New Mexico (New Mexico State University Main Campus) Annual Report - FY2023

Report Status: Approved as of 05/17/2024

Contributing Organizations

New Mexico State University Main Campus

Executive Summary

Overview

New Mexico State University's College of Agricultural, Consumer, and Environmental Sciences (ACES) is dedicated to enhancing the well-being of New Mexicans and beyond through research, teaching, and Extension programs. Guided by a commitment to address pressing challenges, our research and Extension efforts prioritize four critical issues: Food & Fiber Production and Marketing, Water Use and Conservation, Family Development and Health of New Mexicans, and Environmental Stewardship. These initiatives are grounded by our focus on educating and training skilled professionals in the field of agriculture.

The Agricultural Experiment Station (AES) system at NMSU includes scientists on the 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 Agricultural Science Centers (ASCs) 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. The NMSU AES supports research that addresses real-world problems. Research is at the core of NMSU's mission to improve the lives of people in New Mexico and globally.

Research projects address critical issues in New Mexico as identified by advisory committees. Throughout 2023, AES continued to expand ongoing carbon management and soil health research, received funding to support the establishment of an agrivoltaics research program, and extended digital agriculture research efforts beyond virtual fencing. NMSU has a successful virtual fencing project that has been continuing to develop, in addition, in 2023 Smart Feed systems and Green Feed systems were installed at two of the Agricultural Science Centers. The Smart Feeding System can identify individual animals using an electronic ear tag and feed the animal-specific feed and volume of feed. This tool will allow researchers to further study the impacts of strategic supplementation in grazing animals. Additionally, the Green Feed System also uses ear tags to monitor feed intake for individual animals and then allows researchers the ability to measure beef cattle greenhouse emissions through novel feeders and provide the exact portion of feed and then capture and measure methane, carbon dioxide, hydrogen, and oxygen emitted from the digestive system.

A change that occurred in 2023 regarding Hatch Capacity research projects is that the AES has created umbrella projects that will allow broad multidisciplinary collaborative projects under 14 different areas. There is a lead investigator for each of these projects that will have reporting responsibilities and the remaining members of the team are responsible for ensuring progress towards the various research objectives that have been identified for the projects and to support the PI with reporting. This approach to increase collaboration on Hatch projects should result in more impacts that will be beneficial to New Mexico, the southwest region, and globally. The 14 project areas are guided by the four identified critical issues and include the following topic areas: Genetic Enhancement in Crop and Livestock Systems; Animal Health and Welfare; Food and Fiber Supply Chain; Food Bioengineering, Processing, and Safety; Alternative Crops for Water Limited Systems; Water Quality and Availability; Sustainable Management of Water Resources; Agriculture Literacy and Education; Pathways to Human Health and Well-being; Increasing Economic Opportunities in New Mexico; Carbon, Food, Energy and Water Systems; Ecosystem Structure and Function in a Changing World; Climate Adaptation and Resilience; and Land use and Environmental Function.

The Cooperative Extension Service (CES) focuses on collaboration to foster economic, educational, and community development, keeping the needs of New Mexicans at the forefront. With offices in all 33 counties and many Tribal areas in New Mexico, CES is positioned to be responsive to community needs and collaborates with more than 1,000 organizations, including state and federal agencies, and other universities. CES also relies heavily on about 10,000 volunteers to ensure that quality programs are reaching a diverse clientele.

Extension faculty reached over 660,000 New Mexicans in 2023 who benefit from wide-ranging CES educational programs in critical areas. 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.

Within AES and CES programs, our Extension and research projects are tailored to address stakeholder needs, making substantial impacts in agricultural production, climate change mitigation, and family health and youth development. AES and CES work together to ensure that the voices of New Mexicans are heard, and that our projects and programs reach every corner of the state, fostering resilience and prosperity for all. The College of Agricultural, Consumer and Environmental Sciences is very intentional in integrating the teaching, research, and Extension missions of the College. For example, the AES and CES support the College's academic mission through intentional student recruitment efforts, support of undergraduate internships, and support of graduate student research programs.

