NM STATE

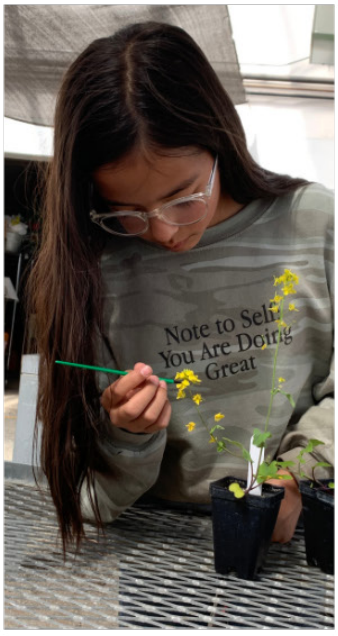
College of Agricultural, Consumer and Environmental Sciences
New Mexico State University

2023 Annual Report









NM STATE

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






Preamble

The College of Agricultural, Consumer, and Environmental Sciences (ACES) experienced great accomplishments in 2023, including the opening of our new agricultural facilities for Food Science, Security and Safety, and Animal Nutrition and Feed Manufacturing. This annual report describes the year's work, including impacts, productivity and goals for each unit, area and program. As always, our college's success in teaching, research and extension is made possible by students, staff, faculty, and community members who work together to achieve objectives on campus, at each of the science and research centers, and in every county of New Mexico. We take pride in this teamwork and cherish our role as the land grant institution for all New Mexicans.

Rolando A. Flores Galarza
Dean and Chief Administrative Officer
College of Agricultural, Consumer
and Environmental Sciences
New Mexico State University

Special Thanks

We gratefully acknowledge the combined efforts of the College of ACES, faculty, staff and students, as well as the 2023 ACES Annual Report Committee, including: Amy Muise, Cherylin Atcitty, Claire Montoya, Efren Delgado, Jay Lillywhite, John Campbell, Julie Hughes, Karim Martinez, Laura Bittner, Manoj Shukla, Marcus Krohn, Shelby Herrera, Yesenia Palma, Heber Lara, Karlei Olivarez, and LaJoy Spears.

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ACES Mission

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

ACES Executive Summary, 2023

Our college continued to advance its mission in 2023, with a focus on the ACES pillars: Food & Fiber Production and Marketing, Water Use and Conservation, Family Development and Health of New Mexicans, and Environmental Stewardship. Academic Programs focused on ongoing efforts to recruit, retain, and prepare ACES graduates for success, through improving student and prospective student customer service, creating a conducive learning environment, and supporting student and faculty achievement. The Agricultural Experiment Station on the main campus and on 12 science centers and research centers advanced research addressing critical issues for New Mexico's varied geographical and environmental conditions, including agrivoltaics, virtual fencing, smart feeding systems, weather stations, and carbon management and soil health. The Cooperative Extension Service continued to meet needs around the state, with a focus in 2023 on efforts related to agriculture and natural resources, positive youth development, community development and the health and wellness of New Mexico families. Extension staff in all 33 counties and many Tribal areas provide communities with effective leadership and collaboration to foster economic, educational, and community development. The Anna, Age 8 initiative saw several counties lay the groundwork in 2023 to establish a 100% Family Center: One-stop Service Hub in their county, as well as coordinate on the effort to provide school-based family services to meet the needs of. The Center of Excellence in Sustainable Food and Agricultural Systems coordinated and encourage interdisciplinary teaching, research, and outreach, with a focus in 2023 on post-harvest valued-added agriculture. The Equity, Diversity and Inclusion (EID) Initiative coordinated and managed strategic activities related to EID on behalf of ACES while serving as a liaison to related campus-wide initiatives. Indian Resources Development (IRD) opened offices in Taos and Gallup in 2023 to better serve tribal nations in the Northern and Western regions of New Mexico, increased partnerships and collaborations to meet the current and future needs of tribal nations. Finally, Aggies Global Program and Aggies Go Global continued efforts to afford every student within the College of Agricultural, Consumer, and Environmental Sciences an enriching international experience before they graduate.

2023 ACES Awards

The ACES Awards Selection Committee voted on the 2023 faculty and staff nominations that were submitted for our distinguished awards. The award winners are listed below.

ACES Team Award
Living Well With Inflation
Team Members: **Beatriz Favela, Bryce Jorgensen, Desaree Jimenez, Dianne Christensen, Joy Czmyrid, Richard Griffiths, and Susann Mikkelson**

Charles Tharp Farms Distinguished Service Award
Shanna Ivey

Distinguished County Extension Agent Award
Beatriz Favela

Distinguished Cooperative Extension Agent Award
Mindy Turner

Distinguished Professional Staff Award-On Campus
Ruba Mohamed

Distinguished Professional Staff Award-Off Campus
Shad Cox

Distinguished On Campus Staff Award (non-exempt)
Liz Lopez

Distinguished Teaching Award
Early Mid-Career - **Rachel Gioannini**

Leyendecker Agriculturist of Distinction Award
Kim O'Byrne

Malone Farms Distinguished Off Campus Staff Award (non-exempt)
Janice Bernal

Mobley Family Endowed Distinguished Research Award
Research Early/Mid-Career: **Sergio Martinez-Monteagudo**
Research Advanced/Senior Career: **Shengrui Yao**

North American Colleges & Teachers of Agriculture (NACTA) Teaching Award
Pete Mitchell

Outstanding Global Work Award
Manoj Shukla

Awardees selected by the Departments:

Family & Consumer Science Industry Award
Willis Fedio

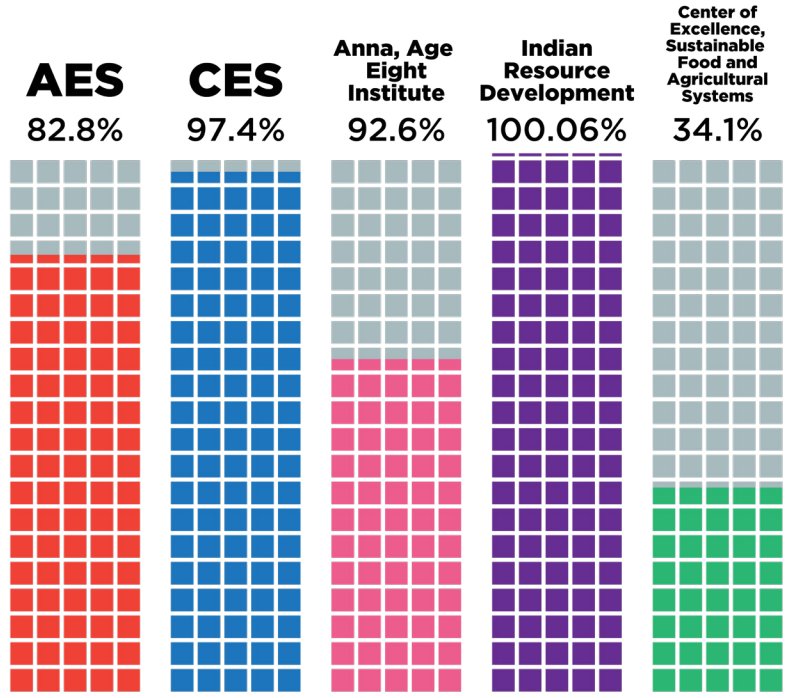
Outstanding Family & Consumer Science Teacher Award
Dianne T. Kemp

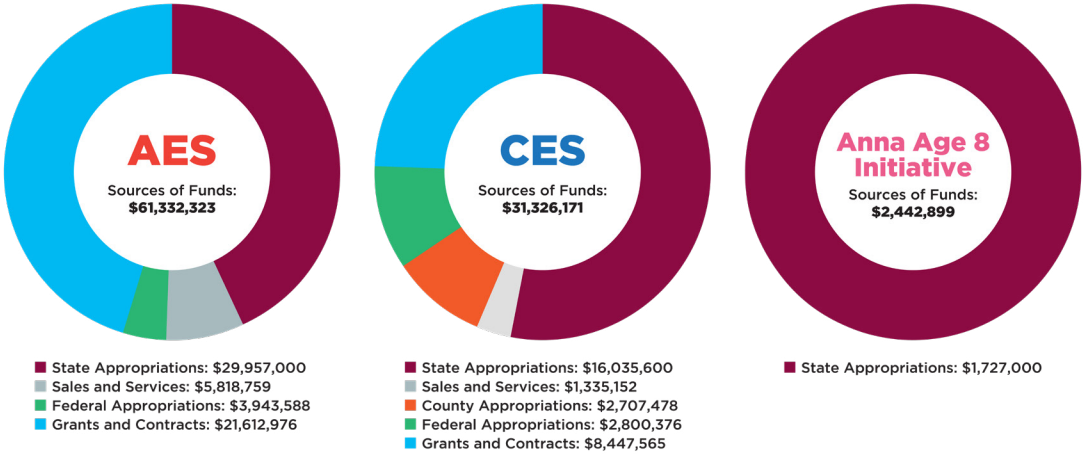
Outstanding 4-H Agent Award
Talisha L. Valdez

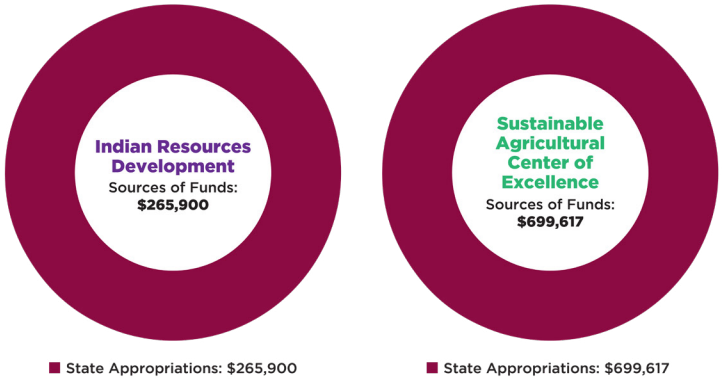
School of HRTM Industry Leadership Award
Mark Burden

College of ACES

Report of Actuals
Las Cruces Campus FY2022-2023

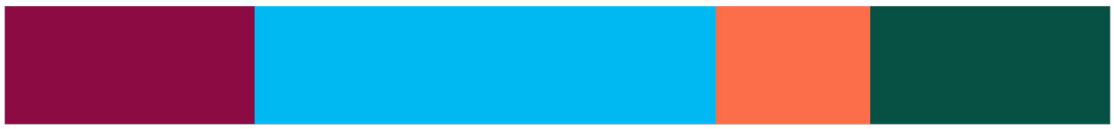






*Includes Funds for Future Reforestation Center

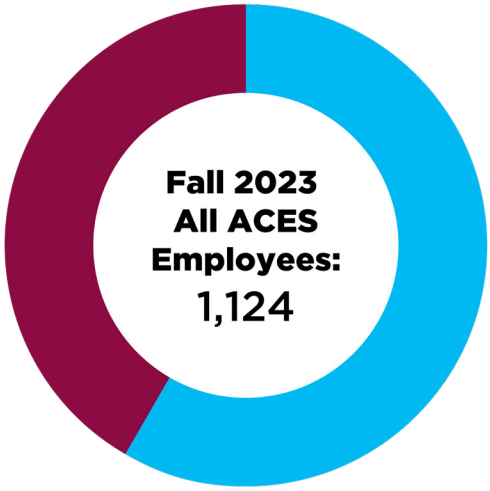
College of ACES
Employee Demographics



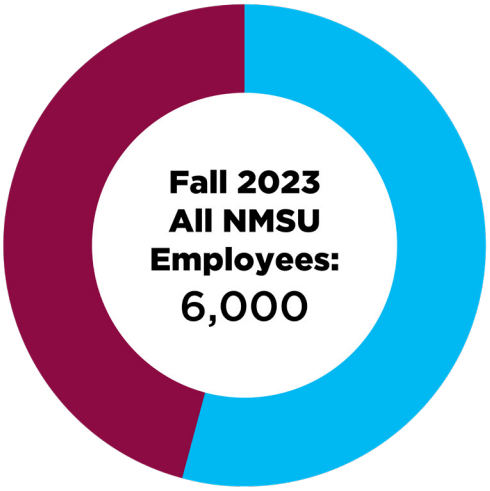
Faculty: 254 (22.6%) | Staff: 469 (41.73%) | Graduate Assistant: 157 (13.97%) | Student Employee: 244 (21.71%)

NMSU
Employee Demographics

Faculty: 1,115 (18.58%) | Staff: 2,453 (40.88%) | Graduate Assistant: 933 (15.55%) | Student Employee: 1,499 (24.98%)



Female: 658 (58.54%)
Male: 466 (41.46%)



Female: 3,252 (54.2%)
Male: 2,748 (45.8%)

College of ACES
Employee Demographics

American Indian: 37 (3.47%) | Asian: 22 (1.96%) | Black / African American: 20 (1.78%) | Hispanic: 389 (34.61%) | Non Resident Alien: 110 (9.79%) | Two or More Races: 19 (1.61%) | Unknown: 16 (1.42%) | White: 509 (45.28%)

NMSU
Employee Demographics

American Indian: 90 (1.5%) | Asian: 171 (2.85%) | Black / African American: 101 (1.68%) | Hispanic: 2,585 (43.08%) | Non Resident Alien: 635 (10.58%) | Two or More Races: 113 (1.88%) | Unknown: 95 (1.58%) | White: 2,210 (36.83%)

Executive Summary

In 2023, the Academic Programs office remained focused on strategic areas such as student recruitment, retention, preparation, and placement. Our accomplishments were successful in these areas through initiatives such as improving student and prospective student customer service, creating a conducive learning environment, and supporting student and faculty achievement. These efforts were in line with the mission of the ACES Academic Program Office and aimed to enhance the College's academic offerings. Research was conducted to assess the academic portfolio, identify challenges and opportunities, and devise strategies to tackle issues like changing demographics and workforce requirements. Looking ahead to 2024, efforts will be dedicated to continually growing the future of ACES Academics and developing strategies to realize this vision.

Accomplishments in 2023

Support of NMSU Strategic Goal #1: Enhance Student Success and Social Mobility

Leadership and commitment were instrumental in fostering an environment conducive to the success of all students and faculty. In order to sustain a positive academic climate, a primary focus of our office, it was crucial for advancing the College's academic mission. Clear expectations regarding the ACES academic environment were communicated and demonstrated consistently, both proactively and reactively. The primary drive remained the success of ACES students and faculty. During 2023, efforts were directed towards enhancing knowledge and expertise to better serve ACES' needs. Additionally, connections with prominent academic and professional organizations such as MANRRS, Agriculture Future of America, AgCareers.com, Together We Grow, APLU, and the JED Foundation were strengthened to further support this goal. Contributions in this regard were significant accomplishments in 2023.

Support of NMSU Strategic Goal #3: Amplify Extension and Outreach

Through our FFA – Agricultural Education and NMSU Rodeo programs housed within the AP office, significant achievements were accomplished. Participation of high school students in FFA continued to exceed expectations, with over 5,000 students statewide, highlighting the expanded offerings and impact of these youth programs. In 2023, the NMSU Rodeo teams demonstrated remarkable success, with both the women's and men's teams securing first place in the Region. The rodeo team is also continually growing and developing their practice facilities, working to establish new and larger events, and has now re-established a Rodeo Booster Club.

Support of NMSU Strategic Goal #4: Build a Robust University System

ACES-APO implemented enhancements to student registration and audit procedures, streamlined the scholarship award process for improved timeliness in award decision making and distribution, initiated an assessment of our College's academic portfolio, oversaw the management of the College's promotion and tenure system, and contributed to the development of the new Ag Modernization Phase 1 and 2 facilities. The ongoing focus of ACES-APO remains on delivering excellent customer service to support an environment within the College where students, faculty, and staff can thrive.

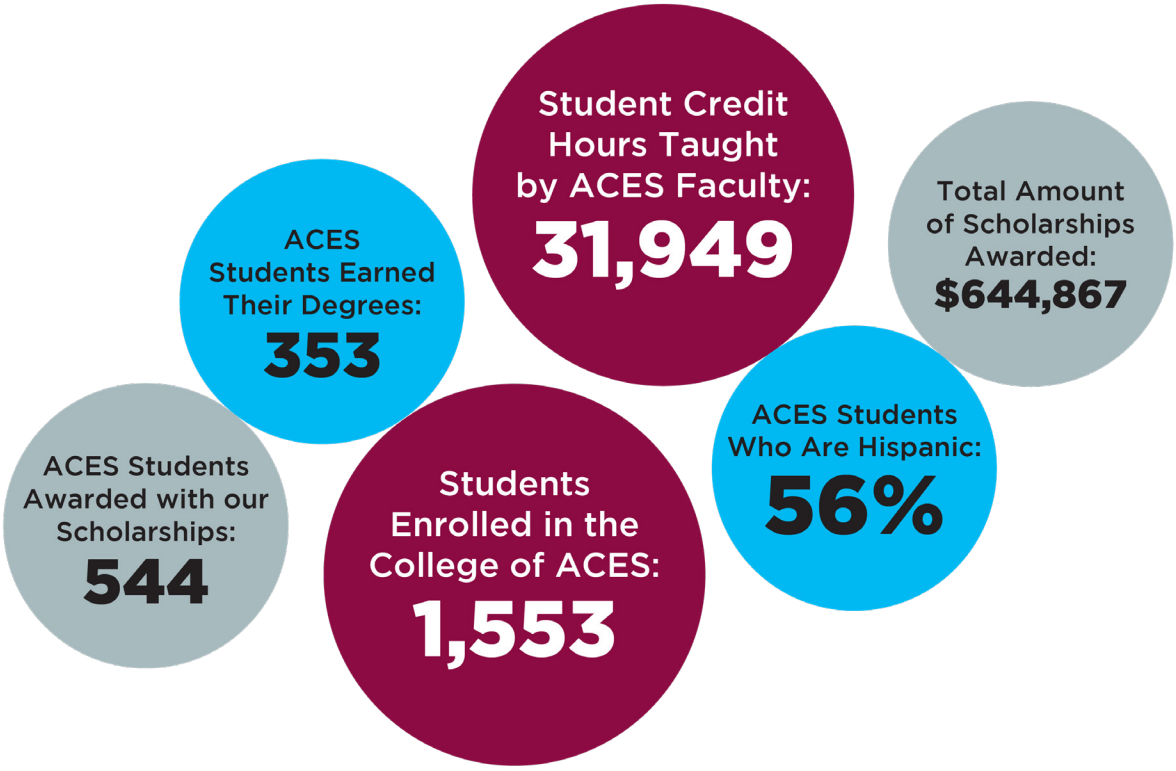
Support of NMSU Strategic Goal #5: Build an On-Line Campus

ACES-APO worked with each department in the College to continue assessing opportunities to develop impactful NMSU-Global programs. Of note, a new PhD program focusing on the Human Dimensions of Agriculture was developed and was revised for submission in 2024. The College also named a new NMSU-Global Program Coordinator to facilitate development of new on-line programs in the College and to liaison with the NMSU-Global leadership. This Coordinator will start in January 2024.

Support of NMSU Strategic Goal #6: Build, Elevate, and Strengthen Sustainable System-wide Equity, Inclusion and Diversity Practices.

In response to concerns about the annual ACES Welcoming Ceremony, significant changes were made this year to better reflect the College's commitment to Equity, Inclusion, and Diversity (EID) values and continue to make all students feel truly at home in the College. Additionally, a successful chartering of a MANRRS chapter within ACES was achieved with students already attending the MANRRS National Conference. Collaboration with the Graduate School and ACES departments continued to address the NIFA Civil Rights audit regarding graduate programs, which led to revisions in catalog wording related to ensuring equitable admission processes for graduate students.

By the Numbers



Academic Updates

AEAB:

The NMSU NAMA team created a marketing plan and competed with a new and innovative salsa product branded as Badlands Salsa at the 2023 National Agri-Marketing Student Competition, and brought home a first place win!

ANRS:

Enrollment in 2023 was up 5%, reaching the highest ANRS enrollment since 2020. Participation in multiple USDA Next Gen grants continues to benefit and grow HSI representation. One grant includes a 5-year program which creates pathways for students from high schools to progress through undergraduate and graduate programs and into agriculture-related careers.

AXED:

Dr. Shannon Norris-Parrish and Dr. Steve Fraze and the AXED Department will join the ANRS department in one of the USDA Next Gen grants to continue to benefit and grow our HSI representation.

EPPWS:

Reached students across campus with EPWS 325V Insects, Humans, and the Environment as a Viewing the Wider World course, with 887 NMSU students taking this class last year.

FCSC:

Developed and submitted a proposal for a PhD in Food Science, which is progressing well through the approval process.

FWCE:

Continued work on a consortium agreement between NMSU and the US Fish & Wildlife Service, which will provide federal employment opportunities for Hispanic students.

HRTM:

Received a $500,000 USDA NIFA AFRI Grant for Professional Development for High School Teachers: Connecting Culinary Arts and Hospitality Management with Sustainable Agricultural Systems. Recruited and taught the first cohort of students in the first online course for the program.

PES:

The PES Department leads the College of ACES in Graduate Student education, with 43 students.

