millers, Tribal range managers, windmill enthusiasts, and traditional college students.

- **The primary focus of Dr. Dawn VanLeeuwen's work conducted through the Agricultural Biometric Service is to promote the use of appropriate statistical techniques on ACES college projects.** Her work contributes to using research dollars efficiently. Consultation from a statistician may result in designs that are much more likely to yield information that can be used to answer questions of importance.

FACULTY AND EXPERTISE

- **Steven Fraze, Department Head, Professor,** Agricultural Teacher Education, Extension Education
- **Don Edgar, Professor**, Agricultural Teacher Education, Mechanization, Extension Education
- **William Norris, Assistant Professor**, Agricultural Teacher Education, Extension Education
- **Shannon Norris-Parish, Assistant Professor**, Agricultural Communications
- **LaJoy Spears, Assistant Professor,** Program Development and Evaluation Specialist
- **Lacey Roberts-Hill, Assistant Professor,** Agricultural Communications
- **Dawn VanLeeuwen, Professor,** Applied Statistics

Agricultural Experiment Station

Department of Agricultural Economics and Agricultural Business

aeab.nmsu.edu • 575-646-3215

MISSION

Enhancing the well being of the citizens of New Mexico, the nation, and the world through excellence in teaching, research, and extension programs, our mission includes the three cornerstones: education, research, and extension.

Quick Facts

- The academic department has ten faculty members with a wide variety of research efforts that range across the entire food and fiber supply chain, e.g., from input supplies and production agriculture to the final consumer.
- Researchers work with various stakeholders, including individual producers (farmers and ranchers), industry organizations, and government agencies.
- Most of the research projects conducted by faculty within the department include graduate and undergraduate students, providing them with opportunities for experiential learning.

The Department of Agricultural Economics and Agricultural Business designs and conducts research that improves society's capacity to develop and manage its resources efficiently, fairly, and sustainably.

SELECTED PROGRAM IMPACTS

Effect of cover crop on farm profitability and risk in the Southern High Plains. Farming practices that leave land fallow for extended periods (nine to thirteen months), rising aridity, and heavy wind increase soil erosion (23.64 tons/acre) and reduce soil fertility. It costs the state more than $31.00/acre annually. Cover cropping enhances soil health by reducing erosion, weed density, soil compaction and increasing soil organic matter, water retention, and nitrogen. However, because of the high cost of cover cropping, growers are reluctant to adopt the technology. Our study shows that a $50.00/acre subsidy through the 'Healthy Soil Program' would make cover cropping profitable and enhance sustainability.

Big banks versus agricultural banks: Has too-big-to-fail regulation affected efficiency and scale economies measures? Agricultural banks are critical for a successful agricultural economy as they hold more than forty percent of the U.S. farm debt. The Dodd-Frank Act, which aimed to reduce too-big-to-fail practices of big banks, also increased compliance costs for small agricultural banks. This research finds that Dodd-Frank has "reduced consolidations in very big banks that are subjected to greater oversight" but "created more uncertainty in the agricultural lending market." Uncertainty in agricultural lending might have adverse spillover effects on the U.S. farm economy. Thus, any changes in banking regulation should consider its potential impacts on small agricultural banks.

The College of Agricultural, Consumer, and Environmental Sciences is an engine for economic and community development in New Mexico, improving the lives of New Mexicans through academic, research and Extension programs.

Selected Partnerships and Collaborators

- Ag New Mexico Farm Credit
- Bridgestone
- Foundation for Food and Agriculture Research
- New Mexico Chile Association
- New Mexico Department of Agriculture
- New Mexico Farmers' Marketing Association
- New Mexico Office of the State Engineer
- U.S. Agency for International Development
- U.S. Geological Survey
- United Nations Food and Agriculture Organization (FAO)
- USDA Agricultural Research Service
- USDA Economic Research Service
- USDA Foreign Agriculture Service
- USDA Natural Resource Conservation Service
- World Bank

SELECTED PROGRAM IMPACTS (CONT.)

A 'one in a hundred-year event'? Assessing flood risk perceptions and the term '100-year flood.' A research collaboration between NMSU and the University of Idaho highlighted our understanding of individuals' ability to interpret flood terminology. The US NFIP maps and classifies flood risk based on data of flood events, using terms such as '100-year flood'. The purpose is to convey the likelihood of a flood event to property owners and inform flood insurance purchases. Often, this term is used incorrectly, and homeowners misinterpret the risk conveyed by this term. The research performed by NMSU and U.I. shows that most do not understand these terms, including those who have experienced floods.

Rio Grande Basin aquifer protection policy analysis. North America's Rio Grande Basin is cited as the most climate-stressed river system in the U.S., for whom people who rely on the river system are among the nation's poorest. A recent NIFA project aimed to develop and apply economic analysis to investigate the impacts of new policies, such as changes in costs of aquifer protection in a conjunctive use system, the Middle Rio Grande Basin of North America. The importance of this work is demonstrated by permitting policy experimentation for numerous groups of regional water stakeholders, including agriculture, government agencies, environmental, and social justice interests.