Critical Issue: Environmental Stewardship

Facing ongoing climate change and the emergence of extreme weather patterns both locally in New Mexico and globally, the imperative for environmental stewardship has never been more pronounced. Recognizing the human impact on the environment, AES and CES are at the forefront of efforts to understand, mitigate, and adapt to these challenges. Through their comprehensive research and Extension programs, they are actively identifying and advocating for practices that promote sustainability and resilience for the future.

In 2023, a research project explored precision livestock management and how to improve livestock welfare, productivity, and grazing sustainability with technology. By utilizing real-time tracking sensors that allow livestock producers to remotely monitor animal health, ranchers can implement management practices to manipulate grazing patterns before the degradation of sensitive areas.

Another research project sought to determine desert-adapted crops for water-limited systems. The research overlaps between three critical issues within New Mexico. Water Use and Resources, Agricultural Production (Food & Fiber Production) and Environmental Stewardship. Examining crops for their ability to be sustainable with less, allows producers to learn about various cover crop species and sustainable management practices to overcome problems that have been encountered with more traditional crops.

Another component of environmental stewardship research is to incorporate the biology and biodiversity found within New Mexico in research and education tools. For example, NMSU is home to the New Mexico Arthropod Collection, which allows for research on the specimens collected in addition to an outreach and education piece for the general public. Throughout 2022 and 2023, in collaboration with the CES and AES Games Laboratory, an online insect spreading and pinning interactive tool was developed to increase interest and accessibility to the field of entomology. This interactive tool targets middle school science classes, although there has been wide interest from other student groups as well.

CES initiatives include developing a prescribed fire curriculum to manage ecosystems and mitigate wildfires, enhancing soil fertility for sustainable agriculture amidst food security concerns, and promoting soil health practices in arid environments. Additionally, efforts focus on combating food waste through youth-led innovation and empowering Native women professionals in agriculture and natural resources. These projects result in increased awareness, skills, and collaboration among stakeholders, leading to tangible benefits such as improved wildfire management, agricultural productivity, and cultural preservation. Through partnerships and strategic initiatives, these endeavors contribute to a more resilient and sustainable future for New Mexico's communities and ecosystems.

Critical Issue: Family Development and Health of New Mexicans

The wide range of CES programs aimed at enhancing family development and health in New Mexico incorporates initiatives targeting diverse age groups and addressing multifaceted challenges. From preventing drinking and driving tragedies among high school students through the "Shattered Lives Program" to promoting active lifestyles among adults aged 50 and above via the "Walk with Ease" initiative, these efforts prioritize education and awareness. Additionally, virtual educational outreach by NMSU Extension Family and Consumer Sciences extends vital resources to older adults, while programs like "Resilience in the Midst of It" address substance abuse issues across generations. The Navajo Nation 4-H Youth Development Program empowers Navajo youth with life skills and cultural pride, while initiatives like "Strong Seniors Stay Young and Strong Bones" promote senior health and well-being. Moreover, youth education and skill development programs such as "Teen Cuisine and Growing Minds" foster healthier dietary practices, culinary literacy, and agricultural awareness. Collectively, these programs contribute to healthier, more resilient communities by empowering individuals with knowledge, skills, and resources for improved family development and health outcomes.

Critical Issue: Food & Fiber Production and Marketing

New Mexico remains a large agricultural producer, with the industry representing well over $3 billion in revenue to New Mexico annually. AES and CES have continued to expand projects and programs that support the growth, improvement, and quality of agricultural products in New Mexico. A specific goal over the past year has been to increase the security of agricultural markets within the state and to

develop value-added products.

AES has a broad range of research projects that support this critical issue within New Mexico. Some of the primary agricultural markets within the state include chile, onions, pecans, cotton, and cattle. In 2023, progress was made towards evaluating possibilities of how to use byproducts from the cotton industry as a value-added product. Researchers are developing yeast with a cotton protein that shows higher emulsifying activity that can be used as a binder in extruded aquaculture feed or extruded snacks for human consumption.