Support of our Land-Grant Missions

ACES-APO collaborated with CES to raise awareness of ACES academic programs throughout the state by engaging county offices and personnel in recruitment efforts and events. Various promotional materials such as newsletters, posters, postcards, and other media were drafted with plans for deployment in early 2024. Additionally, ACES-APO provided support for 4-H Aggie Next Steps programs and field trips as needed. Efforts were also made to address graduate student concerns in collaboration with AES, particularly in ensuring compliance with the graduate Collective Bargaining Agreement (CBA).

Support of CESFAS

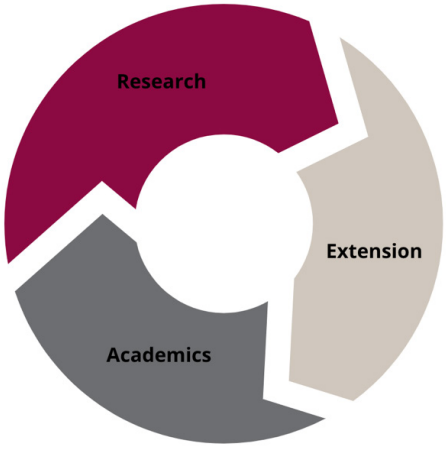
The Food Science PhD program was submitted for approval and made significant progress. Additionally, collaboration with Hanover Research facilitated ongoing evaluation of our curricula and marketing efforts, particularly those related to natural resources and value-added programs, which align closely with CESFAS priorities.

Looking Ahead

A primary objective for 2024 will be to craft a vision and strategy aimed at positioning ACES Academics for future success and impact. To pave the way for this goal, in 2023, four studies were initiated through collaboration with Hanover Research. These studies, which included Academic Portfolio Optimization, Benchmarking Analysis, Marketing Position Analysis, and Brand Perception Survey, have since been completed, providing essential data to inform decisions in pursuit of the 2024 objective. The insights gleaned from these studies, combined with resources from NMSU, have furnished valuable information crucial for shaping the College's direction for our academic programs. Leading and overseeing these studies represents a significant achievement, contributing to the advancement of ACES's academic endeavors.

Executive Summary

A key component of every land-grant university is the Agricultural Experiment Station (AES). The AES system includes scientists on NMSU's main campus and at 12 agricultural science and research centers. Each agricultural science and research center serves as an outdoor research facility and is representative of 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.



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 Science Centers

- 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
- 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

Agricultural Experiment Station

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

Welcome to New Faculty Researchers who Started in 2023!

We look forward to seeing their contributions to the College of ACES that will have a regional, national, and global impact.

Francine Mezzomo Giotto

Assistant Professor in Animal and Range Sciences, Extension Animal Science and Natural Resources, and Family and Consumer Sciences

Anowar Islam

Academic Department Head of Plant and Environmental Sciences and Extension Plant Sciences

Theresa Laverty

Assistant Professor in Fish, Wildlife, and Conservation Ecology

Ricardo Ramirez

Academic Department Head of Entomology, Plant Pathology & Weed Science

Saeid Zehtab Salmasi

Associate Professor in Plant and Environmental Sciences and Research Director of the Sustainable Agricultural Science Center in Alcalde

Agricultural Science and Research Centers

Sustainable Ag Science Center at Alcalde: Located in north-central New Mexico to serve as a resource for small-scale producers (most farms in the area are under 100 acres). Research programs focus on native and high value crops for sustainable, climate-smart agriculture including jujube cultivars, saffron, cover cropping in winter and spring, and acequia irrigation.

Artesia Ag Science Center: Located in the heart of ag production for southeast NM and plays an instrumental role in solving issues facing producers in the area. Research is focused on soil issues as it pertains to fertility and water salinity at the forefront of pest infestations. In the near future, the ASC plans to add hydrology and water ecology as an additional focus.

Chihuahuan Desert Rangeland Research Center: The facility is utilized by NMSU faculty, students, and collaborators for conducting research in the use of novel ranching technologies, rangeland management, and ecosystem health. With a focus on providing knowledge from research to livestock producers and natural resource managers for the improvement of ranching operational efficiencies, rangeland monitoring, and ecosystem services.

Clayton Livestock Research Center: Sustainable beef production focusing on health, carbon, and profitability growing through harvest. One of the largest university feedlots in the nation with group and individual animal intake capability.

Clovis Agricultural Science Center: The research at ASC Clovis focuses on on multiple conservation and regenerative farming practices that improve soil health and water use efficiency in various crops and cropping systems while meeting the needs of local dairy and grain crop producers,

Corona Range and Livestock Research Center: A working ranch research facility with a focus on sustainability. 39 wind turbines are installed and operational in partnership with Pattern Energy.

Farmington Ag Science Center: Weather in the Four Corners region is variable due to a high elevation of >5,600 ft, intermountain climate, and research at this center focuses on adaptability of crop varieties and cropping systems fitting its shortened growing season. A unique partnership with the Navajo Agricultural Products Industry (NAPI) provides a strong connection to local agricultural producers and regional cultural values.

Fabian Garcia Research Center: The Center supports a diverse variety of agricultural research focusing on sustainability, water-wise agriculture, and advancing agriculture technology in the chile peppers, onions, alfalfa, viticulture, algae for biofuel, and many other crops.

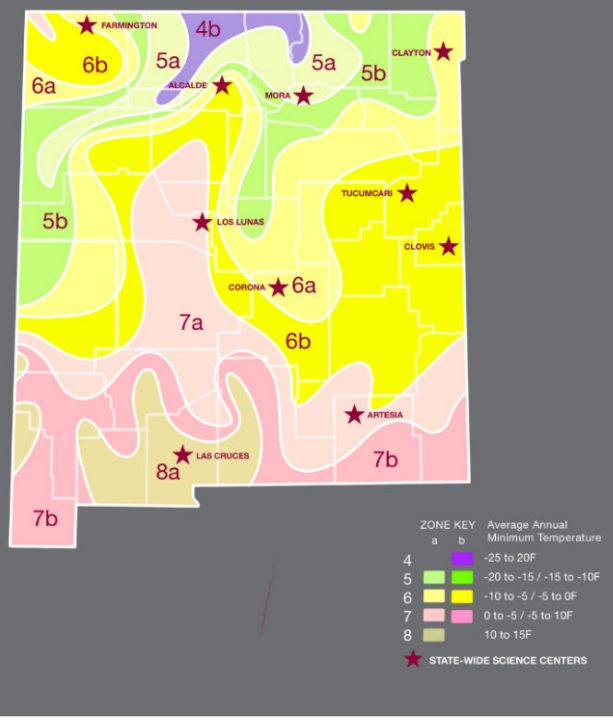
Leyendecker Plant Science Center: Issues being addressed include irrigation management in various cropping systems, agrovoltaics in vegetable production, soil health management, weed management, management of plant diseases, breeding of crops for higher yields and environmental resilience, and the development of alternative crops.

Los Lunas Agricultural Science Center: Near Albuquerque in central New Mexico and within the middle Rio Grande agricultural region, this location allows for specialized programs in small farming and urban horticulture. Research focuses on tomatoes, chile peppers, cover crops, tree fruits, forage crops, and experimental wine and table grapes.

John T. Harrington Forestry Research Center at Mora: The only research center in the southwest US focusing on forest nursery technologies, tree improvement, and ecophysiology of young forest trees to facilitate ecological restoration.

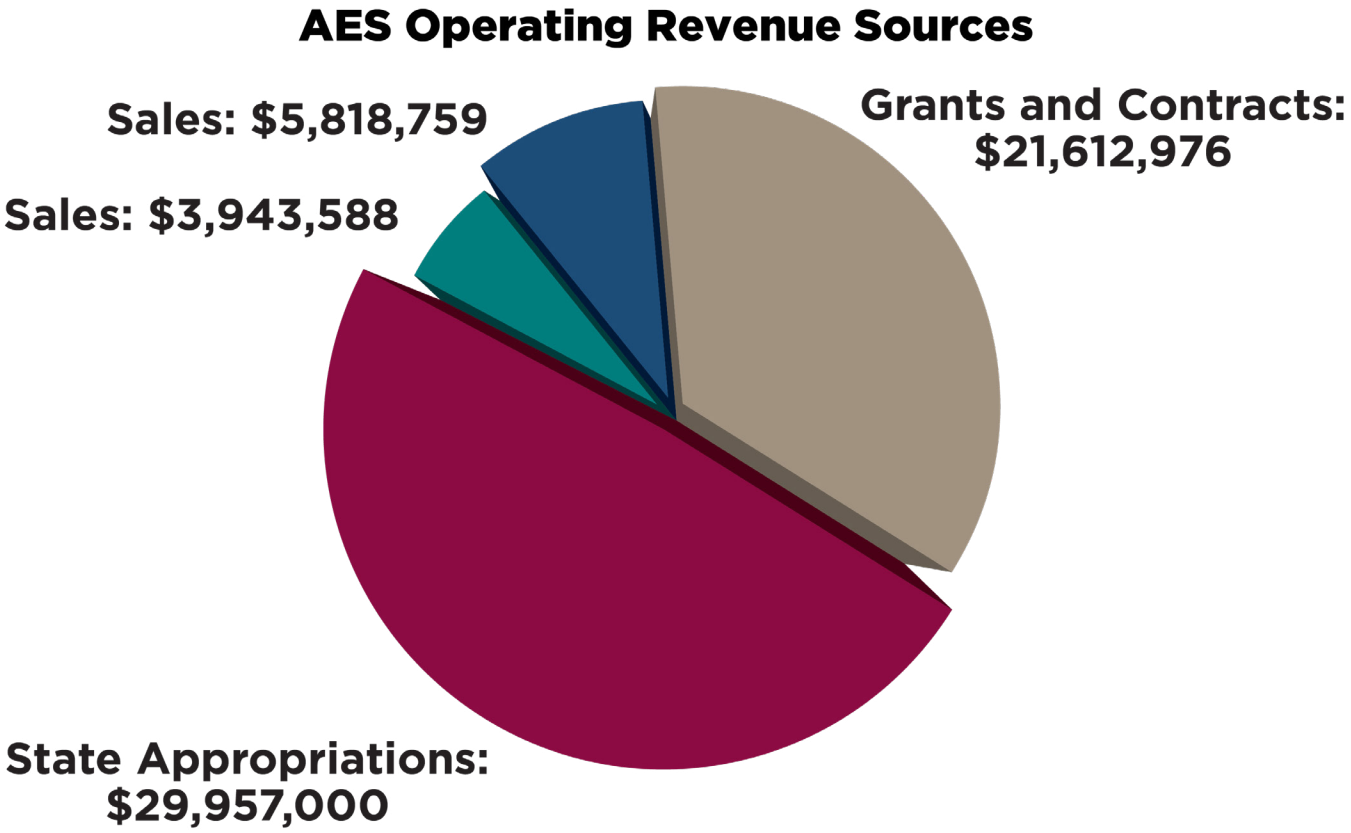
Rex E. Kirksey Ag Science Center at Tucumcari: One of the few centers with the capability to conduct both crop and livestock research. Research focuses on irrigated and dryland cropping systems, including the use of treated municipal wastewater for agricultural irrigation, and beef cattle feed for efficiency testing to improve New Mexico's beef herd genetics.

AES Agricultural Science Centers (ASC) are strategically located throughout the state to conduct research in various climate zones. New Mexico is unique, with three crop production regions, ten plant hardiness zones, five 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.



2023 AES Funding Sources

The total amount of operating revenue for AES in 2023 was $61.13 million. The College of ACES continues to lead NMSU in grants awarded and expended; ACES personnel work hard to ensure New Mexico's investment in AES is matched by more than a 1:1 ratio. The increase in state appropriations is due to NMSU being the fiscal agent for the New Mexico Reforestation Center, which was allocated $8.5 million in FY24 for the first phase of establishing the center. In addition, NMSU AES was allocated $1.5 million for state-wide revegetation efforts.



AES Ongoing Research Initiatives and Special Projects

ZiaMet Mesonet Weather Station:

Operated by New Mexico State University's AES, the ZiaMet MesoNet Weather Station consists of 215 weather stations around the state. Data from these stations is used by farmers for crop irrigation, crop planting, and determining optimal conditions for pesticide applications. The data also supports gaps in the National Weather Service data, which often leaves out parts of rural New Mexico.

Agrivoltaics:

Agrivoltaics refers to the collocation of solar panels (photovoltaics) with agriculture. The goal for agrivoltaic systems is to maintain and hopefully enhance agricultural productivity and environmental benefits while providing renewable energy and diversified income opportunities for farmers, ranchers, and rural communities. In New Mexico we are fortunate to be one of the top three states in the U.S. for Solar Energy Potential, making it an ideal location to study the potential of agrivoltaics, particularly the benefits to agriculture that might be provided through shading and reduced stress. At NMSU we have received just over $1.5 million in funding to support the establishment of an agrivoltaics research program including: the deployment of agrivoltaic arrays at multiple Agricultural Science Centers throughout the state (both rangeland and cropland), research collaborations with the USDA Southwest Cotton Ginning Research Lab and Jornada Experimental Range, and research on the potential benefits of the collocation of photovoltaics and tomato and chile crops. Through this new research program, NMSU will be able to support increased research and development on the nexus of renewable energy generation and sustainable food production in arid and semi-arid environments.

Virtual Fencing:

There is a need to support ranchers through the investigation of more efficient livestock, grazing, and land management strategies. Virtual fencing is one tool available for ranchers that can help answer these needs. With virtual fencing, boundaries for livestock containment are defined without using physical barriers but rather with smart GPS collars on individual cows. Guided by the pitch of a familiar audio tone emitted by the collar, trained cattle learn to turn around and avoid getting minor electric pulses if they trespass the audio warning boundary. Research conducted at the NMSU Chihuahuan Desert Rangeland Research Center is providing proof of concept for the ability to manage livestock grazing with invisible boundaries and at commercial scales. Two commercially available virtual fencing systems are being tested, and information regarding safe and effective use of collars is being used to assist ranchers, land management agencies, and early adopters throughout the Southwest. The technology has enabled dynamic alterations of livestock-targeted grazing in desert pastures, mountain pastures, and forage crop fields that otherwise will require new investment in expensive fencing and water development. The use of virtual fencing collars has a promising potential to provide a scalable and cost-effective methodology for adaptive grazing management and rangeland resource conservation on New Mexico ranches.

Smart Feeding Systems:

The Corona Range and Livestock Research Center has added two C-LOCK Super Smart Feeding Systems to its research capacity. These feeders can identify individual animals using an electronic ear tag and feed them specific feeds and amounts. This is all accomplished through a self-contained portable system that is solar-powered and can hold up to 4 different feeds. These tools will allow researchers to further study the impacts of strategic supplementation in grazing animals. In addition, this research will provide proof of concept as producer models are developed that provide similar opportunities for livestock production. Future use of digital

feeding technology will allow for individual animal management while running combined age classes with varied nutritional needs or managing while gathering performance indicators for culling or marketing at a higher level. Weighing and water monitoring systems are becoming available for integration with smart feeders to digitally capture additional daily inputs that can be analyzed in combination in the pasture with the aid of cellular or Wi-Fi connectivity. With the future addition of artificial intelligence monitoring these smart systems could provide real-time data, with suggested management changes to optimize input costs and identify health issues and herd leaders.

Green Feed Systems:

The Clayton Livestock Research Center is also utilizing smart feed technology to monitor feed intake on an individual basis, with the addition of nine C-LOCK Smart Feeders that measure animal intake using RFID ear tags. Further, the recent addition of two pasture Green Feed Systems can now give researchers the ability to measure beef cattle greenhouse emissions through novel feeders that provide a small portion of feed and capture, then measure, methane, hydrogen, and oxygen emitted from the digestive system. These systems can be used in feed pens or in the pasture. Future studies are being designed to analyze pasture backgrounding on traditional small grains as compared to perennial grasses through measurements of pasture system carbon flux (with newly acquired GasMet Analyzer) in addition to rumen emission developing a systems approach to carbon management in backgrounding, as well as in the feeding phase.

Carbon Management and Soil Health:

The ACES carbon management initiative has made significant progress in 2023. The initiative continues to engage farmers, ranchers, and minority and Native American communities on carbon management and soil health research, outreach, and extension activities. Research and demonstration activities are underway in 7 of the 12 NMSU Agricultural Science centers. We collected about 500 soil samples for carbon analysis. Soil carbon sequestration assessment on selected projects showed 7–22% more soil organic carbon storage within four years of cover cropping and no-tillage management under irrigated conditions, which is equivalent to 0.7–1 ton of carbon per acre per year. In lands transitioning from irrigated to dryland, the same level of increase in soil carbon with regenerative practices is not possible because biomass production significantly decreases with dryland cropping. However, the establishment of perennial crops and native perennial grasses resulted in an increase in bioavailable organic matter of 58–138%. Research findings from these projects were shared with Extension agents, researchers, and other agricultural stakeholders during an Extension workshop, Carbon Farming in New Mexico, held in Albuquerque, NM, on July 26, 2023. The workshop drew the attention of so many people that we will organize a bigger and more farmer-centric event in the summer of 2024. (https://nccmsh.nmsu.edu/)

ACES Undergraduate Research Program

A program initiated in the 2023–2024 academic year emphasizes undergraduate research and provides an opportunity for students to gain hands-on research experience with a faculty mentor. Dr. Jennifer Hernandez Gifford is the Program Director overseeing this project. The inaugural year had eight student participants and six mentors.

Atlee Musgraves (Mentors: Merranda Marin and Kelly Coffeen)

"We Got The Spirit, Yes We Do: School Fashion and Sense of Belonging" is a research study focused on understanding the connection between wearing New Mexico State University merchandise, including colors, logos, and clothing, and NMSU students' sense of belonging on campus. The study focuses on full-time, undergraduate, and main-campus students. The research team sent students a survey with demographic questions, questions relating to school fashion, and questions about a sense of belonging scale. The study's overall goal is to see how school fashion helps establish a sense of belonging on campus and whether there is a correlation between the two. This study will help give insight into how wearing school clothing and colors can help make students feel more at home on a university campus, not just for NMSU students but also at other universities. The impact will be valuable knowledge on how students at a four-year university genuinely make themselves at home, and how school fashion plays a role in that sense of belonging.

Christa Fisher (Mentor: Clint Löest)

The total production of chile peppers in the US from 2019 to 2020 averaged 240,450,000 pounds (USDA, 2022). New Mexico provides 54% of this production with an average of 128,675,000 pounds for the 2019 and 2020 seasons. The total yield from acres planted (269,102,120 pounds) generated roughly 28,652,120 pounds of waste each year not including the leaves. The waste product that accumulates from these production plants has many attributes of a high-quality feedstuff for livestock, from its pods that contain capsaicin to its fibrous leaves and stems. Ranchers over the years have fed chile trash with little knowledge of the nutritive benefits provided by the feedstuff. Currently, there is little information available on its nutrient composition and digestibility over an entire chile season. The goal of this study is to observe how chile trash changes over the months throughout the season to provide ranchers with ways to adjust diets in their operations. It also has a positive impact on producers because as we promote the nutritional value of the chile trash, producers will have less to worry about regarding the disposal of their byproducts, as ranchers will pick up and haul the feedstuffs away. Lastly, and most importantly, it will improve the quality of life for livestock. This impact is attributed to the fact that with the amount of chile trash being fed, ranchers will know how to adjust diet plans for their cattle to keep them healthy, growing and producing.

Lauren Butler (Mentor: Ryan Ashley)

This research deals with analyzing how the expression of Pregnancy-Associated Glycoproteins (PAGs) are affected by inhibiting the CXCL12-CXCR4 chemokine-receptor axis in placental tissues of sheep. PAGs are a type of glycoprotein that are made by the placentas of ruminant animals. When PAGs are secreted, they travel into the maternal circulation, where they can be

used to detect pregnancy. PAGs are also known to indicate placental function, which is vital to fetal development since the placenta is responsible for the transfer of oxygen and nutrients from the dam to the fetus. In regard to the CXCL12-CXCR4 axis, the lab has been investigating how different components of the placenta and fetal tissues are affected through chemical manipulation of this axis. In doing so, we are able to have a better understanding of the interplay between this axis, the placenta, and fetal development, which is important for knowing how to improve human pregnancy health and minimize the occurrence of issues such as preeclampsia. Additionally, we can also use this research to better understand how to improve pregnancy rates in livestock herds/flocks, since reproductive success in livestock is vital to the profitability and livelihood of producers.

Karmine Luna (Mentor: Jennifer Hernandez Gifford)

By helping producers distinguish between pregnant and non-pregnant females, to manage pregnant ewes separately, early pregnancy detection in sheep allows for better flock management. If ewes aren't productively reproducing, sheep farmers risk losing money. A producer may lose $300 annually on average if they fail to detect whether a sheep has a viable conceptus or has miscarried a pregnancy in the middle of gestation. While early pregnancy detection techniques like ultrasonography are well established, producers may not always have easy access to them. Ultrasound equipment typically costs $1500, and this amount might go up if you hire a skilled veterinarian or ultrasound technician. This study's goal was to assess the accuracy of a commercial chute-side pregnancy test is for detecting early pregnancy. Thirty Rambouillet ewes were synchronized to correspond with analogous phases of their ovulation. Before synchronization (d 0) and on days 20, 35, and 70 following breeding, blood components, including whole blood, plasma, and serum, were taken. The IDEXX Alertys™ OnFarm pregnancy test was used to assess the blood samples for pregnancy. For further pregnancy validation, hormone tests and ultrasound examinations were also used. The IDEXX pregnancy test detected more pregnancy in serum and plasma on day 20 of gestation than in whole blood, according to the results. Nonetheless, there were no appreciable variations in pregnancy detection across the blood components between days 35 and 70 of gestation. These results could point to a more straightforward early pregnancy detection technique that sheepfarmers could employ to prevent income losses from their operations.