FACULTY AND EXPERTISE

- **Jay M. Lillywhite**, Business Feasibility, Consumer Preferences, and Economic Impact Analysis
- **Ram Acharya**, Food Security, Food Marketing, Climate Change, and Sustainability
- **Alwin Dsouza**, Production Efficiency Analysis, Economic Impact Analysis, Food Supply Chain Management, and Consumer Preference
- **Brian Hurd**, Economic Impacts and Adaptation of Agriculture and Water Systems
- **Frannie Miller**, Impacts of foreign animal diseases, Dairy and Beef Livestock Economics
- **Madhav Regmi**, Agricultural Finance, Agribusiness Risk Management, Production Economics, and Public Policy
- **Chadelle Robinson**, Marketing, Consumer Preferences, And Supply Chain Management
- **Greg Torell**, Renewable Sources Of Electricity, Issues Related To The Intersection Of Water And Energy Resources, Valuation Of Ecosystem Services On Rangelands
- **John Townsend**, Commodity Futures and Options, Agricultural Marketing, Commodity Risk Management
- **Frank Ward**, Irrigation Economics and Policy

New Mexico State University is an equal opportunity / affirmative action employer and educator. NMSU and the U.S. Department of Agriculture cooperating.

Agricultural Experiment Station

Department of Animal and Range Sciences
anrs.nmsu.edu • 575-646-2515

MISSION

The Department of Animal and Range Sciences is committed to providing premier programs to those we serve by focusing on education, research, and outreach.

Quick Facts

- In 2021, ANRS secured over $3 million in funding and in-kind donations. For every dollar we bring in from state and federal sources, we bring in additional dollars more from outside sources.
- Currently, ANRS is training 42 graduate students and 22 undergraduate students in research techniques related to livestock production, range management, and water science at three agricultural science centers and the on-campus livestock farms.
- ANRS researchers are focused on enhancing efficiency in beef cattle production.

Research conducted in animal science and rangeland resources benefits livestock producers and land managers in semi-arid and arid environments, and allows for training of students to be future leaders in the industry.

SELECTED PROGRAM IMPACTS

- **Factors that impact pregnancy in livestock and humans.** This research is supported in part by the National Institutes of Health. Attachment and implantation of the embryo into the maternal endometrium and subsequent development of the placenta (referred to as placentation) is central to pregnancy success. Using sheep as a model, we are able to address gaps in knowledge relevant to agricultural production concurrent with biomedical research in the effort to identify novel targets for the diagnosis and treatment of both pathological pregnancies and cancer. Bacterial infections are linked to infertility in women. Gram-negative bacteria which release the endotoxin, lipopolysaccharide (LPS), can disrupt normal ovarian function, and reduce intra-follicular estradiol concentrations. Even low or subclinical concentrations of LPS can be detrimental to the ovary and the developing oocyte. Elucidating the impact of bacterial infections on ovarian function can lead to improved management to reduce consequences of disease on female fertility.
- **Efficient utilization of resources using technology.** Researchers are using virtual fencing and GPS tracking of livestock to better manage the utilization of rangelands and to monitor animal health. Virtual fencing allows producers to control livestock distribution in rangeland landscapes without physical fences. Livestock wear collars that communicate with GPS and reception towers to form a virtual fence set by the rancher or land manager. This technology can be used to exclude animals from sensitive areas such as riparian areas, areas of management concern, and recently burned areas. Virtual fencing has also been found effective in encouraging cattle to graze on undesired/invasive species. The GPS tracker needed for virtual fencing can also be used to monitor animal health. For example, when a pedometer is included with the GPS tracker, animals displaying changes in behavior could indicate an illness.

The College of Agricultural, Consumer, and Environmental Sciences is an engine for economic and community development in New Mexico, improving the lives of New Mexicans through academic, research and Extension programs.

Selected Partnerships and Collaborators

- Elephant Butte Irrigation District
- Feed and pharmaceutical companies, including Westway Feed Products,
- Hi-Pro Feeds, Paul's Veterinary Supply, Merck, Zoetis, Cargill, and Elanco
- New Mexico Acequia Association
- NM Cattle Growers
- NM Department of Agriculture
- NM Wool Growers
- NMSU Range Improvement Task Force
- Society for Range Management
- USDA and USDI federal agencies, including BLM, NRCS, EPA, Forest Service, Fish and Wildlife Service, and Valles Caldera National Preserve
- USDA–ARS Research Laboratories, including Fort Keogh, Miles City, MT; Meat Animal Research Center, Clay Center, NE; Jornada Experimental Range, Las Cruces, NM; and Northern Great Plains Research Laboratory, Mandan, ND
- Various livestock breed associations, cooperatives, and producer groups
- Various universities, including Texas A&M University, Oklahoma State University, University of Nebraska, University of Arizona, Texas Tech University, San Angelo University, and North Dakota State University

SELECTED PROGRAM IMPACTS (CONT.)

- **Restoration of rangelands.** Providing effective restoration is broadly important in that it has the potential to benefit multiple ecosystem services. With nearly 70% of lands in the Western United States classified as rangelands, the services these multi-use lands provide is increasing in importance as stressors are also predicted to increase. Seemingly small actions such as identifying effective species to seed, or how to reduce soil erosion through ecological restoration actions can have large economic and social benefits. Identifying mechanisms for effective restoration actions to improve habitat quality can ultimately improve livestock production, which leads to helping local economies.

- **Understanding basis of plant invasions. Why do species become invasive?** This issue has puzzled humanity for decades. In 2021, the Director of the NMSU herbarium started a new genomic project to identify the genetic basis behind several mechanisms driving plant invasion in drylands. DNA is being harvested from century-old herbarium specimens and gathered for experimental greenhouse data, in collaboration with Tel Aviv University, Israel and the NSF-funded Consortium for Plant Invasion Genomics Initiative. Results may help mitigate detrimental effects of invasive species and could reduce the $36 million annually spent on invasive plant control in the US.