Crop genetic improvements are an important aspect of research, especially for crop producers who live in an arid climate with water challenges. AES researchers are utilizing the agricultural science centers around the state to test varieties of alfalfa, onion, chile, and cotton to help farmers conserve water, while still producing sufficient quantities of their selected crop.

Spanning a wide range of program areas, including agriculture, nutrition education, community empowerment, and cultural preservation CES has made significant impacts. The NM “Farm to School and Farm to Institution” program addresses limited access to fresh produce, reimbursing institutions purchasing locally grown fruits and vegetables, benefiting both farmers and consumers. The Extension Master Gardener Program responds to increased interest in home gardening, providing comprehensive training and fostering community engagement. “Kitchen Creations Cooking School” targets diabetes management, offering nutrition and cooking education to underserved populations. The “Table-Top Cooperative” and the Navajo Heritage Peach Orchards project promote economic growth and cultural preservation through agricultural initiatives. The “Med Instead of Meds” webinar series and the Santa Clara Farm Day focus on nutrition education and food security, enriching communities with knowledge and resources. Lastly, genetic improvement initiatives and pasture productivity demonstrations advance the state's cattle industry and sustainable land utilization, respectively. These programs collectively empower individuals and communities, promote economic development, and preserve cultural heritage while addressing critical challenges in agriculture and nutrition.

Critical Issue: Water Use and Conservation

Water continues to be the most limiting resource for New Mexico. Drought and severe climate change, along with limited surface water, have challenged agricultural producers to keep up with demand while also conserving water.

Many of the ongoing research projects within AES overlap between multiple critical issues of New Mexico, as water use and conservation have an impact on all areas of agricultural production, profitability, and human health.

Due to the demand for irrigation techniques that can be efficient while limiting water loss, an AES researcher has shown that canal water can be delivered from a river at the desired flow rate with less than a 4% effort during flow changes within the supply canal system. This control method can be adapted to many irrigation water supply systems and help in the efficiency of operation without wasting water.

Another important issue surrounding water beyond usage is water policy. An NMSU researcher has continued to develop water resource policy that is essential for ensuring the sustainable use of water resources, especially in the face of climate change and other stresses of water users in the Middle Rio Grande basin.

The highlighted programs demonstrate impactful efforts in water conservation and sustainable water management practices across different sectors in New Mexico. The Sandoval County Drip Irrigation Workshops equipped homeowners and farmers with knowledge and practical skills to implement water-efficient irrigation methods, addressing the urgent need for water conservation in the arid Southwest. Similarly, the Aquaponics workshops promoted sustainable agriculture by conserving water while providing fresh produce and fish, contributing to food security and economic resilience. Additionally, the Xeriscape Gardening initiative in Roosevelt County showcased the potential for significant water savings through drought-tolerant landscaping practices, benefitting both individual households and the community's water resources. Furthermore, the Western Pecan Growers Association Conference and the Athletic Safety Workshops addressed water management challenges in agriculture and sports fields, emphasizing the importance of optimizing water usage for sustainable practices and injury prevention. These Extension programs collectively underscore the critical role of education and community engagement in mitigating water scarcity and promoting environmental stewardship in the face of climate challenges.

Merit and Scientific Peer Review Processes

Updates

In 2023, AES implemented a structural change to Hatch Capacity projects. This change is moving away from individual projects to broader-scale, collaborative projects that will include a primary investigator, along with several co-investigators. Part of this process includes a thorough review process for all new projects proposed. The 14 umbrella projects that have been developed and initiated went

through a large review process that consisted of feedback from all researchers within the college. Once the project areas had been identified, the research teams were formed. Research teams developed research project proposals and NIFA project initiations that were then peer-reviewed by someone outside of their team.

After the peer-review, the project proposals were reviewed at the AES director's office level before sending them forward to NIFA for project initiation.