Katherine Ropp (Mentor: Ryan Ashley)

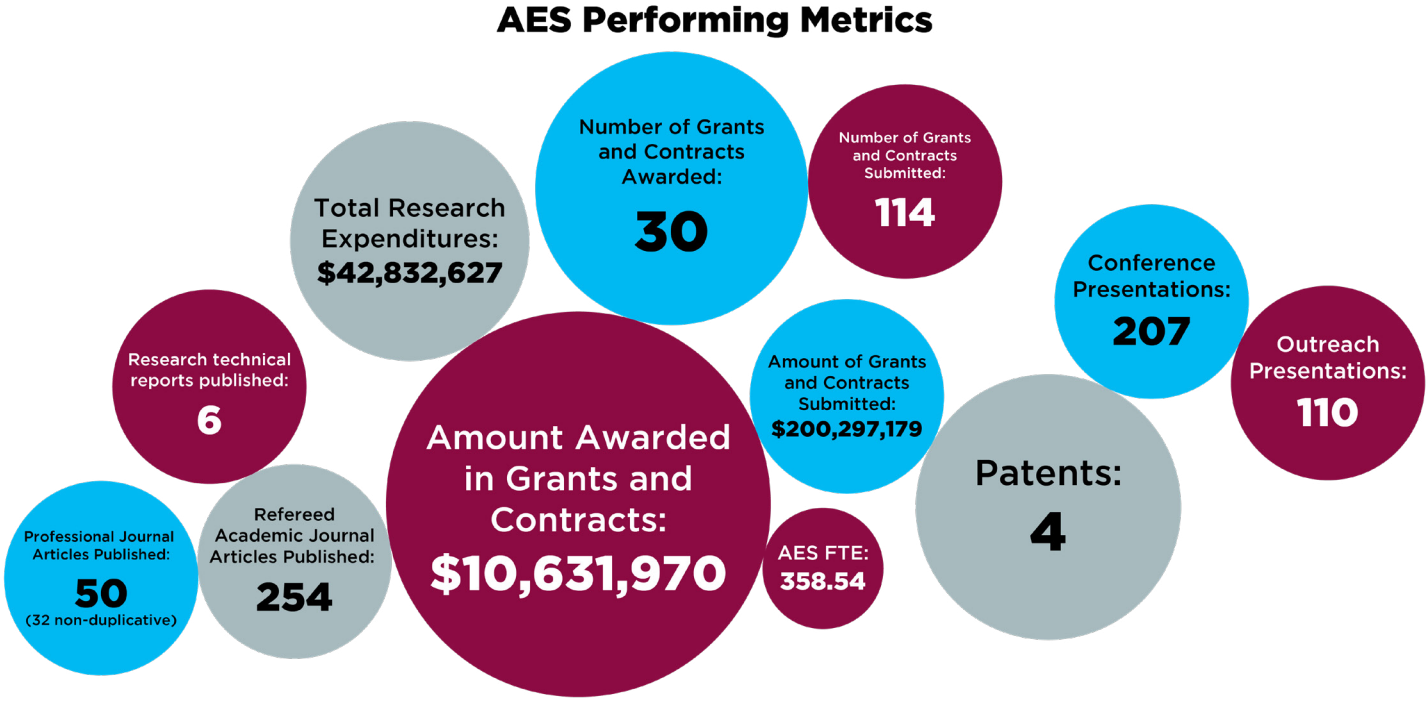
Placental insufficiency is the root of many reproductive complications such as preeclampsia and fetal growth restriction. While the causes of placental insufficiency are poorly understood, it is thought to originate during placental implantation. More specifically, improper regulation of new blood vessel formation has emerged as one of the primary factors contributing to placental dysfunction. The interaction between the signaling protein CXCL12 and its receptor CXCR4 has been found to significantly impact blood vessel development through its impact on the potent angiogenic factor VEGF. To better understand the interaction between this protein axis and VEGF, as well as its role in placental development, we impeded the CXCL12-CXCR4 axis with increasing doses of an antagonist, AMD3100. We found that VEGF significantly decreased at the highest treatment concentration when compared to the control and tended to decrease in the other two treatments. Our results provide evidence that inhibiting the CXCL12-axis does impact vascularization and may be helpful in further studying the consequences of placental insufficiency.

Shaylie Salopek (Mentor: Ryan Ashley)

This research project focuses on embryo transfer in sheep. Within this study, embryos were taken from ewes who had been superovulated (made to produce many eggs at once) and bred with a ram. Some of the embryos were transferred with CXCL12 and others were transferred with the control. CXCL12 is a chemokine, which is a type of protein. This chemokine contributes to vascularization. This study explores whether additional CXCL12 affects pregnancy and pregnancy retention when added in an embryo transfer. This research has both human and animal applications. In livestock and dairy production systems, increasing pregnancy retention would have significant impacts to increasing reproductive efficiency and thus profits. For humans struggling with infertility, increased pregnancy retention could help alleviate both the financial burden of IVF and other fertility treatments as well as the mental burden of infertility.

Cassandra Smithyman (Mentor: Clint Loest)

The food industry generates an enormous amount of waste. At retail and consumer levels, an estimated 31% of the food produced is not fit for human consumption. Although not used for human consumption, food waste and byproducts can be a good source of nutrients for livestock. Utilizing byproducts in livestock diets has the potential to reduce feeding costs, improve animal product sustainability, and lessen the environmental impact of the food production chain. The current study's objective is to evaluate the nutrients in potato waste byproducts and how they may contribute to cattle's nutritional needs to assess the possible advantages of feeding potato byproducts to beef cattle. It is hypothesized that these byproducts will be highly degradable and provide beneficial nutrients to livestock. The results of this study will provide data to improve the accuracy with which diets are balanced for nutrients and further help cattle producers feed livestock more efficiently while giving producers a wider range of feedstuff that could potentially be more readily accessible and cost-effective.



Impact Highlights

New Mexico State University's College of Agricultural, Consumer, and Environmental Sciences (ACES) has a mission to improve the lives of New Mexicans, the nation, and the world through research, teaching, and extension. AES research programs focus on four identified critical issues for New Mexico. These critical issues are the ACES Pillars, which help guide planned programs and research focus. The pillars are Food & Fiber Production and Marketing, Water Use and Conservation, Family Development and Health of New Mexicans, and Environmental Stewardship.

Food & Fiber Production and Marketing

Small Ruminant Transportation – Dr. Eric Scholljegerdes (ANRS)

The number of well-trained technicians capable of carrying out these assisted reproduction techniques is sparse, which necessitates the need for producers to haul their small ruminants to the technician. Researchers have found that transporting female goats 24 hours prior to insemination increased pregnancy success compared to transporting the day of insemination. This work demonstrates that if animals are to be transported to a facility for artificial insemination, it should be done prior to the day of the procedure. Although costs will be incurred to house the animals overnight, the improvement in conception will more than likely cover the associated cost.

Food Processing and Safety – Dr. Francine Mezzomo Giotto (ANRS and FCS)

Foodborne diseases remain a major public health concern in the United States, where 31 known pathogens cause 9 million illnesses, 56,000 hospitalizations, and 1,300 deaths annually. Exposure to common food preservatives and surface sanitizers may induce antibiotic resistance and enhance the pathogenicity of bacterial pathogens in meat products. This research aims to study the use of food preservatives and surface sanitizers in food processing operations as a selective stress driving the prevalence of antibiotic resistance in bacteria. The expected findings from this study will facilitate the selection of proper meat sanitizers and preservatives to minimize the prevalence of antibiotic resistance and pathogenicity in the food chain.

High Value, Low Input Crops for Small Farms of Northern New Mexico – Dr. Saied Salmasi (PES and Research Director of Sustainable Agricultural Science Center at Alcalde)

Medicinal and aromatic plants have a wide range of uses because they constitute the important raw material of pharmaceutical, food, beverage, cosmetics, and many other industries. In the U.S., saffron prices at wholesale and retail rates range from US$500 to US$5,000 per pound. Diversification towards high-value crops can be a promising strategy to enhance farmers' economic welfare in the region. A new project will produce new knowledge and promote

high-value, low-input plants to the growers of Northern New Mexico. Associated soil health and environmental benefits can improve overall on-farm resiliency, reduce off-farm inputs, and increase biodiversity.

Chile Cover Crops – Dr. Brian Schutte (EPPWS)

If not controlled, mid- to late-season weeds in chile pepper result in $34 million in lost profits for New Mexico growers. To help growers avoid these losses, the NMSU Weed Science Lab is developing optimal practices for using crop rotations and herbicides to prevent and control mid-to-late season weeds in chile pepper. Methods that we develop can be put into commercial practice immediately, and they reduce both weed densities and hand hoeing expenses. By developing immediately applicable, cost-effective methods for managing weeds, we are generating information that New Mexico chile pepper growers can use to improve the profitability of their operations.

Disease Preparation – Dr. Frannie Miller (AEAB)

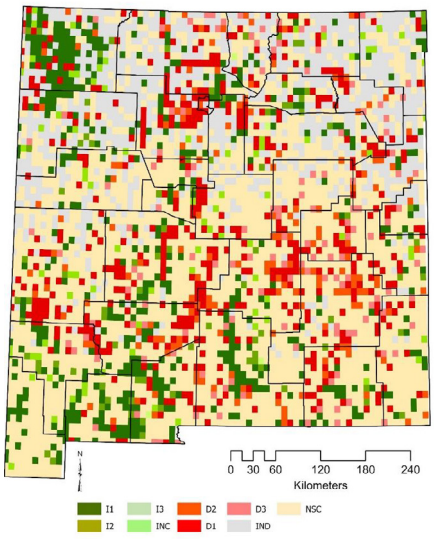
Although the U.S. agricultural industry is economically dependent on international trade, this connectivity also increases the risk of a foreign animal disease reaching our soil. Such an introduction would be massively disruptive for the entire livestock supply chain. This could potentially result in the loss of $47 billion in GDP and as many as 677,000 jobs. In response, New Mexico State University and the New Mexico Department of Agriculture, along with a wide swath of the agricultural industry, have developed plans to allow faster response to a disease outbreak. Miller has assisted in the development of two statewide plans for disease response – a carcass management plan and a Foot and Mouth Disease vaccination plan – both funded through USDA grants. A paper describing New Mexico producers' carcass management protocols is under submission. Miller has presented this research at two statewide meetings and at the International Livestock Identification Association.

Water Use and Conservation

International Work on Aquifer Protection – Dr.Frank Ward (AEAB)

Ongoing challenges from population growth and climate that stress access to water in the world's aquifers raise the importance of finding economically sustainable aquifer use patterns. Much work has been conducted on the impacts of water supply fluctuations, climate change, and population growth on economic access to water resources. Dr. Ward's work has filled a gap: few works to date have comprehensively investigated the sustainable economic performance of additional infrastructure development or policy design in many of the world's aquifer basins for handling ongoing challenges of drought, increased economic activity, and climate water stress at the basin scale.

Assessment of Arid Land Sustainability Through Drought and Wildfire Management- Dr. Hatim Geli (ANRS)



Drought and wildfire are major natural hazards that affect New Mexico's ecosystem sustainability due to climate change. Two NOAA-funded projects aim to identify vulnerable regions and communities across New Mexico, document how affected communities use science-based tools to adapt to these natural hazards, and identify current gaps to enhance their use to support the sustainability of arid land ecosystems. The projects will develop drought impact predictions; collaborate with affected communities; develop remote sensing-based maps that identify rangeland degradation; and document past, current, and expected changes in wildfire dynamics to better manage their impacts. Such tools will allow development of effective arid land sustainability practices.

The Impact of Deficit Watering on Pecan Pollen Viability – Dr. Jennifer Randall (EPPWS)

Pecans are a large contributor to New Mexico's agricultural economy with production exceeding $130 million annually. An important horticultural constraint for profitable pecan production in NM is water availability. As water is a limited valuable resource, NMSU researchers evaluated the impact of deficit irrigation on pecan tree pollen. Findings revealed that 'Pawnee' trees experiencing water deficit produced less viable pollen compared to 'Pawnee' pollen from adequately watered trees. Additionally, morphology differences were observed in pollen tube formation, with as a slight reduction in pollen tube length observed in the water deficit samples. Even a year after the trees were provided with full water, the impact on pollen viability persisted. Gene expression analyses in germinated pollen showed notable differences between pecan trees subjected to full watering and water deficit.

Soil Moisture Sensors for Precision Irrigation Water Management – Dr. Koffi Djaman (PES and Farmington Agricultural Science Center)

Promoting the soil moisture sensors under deficit irrigation strategies could help irrigate an additional 20–25% of farmland while reducing groundwater pollution by nitrates. Conservation agriculture targeting precision irrigation improves crop water productivity. Research showed water saving of about 25% of seasonal irrigation amount while maintaining crop yield. The extrapolation of this study into farmers' fields targeting the Navajo Agricultural Product Industry (NAPI) with more than 72,000 acres developed, could help in increasing actual capacity to irrigate an additional 15,000–18,000 acres. NAPI and Navajo Mesa Farms have adopted soil moisture sensors for precision irrigation water management, water conservation, and system sustainability.

Family Development and Health of New Mexicans

Supporting and Sustaining Independently Owned New Mexican Rural Tourism Business Operators – Dr. Keith Mandabach (HRTM)

The tourism industry contributed an estimated $8.3 billion, surpassing 2021 by $1.1 billion. The all-time direct visitor spending record was previously set in 2019 at a total of $7.4 billion. The project is studying and developing operational and marketing strategies for NM tourism business operators. The project is developing collaborations with other researchers at other Land Grant institutions and CESFAS. This project studies rural tourism from the gate to the plate by surveying industry operators and tourists, examining best practices and developing support resources for rural tourism business operators.

Young AgriScientists Program: Developing the Next Generation for FANH Sciences – Dr. Lacey Roberts-Hill (AXED)

The Young AgriScientist Program is training undergraduate researchers at New Mexico State University to solve complex problems in food, agriculture, natural resources, and human (FANH) sciences. Eight students from a range of science industries are completing experiential learning opportunities, including direct engagement with research and communication training to better diffuse research findings to wide audiences. These experiences equate to highly skilled employees to better serve the needs of FANH industries.

Environmental Stewardship

Preparing Hispanics and other Underrepresented Students in Fisheries and Aquaculture – Dr. Wiebke Boeing (FWCE)

Dr. Wiebke Boeing received $400K from a $1 million USDA grant to develop the future workforce. Aquaculture is the fastest-growing sector of food production in the US and safe, nutritious, domestically produced seafood is a national priority. Aquaponics are recirculating systems that simultaneously grow fish and plants. Fish provide nutrients to the plants, and plants clean the water for the fish. Aquaponic systems can be built at any scale in rural and urban settings and are climate-smart and water-efficient at producing seafood and vegetables.

Cropping Systems and Soil Management Program – Dr. Rajan Ghimire

Soil health assessment based on indicators developed in more productive, humid environments may not respond to management changes in arid and semi-arid climates. However, cover cropping has been proven effective for increasing labile soil carbon components, enhancing microbial activity, and improving soil structure and infiltration capacity. Dairy compost application has further improved the soil health response of cover crops. Promoting cover crops and compost application in arid and semi-arid regions could support rural economies in the western United States through improved soil health and ecosystem services. In addition, regional collaboration projects like this can answer fundamental questions on soil health management in arid and semi-arid regions facing challenges due to soil degradation, water scarcity, and high

climatic variability. Engaging graduate and undergraduate students in projects like this further adds public value because it helps prepare the workforce and future leaders in sustainable and climate-smart agriculture.

National Climate Change Roadmap – Dr. Owen Burney (PES and Research Director of the John T. Harrington Forestry Research Center at Mora)

Dr. Owen Burney participated in the development of the National Climate Change Roadmap. This roadmap was released in November 2023. It identifies national priorities for U.S. climate change research related to working lands over the next decade. With a grant from USDA NIFA, a Colorado State University (CSU) research team developed the Roadmap with support from Meridian Institute and 61 leading scientists. CSU and Meridian implemented a Horizon Scan methodology—a visioning process that synthesizes trends and knowledge gaps related to agricultural research and climate change—to project key focus areas for research, extension, and education. Guiding research principles and cross-cutting themes emerged, culminating in a framework for science and funding that is systems-based and highly participatory. The framework presented is not an endpoint but rather a starting place from which to evolve and refine to meet climate science challenges for the benefit of agriculture, working landscapes, and the communities that rely upon them. You can find more about the process, principles, and themes from the National Climate Change Roadmap here.

Biological Control of Insect Pests in New Mexico – Dr. Jane Pierce (EPPWS and Artesia Ag Science Center)

Biological Control has the potential to control many insect pests but is frequently undervalued. Control of insect eggs alone is often over 80% when populations of predators are not disrupted by frequent insecticide applications. The ASC farm has maintained good control of alfalfa weevil with biological control for 20 years. Replicating this type of control in just alfalfa and pecan will save growers over $6.5 million per year in reduced losses and control costs.

Old-Growth Pinyon Produces High Abundance of Cones—A Crucial Wildlife Food Source – Dr. Jennifer Frey (FWCE)

Pinyon-juniper woodland is an expansive and economically important vegetation type. The cones of pinyons serve as a crucial food resource for many species of wildlife. Researchers evaluated factors that drive pinyon cone production and tested if spatial patterns of cone production influence habitat use by a rare chipmunk. Results found that the oldest trees produced the most cones. The chipmunk may prefer sites with the highest cone production during high cone production years. We conclude that thinning pinyon-juniper woodlands may be detrimental to wildlife and that old-growth stands should be protected to support wildlife.

Executive Summary

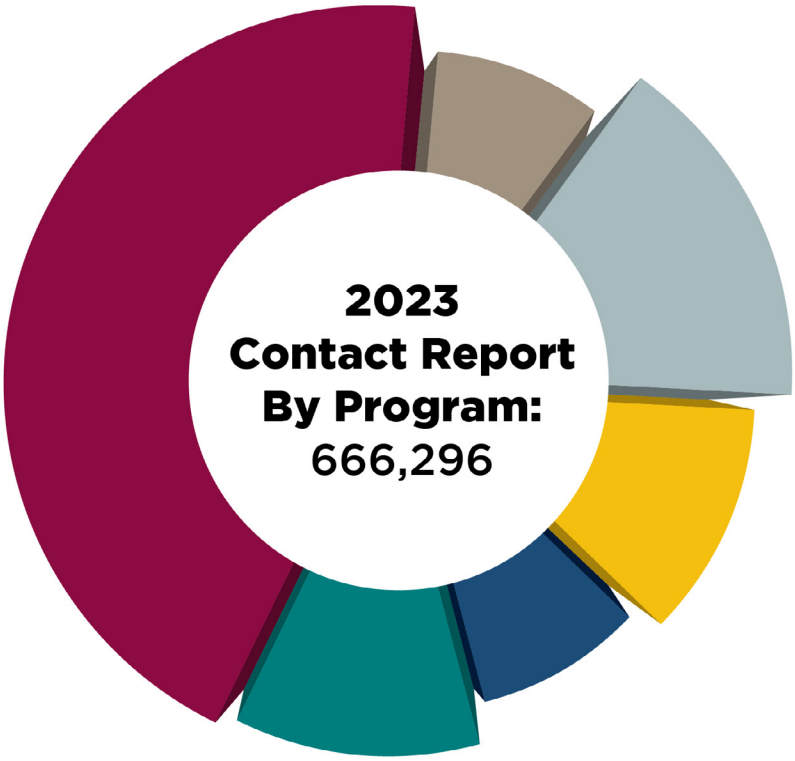
The New Mexico Cooperative Extension Service (CES) provides practical, research-based knowledge and programs to serve the citizens of New Mexico. This has been our mission for more than 100 years and will remain the crux of our efforts in the future. CES is a unique federal, state, and county partnership. CES has staff in all 33 counties and many Tribal areas in New Mexico, and collaborates with more than 1,000 organizations, state and federal agencies, other universities, and 10,000 volunteers.

We focus on collaboration to foster economic, educational, and community development, keeping the needs of our neighbors at the forefront of our work. While our mission endures, the delivery and areas of study evolve. In 2023, Extension efforts related to agriculture and natural resources, positive youth development, community development and the health and wellness of New Mexico families have been priorities.

Extension work will continue to evolve, and specialists and agents will seek additional resources to remain responsive and advance our diverse programs and research in areas we have identified as critical to our state's future. The programs highlighted here are just a sample of the amazing work done across the state this past year to improve the lives of New Mexicans.