FACULTY AND EXPERTISE

Animal Sciences

- Ryan Ashley, Professor, Reproductive Physiology
- John Campbell, College Associate Professor, Judging Team Coordinator
- Glenn Duff, Professor, Ruminant Nutrition
- Gaylene Fasenko, Professor, Companion Animals
- Jennifer Hernandez-Gifford, Associate Professor, Reproductive Physiology
- Shanna Ivey, Department Head/Professor, Rumen Microbiology
- Clint Loest, Professor, Ruminant Nutrition
- Tim Ross, Emeritus Professor, Sheep Production
- Eric Scholljegerdes, Associate Professor, Ruminant Nutrition
- Adam Summers, Associate Professor, Reproductive Physiology
- Sergio Soto-Navarro, Professor, Ruminant Nutrition

Range Science

- Derek Bailey, Professor, Grazing Management and Behavior
- Andres Cibils, Emeritus Professor, Grazing Management and Ecology
- Alexander "Sam" Fernald, Professor, Water Quality Hydrology
- Sara Fuentes-Soriano, College Assistant Professor, Herbarium Curator
- Hatim M.E. Geli, Assistant Professor, Landscape Hydrology
- Lara Prihodko, College Associate Professor, Landscape Systems

New Mexico State University is an equal opportunity / affirmative action employer and educator. NMSU and the U.S. Department of Agriculture cooperating.

Agricultural Experiment Station

Department of Entomology, Plant Pathology, and Weed Science
eppws.nmsu.edu • 575-646-3225

MISSION

The Department of Entomology, Plant Pathology, and Weed Science (EPPWS) is a multi-disciplinary group of scientists and teachers whose mission is to provide academic instruction, research, and service that focuses on managing pests in semi-arid ecosystems.

Quick Facts

- EPPWS has expertise largely focused on the organisms that damage crops, animals, and facilities, rather than on commodity organisms. Our understanding of organisms like weeds, nematodes, bacteria, fungi, viruses, prions, insects, and spiders allows us to develop strategies to avoid the damage they cause.
- In 2021, EPPWS faculty authored or co-authored 54 refereed papers and six book chapters.
- EPPWS faculty served as primary advisors for more than 20 graduate students in four different programs half of whom were Ph.D. students, in 2021.
- Over the past three years, EPPWS investigators have attracted over $8 million in extramural funds from public and private sources. The products of our research, deployed largely by Extension faculty, have an annual economic impact estimated to be roughly 30 times our faculty salaries.

The strength of the department is the interaction of these disciplines in understanding the biology of pest organisms, their interactions, and how pests impact urban, agricultural, and natural resources.

SELECTED PROGRAM IMPACTS

- **Herbaceous Wind Buffers for New Mexico Agriculture.** A new project, funded by the USDA Natural Resources Conservation Service, is observing impacts and value of herbaceous wind buffers (HWB) in arid and semi-arid southwest agricultural landscapes. Many factors threaten agricultural sustainability and conservation efforts in New Mexico and other Southwestern States, these factors include: severe droughts, high and sustained wind speeds, and monoculture landscapes. To address these issues, we are evaluating performance of HWB in providing ecosystem services.
- **Genetic diversity of pecan deciphered.** Pecan production is negatively impacted by several factors including uncertain climate changes, shifts in insect pests and plant pathogens, limited water quantity/quality, and salinity stress. These stresses require costly inputs and reduce pecan sustainability. Our multi-institutional and trans-disciplinary team has generated four high-quality chromosome-level genome assemblies and annotations that span half of the genetic diversity of cultivated and wild pecan. The genetic tools will guide development of pecans that have better nut quality, higher tolerance to drought and rising temperatures, and carry resistance to pests and pathogens, which will decrease inputs like pesticides and water use.

The College of Agricultural, Consumer, and Environmental Sciences is an engine for economic and community development in New Mexico, improving the lives of New Mexicans through academic, research and Extension programs.

Selected Partnerships and Collaborators

- 4-H
- American Phytopathological Society, Entomological Society of America, Weed Science Society of America, American Society for Microbiology, and Soil Science Society of America
- Dow AgroSciences
- Future Farmers of America
- Independent growers engaged in on-farm research
- IR-4
- Many NMSU departments
- Navajo Agricultural Products Industry
- New Mexico Chile Association
- New Mexico Department of Agriculture
- NM Cotton Growers Association
- NM Organic Commodity Commission
- USDA–APHIS
- USDA–ARS
- USDA-NIFA
- Various universities, including the University of Georgia, Oklahoma State University, University of Tokyo, Michigan State University, University of California, University of Illinois, Montana State University, University of Florida, and University of Wyoming

SELECTED PROGRAM IMPACTS (CONT.)

- **Mustard cover crops for reducing reliance on pesticides.** Mustard cover crops are potential tools for reducing reliance on synthetic pesticides in crop production. NMSU researchers initiated development of best management practices for mustard cover crops by conducting field studies to determine cover crop impacts on weeds and soil-borne diseases in cash crops including chile pepper. The results revealed optimal seeding and termination times for mustard cover crops, and clarified circumstances where mustard cover crops have undesirable consequences. By determining potential risks and rewards from mustard cover crops, we generated information that allows New Mexico farmers to make appropriate decisions on adopting an ecological technique for suppressing agricultural pests.