Stakeholder Input

Actions to seek stakeholder input that encouraged their participation with a brief explanation

AES and CES hosted advisory committee meetings at each science center with an advisory committee and 33 county Extension offices. Additionally, each ASC hosted a field day that was advertised broadly. Public members who are not on the CES or AES advisory committee are welcome to attend these meetings as members of the public.

Methods to identify individuals and groups and brief explanation

AES and CES will continue to utilize US Census data to determine potential audiences and parities that exist, then respond with intentional efforts to minimize parity gaps in stakeholders.

In 2023, AES revised the advisory committee guidelines to be more specific on terms of membership. This revision includes staggered terms for members and provides guidance on how the positions should be publicly advertised for no less than one month. This should allow for a broader diversity of membership on the advisory committees to engage audiences from across New Mexico. In 2023, the Cooperative Extension Service had district meetings with all county Extension faculty to develop best management practices to reach new audiences and underserved communities.

Methods for collecting stakeholder input and brief explanation

AES and CES use a variety of methods to collect stakeholder input. Primarily meetings of various stakeholder groups throughout the state, hybrid options have continued to be offered to fully engage those who may have travel restrictions to an in-person meeting. Additionally, surveys and interviews (both formal and informal) have continued to be used to collect input.

A statement of how the input will be considered and brief explanation of what you learned from your stakeholders

Stakeholder input is gathered throughout the year to assist in planning and developing projects and programs that will continue to support all citizens of New Mexico. State legislators continue to be a connection to the various regions of New Mexico, along with the presence of Extension in all 33 counties around the state and 12 Agricultural Science Centers located throughout the state.

CES and AES advisory committees represent agricultural producers and community members from their specific regions of the state and can present concerns or requests for community education and research throughout the year or at one of the bi-annual meetings that are offered.

This past year, advisory committee members from around the state requested that research be conducted on rangeland soil health restoration and low-input horticultural crops for human food. In response, the ASCs around the state will collaborate with the newly initiated umbrella research projects to develop/refine research objectives to meet this need. The CES has been requested from constituents across the state to provide programming to address mental health and well-being. As a result, the CES received legislative funding to build capacity through faculty hires to better support this programming area.

Highlighted Results by Project or Program

Critical Issue

Environmental Stewardship

Wildlife Wisdom: Fostering Coexistence and Sustainability in New Mexico

Project Director

LaJoy Spears

Organization

New Mexico State University Main Campus

Accession Number
7007047

Enhancing Wildlife Ecology and Management for Sustainable Futures in New Mexico

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

New Mexico's rich biodiversity, encompassing a multitude of wildlife species, serves as both a cultural heritage and an economic asset. However, the state faces persistent challenges due to wildlife-human conflicts, resulting in significant economic losses exceeding $1 billion annually. Improved scientific knowledge is crucial to inform effective wildlife management decisions and mitigate conflicts while fostering sustainable coexistence.

Key Focus Areas:

1. Preserving Food & Fiber Production and Marketing
2. Enhancing Family Development and Health of New Mexicans
3. Promoting Environmental Stewardship

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Our program engages a diverse spectrum of New Mexico stakeholders, including youth, adults, ranchers, farmers, homeowners, county agents, tribal agencies, and more. Through tailored educational initiatives, we aim to empower communities with scientific insights into wildlife ecology and management practices.

Our Wildlife Extension Specialist at New Mexico State University conducts comprehensive educational programs and demonstrations. Activities include supervising the State 4-H Conference Wildlife Habitat Education Program, co-leading curriculum development for the New Mexico Youth Ranch Management Camp, delivering Master Gardener presentations, and providing pesticide applicator trainings. These efforts aim to promote ecologically responsible wildlife management practices across urban and rural landscapes.

Briefly describe how your target audience benefited from your project's activities.

Our endeavors have yielded tangible results, with 88% of participants reporting heightened awareness of ecological concepts and 89% expressing increased confidence in implementing sustainable management techniques. Furthermore, 75% of returning participants have actively applied knowledge gained from our programs, underscoring the practical impact of our outreach efforts.