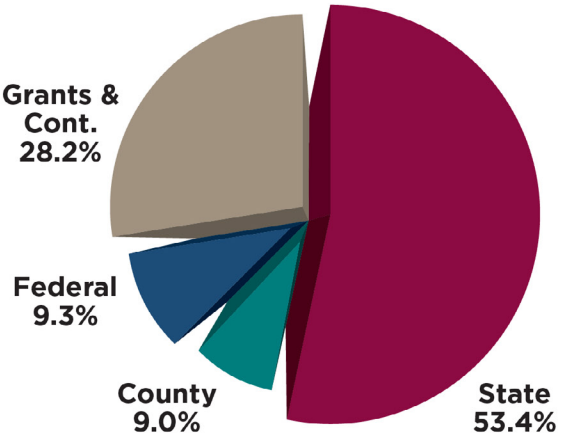
Cooperative Extension Service

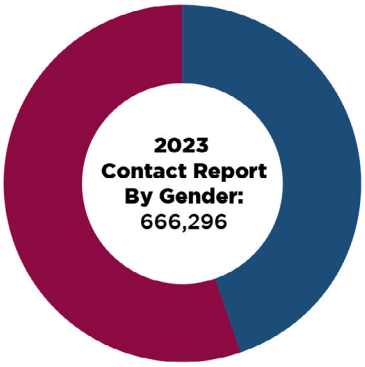
Reaching our Clientele



- 4-H and Youth: 295,587 (44.3%)
- Animal Sciences and Natural Resources: 56,592 (8.4%)
- Community and Economic Development: 106,098 (15.9%)
- Family and Consumer Sciences: 74,875 (11.2%)
- ICAN: 58,209 (8.7%)
- Plant Sciences: 74,935 (11.2%)

CES Funding Sources

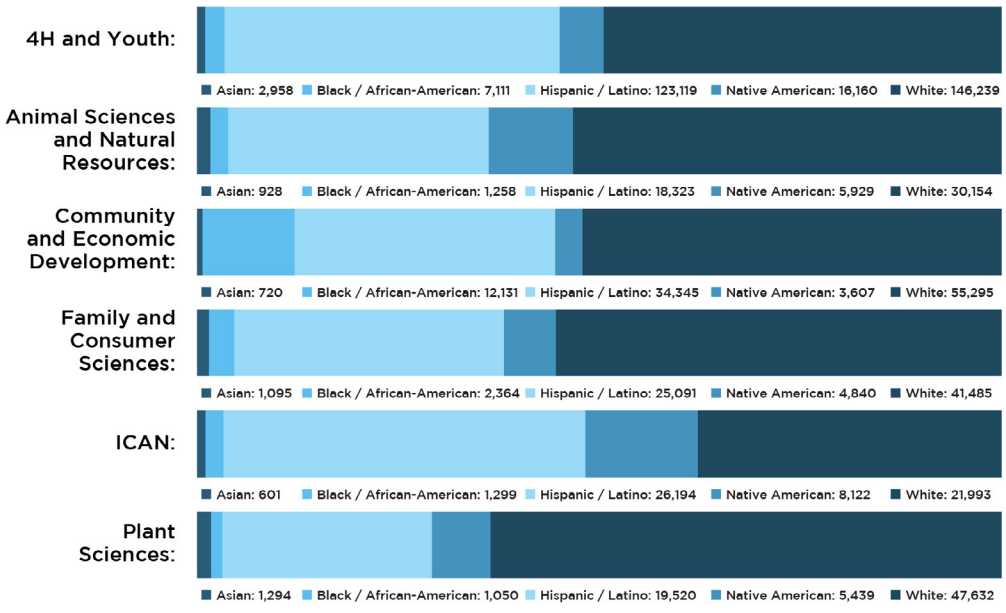




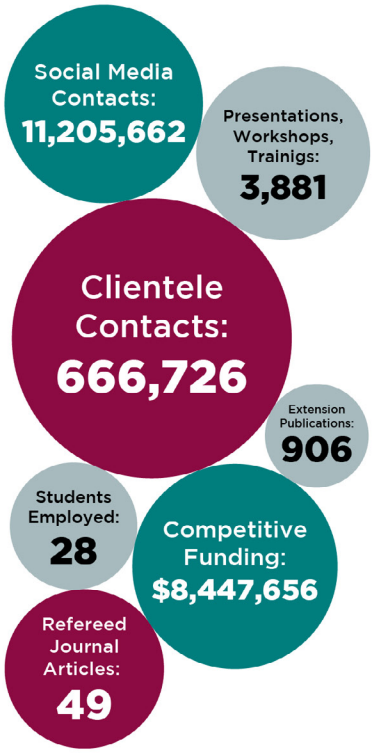
- Female: 368,296 (55.3%)
- Male: 298,000 (44.7%)

Cooperative Extension Service

Extension Personal Contact by Ethnicity



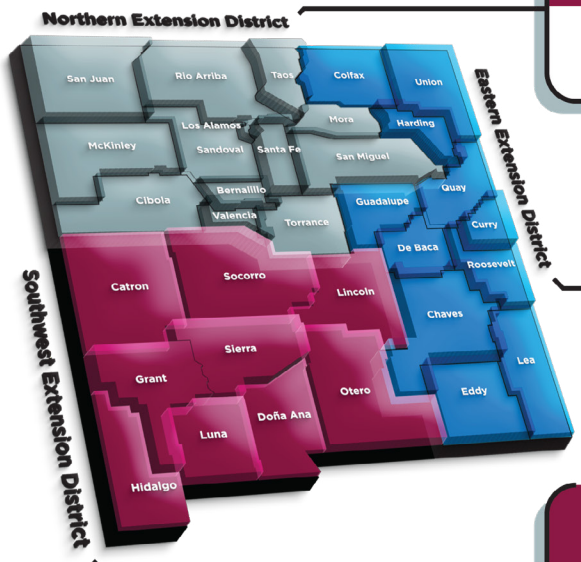
CES by the Numbers



Reaching New Mexicans: District Departments Selected Highlights

The Cooperative Extension Service (CES) has staff in all 33 counties and many Tribal areas in New Mexico who provide communities with effective leadership and collaboration to foster economic, educational, and community development. Decisions on what educational programs are conducted in communities across the state are largely determined by local advisory committees and stakeholder groups and focus on areas identified by the college as critical issues or the ACES Pillars. The pillars guide planned programs in Food and Fiber Production and Marketing, Water Use and Conservation, Family Development and Health of New Mexicans, and Environmental Stewardship. Below are selected highlights of programs and events in 2023.

Cooperative Extension District Departments



Northern District:
Department Head: **Christina Turner**

13 Counties and Tribal Extension
District Population 1,418,895
94 Agents/Staff

Eastern District:
Department Head: **Leigh Ann Marez**

11 Counties
District Population 297,462
46 Agents/Staff

Southwest District:
Department Head: **Tom Dean**

9 Counties
District Population 399,520
48 Agents/Staff

Med Instead of Meds Statewide Webinar Series 2023

According to the National Institute of Health, fruit and vegetable consumption reduces the risk of death. Eating an average of five servings a day was associated with a 13% lower risk of death as opposed to eating only two servings per day. The Centers for Disease Control research indicates only 10.3% of adults in New Mexico meet the daily vegetable intake recommendation, reflecting the need for greater nutrition education for New Mexicans.

In response to data on low fruit and vegetable consumption in New Mexico indicating the need for nutrition education on healthy eating habits, a team of seven Family and Consumer Sciences agents from six different counties presented Med Instead of Meds. Sessions included finding new protein sources, eating healthy fats and nuts, and more fruits and vegetables. Whole grains and consuming less sugar were also covered. The six one-hour sessions were delivered weekly in October and November 2023. Participants (47) from across the state registered, representing 282 educational hours with residents learning the concepts from the virtual sessions or viewing the recordings. A website was created, which will facilitate more New Mexicans having access to the curriculum in the years ahead.

Prior to the series, participants had an average score of 2.5 (out of 5.0) when asked about their knowledge of the Mediterranean eating style, the health benefits, how to implement it, and mindful eating. After the series, they had an average score of 4.35, an increase of nearly 2 points. Citing new behaviors implemented from the series, 75 percent noted eating fruit more often, eating appropriate serving sizes, and planning more Mediterranean style meals. Eighty-three percent indicated eating healthy proteins more often, increased olive oil use, and reading labels for health information more often. One hundred percent stated they serve and eat vegetables more often.

“I have seen some changes for the better in blood pressure and weight loss. I think that this trend will continue with a little more time,” said one participant.

Med Instead of Meds results indicated positive changes in knowledge, confidence, and behavior around increased healthy eating habits.

Dianne Christensen, ***Extension Home Economist, Bernalillo County, Northern District***

ACES Pillar: Family Development and Health of New Mexicans

The Future of Livestock Grazing on NM National Forests

In Rio Arriba County 14,700, cattle and calves are raised and grazed on farms and ranches. Native American and Hispanic ranchers rely on New Mexico's National Forests for livestock grazing. However, changing climate and rangeland conditions create unprecedented challenges to making a living.

Current management guidelines are based on unilateral observations of the impacts of livestock grazing on forest conditions, but the impacts of conditions on livestock operations are not accounted for, raising questions about the future of livestock production. Sharp reductions in permits and stocking rates, delayed entry, and early curtailment threaten to displace ranchers. As such, more comprehensive rangeland assessments are needed to develop and strengthen implementation of new grazing guidelines.

A collaboration with Northern New Mexico Stockman's Association, USFS, NMSU Extension Specialists and other livestock professionals resulted in a 3-year $375,000 WSARE grant to assess current grazing conditions. Four sites were designated for monitoring on the Carson National Forest and Santa Fe National Forest. Staff traveled to each designated monitoring site, setting up cages, cameras, and rain gauges.

In Rio Arriba County, livestock production exists in over 50 communities and in Native American pueblos and tribes for economic sustainability. The challenge is reaching out to the predominantly part-time producers or small-scale ranchers. A strong effort was made to inform and gather allotment owners to participate in workshops and learn range-monitoring skills.

In 2023, rain gauges were gathered and clippings of plant growth collected, and pictures from the cameras and total rain accumulations are being reviewed. Weights are being calculated to determine utilization for grazing season 2023, and cages were moved five feet for monitoring in 2024.

Donald Martinez, ***County Program Director, Agricultural Extension Agent, Rio Arriba County, Northern District***

ACES Pillars: Food and Fiber Production and Marketing, Environmental Stewardship

Growing Forward Farm Youth Tours

The need for outdoor recreation opportunities that connect healthy food options is paramount, and connecting youth to the agricultural industry and potential career opportunities can assist the San Juan County region in filling employment gaps in the future.

Agriculture and food literacy are not traditionally taught in urban schools. As San Juan County grows, there is a greater disconnect between the food that is produced, and the consumers. There also is a high obesity rate for adults (72.3%) and youth (42%) in San Juan County, according to the San Juan County Partnership. The study also reported that nearly 14 percent of students reported no physical activity throughout their day. The farm employment rate for the region is listed as the fifth highest among industry and has significant potential for growth, according to an NMSU Arrowhead report for San Juan County.

Creating systems and opportunities for farm visits that are connected to NM educational benchmarks makes school tours more accessible not only to the Growing Forward Farm project and Cooperative Extension, but to new and expanding agri-tourism ventures.

In partnership with the San Juan Soil and Water Conservation District, Farmington Municipal Schools, and San Juan County Partnership, Healthy Kids, Healthy Communities, educational tours were hosted in April, September, and October for the fourth-grade students in San Juan County.

The spring fourth-grade tours hosted 565 students at Growing Forward Farm. The fall fourth-grade tours hosted 658 students from eight schools across San Juan County. Students learned about where their food comes from, agricultural careers, nutrition, and outdoor recreation. The Growing Forward Farm tour participants experience a working farm operation, learn about ways to recreate outdoors, and explore six farm activities.

The teachers who participated agreed that the information provided was interesting and aligned with grade level standards. They also felt the field trip will inspire students to make healthier life choices. A high percentage of students (91%) and parents (70%) agreed that the experience would inspire them to make healthier life choices.

Overall, the result of the tours was widespread enthusiasm for farm tours and agricultural information. The 4-H enrollment has increased significantly, nearly 20 percent for early enrollment; many of the participants learned about 4-H during their visit. The tours have allowed the Extension staff concrete experience in providing agri-tourism opportunities, which will benefit other educational programs for farmers across the region.

Bonnie Hopkins Byers, ***County Program Director, Agricultural Extension Agent, San Juan County, Northern District***

ACES Pillars: Family Development and Health of New Mexicans, Food and Fiber Production and Marketing, Environmental Stewardship

Regional Range Caterpillar Control

In summer 2023, Extension agents pulled resources to address a potentially devastating range caterpillar infestation threatening Colfax, Union, and Harding counties. The outbreak impacted private land, state land, and forest service land, requiring agencies, landowners, and lessees to work together to acquire a company to apply some control methods to the rangeland to prevent caterpillar windrowing of the rangeland grasses and liquidation of cattle herds.

Extension partnered with the New Mexico State Land Office, the Kiowa Grasslands, Colfax Soil and Water Conservation District, the Town of Springer, AeroTech Aerial services, and the Federal Aviation Administration to organize a meeting with landowners and lessees about their interest in a control program.

Agents organized sign up locations for producers interested in participating in the control project and collaborated with the State Land Commissioner's Office, Federal Legislative Delegations, local, regional, and district elected officials to help get approvals for the control methods being proposed to apply on state and federal land. Extension also assisted with arrangements to provide water for the spray project and rentals for the respondents.

As a result, 460,000 acres were sprayed to reduce harmful "windrowing" of the caterpillar, saving precious pasture grass, enabling continued grazing of 1,875 commercial cows and 3,266 head of yearling, valued at over $3 million dollars in saved production to producers and county tax base.

Boe Lopez, Talisha Valdez and Courtney Mitchell, ***County Program Directors, Extension agricultural agents, Colfax, Union and Harding counties, Eastern District***

ACES Pillars: Food and Fiber Production and Marketing, Environmental Stewardship

Volunteers Are a Critical Extension Resource

A key component to the success of 4-H is a positive and sustained relationship between youth and adults which exists in our 4-H Adult Volunteer Leaders. Adult volunteers are essential partners in the 4-H Youth Development Program and contribute to maintaining and expanding the New Mexico 4-H Program.

In 2023, the Curry County Extension faculty recorded that their volunteers donated over 4,100 hours to serve county programs that target youth in-school enrichment programming, field ag literacy trips, traditional 4-H leader/youth activities, etc. With the current value of volunteer time in New Mexico being $26.95 per hour (Independent Sector 2022), a contribution of $112,785 in donated support was provided to Curry County 4-H youth.

According to a study done by John Hopkins University Volunteer Measurement Project, of the 37 countries studied, each year 140 million people volunteer, representing the equivalent of 20.8 million full-time equivalent jobs, contributing $400 million to the global economy. According to the study, "Volunteering is a crucial renewable resource for society."

Volunteering is also a crucial resource for 4-H. 4-H Leaders must be identified, recruited, screened, oriented, trained, utilized, recognized, and evaluated for a sustaining volunteer program. To be successful volunteers, adults need orientation and education to perform the volunteer role. Education topics are developed based on emerging needs and volunteer requests. Continued education and leader certification are imperative to the success and growth of New Mexico 4-H. Trainings in 2023 included Working with Minors, 4-H Policies and Procedures, and specific project-related trainings.

Volunteers offering their time and service to a youth development program such as 4-H help create strong communities as youth attach to other caring adults in their lives outside of the family circle.

Mindy Turner, Kandy Hutchins, Diana Wood, Mason Grau, agents and program assistants, ***Curry County, Eastern District***

ACES Pillar: Family Development and Health of New Mexicans

Mental Health First Aid Training

Behavioral health challenges are prevalent in New Mexico among both youth and adult populations. Health is not merely the absence of disease, but it is a state of complete physical, mental, and social well-being.

Youth Mental Health First Aid teaches adults how to identify, understand and respond to signs of mental health and substance use challenges among adolescents ages 12–18. Participants build skills and confidence needed to reach out and provide initial support to young people who are struggling and connect them to appropriate support.

Family and Consumer Science agents in several counties in Eastern New Mexico partnered with County Youth Services and the Rural Behavioral Health Programs of Eastern Plains Council of Governments to conduct Youth Mental Health First Aid trainings. Funding for agent certification and program supplies was provided through the NM Farm and Ranch Stress Assistance Network Grant in collaboration with the Extension Family Life and Child Development Specialist. Program supplies were supplemented through the United Way of Eastern New Mexico Mental Health Grant.

While only 10 percent of participants initially felt they were highly likely to have a supportive conversation with a youth experiencing signs and symptoms of a mental health or substance abuse challenge or crisis, after the training 68 percent reported a high likelihood. Those reporting a high likelihood of using the action plan to connect youth with appropriate help went from 20 to 80 percent, and 90 percent of participants agreed they could now ask a youth directly whether they are considering killing themselves and respond to a substance abuse crisis, knowing what to do to keep a youth safe.

According to the Steinberg Institute, mental disorders are the single most expensive category of health costs for many employers, across all industries and sizes. A joint analysis by the National Academies of Sciences, Engineering and Medicine determined that every $1 investment in prevention and early intervention for mental illness and addiction programs yields $2 to $10 in savings in health costs, criminal and juvenile justice costs and low productivity. Mental Health First Aid equips providers and the public to facilitate early intervention with a youth experiencing a mental health challenge. Thirty participants were trained in 2023 at a cost of $20 each. That reflects a potential give back of $6,000 to the community in healthcare savings.

Tamara Schubert, Mindy Turner, Susann Mikkelson and Vonda Frost, ***Family and Consumer Science agents, Chaves, Curry, Guadalupe and Eddy counties, Eastern District***

ACES Pillar: Family Development and Health of New Mexicans

Southern Regional Livestock School

The Southern Reginal Livestock School provides New Mexico 4-H youth ages 9-19 with an interest in beef, goat, sheep, or pig livestock an opportunity to gain knowledge in animal projects. Youth and parents develop a better understanding of showmanship and presentation of their animal, training and exercise programs, day-to-day care, and basic feeding knowledge.

Livestock projects are goal-oriented ventures providing youth self-discipline, self-responsibility, empathy, character, and recordkeeping skills. The school is divided into four species-specific instructional tracks: sheep, goat, swine, and cattle. Each track allows a maximum of thirty participants. Areas of focus include Showmanship, Nutrition, Grooming and Clipping, Animal Health, and Animal Selection.

For the past three years, Southern Regional Livestock School has reached 365 youth across five Southwest counties. One individual indicated their favorite component of livestock school was "the feedback and the way I could see results from hands-on-learning." Of the participants, 95 percent indicated they had a deeper understanding of their livestock project and 97 percent indicated they were more confident in all focus areas. A parent said, "both of my boys gained so much confidence from the workshop. This was their first year in cattle breeding. There was so much to learn, but the confidence they gained is unexplainable."

Sponsorships were provided by Tractor Supply, The Running Iron Boutique, Southwest Food Service Excellence, The Orchard, Farm Bureau Financial Services, and the city of Truth or Consequences. Collaborating counties include Sierra, Hidalgo, Socorro, and Doña Ana. Livestock School increases the youth's awareness of animal husbandry and producing safe food for consumers.

Sara Marta, ***County Program Director, Agricultural Extension Agent, Sierra County, Southwest District***

ACES Pillars: Food and Fiber Production and Marketing, Family Development and Health of New Mexicans

NM Youth Attend Ignite by 4-H

The New Mexico State 4-H Office provided funding for youth to attend the first Ignite by 4-H in Washington D.C.

4-H provides youth with numerous opportunities to be involved at the local, county, state, and national levels. For many New Mexico youth, participating in national level activities is a highlight of their 4-H career and is often the first time of they have left the state, traveled without their parents, or flown in an airplane.

National opportunities provide members the opportunity to grow as individuals. Youth were selected through an essay process, and attendees were expected to share what they learned with other New Mexico 4-H participants.

Participants selected a focus track of either STEM, Healthy Living or AgriScience and attended hands-on workshops related to their selected track. New Mexico participants had the opportunity to network with more than 900 youth from across the nation and tour the Nation's Capital. Planning Zoom sessions were conducted by the participants to implement two workshops for the State 4-H Conference.

Ignite by 4-H allowed youth from across the country to develop a sense of belonging, increase their confidence in planning and facilitating youth-led workshops, and even inspired one New Mexico delegate to apply to serve on the Leadership Team for National 4-H Congress.

These experiences allow for healthier life choices, civic engagement, and positive contributions to their community.

Eva Madrid, ***Extension 4-H Agent, Dona Ana County, Southwest District***

ACES Pillar: Family Development and Health of New Mexicans

Large Animal Emergency Rescue Training

The occurrence of large animal incidents is becoming more common; emergency services personnel have begun to respond to such calls for service as the public has adopted a "911 Call Does It All" mentality. With the increase in the number of incidents involving large animals, the need for specialized training has become evident. In 2023, the Cooperative Extension Service addressed the issue and provided an awareness course to individuals from Luna, Hidalgo, and Grant counties.

There are many threats and hazards of concern as it relates to livestock, and it is highly likely that an incident involving animal agriculture will exist. According to Daniel Manzanares, Director of the Santa Teresa International Export/Import Livestock Crossing, on average, 75 cattle trucks a

week leave the border destined for pasture and feedlots in Texas, New Mexico, Arizona, California, and the Midwestern states via NM highways.