- **Genetic origins of toxins in loco weeds uncovered.** Livestock ingesting locoweed may accumulate the toxin swainsonine, causing the condition, locoism. The fungus Alternaria oxytropis produces swainsonine and other secondary metabolites. Researchers genetically analyzed A. oxytropis to determine evolutionary origin of enzymes producing its secondary metabolites. Enzymes detected were polyketide synthases (PKSs), non-ribosomal peptide synthases (NRPSs), or hybrids of the two groups. Amino acid sequences showed most were similar to those found in close relatives of Alternaria species. However, seven were determined to have a unique origin. Understanding origins of enzymes involved in toxin production helps predict how they work.

FACULTY AND EXPERTISE

Entomology

- Scott Bundy, Professor, Insect Taxonomy and Outreach
- Brad Lewis, College Assistant Professor, Economic Entomology
- Jane Pierce, Associate Professor, Economic Entomology
- Alvaro Romero, Associate Professor, Urban Entomology
- Dave Thompson, Professor, Entomology

Plant Pathology

- Rebecca Creamer, Professor, Plant Virology
- Steve Hanson, Associate Professor, Molecular Biology
- Jennifer Randall, Professor, Plant Physiology
- Soum Sanogo, Professor, Fungal Plant Pathology

Weed Science

- Leslie Beck, Associate Professor, Weed Science
- Erik Lehnhoff, Associate Professor, Weed Science
- Abdel Mesbah, Associate Professor, Weed Science
- Jerry Sims, Department Head, Environmental Microbiology
- Brian Schutte, Associate Professor, Weed Science

New Mexico State University is an equal opportunity / affirmative action employer and educator. NMSU and the U.S. Department of Agriculture cooperating.

Agricultural Experiment Station

Department of Family and Consumer Sciences

fcs.nmsu.edu • 575-646-3936

MISSION

The mission of the Department of Family and Consumer Sciences is to serve the culturally diverse clientele of New Mexico and the border region through quality teaching, research, and service.

Quick Facts

- A six week Continental cooking and nutrition education program within FCS (September 13th -October 18th) for adolescents in the silver kitchen exposes them not only to the direct benefits of education, but also how research in human nutrition is beneficial to overall health and well-being.
- Research in FCS is collaborative and focuses on enhancing the lives of the people of New Mexico.
- FCS is home to NMSU's equine therapy program. Horses help humans to understand relationships. The area of equine-assisted psychotherapy has been used to enhance the lives and well-being of the people of New Mexico

The Department of Family and Consumer Science is committed to research and strives to embrace NMSU's strategic plan goal 2 of elevating research and creativity. While each of the program areas FCSE, FMAD, FSTE, HDFS, and HNDS strive to balance quality teaching with research and faculty in each program area have varying research expectations, each area is involved in important research activities.

SELECTED PROGRAM IMPACTS

Food Science and Technology (FSTE)

The COVID-19 pandemic brought significant barriers to learning, but it also created new opportunities and receptiveness to innovate what and how we teach. The USDA multi-state project NC-1023 (Engineering for food safety and quality), attempted to break these barriers and provide opportunities for students to interact with researchers from across the county through a new, online multi-institutional seminar course in food engineering. With an interdisciplinary group of more than 18 food science and food engineering programs from different universities in the country, we organized the first of its kind "Multi-Institutional Food Engineering Seminar Series" as part of the USDA Multistate Committee NC1023."

Research in the department involves generating novel experimental data to better understand the impact of visible light and photosensitizer on the inactivation of enteric pathogens. aPDT technology may play an important role in eliminating persistent pathogen reservoirs, thereby reducing the risk of food safety incidents. This research will not only complement and expand on existing research, but also will serve as a foundation for the design and validation of suitable aPDT that could be coupled with conventional sanitizing strategies to enhance microbial inactivation across the entire landscape of agri-food products and food-contact surfaces. This cutting-edge technology has gained much attention during the last decade from funding agencies as a promising technology for its potential to improve the safety and sustainability of food production.

The College of Agricultural, Consumer, and Environmental Sciences is an engine for economic and community development in New Mexico, improving the lives of New Mexicans through academic, research and Extension programs.

Selected Partnerships and Collaborators

- Cornell University
- Families and Youth, Inc.
- Illinois Institute of Technology
- Iowa State University
- La Pinon Sexual Assault Recovery Services
- Michigan State University
- NMSUs Honors College
- NMSUs Student Success Center
- Oregon State University
- Rutgers University
- South Dakota State University
- The Ohio State University
- The Pennsylvania State University
- UC Davis
- University of Arkansas
- University of Illinois, Urbana-Champaign,
- University of Kentucky
- University of Maryland
- University of Minnesota
- University of Nebraska-Lincoln
- Washington State University

SELECTED PROGRAM IMPACTS (CONT.)

Human Development and Family Science (HDFS)
Advocating for diversity, equity, and inclusion in all spaces is essential. We are currently analyzing how this can be done through a lens of collective sense of responsibility and accountability among Institutional Review Boards (IRBs) which can carve a new way to enhance the protection of human subjects.

COVID-19 impacted everyone, but especially impacted Marriage and Family Therapy students in training. While most supervision of MFTs in training is conducted using specific models, none of the existing models account for wider socioecological factors on the impact of MFT training. Currently an ecological model to MFT training is being developed and tested.

NMSU will receive $1.3 million over the next five years to support the McNair Scholars Program, a federal TRIO program designed to prepare undergraduate students for doctoral studies through involvement in research and other scholarly activities. This collaborative effort includes NMSU's Student Success Center, NMSU's Honors College, and NMSU's Professor Dr. Merranda Marin.

Human Nutrition and Dietetics (HNDS)
Research efforts have examined food insecurity among adults and children and has found increases during COVID-19 pandemic due to rising levels of unemployment, poverty and limited access to school nutrition programs.