Collaboration lies at the heart of our program's success. We collaborate with NMSU Extension, research and teaching faculty, state agencies, municipalities, tribal entities, and other stakeholders to advance scientific understanding of wildlife ecology and management. Through partnerships with New Mexico 4-H, NMSU Pesticide Applicators Training, Master Gardener programs, and the NMDA Agricultural and Environmental Services division, we amplify our impact and reach.

Briefly describe how the broader public benefited from your project's activities.

Our program fosters a deeper appreciation for New Mexico's wildlife while equipping participants with the knowledge and tools to address wildlife-related challenges in their communities. By promoting informed decision-making in habitat management and wildlife-human interactions, we strive to achieve a sustainable equilibrium between human needs and wildlife conservation.

Multi-purpose summer cover crops for semi-arid environments

Project Director
Richard Pratt
Organization
New Mexico State University Main Campus
Accession Number
7002896

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Cover crops are desirable in the cropping systems becuase they can contribute various ecosystem services, and can be highly beneficial to soil health and fertility. Cover crop adoption in the arid Souhwest has been slow becuase of concerns regarding their need for limited water resources. Our project addresses that concern by determining which desert-adapted cover crops provide the most benefit to the cropping system for the least amount of water. Crops were also examined for their ability to fit into the traditional monsoon cropping cycle and for their ability to suppress weeds and provide suitable forage for ruminant animals.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Major activities: Four grasses and four legumes cover crops were evaluated at the Fabian Garcia and Farmington Research Centers. Strip plots of selected cover crops were also grown and evaluated by grower/cooperators. Soil moisture data and the aboveground cover crop and weed biomass were collected to calculate the Cover Crop Weed Index. Leaf tissue samples were obtained for forage analysis. Results showed that good cover crop biomass could be achieved with limited irrigation. The two varieties of sorghum-sudangrass and pearl millet produced more aboveground dry biomass than the other cover crops. Moreover, pearl millet and sorghum-sudangrass varieties showed an outstanding weed control followed by sunn hemp, also with excellent weed control.

Briefly describe how your target audience benefited from your project's activities.

Our target audience gained knowledge and practical experience with cover crops--often for the first time. Our project also brought together researchers and grower/cooperators who learned from each other about the pluses and minuses of candidate cover crop species and suitable management practices to overcome problems that were encountered.

Briefly describe how the broader public benefited from your project's activities.

The broader public will benefit from the production of high quality, local foods and feeds from more sustainable cropping systems. The public will also benefit from farming practices that are able to utilize our shared water resources more efficiently.

Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.

A major problem was the record high temperatures experienced last summer. All of the candidate cover crops did produce acceptable biomass, in spite of limited irrigation treatments and high temperatures. We started using SeedLINKED, a web-based platform, so that copperators could share their results in a user friendly digital environment.

Training opportunities:

One PhD student in Plant and Environmental Science (PES) department is involved in this project as part of his graduate research project. The graduate student attended two regional meetings and made presentations of his research to diverse audiences.

One undergraduate student in the LEADING Hispanics program is supporting this project.

Program Plans:

The procedures for trait assessment etc. in SeedLINKED require further refinement.

We will produce a publication, and possibly a video, to assist growers with cover crop selection and management.

INCREASED FUNCTIONALITY THROUGH MULTI-SPECIES ECOSYSTEMS

Project Director
Wiebke Boeing
Organization
New Mexico State University Main Campus
Accession Number
7000547

INCREASED FUNCTIONALITY THROUGH MULTI-SPECIES ECOSYSTEMS

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Species diversity is a valuable, non-renewable natural resource that is critical for ecosystem functioning. My project aims to address (1) functioning of playa lake communities and benefits to other organisms; (2) habitat and life history of an endangered microsnail Pecos assiminea, and (3) improvements of aquaponic systems to simultaneously grow fish and crops, including in rural and urban areas. Furthermore, we investigated worldwide occurrence of antibiotics and antibiotic-resistance genes in reservoirs and the benefits of green infrastructure for cities.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

We found that taxonomic composition of macroinvertebrates in playa lakes across the Great Plains varies depending on the region. However, despite different taxonomic compositions, community-level indices and trait compositions were similar. This indicates, that similar hydrological regimes shape wetland macroinvertebrate communities toward trait and diversity convergence.