Most first responders do not have training in how to handle large livestock and are not familiar with aspects of cattle behavior, livestock trucks, euthanasia methods, and the many different people who need to be notified and involved in the incident. Improperly handled livestock, especially those on the loose, can be a risk to both responders and the public.

"Each branch of first responders needs to be at these types of trainings," said the Luna County Emergency Manager. "Thank you so much for holding one in our region."

Following the training, 80 percent of the participants felt confident with their ability to apply basic principles of a Large Animal Rescue, compared to 36 percent prior to the training, 90 percent of the respondents felt confident in communicating the practices they learned with other first responders or owners to prevent or mitigate emergencies related to large animals, and 80 percent now feel confident in their ability to explain hazards and concerns of large animal accidents to livestock owners. In addition, 73 percent increased their knowledge of basic methods of containing animals following a highway accident.

Jack Blandford, Savannah Daniels, Teresa Dean and Sidney Gordon, ***Agricultural Extension Agents, Luna, Hildago, Dona Ana and Otero counties, Southwest District***

ACES Pillars: Food and Fiber Production and Marketing, Environmental Stewardship

Developing Resources: Specialist Departments Selected Highlights

Extension Specialists provide research-based information on important and relevant topics that affect individuals, families, and communities. Specialists work directly with County Agents and provide educational programs to numerous commodity and special interest groups throughout New Mexico. They also conduct regional and state workshops, and demonstrational and short-term research projects. Often these Extension faculty represent the single state-wide or regional source for research-based information on a particular topic. Below are selected highlights of programs and research in 2023.

Cooperative Extension Specialist Departments

Animal Sciences and Natural Resources
Department Head: **Shanna Ivey**
12 Specialists/Faculty/Staff

Mission Statement: The Department of Extension Animal Sciences and Natural Resources is committed to providing the citizens of New Mexico with research-based, practical, and applied educational programming that meets the demands New Mexico has in the agricultural and natural resource communities.

Plant Sciences
Department Head: **Anowar Islam**
26 Specialists/Faculty/Staff

Mission Statement: The mission of the Extension Plant Sciences Department is to extend research-based knowledge and technology that enables our clientele to improve the quality of their lives and enhances the agricultural, economic, environmental, and social well-being of the state.

Economics
Department Head: **Steve Fraze**, Interim
13 Specialists/Faculty/Staff

Mission Statement: The 21st century presents many challenges and opportunities concerning our agricultural, natural, and human resources. Our mission is to enhance the well-being of the citizens of New Mexico, the nation, and the world through the cornerstones of teaching, research, and Extension programs.

4-H Youth Development
Department Head: **Laura Bittner**, Interim
9 Specialists/Faculty/Staff

Mission Statement: 4-H provides youth with opportunities to learn skills, gain knowledge, have fun, and make contributions in such areas as environmental education, community service, and current youth issues. As the world's largest youth organization, 4-H grows youth into capable, responsible, and caring individuals.

Family and Consumer Sciences
Department Head: **Efren Delgado**
54 Specialists/Faculty/Staff (Includes 27 Nutrition Educators assigned throughout the state.)

Mission Statement: The mission of the Department of Extension Family and Consumer Sciences (EFCS) is to improve the quality of life for the citizens of New Mexico by distributing research-based information on community and environmental health, food technology, nutrition and wellness, personal and family finance management, and family life and child development.

Innovative Media Research and Extension
Department Head: **Barbara Chamberlin**
25 Specialists/Faculty/Staff

Mission Statement: The mission of this educational research and design studio is to translate university-based research into high-quality educational media tools, such as games, apps, virtual labs, animations and videos. Ongoing faculty research on digital and interactive media topics informs development of effective tools and contributes to the larger body of knowledge.

Building Capacity to Provide Mental Health Outreach

Behavioral health challenges are critical issues in New Mexico, with suicide rates 59 percent higher than the United States as a whole, and suicide being the second leading cause of death for NM residents, age 10-44 years of age (NM DOH, 2015). The COVID-19 pandemic only exacerbated these issues. In a report from the CDC, 40 percent of adults surveyed reported struggling with mental or behavioral health issues associated with the stresses of the COVID-19 pandemic. And in 2021 the American Academy of Pediatrics (AAP), the American Academy of Child and Adolescent Psychiatry (AACAP) and the Children's Hospital Association (CHA) joined together to declare a national state of emergency in children's mental health.

In response, a multidisciplinary team of Extension professionals formed in 2019 to explore the NMSU Cooperative Extension Service's role in addressing behavioral health issues such as mental health challenges and suicide. A needs assessment survey of Extension employees found that while confidence levels in providing behavioral health programs was low, there was strong interest in participating in professional development. The Family Life and Child Development Specialist, along with the team, identified evidence-based and evidence-informed programs such as Youth Mental Health First Aid (YMHFA); Question, Persuade and Refer (QPR) suicide prevention; and Mind Matters: Overcoming Adversity and Building Resilience. The Extension Specialist coordinated professional development opportunities in these programs and collaborated with other organizations to promote mental health outreach efforts.

The specialist coordinated national Mind Matters instructor training, resulting in 21 agents and community partners being trained at a value of $29,000. As a result of professional development in mental health, County agents reached about 500 people through Mind Matters and QPR mental health outreach in their communities.

The Extension Specialist also provided significant coordination assistance to NMDA to provide a Farmer Stress Summit titled "Best Practices to Support Mental Health in Ag and Rural Communities." The goals of this professional development event were to build capacity in mental health providers and others who work in Ag and rural communities to support mental health through use of best practices and build a network of people interested in supporting mental health in Ag and rural communities. There were 34 attendees who represented the Cooperative Extension Service, New Mexico Department of Agriculture, farmers, ranchers, other Ag professionals, and mental health professionals.

Mental health challenges and suicide are pressing issues in New Mexico for both youth and adults. These and other initiatives demonstrate CES's ability to build capacity through multidisciplinary efforts to address emergent issues through delivery of evidence-based programs.

Karim Martinez, ***Extension Family Life & Child Development Specialist, Extension Family and Consumer Sciences***

ACES Pillar: Family Development and Health of New Mexicans

The 8 Success Habits Everyone Should Implement

In early March 2020, the World Health Organization announced the designation of COVID-19 as a global pandemic. Since then, several news sources reported that the financial impacts of the pandemic on households, businesses and financial markets have been profound, including high inflation. With the third-highest unemployment rate and as the third most financially distressed state, New Mexico residents were especially vulnerable to the impacts of the pandemic. Financial stress often leads to conflicts in the home, depressive symptoms, and feelings of helplessness. Helping individuals and families in New Mexico understand their financial options, how to best prepare for their future, and how to create a plan of self-improvement and growth is a critical need in New Mexico.

In response to emerging concerns for the financial and emotional well-being of families across the state of New Mexico, Extension Specialists identified The 8 Success Habits Everyone Should Implement as a workshop that could help individuals and families during this stressful time from a financial, emotional, and individual growth standpoint. Mindfulness, gratitude, goal setting, and principles of positive self-improvement were used to help participants reflect on their current and future situation.

A retrospective pre- post-survey that included objective and subjective questions targeting change in knowledge, attitudes, and skills with intent to change behavior was administered. The results revealed participants had more knowledge, more positive attitudes, and confidence in their ability to create and follow through on success habits, and more strategies and tools to help them live a life of success. Participants also planned to change their behaviors to make a positive change in their life.

Participants shared, "Success isn't the number in your bank account it is living with purpose."

"To be more successful in life you do not want to stay in your comfort zone forever, because how else would you learn about new things. Stepping into your discomfort zone will help you a lot in life."

"I intend take control of my own happiness and stop wasting the time I have left."

Mindfulness, gratitude, goal setting, and principles of positive self-improvement leads to feeling less stressed and more in control of one's own life, especially during high inflation and financial hardship.

Bryce L. Jorgensen, ***Extension Family Resource Management Specialist, Extension Family and Consumer Sciences***

ACES Pillar: Family Development and Health of New Mexicans

Food Waste Hackathon

Food wasted by consumers impacts climate change, wasting resources and producing methane gases that affect global warming. The Innovative Media Research and Extension team collaborated with 4-H agents to design a Food Waste Hackathon, including animations and designs for in-person activities. Youth have the potential to create change at multiple levels: from addressing food waste behavior in their own household to advocating for changes in the community.

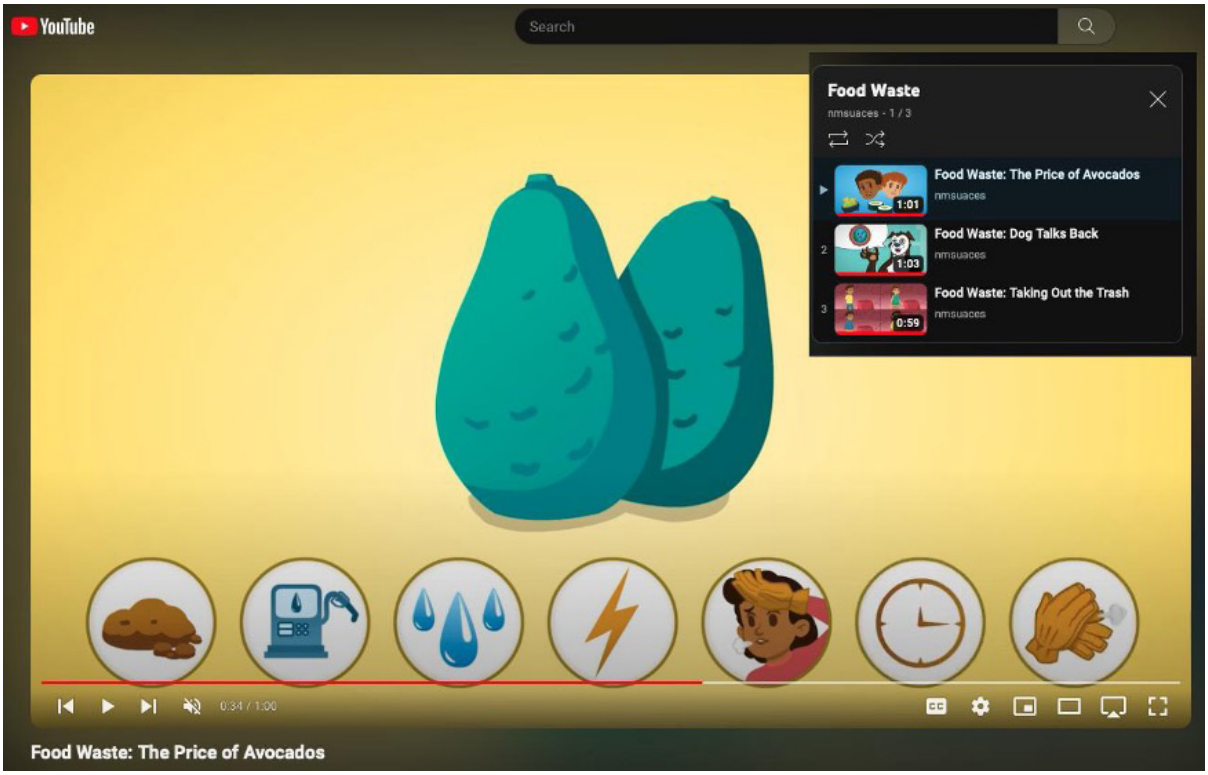
In 2023, the department hosted a Learning Games Lab Food Waste Hackathon, giving middle school students a chance to work with an expert team of media developers to design media solutions to stop food waste. Youth learned about the impacts of food waste, learned a design process, and proposed games and animations to help consumers understand and stop food waste. They enhanced their digital fluency and media literacy skills by designing with digital tools and delivering media prototypes to change behavior.

Youth ranked the Learning Games Lab experience as "extremely good" and valued the skills taught in the session. One participant said, "It made me interested in how much food is wasted each year and so many ways we can prevent it, but we don't."

By collaborating with digital tools, designing solutions and delivering presentations, youth are better able to solve problems that are important to them (such as food waste), using the tools they are comfortable using. With Hackathons, youth have agency and feel empowered when they can design solutions through collaboration and research.

Matheus Cezarotto ***Extension Specialist Educational Technology, Innovative Media Research and Extension***
Barbara Chamberlin, ***Department Head, Innovative Media Research and Extension***

ACES Pillar: Environmental Stewardship



Stay Safe Working with Horses Interactive Module

Youth and adults must follow safety practices to keep themselves safe when working with horses. The Innovative Media Research and Extension team designed the Stay Safe Working with Horses online interactive module. This web-based interactive module is available on computers or tablets in formal (classroom) or informal settings and uses interactive panels of images and text to communicate how to safely catch, halter, and release a horse in a pen or stall and the paddock. The module also provides safety tips about horse behavior and ways to prevent accidents.

Measuring the learning impact of an educational technology tool is essential to understanding its value and usefulness. The Stay Safe Working with Horses interactive tool was developed with university researchers in 2013 but was recently updated with accessibility features and made available online as a free module. The research study measures learning outcomes from adults interested in working with horses, measuring their self-reported knowledge after using the module, their level of enjoyment with the lab and perception of product usability.

Preliminary results indicated that 64.7 percent of participants enjoyed the module experience, and 69 percent planned to share the module with others. Overall, after using the interactive module, participants had an increased perception of knowledge in approaching a horse safely, putting on the halter properly, positioning themselves safely relative to the horse, making sure other horses don't escape, keeping a horse calm, and interpreting horse behavior.

Accessible, user-friendly, and research-based educational technology tools effectively support extension efforts between NMSU and the community. The online module is available free online at http://staysafewithhorses.org.

Matheus Cezarotto, ***Extension Specialist Educational Technology, Innovative Media Research and Extension***

ACES Pillar: Family Development and Health of New Mexicans

Improving Soil Health in Irrigated Arid Cropping Systems

Adapting soil health practices in New Mexico will maintain and improve crop yields, increase carbon sequestration in the soil, reduce greenhouse gasses, enhance the resiliency of the cropping systems to climate change, and sustain farm profit, but soil health has become challenging in the irrigated cropping systems in New Mexico.

Problems identified in multiple fields include low organic matter, poor microbial community structure, soil compaction, and poor nutrient cycling. All these have led to reduced yields, increased inputs for crop production, reduced resilience of the soil to climate change, and an increase in greenhouse gas emissions.

Training farmers and agricultural support professionals on adaptable soil health practices that will improve crop yields, develop climate-resilient soil, and reduce greenhouse gas emissions will help maintain and enhance crop production and conserve the environment in the region.

To support this effort in 2023, educational activities included field days, on-farm and on-station demonstration trials, presentations at grower conferences, and the release and distribution of extension publications related to soil health management. During the events, information on cover cropping, the use of organic amendments such as biochar, and reduced

tillage management was shared. This involved a demonstration of how to produce biochar from wood wastes, practical considerations in selecting cover crop species, and a demonstration of reduced tillage equipment in the field. Demonstration trials and educational activities were supported by funding from USDA-NIFA, NMDA, and CES.

Soil health demonstration trials showed that using mixed cover crop species increased yield by 22 percent, while a compost-biochar blend increased yield by 13 percent after two years of applying these soil health practices. In addition, soil health practices led to significant improvements in soil organic matter and the microbial community structure of the soil.

Participants in the educational events indicated an average of 70 percent gain in knowledge from the information provided at various soil health events. About 80 percent of the participants indicated their willingness to adopt at least one of the soil health practices.

John Idowu, ***Extension Agronomist, Extension Plant Sciences***

ACES Pillar: Environmental Stewardship

Urban Horticulture – Extension Master Gardener Training

The Master Gardener Program trains volunteers to be effective community educators in horticulture and provide their communities with relevant, unbiased, research-based gardening information. Extension Master Gardener Volunteers assist their County Extension offices in answering gardening questions, maintaining learning gardens, youth activities, and delivering gardening and home food production classes and workshops.

During the pandemic, a resurgence of home food gardens resulted from initial shortages of goods at grocery stores, people working remotely from home, and a need to be proactive in the face of the pandemic. In 2020 the volume of gardening questions increased by 1,740 percent from the previous year, in 2021 there was an increase in inquiries of 245 percent and 186 percent in 2022 from pre pandemic years.

According to the National Gardening Association's annual survey, the most popular gardening trends for 2023 will be creating vegetable gardens, planting flowers, shrubs, and growing new types of fruits and vegetables. For Extension Master Gardener Volunteers (EMGV) to meet public demand for science-based gardening and home food production information, ongoing training and mentoring is vital. A comprehensive training program is the foundation for developing their horticulture knowledge and key to building confidence to serve as community educators.

After completing the training, interns must contribute a minimum of 30 volunteer hours in sanctioned activities with their County Extension program. Upon completion of the training and volunteer hours, interns become certified Extension Master Gardeners. Certified EMG volunteers are required to earn a minimum of 10 continuing education hours each year to remain in good standing.

There were 201 Master Gardener interns from 10 counties enrolled in online training in 2023, and there was an average increase of 28 percent in pre- and post- test scores for each There were 156 interns that completed the course requirements and 118 interns that completed the course and volunteer hours to become certified Extension Master Gardener Volunteers.

In 2023, Master Gardener interns contributed a minimum of 30 volunteer hours to their County Extension offices, increasing availability of current reliable home horticulture information and programming for residents. With a value of $31.80 per hour, the dollar value of their service exceeded $112,572.

There also were 189 Veteran Master Gardeners enrolled in online training for their continuing education hours and 45 Veteran EMGs improving their diagnostic and identification skills with hands-on field training.

"Even with gardening experience in two other states, I found the NMSU EMG course invaluable as a newer resident of Santa Fe. All instructors were top notch and presented well," said one participant. "I appreciate the specifics for our area and New Mexico. I'm thankful for all who presented and hate to see the course end! Now the service begins, the learning and fun continues."

Lynda Garvin, ***State Extension Master Gardener Program Manager, Extension Plant Sciences***

ACES Pillar: Food and Fiber Production and Marketing

Virtual Fencing in Response to the Black Fire

The Black Fire was the second largest fire in New Mexico history and burned over 325,000 acres. Many of the acres that were burned are used by local ranchers for grazing cattle. Fire and subsequent flooding damaged or eliminated hundreds of miles of fencing required to maintain cattle according to grazing management plans. Without fencing, ranching operations in the region were jeopardized.

In response, the Sierra County Extension Office, Extension Animal Sciences and Natural Resources Specialists, and Animal and Range Sciences Researchers worked collaboratively with local ranchers and the US Forest Service to secure funding from the USDA NIFA Rapid Response to Extreme Weather Events Across Food and Agricultural Systems program. Funding was used to deploy virtual fence technology on ranches impacted by the wildfire. To date, over 200 cows have been collared and are grazing more than 30,000 acres.

Participating ranchers learned how to use the technology and are actively using virtual fencing to manage grazing. The US Forest Service estimated about 90 percent of the cattle were contained appropriately and that sensitive environmental sites were protected by virtual fencing. Collaborating ranchers reported that their fall gathering times were reduced by seven days and gathering efficiency was increased by 10 percent. In addition to helping ranching operations in the area, results and observations from the project will serve as a template for responses to future wildfires on grazing lands.

Craig Gifford, ***Extension Beef Cattle Specialist, Extension Animal Sciences and Natural Resources***

ACES Pillar: Food and Fiber Production and Marketing

Rangeland Ecology and Management

New Mexico comprises 78 million acres of rangeland that has a complex ecological interaction of water, soil, vegetation, and grazing animals. Monitoring is the process of assessing these attributes, over time, to establish a functional baseline for proactive management planning and decision making, but monitoring and understanding ecological function of New Mexico rangelands can be a complex process.

There is an increasing need for land stewards to be trained in the collection of quantitative rangeland data, use of available technologies, inference development to support ecological function, and to make scientifically based proactive management plans and decisions.

The CES Extension Range Management Specialist worked with a diverse group of New Mexico Stakeholders that have interest in or a need for scientific information regarding established and novel approaches in rangeland assessments, plant identification and ecology, weed management, poisonous plants, and natural resources policy. This includes ranchers, land managers, tribal entities, county extension faculty, federal and state agencies, and youth and young adults.

CES provides beginner monitoring kits, a computer-based data interpretation and records keeping program, and trains New Mexican rangeland professionals, producers, and public to assess rangeland conditions quickly and effectively through on-the-ground and remote sensing technologies, understand ecological function, interpret monitoring data, and develop rangeland management plans through presentations and in-field demonstrations. Trainings are used to deliver scientifically based information in support of the Beef Quality Assurance and Pesticide Applicators Training programs as well as Youth, Tribal, and independent events for all New Mexicans.

In 2023, 86 monitoring kits were requested and made available to trainees in support of their on-the-ground efforts to assess rangeland conditions. There also were 22 drone use and trainings made available with two private ranches adopting the novel technology. Of the participant

76 percent indicated an increase in knowledge following presentations and demonstrations and 64 percent stated they would use the information, saving an average of $2,179 per operation.

There were 10 private producers, three tribal entities, and five government agencies that adopted the use of the computer-based data interpretation and records keeping program (RaDAR; rangelandradar.app) for the use of range management planning.