HNDS faculty are assessing access and effectiveness of programs such as SNAP, P-EBT, WIC, and other food assistance programs provides valuable information that will assist with improving effectiveness of access to those in need.

Assessing the food environment on college campuses and elementary schools, its influences on food choices and body image is important as it identifies opportunities for improvement and begins a planning process for making the college campuses and elementary schools a healthy environment.

FACULTY AND EXPERTISE

FCSE | Family and Consumer Science Education
- Ms. Jessica Azcarate, College Assistant Professor

FSTE | Food Science and Technology
- Dr. Efren Delgado, Professor
- Dr. Sergio Martinez-Monteagudo, Assistant Professor
- Dr. Luis Sabillon-Galeas, Assistant Professor

HDFS | Human Development and Family Science
- Dr. Merranda Marin, Professor, Licensed Psychologist, Licensed Marriage and Family Therapist
- Dr. Marcel Montanez, Professor, Licensed Marriage and Family Therapist
- Dr. Kourtney Vaillancourt, College Professor, Licensed Marriage and Family Therapist (LMFT), Licensed Alcohol, Drug Counselor (LADC), and AAMFT Approved Supervisor

HNDS | Human Nutrition and Dietetics
- Dr. Shadai Martin PhD RDN
- Dr. Karen Plawecki, RD, LDN, Interim Director of Dietetics
- Ms. Gaby Phillips, College Assistant Professor, Dietetic Internship Director

FMAD | Fashion Merchandising and Design
- Dr. Insook Ahn, Assistant Professor
- Dr. Kelley Coffeen, College Assistant Professor

Agricultural Experiment Station

Department of Fish, Wildlife, and Conservation Ecology

fwce.nmsu.edu • 575-646-1544

MISSION

The Department of Fish, Wildlife, and Conservation Ecology is dedicated to natural resource stewardship. They work collaboratively with state, federal, Tribal, and private stakeholders to resolve fishery and wildlife management challenges. FWCE faculty train the next generation of professionals using traditional and emerging scientific methods, and apply this knowledge to the conservation and management of fish and wildlife in New Mexico, the Southwest, and internationally.

Quick Facts

- FWCE has very strong ties to state and federal agencies, with three federal scientists acting as faculty.
- The department trains approximately 150 undergraduates and 40 graduate students and is one of the premier wildlife and fisheries management programs in the southwestern US.
- Faculty and students engage work on diverse issues, including endangered species management, human-wildlife conflict, game and sport fish restoration, understanding playa lake ecology, addressing the impact of forest fires and energy development on wildlife, assessing the impact of wildlife diseases, & mapping animal migrations.
- FWCE research occurs not only in southwestern states, but across the USA and the globe, with recent research addressing wildlife topics in Belize, Brazil, India, Madagascar, Mexico, Namibia, Nepal, Nigeria, Pakistan & South Africa, among others.

The FWCE research program provides innovative solutions to natural resource problems by maintaining a competitive research agenda that results in peer-refereed publications and technical reports that advance our knowledge and enhance the management and conservation of fish and wildlife.

SELECTED PROGRAM IMPACTS

- **Understand the Habitat Suitability for Species Restoration**: Research on species as diverse as the Gila chub (a fish of New Mexico) and the red wolf (a mammal of the southeast US) is being conducted in collaboration with federal and state agencies to better understand where species reintroductions might successfully occur.
- **Which Bighorn Sheep Populations need Conservation Management:** Research with colleagues from the US Fish and Wildlife Service was conducted on desert bighorn sheep to understand the populations that can persist w/o human intervention.
- **Bald and Golden Eagle Sustainable Take Rates:** Research on eagle mortality at wind energy projects resulted in the U.S. Fish and Wildlife Service modifying the eagle permitting process for wind energy facilities.
- **Ensuring Continued Persistence of Rio Grande Cutthroat Trout:** Collaborations with the New Mexico Department of Game and Fish helped identify and save trout populations that were vulnerable to ash and sediment flow following forest fires. These fish were removed from streams prior to sediment run-off and used to population other steam sections in the state.
- **Understanding the Impacts of Disease on Wildlife:** Research on the emergence of Rabbit Hemorrhagic Disease Virus in native cottontails and jackrabbits was conducted to show the extent to which this disease outbreak is affecting these species in southern New Mexico

The College of Agricultural, Consumer, and Environmental Sciences is an engine for economic and community development in New Mexico, improving the lives of New Mexicans through academic, research and Extension programs.

Selected Partnerships and Collaborators

FWCE collaborates with government, nongovernment, and international agencies.

Type(s) of collaboration: **I**: Internships; **H**: Hire students that graduate from our department; **MOU**: A specific memorandum of understanding exists between FWCE and the agency; **R**: Research funded by agency, often supporting graduate students to work on project; **S**: Scholarships

Government Agencies and Organizations

- Arizona Game and Fish Department—R
- Arkansas Game & Fish Commission—R, I
- Bureau of Land Management—I, H, MOU, R
- BOR/Army Corps of Engineers—R
- City of Las Cruces—R
- Department of Defense (Fort Bliss, Kirtland Air Force Base, Fort Irwin – National Training Center; White Sands Missile Range)—R
- Environmental Protection Agency—R
- Mescalero Apache Tribe—R • Mesilla Valley Bosque State Park—R
- Missouri Department of Conservation—R
- New Mexico Department of Game and Fish— I, H, R, S
- National Park Service (White Sands National Park, Valles Caldera National Preserve)—R
- Natural Resource Conservation Service (NRCS)—R
- Texas Parks and Wildlife—R
- US Fish and Wildlife Service—I, H, R, MOU
- US Department of Agriculture – Animal and Plant Health Inspection Service (Wildlife Services)—I, H, MOU, S
- US Department of Agriculture (Agricultural Research Service; Farm Service Agency)—R
- US Forest Service—H, R
- US Geological Survey—H, MOU, R, S