One publication regarding this subject has been submitted for publication to the journal "Freshwater Biology".

Furthermore, after identifying an appropriate method to sample endangered microsnail Pecos assiminea (Assiminea pecos), we were able to increase the density estimate from a couple of snails m-2 to over 6,000 m-2. We discovered that their preferred habitat is 3 m from the shoreline and 5-20 cm below the soil surface. We are also finding four other microsnail species at these locations that yet have to be identified. A publication with a Community College student has come out in 2024:

Sidhe, C.**, A. Foutch**, O. Shackleton**, R. Yarbrough**, **W.J. Boeing**. 2024. Soil-dwelling microsnails: Pecos assiminea (*Assiminea pecos*) survey methods and habitat assessment. American Malacologial Bulletin 40: 1-7. **Cover of volume is C. Sidhe's photo**

In terms of antibiotic occurrence in reservoirs, we found that geographic location, seasonal variation, artificial impervious area around the reservoir, reservoir characteristics, and water quality all influenced reservoir antibiotic distribution. Two publications came out in 2023:

Guo, Z.F.*, **W.J. Boeing**, Y.Y. Xu, E. Borgomeo, D. Liu, Y.G. Zhu. 2023. Data-driven discoveries on widespread contamination of freshwater reservoirs by dominant antibiotic resistance genes. Water Research 229: 119466.

Guo, Z.F.*, **W.J. Boeing**, Y.Y. Xu, E. Borgomeo, D. Liu, Y.G. Zhu. 2023. A systematic workflow of data mining confirms the widespread occurrence of antibiotic contamination in freshwater reservoirs. Exposure and Health 15: 889-901.

We also confirmed that green infrastructure has the potential to dramatically increase functioning and integration into the natural ecosystems of cities:

Ruan, T., Y. Xu, L. Jones, **W.J. Boeing**, C. Calfapietra. 2023. Green infrastructure sustains the food-energy-water-habitat nexus. Sustainable Cities and Society 98: 104845.

Lastly, we started working with aquaponic systems. Aquaponics simultaneously grow fish and crops in a recirculating system. Twelve systems in a greenhouse on the NMSU campus are functional and open to the public for viewing and educational purposes. Various experiments throughout the year have been planned.

Briefly describe how your target audience benefited from your project's activities.

Researchers have begun to better understand the functioning and importance of playa lakes and also facilitated the management of an endangered microsnail species at Bitter Lake National Wildlife Refuge. In addition, this project has increased awareness of antibiotics in freshwater reservoirs and potential solutions to mitigate them. Researchers found that green infrastructure has the ability to solve some of the problems we are seeing with modern cities (e.g., flooding).

Briefly describe how the broader public benefited from your project's activities.

Antibiotic occurrence in reservoirs used for drinking water presents a serious health crisis. Better understanding the dynamics between antibiotics and predicting variables will help to ensure safe drinking water.

Furthermore, aquaponic systems have a much smaller footprint than traditional agriculture and might be extremely beneficial in areas with water scarcity or food deserts.

Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.

This aquaponics demonstration facility is open to the public and can serve as an educational tool.

Overall, 3 graduate students and over a dozen undergraduates were trained in this research over the past year.