Casey Spackman, ***Extension Range Management Specialist, Extension Animal Sciences and Natural Resources***

ACES Pillar: Environmental Stewardship

2023 ANS College Experience

The Aggie Next Step College Experience (ANS-CE) encourages youth to create a path for life after high school by inviting youth to campus starting in eighth grade and introducing them to faculty members, college students, and student life at a university.

In 2017, a joint policy resolution of the Office of the Secretary of Higher Education, Department of Labor, Workforce Development, and the Governor's Higher Education Council set a goal of 66 percent of the New Mexico's workforce population having a postsecondary degree, certificate, or training beyond high school by the year 2030. The national average of post-secondary educational attainment stands at 51.9 percent, while 45 percent of New Mexico's workforce has attained post-secondary education or training.

Increasing youths' awareness of postsecondary degree, certificate, training, and career options can serve to develop a more skilled and educated workforce and research indicates that field-trip-based interventions can meaningfully affect student college decisions and preparation.

ANS-CE provided four campus visits in 2023. Twenty-four departments from five NMSU colleges, two Doña Ana Community College campuses, and Burrell College of Osteopathic Medicine participated. Faculty, staff, and students provided 44 experiential learning activities for 261 eighth grade students from Chaves, Grant, Rio Arriba, Sierra, and Valencia counties.

In a pre-survey of participants, 38 percent had never been on a university campus, and 65 percent had never visited NMSU. In a post survey of the eighth-grade participants, 71 percent indicated they were more likely to attend NMSU, and 78 percent indicated they felt better prepared to pursue their career and education goals.

"It changed my view of college. I want to go to college even more now," said one participant.

"I really enjoyed touring the campus, it gave me more of an idea of what college life is like," said another.

J. Newt McCarty, ***State 4-H Agent Aggies Next Step Program and Youth Development, State 4-H***

ACES Pillar: Family Development and Health of New Mexicans

Integrating Literacy, Numeracy, and Agriscience at the NMSU Extension and Research Youth Agricultural Science Center

New Mexico State University's Extension and Research Youth Agricultural Science Center (Center) is a youth science center emphasizing inquiry-based learning and experiential education. The mission of the Center is to deliver STEM-based formal education programs in agriculture and natural resource science to youth in Las Vegas, NM.

A basic premise of the mission is to develop a teaching and learning model of excellence that complements in-class instruction by providing context to content through hands-on learning opportunities. As school districts across New Mexico have undergone significant change in the past decade, the Center was presented with an opportunity to reach more youth through additional educational programs at the same cost.

In 2019, the youth ag science center model was expanded. The redesigned model is an innovative cross-curricular program that allows for educational intervention at a younger age that continues through high school. Research into model efficacy indicated that science education at the elementary level was lacking and that hands-on learning opportunities to improve learning outcomes for youth was needed. Core programs delivered through the Center include:

agriscience (basic principles and applications of food/crop production), sustainability (agriculture, energy, water nexus), and integrated programs delivered across the core educational curriculum.

To meet this challenge, a greenhouse and school-based gardens at the elementary school sites were constructed to deliver hands-on and inquiry-based school enrichment. A hoop house at the high school was constructed with students from grant funds. This provides the connection between the science taught at the primary grades and applications to real-world growing opportunities taught at secondary grades.

This approach enhances student's production-based agricultural competency and prepares them for postsecondary education in STEM careers, like agriculture or natural resource science. The elementary greenhouse and high school hoop house are also used to spur community and economic development through demonstration /training, farm-to-school programs, farmers market production, and support to the local Master Gardeners program.

We feel this approach has allowed NMSU CES in partnership with the Las Vegas City Schools to maximize educational strengths of the partner institutions, land resources, facilities, and public/private funding for public education school enrichment programs.

Research indicate the programs significantly close the achievement gap for students performing below grade level, that science skill development is a significant predictor of overall science comprehension, and that youth exposed to the Center model score significantly higher in agriscience and have significantly higher science scores on state mandated assessments compared to a control school.

Partner public education teachers report that programs delivered through the Center improve student science skills, science knowledge, and science understanding. Students participating in Center programs report improved agricultural production skills and knowledge. Lastly, Center programs support a pathway to post-secondary education in STEM disciplines.

Underserved and economically disadvantaged communities like Las Vegas, NM, benefit greatly from Extension programs. During the past 17 years, the NMSU Extension and Research Youth Agricultural Science Center has enhanced educational opportunities for youth in agricultural science and related STEM programs, agricultural literacy, and the production of fresh and nutritious food.

Peter Skelton, ***Youth Agriscience Education Specialist, Director Youth Agricultural Science Center, State 4-H***

ACES Pillars: Family Development and Health of New Mexicans, Food and Fiber Production and Marketing

Anna, Age Eight Institute

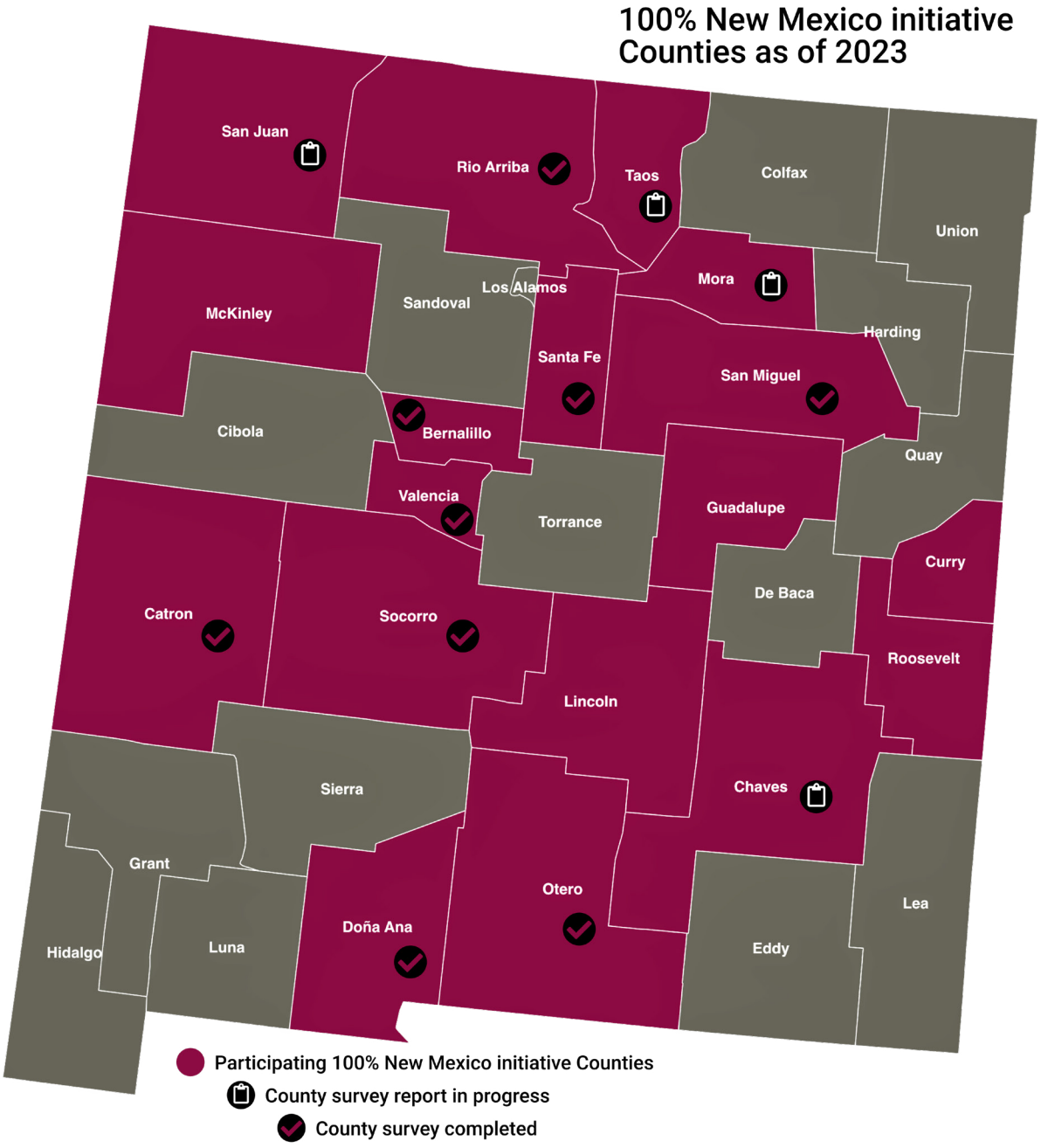
Leaders from all initiative counties participating in the Road to 100% Initiative quarterly training.

Executive Summary

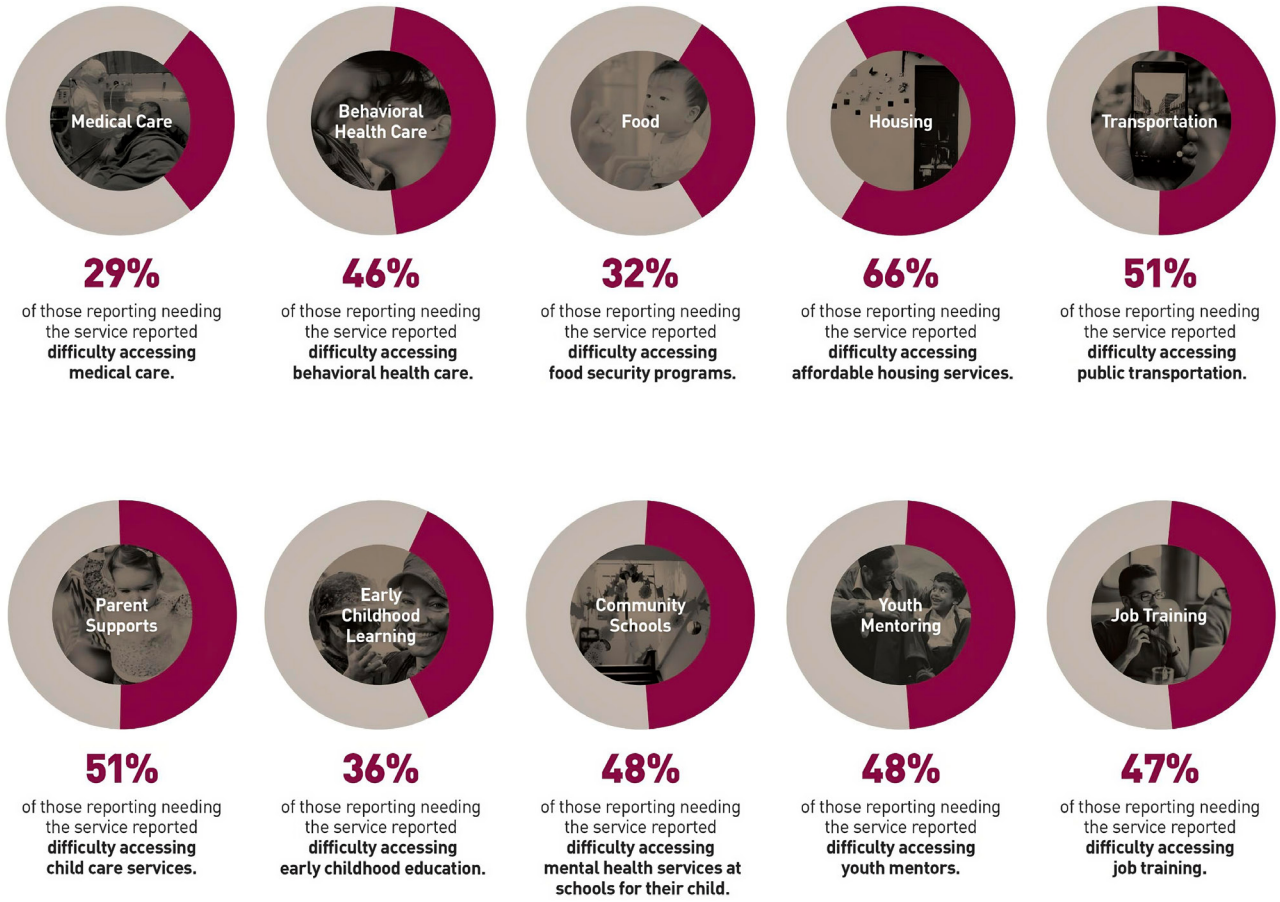
The Anna, Age Eight Institute's mission is to transform New Mexico into a state where all children, students, and families can thrive. Through the 100% New Mexico initiative, we are addressing two critical challenges: adverse childhood experiences (ACEs) and negative social determinants of health (SDOH) by providing frameworks, research, and technical assistance at the county level to ensure access to the ten vital services essential for families to thrive. In 2023 we greatly expanded our presence in the 18 counties currently participating in the initiative. Nine of the counties have completed their initial surveys of the barriers that prevent families from accessing services, with an additional four counties in the process of surveying families in 2023. Our grants this year have not only supported the critical survey step, but have allowed team leaders in each county to bring in qualified team members to turn survey results into action. 2023 saw several counties lay the groundwork to establish a 100% Family Center: One-stop Service Hub in each county as well as coordinate on the effort to provide school-based family services to meet the needs of families where their children are present most.

Surveys: The Critical First Step

The initiative leaders in every county know that families have difficulty reaching what we collectively call the ten vital services for surviving and thriving: medical and dental care, behavioral healthcare, food security programs, housing security programs, transportation, parent supports, early childhood learning, community schools, youth mentor programs, and job training. In some cases, the services exist but are inaccessible for a multitude of reasons. In other cases, the services are entirely absent or are so far away they might as well not exist. The initial county survey uncovers these barriers.



NM counties participating in the 100% New Mexico initiative with survey completion status.



Example survey results at-a-glance from the Rio Arriba County survey.

In 2023 we had four counties proceed with their initial survey with the goal of achieving the largest-possible relevant dataset.

- Chaves
- Mora
- San Juan
- Taos

Once complete, they will join the group of nine counties where the data collected from completed surveys are being analyzed and acted on.

- Bernalillo
- Catron
- Doña Ana
- Otero
- Rio Arriba
- San Miguel
- Santa Fe
- Socorro
- Valencia

Directories to Verified Services

Another data collection step in the initial phases of the initiative is to complete a directory of verified services within the county. Many directories containing resources in New Mexico exist, but their data is not typically vetted. Initiative team members identify local resources, then contact each one to verify hours, services, costs, transportation, and more. It is not unusual for this step to reveal that many service providers no longer exist or their service details are inaccurate, out of date, or misleading. In 2023, San Juan County, Catron County, Curry County and Roosevelt County completed this step and now have published publicly accessible, vetted directories. Notably, the Anna, Age Eight Institute has begun assembling AI-based tools to help county teams reduce the labor intensity of this important step and the necessary reevaluation steps in the future. We are also experimenting with conversation-based interfaces to help those seeking vetted resources find exactly what they need, even if they are uncertain how to describe the solution they are seeking.

Summits Building Momentum

Our local 100% New Mexico initiative summits bring together community leaders and community members to discuss how to coordinate resources to make sure that 100% of the residents in the county have access to the vital services needed to survive and thrive. The summits are open to the public and bring lawmakers, service providers and community members to the table to discuss topics such as fully resourcing local schools, establishing 100% Family Center: One Stop Hub model, and building partnerships so that 100% means everyone's in and no one is out.

Jennifer Ammann and Naomi Concha of the 100% Taos County initiative discussing local challenges and solutions at the 100% training.

Summit activity reached new heights in 2023. Our local initiatives held summits in Otero, Chaves, San Juan, and Taos counties along with a special 100% Northeast Regional Youth Summit bringing together the counties of Guadalupe, Mora, and San Miguel. The momentum is carrying through to 2024, with more summits planned in the first two quarters than all of the previous year.

Training Leaders for Success

Diego Lopez, 100% Rio Arriba County initiative leader discusses at the 100% training the challenges to families in his community.

In 2023, the institute kicked off a new in-person training series for 100% New Mexico initiative leaders. Two sessions were held in October and December, with sessions planned for 2024. The "Road to the 100% New Mexico Initiative" training event was an opportunity for initiative leaders from the participating counties to join together for a shared learning experience, and covered the topics vital to the success of the initiative in each county.

- How to strengthen local support for the 100% Community model to ensure ten vital services to prevent adversity inside and outside the home.
- How to build local capacity to facilitate the 100% New Mexico initiative's seven steps, including surveys, directories, summits, mural projects, and buy-in from local government and stakeholders.
- How to create and pitch proposals for the 100% Family Center: One-stop Service Hubs and meet the urgent need of families by ensuring ten vital services for surviving and thriving.
- How to identify potential funders and partners within the public and private sectors and on every level of government to support the development of the 100% Family Center as a transformative community and school-based model.

The training sessions offered the initiative leaders a chance to develop the skills, resources, and insights to do transformative work in local problem-solving, capacity-building, and community engagement as we ensure ten vital services for surviving and thriving for 100% of New Mexico's children, students, and families.

Murals Engaging Communities

Community outreach is an important component of the 100% New Mexico Initiative. We have found that initiative-themed community art projects do more than beautify towns and neighborhoods, they spread the word of the local 100% New Mexico initiative and rally residents around a common cause.100% Taos County unveiled a stunning mural in the city of Taos, and 100% Rio Arriba County and 100% Valencia County added beautiful murals to increase public awareness of the initiative.

The 100% Taos mural: Our 100% Mural projects bring together students, families, and stakeholders with a message of healing, hope, and a call to action.

Meeting the Need: Family Centers and Schools with Services

The 100% Family Center concept, a one-stop service hub, is a cornerstone of the initiative. These centers provide centralized access to ten vital services, offered both onsite and online. Dedicated staff are available to guide individuals and connect them with local service providers, eliminating the complexities of navigating fragmented systems. 2023 saw several local initiatives make great inroads into making the 100% Family Center a reality in their local communities. Detailed plans were reviewed with local stakeholders, locations were identified, and grant applications submitted. The process clearly demonstrates that we know the challenges and how to fix them. All that's lacking is the buy-in to make the health, safety, and education of 100% of New Mexico's children and students the number one priority.

> *The Anna, Age Eight Institute's 100% New Mexico initiative stands as the nation's first statewide collective impact strategy dedicated to preventing adverse social determinants of health (SDOH) and adverse childhood experiences (ACEs). Leveraging this groundbreaking initiative, the Anna, Age Eight Institute provides participating counties with frameworks, research, and data to bolster their own localized version of the 100% New Mexico initiative. 2023 was a pivotal year for expanding county-level engagement and moving local initiatives into more advanced stages of the seven-step strategy. Especially notable was momentum created by the numerous county-level summits, the Road to 100% Trainings, the "Road to 100%" documentary series, and the concrete progress in the push to establish a 100% Family Center: One-stop Service Hub in each county.*
>
> – Dr. Katherine Ortega Courtney, Co-Director of the Anna, Age Eight Institute

The success of the 100% New Mexico initiative hinges on collaboration. We are grateful for the unwavering support of NMSU, our partners, community leaders, and dedicated staff. Together, we are making a significant difference in the lives of countless New Mexicans. By fostering a spirit of collaboration and investing in evidence-based interventions, we are building stronger communities, brighter futures, and a healthier New Mexico.

NM EDGE: Better Government through Education

NM EDGE (**E**ducation **D**esigned to **G**enerate **E**xcellence in the public sector) is designed to provide a comprehensive course of study to administrators, managers, elected officials, and staff in local, state, tribal, and national government. Through this program, participants can acquire and apply best practices, theories, and strategies based on the highest professional standards.

NM EDGE is an umbrella organization operated through the NM Cooperative Extension Service under which the County College (founded with NM Association of Counties), the NM Certified Public Manager® Program, and other continuing education certification programs are administered. The idea behind NM EDGE is to expand training programs beyond county government into other areas of the public sector such as municipal entities, state agencies and other public-oriented organizations that have a need for specialized training.

Annually, about 400 online and in-person classes are offered and about 1,200 public employees take NM EDGE classes. In 2023, students logged 18,366 hours.

In 2023, NM EDGE was reaccredited through the National Certified Public Mangers Consortium through 2027. The Consortium was formed in 1979 and establishes and preserves standards for the Certified Public Manager® designation by providing and monitoring accreditation standards, facilitating program development, encouraging innovation, and developing linkages with programs and organizations across the U.S. and internationally.

The CPM Certification is comprised of three tiers – Certified Public Official, Certified Public Supervisor, and Certified Public Manager. Since 2008, 520 public officials have completed the first tier, 196 the second tier, and 34 the final tier.

All NM EDGE certifications follow the CPM curriculum guidelines, and there have been 426 public officials who have completed a program.

In 2023, seven scholarships were awarded for the NM Certified Human Resource Professional certification and 13 for the NM Certified Jail Specialist certification.

NM EDGE continually evaluates programs and courses and is currently conducting complete curriculum reviews for the Certified County Clerk and Certified Extension Specialist certifications and just completed full reviews of the Risk Management and Tax Policy curriculum.

For more information, visit https://nmedge.nmsu.edu/.

Southwest Border Food Protection and Emergency Preparedness Center

The Southwest Border Food Protection and Emergency Preparedness Center (SWBC) is a collaborative effort of New Mexico State University (NMSU) College of Agricultural, Consumer and Environmental Sciences (ACES) and the New Mexico Department of Agriculture. The SWBC helps protect the nation's food supply against threats ranging from foodborne illnesses to supply chain disruptions to agroterrorism.