Non-Government Agencies and Organizations (R)

- AmericaView, Inc.
- Envirological Services
- Global Owl Project
- International Arid Lands Consortium
- Kansas City Zoo
- Mesa Ecological Services
- New Mexico and Arizona Audubon Societies
- New Mexico Ornithological Society
- New Mexico Association of Conservation Districts
- Safari Club International
- Southwest Environmental Center
- T & E, Inc.
- The Nature Conservancy
- Trout Unlimited
- Turner Endangered Species Fund
- Wilburforce Foundation

International Agencies (R)

- ProFauna (Mexico)
- Scarlet Six Biomonitoring Team (Belize)

SELECTED PROGRAM IMPACTS (CONT.)

- **Endangered Species Conservation:** Research with collaborating state, federal, and tribal agencies on endangered birds, fish, mammals, reptiles, and invertebrates leads to more efficient survey protocols and a better understanding of how modifications to management approaches can be used to help recover species.

- **Large Mammal Responses to Forest Restoration:** The increase in catastrophic wildfires in the western U.S. over the past two decades has spurred forest restoration projects to reestablish historic forest structures and fire regimes. Researchers are determining the influence of landscape-scale forest restoration treatments on patterns of resource selection by mule deer, elk, black bears, and mountain lions in Northern New Mexico to help land managers determine how best to implement vegetation treatments that will meet forest restoration and wildlife management objectives.

- **Conducting Species Status Assessment:** A Species Status Assessments (SSA) is an analytical approach used to deliver foundational science for informing all Endangered Species Act decisions. The drafting of an SSA for the alligator snapping turtle is being conducted for the US Fish and Wildlife Service, and similar work is being conducted to inform the management of species such as kestrels and rails.

- **Ecology of State Endangered Small Mammals:** FWCE faculty are researching the ecology of state endangered small mammal species to aid in the development of management plans and to forestall federal protections under the Endangered Species Act.

FACULTY AND EXPERTISE

- **Wiebke J. Boeing**, Professor, aquatic communities and algae as biofuel James
- **W. Cain III,** Affiliate Associate Professor, wildlife-habitat relationships and large mammal ecology
- **Colleen A. Caldwell,** Affiliate Professor, fish conservation, aquatic ecology, fish physiology, aquatic toxicology
- **Martha J. Desmond**, Regents Professor, avian ecology and conservation
- **Jennifer K. Frey,** College Professor, mammalian diversity and conservation
- **Fitsum Abadi Gebreselassie,** Assistant Professor, capture-recapture models, integrated population models, Bayesian inference
- **Jay Gedir**, Senior Research Scientist, vertebrate population dynamics, raptor demographic modeling
- **Matthew E. Gompper**, Department Head and Professor, mammal ecology, management and conservation; disease ecology and zoonoses
- **Zachary Klein**, Assistant Professor, fish ecology and conservation, fisheries management, population ecology
- **Theresa Laverty**, Assistant Professor. Wildlife ecology and conservation, bat ecology, social dimensions of conservation
- **Abigail Lawson**, Affiliate Assistant Professor, population ecology, harvest modeling, endangered species, ornithology, herpetology

New Mexico State University is an equal opportunity / affirmative action employer and educator. NMSU and the U.S. Department of Agriculture cooperating.

Agricultural Experiment Station

Department of Plant and Environmental Sciences

pes.nmsu.edu • 575-646-3405

MISSION

The Department of Plant and Environmental Sciences is committed to providing an outstanding education through classroom and individualized instruction, as well as through hands-on, real-world learning in internships, externships, experiential class projects and employment in the department.

Quick Facts

- Over the past five years, PES faculty have published more than four books and 400 refereed journal articles, and have had five papers appear as cover articles on scientific journals.
- The department is home to many research and outreach programs, such as the alfalfa, chile, cotton, and onion breeding programs; the State Climatology Office; and the Partnership for the Advancement of Cancer Research.
- PES's award-winning faculty have received 60 academic awards and 10 service awards, released 111 cultivars, and been awarded four patents. The department has two Regents Professors and four endowed chairs. Over the last three years, faculty have attracted nearly $8 million in external grants and contracts.

The Department of Plant and Environmental Sciences has experienced and internationally recognized faculty with varied specialties, including plant breeding, genetic engineering, biotechnology, ornamental plant production, landscape design, horticulture, turfgrass management, sustainable crop production, soil remediation and environmental science.

SELECTED PROGRAM IMPACTS

- Declining irrigation water resources and increasingly variable climate are threatening sustainability of Ogallala Aquifer irrigated agriculture in the Southern Great Plains. Circular buffer strips improved rainfall conservation, reduced crop stress, improved biomass production and improved rainfall water use efficiency. Benefits of circular buffer strips depended on rainfall intensity.
- Improving the availability of soil survey data and knowledge to address persistent and on-going resource use needs of New Mexican's requires novel and efficient methods of soil survey. This research is foundational for stewards of all natural and working land in NM including federal and state land managers, agricultural producers, private ranchers and foresters, and the NMDA Healthy Soil Program by providing the baseline information necessary to assess site-specific land management decisions such as grazing intensity, brush management, or livestock rates.
- The hyporheic zone within streambeds is the biogeochemical reactor of streams controlling nutrient cycling, habitat selection and suitability, and primary production and respiration. However, mapping methods for spatial interpolation under data-limited conditions can be challenging, especially for constrained environments such as streams and rivers, which exhibit mapping errors due to low point-measurement data density and clustering. Adding left censored data increased the data density to recommended ranges, reduced data clustering, increased the spatial dependence for some attributes, and reduced the standard error for each of the three attributes. Now, hyporheic zone mapping can be more accurately used to assess nutrient management and ecosystem functioning of streams even in locations with lower data density, and data collection costs are decreased with decreased data density. This will allow better management of water resources, water quality, and ecosystems.