Mitigating Wildfire Risks in New Mexico: Community Education & Preparedness

Project Director
LaJoy Spears
Organization
New Mexico State University Main Campus
Accession Number
7002277

Developing and Delivering Prescribed Fire Curriculum for New Mexico

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

In New Mexico, the proper use of prescribed fire is critical for maintaining healthy ecosystems and reducing the risks of severe wildfires. The Prescribed Burning Act, established in response to recent wildfire challenges, mandated the development of a comprehensive prescribed fire curriculum by the New Mexico Cooperative Extension Service.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

The issue addressed by the project is the challenge of utilizing prescribed fire effectively to manage ecosystems and mitigate severe wildfires in New Mexico. The project aimed to develop and deliver a prescribed fire curriculum to educate private residents and citizens about safe and effective prescribed burning practices.

Through the development and delivery of nine online courses covering various aspects of prescribed burning, the project made significant progress toward its goals and objectives. The curriculum provided participants with comprehensive training, including legal requirements, safety measures, fire behavior, and public relations.

This curriculum aimed to train private residents and citizens in the safe and effective use of prescribed fire, covering legal requirements, safety, weather, fire behavior, and more.

Briefly describe how your target audience benefited from your project's activities.

The target audience, including private residents and citizens of New Mexico, benefitted from the newly developed prescribed fire curriculum. Through online courses covering various aspects of prescribed burning, 39 participants completed the training by December 2023. Moreover, successful completion of the coursework granted participants exemption from double damages liability in case of escaped fires, ensuring both safety and legal protection.

Briefly describe how the broader public benefited from your project's activities.

The broader public also benefitted from the project's activities as the risk of severe wildfires was mitigated through improved management practices and increased awareness of prescribed burning. The New Mexico Forestry Division expressed satisfaction with the course development, prompting further collaboration for the creation of a secondary burn plan writing course.

Arthropod Biology and Biodiversity in New Mexico

Project Director
Charles Bundy
Organization
New Mexico State University Main Campus
Accession Number
1025935

Arthropod Biology and Biodiversity in New Mexico

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Little is known about the biology and biodiversity of many important insect groups in New Mexico. My research targets the bionomics and taxonomy of understudied insects and attempts to make information about these groups available to other scientists, students, and the general public.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Objective 1. Examine the bionomics and taxonomy of understudied insect taxa, with an emphasis on the true bugs (Heteroptera).

Several research projects are in various stages of completion. A research article was published on a checklist of jewel beetles found in Doña Ana County, New Mexico with Joel DuBois and Wayne Steffens. Research is completed on the biodiversity of native bee taxa in agricultural buffers with my graduate student, Mickie Wilkinson.Research also continues on a revision of the assassin bug genus *Sinea* in North America with J. E. McPherson.

Objective 2. Curation of the NMSU Arthropod Collection.

We continue significant work on curating the insect material in the NMSU Arthropod Collection. Specifically, we databased and imaged thousands of specimens in the collection to make them and their data more accessible. We added thousands of new specimens to the collection representing insects found in the Southwest and other regions of the country. We also worked with several scientists throughout the world to provide access to our material for their research in the form of data, images, and loans. I receive hundreds of requests to make identifications of unknown insects and other arthropods each year. Specimens we curate in the collection allows us to make accurate identifications on these insects. We also provided access to our collection to thousands of students from pre-K through college and the general public.

Objective 3. Conduct research on educational tools related to entomology.

In a cooperative project with the NMSU Games Laboratory (Barbara Chamberlin and Pamela Martinez), we created an online insect spreading and pinning interactive to increase interest and accessibility to the field of entomology. This interactive targets middle school science classes. However, we have found that it is of strong interest for several other groups as well, including 4H, FFA, etc. This interactive, first made available in 2022, continues to be highly useful to a wide range of student ages.

Briefly describe how your target audience benefited from your project's activities.

Objective 1. Examine the bionomics and taxonomy of understudied insect taxa, with an emphasis on the true bugs (Heteroptera).