We honor a three-pronged approach to Food Protection: Food Safety, Food Defense and Food Security.

Food Safety – Protection of food products from unintentional compromise.
Food Defense – Protection of food from intentional compromise.
Food Security – Ensuring food is available and accessible.

SWBC or the Center works to protect New Mexico agriculture through planning, training, and assisting in the response to all hazard events. In many of New Mexico's 33 counties, agriculture is the No. 1 economic engine, and the SWBC seeks to train emergency responders, law enforcement, extension personnel, and NMDA personnel in agriculture security, food protection and family, business and community preparedness.

The SWBC assesses the security of agriculture operations through our AGROGUARD program and provides training for farmers, dairy and livestock producers, public health officials, law enforcement and the public. We maintain first-response trailers across the state stocked with equipment to help officials respond to an agriculture emergency.

In 2023, SWBC supported multiple activities, including hosting the Food Protection Alliance Conference, which included over 20 different food-related entities to discuss the ever-changing food industry.

Produce Safety Grower Training has provided 120 producers with risk-based measures to implement within operations to provide a safe food product for consumers, resulting in 95 percent of the participants improving their pre- and post- test scores with an average 25 percent increase.

The Center's Specialty Crop Block Grant provided educational opportunities to address food safety concerns. The Center has successfully recruited and enrolled 36 Quality Assurance (QA) Managers from New Mexico's packinghouses and processing plants into the Listeria Control Specialist Certificate program.

The Center monitored 64 Ag Tip Line calls involving verification with Livestock Board regarding response or response directed to necessary party – six of the 64 were food related. The Center provides education and Food Safety outreach materials for dissemination throughout the state via county, regional and state Ag literacy programs, reaching 1,900 youth community members throughout New Mexico.

The High Mortality Carcass Management Plan and resulting deliverables have played a key role by building relationships among responsible agencies and subject matter experts as well as providing foundational knowledge to move forward. During the COVID-19 pandemic, there was high turnover and temporary duty assignments for many of the agencies and organizations with jurisdiction over the project topic. The project served as a catalyst to reorient and reinvigorate preparedness efforts to respond to foreign animal diseases or other animal health concerns within the state of New Mexico. Twenty-two entities contributed.

The Agricultural Livestock Incident Response Team (ALIRT) trains annually to remain poised and ready if an event arises. This team additionally provides data to enhance disease surveillance across the state. This year's training included ICS refresher; Agency Updates; Enhancements to Traceability and Biosecurity Measures. Attendees were run through multiple response drills as refreshers.

NMSU Campus Ag Emergency Expo provided an opportunity to pull out emergency equipment to learn through discussion and exercising its use. Stations included Mental Health materials from the Here to Help New Mexico Initiative of the Farm and Ranch Stress Assistance Network, a Just in Time Vaccination training, the Socorro County Mobile Animal Shelter Unit, the Cooperative Extension Large Animal Response training, and the Personal Protective Equipment training.

Finally, multiple dynamics make New Mexican vaccination plans uniquely complex. New Mexico sits at the nexus of essential trade paths, including the largest international livestock border crossing in the United States, an interstate border with five states, and sovereign tribal land. New Mexico also has the largest dairy herd in the United States, where normal vaccination processes could quickly be overcome. As a result, the issues encountered here will provide a wide range of lessons that can inform vaccination plans throughout the country.

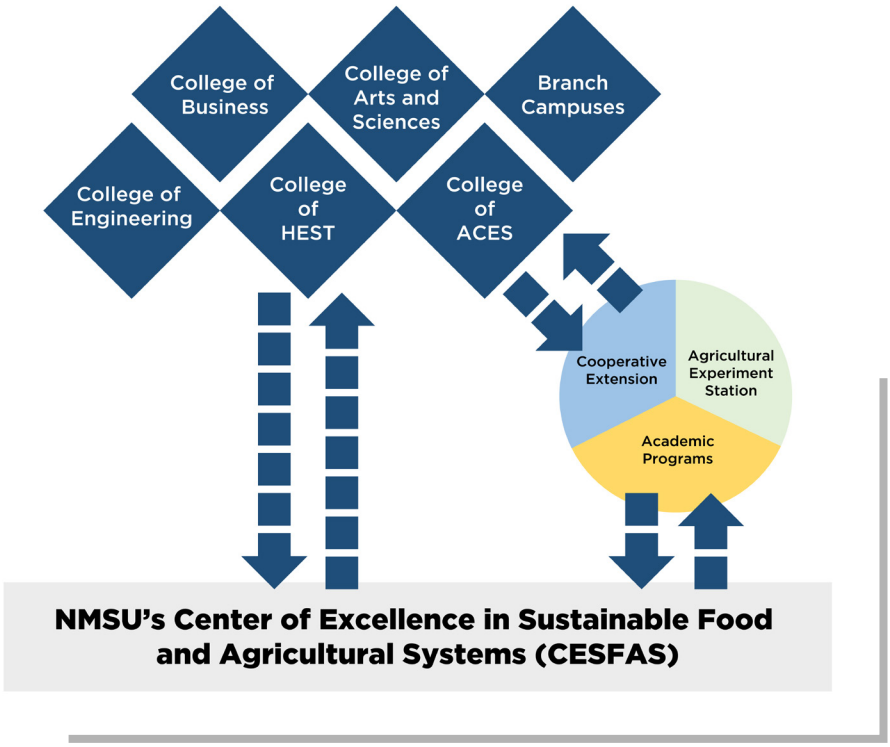
For more information about the SWBC, visit https://preparedness.nmsu.edu/.

Executive Summary

The Center of Excellence in Sustainable Food and Agricultural Systems (CESFAS) was established in 2019 by Governor Lujan Grisham and the New Mexico Legislature. Within the Governor's initiative, four university-associated centers of excellence associated with emerging disciplines or needs were organized. The centers include:

- New Mexico State University's Center of Excellence for Sustainable Food and Agricultural System
- San Juan College's Center of Excellence for Renewable Energy & Sustainability
- University of New Mexico's Bioscience Center
- New Mexico Institute of Mining and Technology's New Mexico Cybersecurity Center of Excellence

The Center of Excellence is housed within the College of Agricultural, Consumer, and Environmental Sciences at New Mexico State University. A primary goal of the Center is to coordinate and encourage interdisciplinary teaching, research, and outreach (Extension) activities that support sustainable food systems, develop and expand value-added agriculture, create jobs, and prepare workforce-ready graduates. In 2023 the Center of Excellence focused its mission, goals, and objectives on post-harvest valued-added agriculture.



The College of Agricultural, Consumer, and Environmental Sciences

The College of Agricultural, Consumer, and Environmental Sciences (ACES) is broadly organized into three interrelated functional areas: Academic programs, the Agricultural Experiment Station, and the Cooperative Extension Service. Teaching, research, and Extension efforts within the College are centered on four primary pillars, with a foundation of education and training. The four pillars are (1) food and fiber production and marketing, (2) water use and conservation, (3) family development and health of New Mexicans, and (4) environmental stewardship. The Center of Excellence supports academic, research, and Extension/outreach activities within these pillars.

2023 Center Efforts

Research

Faculty and staff working with the Center of Excellence continue work on controlled environment agriculture in 2023. The container farm housed on the University's branch campus in Grants, New Mexico, continued to operate, producing kale in fulfilling its obligations related to a nationwide research project with the Electric Power Research Institute (EPRI).

Controlled Environment Agriculture

Controlled environment agriculture includes crops grown in high tunnels, greenhouses, in indoor vertical farms housed in "brick & mortar" facilities, and container farms. The Center of Excellence is supporting a third-party built container farm in Grants, New Mexico, and working with faculty and students in the College of Engineering to develop an NMSU-designed and -built container farm.

In addition to the container farm located in Grants, New Mexico, faculty and staff in the Center are working with the College of Engineering in designing and building their own container farm. One team of students in the engineering capstone course worked to develop initial designs in Fall 2023. In 2024, three teams of students in the capstone course are working on refining the design. These students are developing a prototype growing chamber and will begin building a twenty-foot container, beginning this summer.

Genetic dissection of *Phytophthora capsici* resistance in chile pepper using epigenomic and transcriptomic approaches is another grant project Center of Excellence faculty and staff are working on. Chile peppers (*Capsicum spp.*) are one of the major economic and cultural crops in the state of New Mexico. In the proposed project, CESFAS faculty will facilitate the development of *Phytophthora capsici*-resistant chile pepper varieties in New Mexico using powerful epigenomic and transcriptomic tools. Results from this study will render novel insights into the genetic architecture of the *P. capsici–Capsicum* pathosystem, which can direct breeding and selection efforts to improve disease resistance of chile pepper in New Mexico.

Developing an Alliance for Training and Apprenticeship in Climate-Smart Agriculture (DATA-Ag)

This project addresses post-harvest agriculture systems and technology and agricultural economics and rural communities by increasing the number and diversity of students, enhancing student experience, and create technology data-savvy workforce. Educational activities include but are not limited to: Curriculum Development, Instructional Delivery Systems, and Faculty Development in STEM and Agriculture Science Education. Experiential Learning and Internship areas cover agriculture data analytics, sustainable agriculture and agricultural logistic planning. The broad impacts of this project will result in a pipeline of urban community college

students that will become data-savvy and technology-savvy, increasing diversity of the workforce, and increasing human capital to serve under-represented and under-served communities in Texas and New Mexico.

Working with Oregon State University on a Joint Research Proposal on Strengthening the Bioeconomy:

This project will focus on developing sources of clean energy and high-value biobased products from agricultural and forestry feedstocks to foster economic development and prosperity, with an emphasis toward generating benefits to underserved communities, that will benefit both States.

Outreach

Training:

Faculty and staff working with the Center of Excellence, together with private industry and USDA's Rural Partner Network, developed a meat processing "certified butcher" training course. The course is designed as a "train-the-trainer" course. Industry trainers working with Stampede Meat, LLC (now Stampede Culinary Partners) participate in ten hours of online training and four-hours of in-person training conducted by NMSU faculty and staff. Stampede employees participate in the same training, with the exception that University-trained Stampede Meat trainers conduct the in-person training. More than 50 employees participated in the training in 2023 and additional trainings have been conducted in 2024.

CESAFAS faculty is also working on "Training of Next Generation Workforce for Smart Food Science and Agricultural Technology in the Internet of Things Era (WorkFoS-Ag)." WorkFoS-Ag is a collaborative project between the New Mexico State University and Doña Ana Community College. WorkFoS-Ag's main components provide educational and experiential learning opportunities to traditionally underserved community college students and prepare students for the workforce in programs yielding an industry-recognized certificate and/or an apprenticeship opportunity in the broad areas of smart agriculture and food science and more specifically in the pioneering areas of the Internet of Things and data analytics. WorkFoS-Ag falls within the Food and Fiber Production and Marketing Pillar of ACES and within the achievement of each institution's strategic plan, which involves creation of new curriculum in big data analytics, experiential learning opportunities that enable working in job simulation, and implementation of training environments with cutting-edge technology and advanced data skills.

CESFAS faculty has also partnered with Arrowhead Center to support small food processors in NM with sensory analysis evaluations, shelf-life studies, product development, and food preservation processes.

Courses:

Faculty and staff, working with the Center of Excellence, developed an online grant writing course, available through the University's distance education portal NMSU Global Campus.

The introductory course, free to? New Mexico residents, helps food and fiber supply chain participants in developing more competitive grant proposals that may assist them in creating or expanding their businesses.

CESFAS also coordinated Food Safety training for food processors.

Testing Services:

The Center of Excellence purchased state-of-the-art testing equipment that will help New Mexico's wineries and wine makers understand wine composition and improve their wines. The testing services, still in its infancy, has provided testing services for several state wineries. Center of Excellence faculty and staff are working with leaders in the wine industry to market the testing services to a broader audience.

Publications:

The Center of Excellence is developing a publication series, focused on supporting food and fiber supply chain participants. The publication series will provide information to industry stakeholders in a form that is easily accessible and understandable. Articles will be posted on the Center's website and published through NMSU Marketing and Communications. Articles may focus on various topics, including sustainable production, business principles, financial feasibility, economic impacts/contributions, as well as special topics deemed important to industry stakeholders.

CESFAS has also supported or coordinated over six peer-reviewed publications on value-added agriculture.

Community Engagement

The Center of Excellence welcomes opportunities to interact with community members regarding sustainable food and agricultural systems. In 2023, the Center participated in community outreach activities, including the ACES Open House, Ag Days, and the New Mexico Water Symposium.

Center directors assisted colleagues from New Mexico Tech and Navajo Tech in organizing a New Mexico Water Symposium directed towards high school students in the Four Corners region of New Mexico.

CESFAS Faculty Impacts

The Center supports two full-time faculty members, Luis Sabillón (Microbial Food Safety) and Sergio Martinez-Monteagudo (Food Bioprocessing). Additionally, the Center has more than 120 affiliated faculty members interested in collaborating on agricultural-based research initiatives. Examples of impacts of the work conducted by center faculty are provided below.

Food Science and Technology (Efren Delgado)

Relevance:

The food industry is one of the largest globally. Food manufacturing accounts for about 14% of all U.S. manufacturing employment. The impact of modern food manufacturing methods is evident in today's food supply. Food scientists, the industry, and policymakers are determined to improve the food supply to support a healthier and growing population. By 2050, food production must increase 70% to feed 9 billion people. As a consequence, science-based improvements in food science and food systems are critically significant.

Participants/Target Audience:

We have cooperated with the chile, pecan and cotton industries on various funded grants to utilize agro-industrial byproducts to extract alternative plant proteins and antioxidants that can be used as ingredients in the food and aquaculture industry.

Research and Teaching Responses:

Research has been conducted to design and develop innovative technologies for utilizing agro-industrial waste as an alternative source of ingredients such as plant proteins and antioxidants for the food and aquaculture industry.

Our results show the effects of maltodextrins and gum arabic as microencapsulation agents on the stability of sugarcane bagasse extracts and the potential use of the extracts as antimicrobial agents. The bioactive compounds in sugarcane bagasse (SCB) were extracted using 90% methanol and an orbital shaker at a fixed temperature of 50 °C, thereby obtaining a yield of the total phenolic content of 5.91 mg GAE/g. The bioactive compounds identified in the byproduct were flavonoids, alkaloids, and lignan (-) Podophyllotoxin. The total phenolic content (TPC), antioxidant activity, and shelf-life stability of fresh and microencapsulated TPC were analyzed. This experiment's optimal microencapsulation can be obtained with a ratio of 0.6% maltodextrin (M.D.)/9.423% gum arabic (G.A.). Sugarcane bagasse showed high antioxidant activities, which remained stable after 30 days of storage and antimicrobial properties against E. coli, B. cereus, S. aureus, and the modified yeast SGS1. The TPC of the microencapsulated SCB extracts was not affected ($p > 0.05$) by time or storage temperature due to the combination of M.D. and G.A. as encapsulating agents.

The Food Science and Technology Group in the Department of Family and Consumer Sciences managed to study the antioxidant and antimicrobial capacities of sugarcane bagasse extracts showed their potential use as a source of bioactive compounds for further use as a food additive or nutraceutical. The results are a first step in encapsulating phenolic compounds from SCB as a promising source of antioxidant agents and ultimately a novel resource for functional foods.

Graduate and undergraduate students and postdoctoral students were incorporated into the research activities. The students participated in the graduate seminar and cooperated with the food industry to analyze samples. Figure 1 shows the effect of different concentrations of Ampicillin (AMP) and sugarcane bagasse (SCB) extracts on inhibiting the cell viability of various foodborne pathogens and modified yeast. Figure 2 shows the effect of different storage times and temperatures on the shelf-life stability of bioactive compounds from sugarcane bagasse.

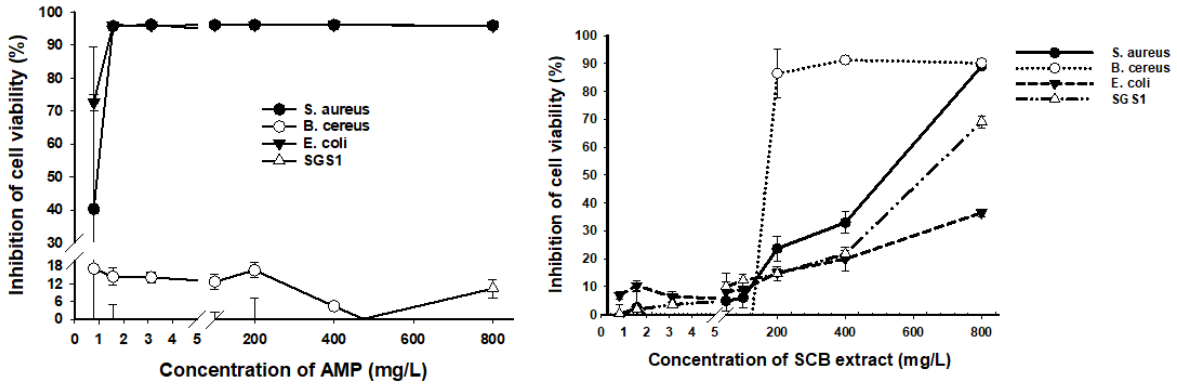


Figure 1. Effect of different concentrations of Ampicillin (AMP) and sugarcane bagasse (SCB) extracts on inhibition of cell viability of various foodborne pathogens and modified yeast. SGS1 = Slow Growth Suppressor 1, AMP = Ampicillin, SCB= Sugarcane bagasse, SGS1 = Slow Growth Suppressor 1. The curves show means ± S.D. (n = 3) for each concentration.

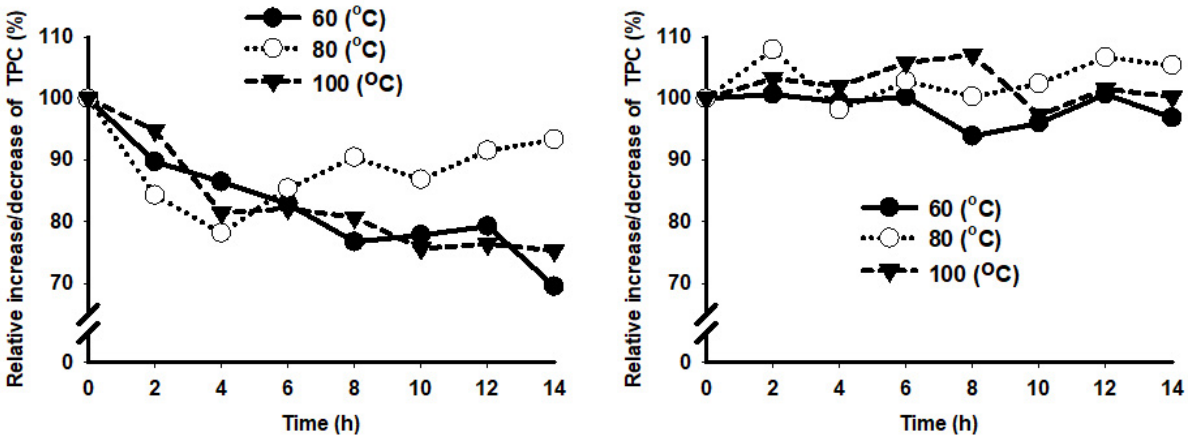


Figure 2. Effect of different storage times and temperatures on shelf-life stability of bioactive compounds from sugarcane bagasse. TPC= total phenolic content, A = free compounds extract, B= microencapsulated compounds extract. The curves show means ± S.D. (n = 3) for each concentration.

With an interdisciplinary group of more than 18 food science and food engineering programs from different universities in the country, CESFAS coordinated the first of its kind "Multi-Institutional Food Engineering Seminar Series" as part of the USDA Multistate Committee NC1023." The participating higher education institutions were: New Mexico State University, Cornell University, Illinois Institute of Technology, Iowa State University, Michigan State University, 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 and Washington State University. We had an average of 139 participants each week from January to March 2021. The seminar was also posted for virtual participation. We had an average of 2634 minutes viewed. We had related areas: Food By-Product Utilization, Engineering for Health, and Engineering and Processing for Sustainable Systems. We had 12 presentations from faculty from 12 different food science or food engineering programs in the country.

Program Impacts and Results

- Sugarcane bagasse (SCB) extracts contain the high antioxidant activity of bioactive compounds.
- The antioxidant activity of SCB is stable for 30 days of storage at 4 °C, showing stability with no degradation, allowing further processing as a potential food additive or nutraceutical.
- The bioactive compounds found in sugarcane bagasse have been reported as therapeutic and anticarcinogenic agents.
- The outcome of this research showed promising effects against well-known pathogenic bacteria and as a possible anticancer agent.
- A microencapsulation process of freeze-drying bioactive compounds was optimized, ensuring the protection of the extracted bioactive compounds, positively supporting its potential use as a food additive.
- Co-organized the first "Multi-Institutional Food Engineering Seminar Series" as part of USDA Multistate Committee NC1023.

Partners:

Chile, Pecan, USDA, Industrial Engineering, Mechanical Engineering, and the cotton industry in N.M.