The College of Agricultural, Consumer, and Environmental Sciences is an engine for economic and community development in New Mexico, improving the lives of New Mexicans through academic, research and Extension programs.

Faculty and Staff

Agronomy and Soils
- Colby Brungard
- John Idowu
- Koffi Djaman
- Kulbhushan Grover
- Leonard Lauriault
- Mark Marsalis
- Murali Darapuneni
- Rajan Ghimire
- Robert Flynn
- Sangamesh Angadi
- Steven Guldan

Environmental Science
- April Ulery
- Blair Stringam
- Brandon Edwards
- Caitriana Steele
- David DuBois
- F. Omar Holguin
- Jacqueline Jarvis
- Kenneth C. Carroll
- Manoj Shukla
- Niall Hanan
- Nicholas Webb
- Nicole Pietrasiak
- Owen Burney
- Rajan Ghimire

Genetics and Biotechnology
- Champa Gopalan
- Christopher Cramer
- Ian Ray
- Jinfa Zhang
- Laura Rodríguez-Uribe
- Naveen Puppala
- Paul W. Bosland
- Richard C. Pratt

Horticulture and Turf Science and Management
- Bernd Leinauer
- Geno Picchioni
- Ivette Guzmán
- Kevin Lombard
- Marisa Thompson
- Rachel Gioannini
- Richard Heerema
- Rolston St. Hilaire
- Ryan Goss
- Shengrui Yao
- Stephanie Walker
- William Giese

SELECTED PROGRAM IMPACTS (CONT.)

- Faculty identified potential opportune crops to replace fallow in the current cropping system. Introducing these crops will not only increase the overall productivity per unit area but also improve the resource use efficiency, such as water and soil nutrients. Pearl millet, German millet, proso millet, cowpea, and sesbania are some of the potential species with consistently greater yields and water use efficiencies.

- Water management is one of the most pressing issues turfgrass managers face in the arid regions of the world and periodically in temperate regions. The results of this research provide turfgrass managers a decision making tool to determine which herbicides should be applied to maximize herbicide efficacy on weeds and minimize herbicide injury to desired turfgrasses. These tools have been utilized by NM golf course and athletic field managers to protect their desired turfgrass stands from herbicide injury and ensured herbicide applications were made to maximize efficacy based on plant water status.

- Best management practices arising from multiple years of trials with guar and guayule are being shared with producers in the state. Demonstration trials at different locations in New Mexico have been used to explain important production practices to farmers. Growing guar and guayule as industrial crops in New Mexico can diversify the income of farmers and provide much-needed support towards economic and cropping systems sustainability.

- Acreage for the New Mexican chile crop has decreased 73% in the last 25 years. A three-pronged strategy was developed to increase competitiveness of NM type green chile through mechanization. Regaining lost NM type green chile acreage will result in approximately $70 million additional cash receipts for New Mexico growers.

SELECTED PARTNERSHIPS AND COLLABORATORS

- Alforex Seeds
- Bureau of Land Management
- Cotton Incorporated
- Dow AgroSciences
- U.S. Forest Service
- Fred Hutchinson Cancer Research Center
- J. Frank Schmidt & Son Nurseries
- Local farmers
- National Cancer Institute
- New Mexico Acequia Association
- New Mexico Chile Growers Association
- New Mexico Environment Department
- Oak Ridge National Laboratory
- USDA–ARS, USDA–NRCS
- Other universities, including Arizona State University, University of California, and the University of Arizona

Agricultural Experiment Station

School of Hotel, Restaurant and Tourism Management

hrtm.nmsu.edu • 575-646-5995

MISSION

The mission is to serve the needs of our constituents as an engine for economic growth and community development in New Mexico through innovative teaching, research, service, professional applications, and partnerships in a multi-cultural and international environments.

QUICK FACTS

- Visitors to New Mexico spent $7.4 billion in 2019, which generated $10.4 billion in total business sales, including indirect and induced impacts and after two disappointing years, 2022 in on track to pass 2019 according to the Department of Tourism.
- Tourism's prominence is illustrated by Santa Fe being the best travel destination in the world and the #1 attraction in the USA for 2022 by Forbes Magazine.
- The deep space food research initiative will grow New Mexico Fairy Shrimp from the playa lakes.

SELECTED PROGRAM IMPACTS

Robotics and Hospitality | Economic and Community Development

Traditionally a people industry, the hospitality industry is becoming increasingly automated. The pandemic has accelerated automation with the need for contactless services. Dr. Betsy Stringam's leadership in several projects assists in successful implementation of automation and technology for the hospitality industry. As part of an NSF funded large multi-university and entity project, Dr. Stringam is helping to prepare workers and workplaces for increased technology and automation. Dr. Stringam also leads the Sodexo/KiwiBot collaborative project examining the implementation of food delivery robots. Dr. Stringam's inclusion of both undergraduate and graduate students in these projects prepares future leaders.