Photodynamic Inactivation of Foodborne Pathogens (Luis Sabillon)

Relevance:

Low-moisture foods that are handled and packed in dry environments are often implicated in foodborne outbreaks due to Salmonella contamination. This enteric pathogen can survive under harsh, dry conditions and colonize food-contact surfaces for lengthy periods of time, thus increasing the risk of cross-contamination during processing. Therefore, there is a real and urgent need for the development of alternative technologies to enhance the antimicrobial efficacy of existing sanitation protocols. In recent years, antimicrobial photodynamic treatment (aPDT) has emerged as an innovative method for microbial inactivation. This water-less, chemical free, blue light-based treatment relies on the photoexcitation of endogenous photosensitizing molecules to create oxidative and heat stress in microbial cells, resulting in death.

Response

The antimicrobial efficacy of aPDT has yet to be studied on a wide variety of food matrices and processing related surfaces. The overall goal of my research program is to design, develop and optimize effective aPDT treatments for food and surface disinfection in industrial settings. The antimicrobial efficacy of aPDT is being tested against several foodborne pathogens and agricultural commodities of great economic importance to New Mexico, such as paprika powder.

Impact

This research program has been generating novel experimental data to better understand the efficacy of antimicrobial blue light on the inactivation of enteric pathogens in food processing operations. This program has yielded three peer-reviewed publications so far, with more awaiting in the pipeline. aPDT technology may play an important role in eliminating persistent pathogen reservoirs, thereby reducing the risk of food safety incidents. The research program is expanding on existing research and serving 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. Future research efforts are being geared toward the evaluation of this technology against bacterial endospores and dry-surface biofilms.

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. A diverse funding portfolio that includes federal competitive grants and private entities is being targeted to secure external funds to further develop this cutting-edge research program.

Public Value Statement

The near-term benefit of my research program is the development of cost-effective, water-less sanitizing tools that can be used in dry food processing environments to further address microbiological risks.

ACES Critical Issue (Pillars)

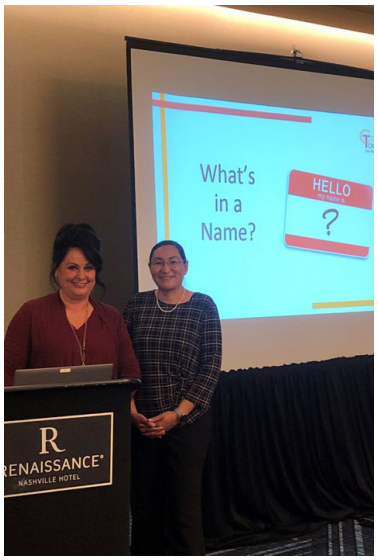
Food and Fiber Production and Marketing

2024 Goals for CESFSAS

1. Facilitate interaction and collaboration between post-harvest, value-added agricultural industry participants and University faculty and staff.
2. Assist University faculty and staff in visualizing innovative future opportunities associated with post-harvest, value-added agriculture in New Mexico
3. Develop a sustainable process to support faculty, staff, and students in post-harvest, value-added sustainable agriculture.

Executive Summary

The College of Agricultural, Consumer and Environmental Sciences (ACES) is committed to embracing equity, inclusion and diversity (EID) in our community that enables all students, faculty, and staff to fully engage in the educational, outreach and scholarly pursuits of our college. Dr. Laura Bittner, Interim State 4-H Department Head, and Dr. Karim Martinez, Extension Family Life and Child Development Specialist, currently serve as co-directors of this initiative. Their duties include coordinating and managing strategic activities related to EID on behalf of ACES while serving as a liaison to related campus-wide initiatives. They collaborate with the NMSU Vice President of EID, Dr. Teresa Maria Linda Scholz, and are also in conversation with ACES administrators to develop a strategic plan aligned with NMSU LEADS 2025 EID Goals throughout the college's academic departments, Cooperative Extension Service and Agricultural Experiment Station.



Highlights from 2023

On February 22, co-directors Dr. Bittner and Dr. Martinez invited a national speaker, Dionardo Pizaña, Diversity, Equity, and Inclusion (DEI) Specialist for Michigan State University Extension, to provide training for the College of ACES. His training, Sharpening our Diversity, Equity and Inclusion Lens, was a full-day seminar attended by eighteen ACES faculty, staff and administrators representing eleven departments/units within the College. This seminar provided participants opportunity to reflect on their commitment to DEI, develop a common language to support change, learn about the role of emotional literacy and resiliency in this work, explore social identity development, and apply a systems approach to supporting transformation and change, personally and professionally.

A post-survey showed that 90% of surveyed participants agreed or strongly agreed the seminar was a valuable use of their time. Participants were also asked how they might use information or activities from the session in their professional and personal lives. Responses included:

- I received much needed encouragement on specific ways to reach other demographic groups—via trust and relationship building and planning these efforts into proposals and budgets.
- I will try to implement this information and activities into my department by making my
- department head aware of the need for this information and hopefully create a departmental workshop to continue learning about DEI.
- I will be making an effort to bring the DEIA (Diversity, Equity, Inclusion, Accessibility) lens with me in ALL conversations. Seeking to build relationships with underrepresented groups in our work. Continue to seek out learning opportunities.
- Being more intentional with plans of work to include relationship building and reaching out to community partners.

The following day, members of the ACES Administrative team attended a special session with Mr. Pizaña. During this time, Mr. Pizaña answered questions, provided ideas for creating more inclusive environments, and shared best practices based on his 24-year career in the DEI Specialist role at Michigan State University.

At the invitation of Cooperative Extension Service administrators, the co-directors collaborated with the NMSU VP for Equity, Inclusion, and Diversity to develop and provide a day-long training for County Extension faculty and staff. The workshop, Amplifying and Strengthening Community Connection through Extension Programing, was provided in each of the three Extension districts, with a total of 75 people attending the workshop. This interactive professional development workshop drew on the strengths of the existing tradition of the Cooperative Extension Service. Participants gained a greater understanding and tools to extend those practices to larger audiences.

Executive Summary

The mission of the Aggies Go Global (AGG) program is twofold: Firstly, it aims to afford every student within the College of Agricultural, Consumer, and Environmental Sciences an enriching international experience before they graduate. Secondly, AGG is committed to advancing the LEADS 2025 goals, particularly in terms of social mobility (Goal 1) and leveraging research to address local needs aligned with global challenges (Goals 2.3 and 2.4). This program is aligned with ACES' Strategic Objectives 4.1 and 4.5, focusing on global student recruitment and sustained engagement in international initiatives.

Through forging new Memorandums of Understanding (MOUs) with international universities and institutions, AGG is actively bolstering NMSU's global standing. Additionally, the College of ACES endeavors to facilitate faculty engagement in global pursuits, emphasizing activities such as teaching short courses abroad, organizing or participating in international workshops, and cultivating opportunities for NMSU students' global exposure through collaboration with AGG.

Participation in grant proposals, including those from large to small, serves to amplify the societal and economic impact of research, while fostering international collaboration and technology transfer (LEADS objective 2.4).

Incentivizing global engagement, AGG administers an annual Outstanding Global Work Award and travel grants for faculty and students. Moreover, in its quest to extend outreach to ACES alumni, the program confers an International Distinguished Alumni award, thus broadening its impact and fostering a global network of ACES partners.

LEADS 2025: GOAL 2. Elevate Research & Creativity NMSU

Summer/winter short course opportunities developed with foreign universities	5
Joint international conferences/symposium organized with foreign institutions and universities	4
MOUs developed with partner international universities	4
Research/outreach projects developed at main campus	1
Number of joint publications developed with international partners	8
Proposed new study abroad programs	2

LEADS 2025 Objective 2.3

Amplify impact of research findings by addressing local needs that align with global challenges.

Continued collaborations with international companies	2
Grant proposals funded	2
Grant proposals submitted with international partners	3
Growers and stakeholders including NM senators and congressmen visited Leyendecker experimental farm	40

Executive Summary

Indian Resources Development (IRD) was created by the Indian Resources Development Act in 1978 and is housed at New Mexico State University to serve the state of New Mexico (NMSA 1978, §§ 21-10-1 --- 21-10-12). IRD offers educational and professional development opportunities for Native American students in high school and college and supports tribal nations in New Mexico in advancing their economic development goals in agriculture, natural resources, engineering, energy, business, workforce development, and education.

Each year, Indian Resources Development improves and increases in capacity. 2023 saw additions to IRD with offices opening in Taos and Gallup, NM to better serve tribal nations in the Northern and Western regions of New Mexico, with 3 staff members. IRD increased partnerships and collaborations to meet the current and future needs of tribal nations. IRD maintained a comprehensive website with educational resources for students, educators and families to meet their educational goals. IRD participated in 16 outreach events and engaged with 965 participants.

The main focus areas of IRD and the and the progress are provided below:

Agriculture

- Agriculture continues to be a major focus area of tribal nations to promote food sovereignty and use of tribal lands. IRD has served as a connector between tribes and organizations to provide resources needed. (Goal 3 – Amplify Extension and Outreach)

- IRD has worked cooperatively with the NMSU college of ACES to provide educational opportunities to tribal farmers and ranchers in food sovereignty, regenerative agriculture, climate resiliency and agribusiness resources. (Goal 5 – Build an Online Global Campus)

- IRD provided resources for internships for high school and college students in agriculture plant/soil science, and agricultural engineering through 4-H in tribal communities and providing in-school educational resources for college and career opportunities. (Goal 3 – Amplify Extension and Outreach)

Natural Resources

- Staff participated and presented at the the 2nd annual N4WPP tribal water symposium in Gallup, NM. (Goal 2 – Elevate Research and Creativity)

- Shared resources for camps, webinars, conferences, and other learning opportunities for youth engagement in game and fish, environmental, and water resources. (Goal 5 – Build an Online Global Campus)

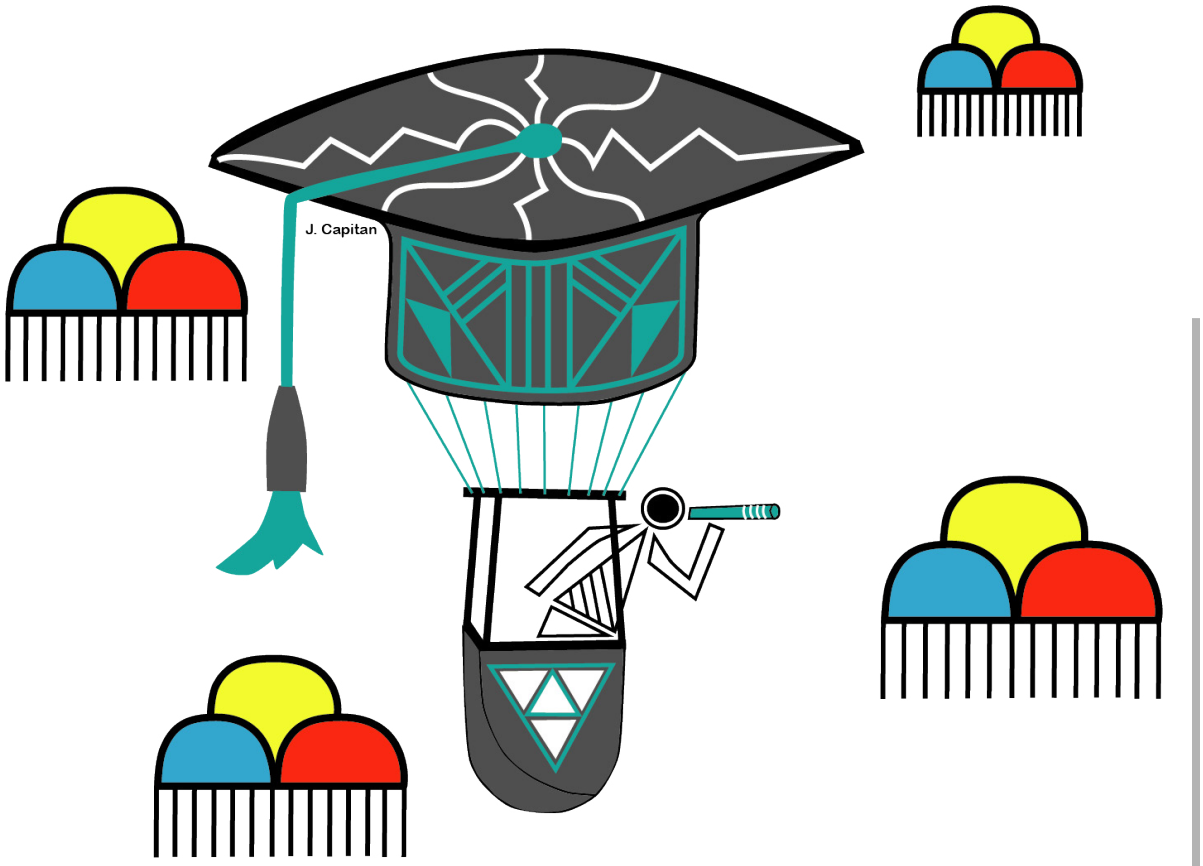
- Met with 13 tribal natural resources departments to gain information to better understand tribal needs and educational opportunities to maintain habitats with respect to cultural practices. (Goal 3 – Amplify Extension and Outreach)

Engineering

- Supported STEM education for tribal youth to address changing technology creatively. (Goal 3 – Amplify Extension and Outreach)

- Worked with UNM Native American Program in the School of Engineering to promote careers and education in the field of Engineering. (Goal 6 – Build, Elevate, and Strengthen Sustainable Equity, Inclusion and Diversity Practices)

- Participated in the N4WPP in connection with New Mexico Tech and New Mexico Math Engineering Science Achievement to bring real world situations to students. (Goal 2 – Elevate Research and Creativity)



Energy

- Promoted careers and educational opportunities for students to learn about energy production on tribal lands to include: renewable energy and oil/gas industry. (Goal 2 – Elevate Research and Creativity)

- In connection with San Juan College, supported internships for students in the energy sector. (Goal 2 – Elevate Research and Creativity)

Business

- IRD worked to build economic development through internships and job postings. (Goal 1 – Enhance Student Success and Social Mobility)

- Provided feedback and resources for future grant opportunities to stakeholders for economic development and to support tribal businesses. (Goal 3 – Amplify Extension and Outreach)

Workforce Development

- Worked to share education and trainings available to students and adults seeking to improve their availability in the workforce through training and certification. (Goal 5 – Build an Online Global Campus)

- Expanded on services provided to veterans of the armed forces. (Goal 6 – Build, Elevate, and Strengthen Sustainable Equity, Inclusion and Diversity Practices)

- Partnered with higher education opportunities on tribal lands. (Goal 5 – Build an Online Global Campus)

Education

- Collaborated with over 40 programs and departments from New Mexico State University. (Goal 3 – Amplify Extension and Outreach)

- Provided educational resources to over 18 schools located on near tribal lands. (Goal 6 – Build, Elevate, and Strengthen Sustainable Equity, Inclusion and Diversity Practices)

- Worked collaboratively with over 15 higher educational institutions in the state of New Mexico. (Goal 6 – Build, Elevate, and Strengthen Sustainable Equity, Inclusion and Diversity Practices)

- Kept abreast of information related to: Johnson-O'Mally, Yazzie/Martinez Consolidated Lawsuit, and progress on the development American Indian Education Technical Assistance Center. (Goal 2 – Elevate Research and Creativity)

- Assisted with the Summer Enrichment Internship Program with NM Public Education Department in providing internships to tribes. (Goal 6 – Build, Elevate, and Strengthen Sustainable Equity, Inclusion and Diversity Practices)

- Other educational areas include anthropology, health field, social sciences, native language, and other interdisciplinary subjects. (Goal 5 – Build a Robust University System)

Indian Resources Development would like to thank Claudia Trueblood for her immense contribution to IRD and wish her well in in her new endeavors.

Executive Summary

Since their opening on November 3rd, the new agricultural buildings at New Mexico State University have swiftly become vital assets, shaping the future of agriculture in the state, and fostering innovation in education. These cutting-edge facilities, the Food Science, Security and Safety Center, and the Animal Nutrition and Feed Manufacturing Facility, stand as pillars of progress in agricultural research and education.

Dean Rolando A. Flores Galarza aptly described these buildings as pivotal moments in New Mexico's agricultural history, emphasizing their extensive reach from farm to table and their role in streamlining the agricultural process. Indeed, these facilities are not merely structures; they represent a comprehensive approach to advancing the state's agriculture industry.

Funded by the general obligation bonds, the construction of these buildings is a testament to the commitment of New Mexico voters to agricultural advancement. The Food Science, Security and

Safety Center, with its state-of-the-art laboratories, serves as a beacon for food safety and security, supporting research in critical areas such as functional foods, nutraceuticals, and food processing.

Similarly, the Animal Nutrition and Feed Manufacturing Facility consolidates NMSU's efforts in livestock education and research, providing a platform for students and researchers to explore innovative feedstuffs and processing methods. Its focus on byproduct utilization underscores its importance in sustainable agricultural practices.

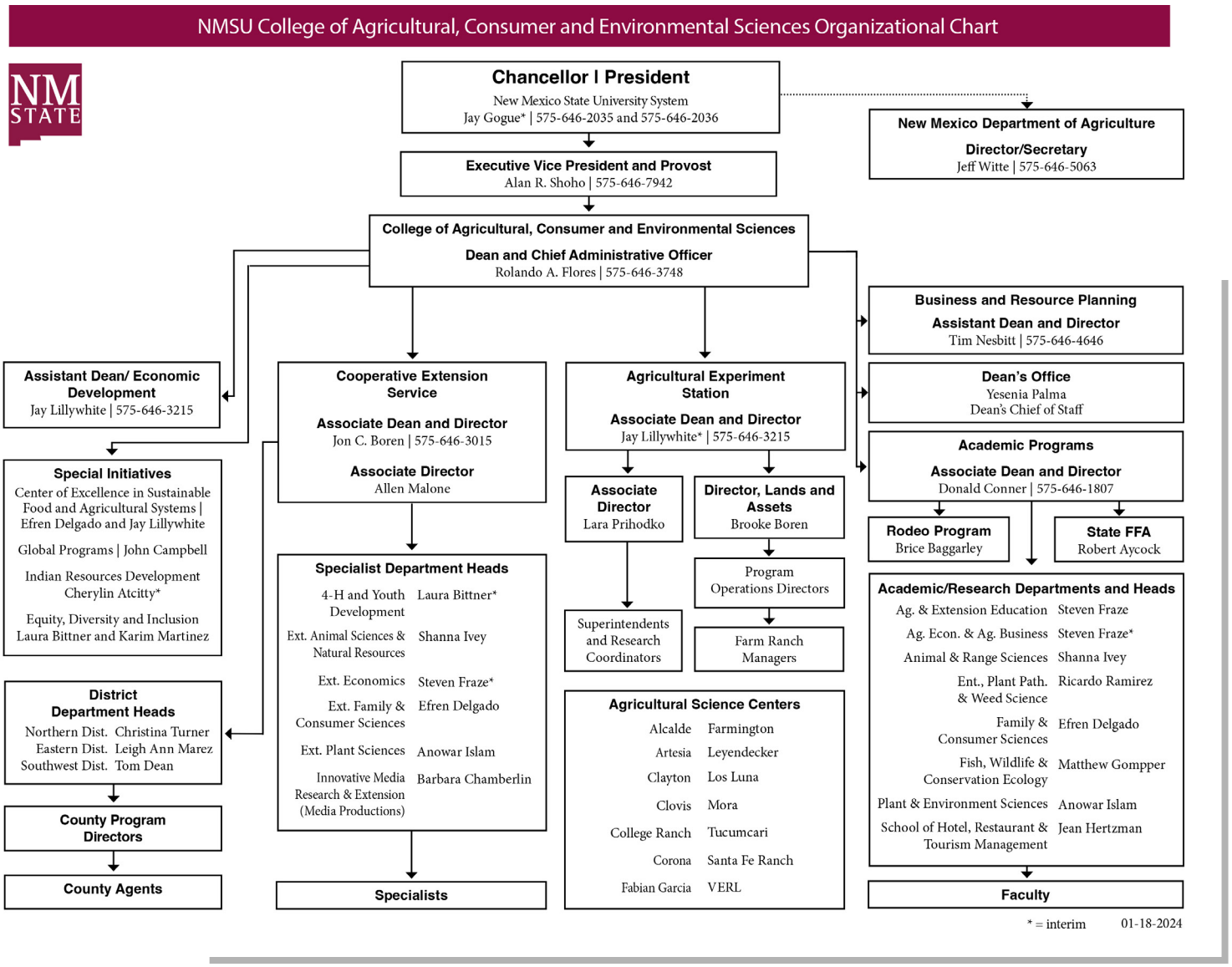
Moreover, the integration of these facilities into NMSU's strategic plan signifies a significant step forward in agricultural research and education. From hiring additional faculty to launching new Ph.D. programs and fostering business opportunities, these buildings are catalysts for growth and innovation.

In essence, these new agricultural buildings represent more than just physical structures; they embody a commitment to advancing agricultural knowledge, fostering innovation, and ensuring a sustainable future for agriculture in New Mexico.


Food Science, Security
and Safety Center


NM STATE
Animal Nutrition and Feed Manufacturing Facility
787 Stewart Street

College of ACES Organizational Chart

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