Facilities Management Podcast Series |Foundational Education and Training, Economic and Community Development

As Board President of the Hospitality Council of the International Facility Management Association (IFMA), Daren Bloomquist produces podcasts interviewing industry leaders regarding current facility management topics. Each podcast is distributed to 86 professional members of the council including 25 members from 15 different countries around the globe. The first podcast this summer ("Bringing Hospitality to Facilities Management...An interview with Jeffrey Buck of RedHat, Inc.") generated 58 views and the second podcast on December 2 ("Robotics in Hospitality Facilities Management... with Richtech Robotics".) has already generated 35 views. Producing the podcasts also reinforces current lectures and provides new lecture topics and future presentations for students in HRTM's required HRTM 430 Facilities Management course.

Rural Tourism |Food and Fiber Production and Marketing, Economic and Community Development

Promoting research in hospitality and tourism. Dr. Keith Mandabach successfully submitted a new a Hatch Project: Supporting and Sustaining Independently Owned New Mexican Rural Tourism Business Operators. The project is in the initial needs assessment and was presented at a regional (112 attendees), industry (800 attendees) and university conferences (400 attendees). He authored a related book chapter for the Routledge Handbook of Wine Tourism, "Integrating Wine Tourism in the Rural Tourism Experience" which was accepted and soon to be published.

The College of Agricultural, Consumer, and Environmental Sciences is an engine for economic and community development in New Mexico, improving the lives of New Mexicans through academic, research and Extension programs.

Selected Partnerships and Collaborators

- American Culinary Federation
- American Hotel and Lodging Association
- Center for the Advancement of Foodservice Education
- El Paso Hotel and Lodging Association
- Greater Albuquerque Hotel and Lodging Association
- International Council of Hotel, Restaurant and Institutional Educators
- Las Cruces Chamber of Commerce
- New Mexico Beef Council
- New Mexico Hospitality Association
- New Mexico Restaurant Association and National Restaurant Association
- Visit Las Cruces and its Industry Partner Group New Mexico Department of Agriculture

Employers Recruiting HRTM Students and Graduates

- 4UR Ranch
- Atrium Hospitality
- Courtyard by Marriott Las Cruces Enterprise
- Hormel Foods
- Hotel Encanto
- Hyatt Regency Tamaya Resort and Spa Jason's Deli
- Labatt Food Service
- Las Cruces Convention Center
- Marriott International
- National Distributing
- North Fork Ranch & Fishing Lodge
- Out West Restaurant Group/Outback
- Pappas Restaurants
- Plaza Hotel Pioneer Park
- Salud! De Mesilla
- Sun Capital Hotels
- Sun Travel
- Xanterra Travel Collection

SELECTED PROGRAM IMPACTS (CONT.)

Deep Space Food Project |Food and Fiber Production and Marketing

NMSU researcher, Pete Mitchell, participates in the NMSU research team consisting of engineering, aquatic environment, food science and hospitality professors. The project is sponsored by Virgin Galatic to enhance their space tourism and sustainable foods on site. This team created a bioreactor to grow aquatic foods on a deep space flight. Once these foods have grown, the food is cooked into a space steak with a waffle iron-type cooking device. The first phase was to design the food-making equipment, now in the second phase, the group is in the experimentation of the processes to grow and cook the space steaks.

DEPARTMENT VALUES

- Providing excellence in instruction in a broad-based hospitality and tourism curriculum.
- Preparing students to enter and advance in their chosen professions.
- Developing effective and ethical management skills that cultivate a diverse and high-performing hospitality and tourism workforce.
- Researching to add to the HRTM body of knowledge.
- Sharing knowledge with students, the industry, and the community to improve individuals and organizations.
- Providing professional service and leadership to stakeholders.

FACULTY AND STAFF EXPERTISE

Jean Hertzman: Director and Professor
- Hospitality and food service operations
- Culinary, wine, and beverage education

Daren Bloomquist: College Assistant Professor
- Sustainable facilities management
- Marketing and tourism

Christina Dimitriou: Assistant Professor
- Tourism and hospitality operations
- Ethical leadership

Keith Mandabach: Professor
- Rural and culinary tourism
- Restaurant and bar management
- Higher Education Assessment

Pete Mitchell: College Assistant Professor
- Culinary arts and restaurant management
- Food safety

Betsy Stringam: Professor
- Educational technology
- Hotel and resort management
- Robots in hospitality

Andrea Arrigucci: Program Coordinator, Marriott Hospitality Futures Center
- Professional development
- Communications and social media

Cassy Salvatti: Program Assistant, Marriott Hospitality Futures Center

New Mexico State University is an equal opportunity / affirmative action employer and educator. NMSU and the U.S. Department of Agriculture cooperating.

We thank you for your ongoing support of the Agricultural Experiment Station.

Dr. Leslie D. Edgar
Associate Dean and Director
Agricultural Experiment Station
(575) 646-1138
ledgar@nmsu.edu

Brooke Boren
Director, Land & Assets
Facilities & Maintenance and
Financial Operations
Agricultural Experiment Station
(575) 646-7983
brookeb@nmsu.edu

Rebecca Martinez
Operations Manager
Agricultural Experiment Station
(575) 646-3125
rbanegas@nmsu.edu

Dr. Lara Prihodko
Interim Associate Director
Research Development and Progress
Agricultural Experiment Station
(575) 646-6134
prihodko@nmsu.edu

Claire Montoya
Director, Communications & Reporting
Agricultural Experiment Station
(575) 646-1123
ccortner@nmsu.edu