The primary target audience for this research is other researchers in the field of entomology. Our data provide the scientific community with important information on understudied insects.The checklist of jewel beetles provides needed data on this important group of beetles, which feed on trees. Many species in this family cause tremendous economic losses in both forest and urban situations. This is the first checklist of its kind for New Mexico.Similarly, little is known about the native bee taxa found in New Mexico. Our study documents bees from 24 genera in five families, 2 tribes, and 6 subfamilies. It shows that a buffer of native grasses is highly beneficial to increasing biodiversity of bees in a corn agroecosystem.

Objective 2. Curation of the NMSU Arthropod Collection.

The data provided from our work in the NMSU Arthropod Collection strongly benefits researchers and the general public. Having the data from our specimens available in a database greatly increases the access of the collection to researchers from around the world. We see an increase in requests for access to the collection from these scientists as we continue to add more material online. The more we identify our material the greater our ability to answer questions on insect identification to researcher and the general public.

Objective 3. Conduct research on educational tools related to entomology.

Our free online insect pinning and spreading interactive continues to see a strong interest by middle school teachers,4H and FFA groups, etc. These target groups will benefit by having digital access to learn valuable techniques on pinning and spreading insects. We feel this will also foster an increased interest in insects and insect science.

Briefly describe how the broader public benefited from your project's activities.

Our work on jewel beetles and native bees provides valuable baseline data on these economically important insect groups. They are excellent examples of insects that can have a negative impact (jewel beetles, tree damage) or positive impact (native bees, valuable pollinators). The more that research like this becomes available on understudied insect groups the greater our understanding develops on insect biodiversity and its interactions with other groups of organisms, including humans. Documenting insect diversity allows the public to see the importance of these groups. It also documents changes in diversity including habitat loss, species extinctions, etc. that are important to everyone.

In addition, increasing awareness of the importance of insects to the general public as tools that may be used to understand and teach science, etc. is strongly beneficial to all of our constituents.

Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.

N/A

Conservation and management of freshwater fishes in the desert southwest

Project Director

Zachary Klein

Organization

New Mexico State University Main Campus

Accession Number
1024673

Rio Grande Cutthroat Recovery

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

The Rio Grande Cutthroat Recovery project focuses on assessing the value of high-mountain lakes as refugial habitats for Rio Grande Cutthroat Trout. We are constructing an age-structured model to assess different management actions (e.g., stocking) for the conservation of Rio Grande Cutthroat Trout in northern New Mexico. Finally, we are evaluating habitat use for different age classes of Rio Grande Cutthroat Trout in two streams.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

In 2022 and 2023, we collected Rio Grande Cutthroat Trout population information on 14 high-mountain lakes. We also collected population information and habitat data from 36 sites in two streams. The information collected from high-mountain lakes was used to evaluate the relationship between Rio Grande Cutthroat Trout population dynamics and habitat characteristics in high-mountain lakes. This analysis revealed that inlet quality and surface area were important determinants of the persistence of Rio Grande Cutthroat Trout in high-mountain lakes. Our analysis of stream data revealed that Rio Grande Cutthroat Trout exhibit habitat partitioning, whereby juvenile fish use stream margin habitats and adult fish occupy deep pools with slow-moving water. We are currently constructing an age-structured model, but the analysis will not be completed until later this year.

Briefly describe how your target audience benefited from your project's activities.

Our results have been presented at six regional meetings over the last two years. Although the general scientific community found the information of value, the New Mexico Department of Game and Fish and Turner Institute of Ecoagriculture have used our information to enhance the recovery of the species. Specifically, NMDGF and TIE have used our information to enhance conservation plans for the species in high-mountain lakes.

Briefly describe how the broader public benefited from your project's activities.

Rio Grande Cutthroat Trout represent the southern most sub-species of Cutthroat Trout and are highly valued by anglers. Therefore, maintaining and promoting Rio Grande Cutthroat Trout populations benefits the angling public. The influx of anglers, in turn, improves economic stability in rural communities through ecotourism.

Precision Livestock Management to Improve Livestock Welfare, Productivity and Grazing Sustainability

Project Director
Derek Bailey
Organization
New Mexico State University Main Campus
Accession Number
1021829

Precision Livestock Management to Improve Livestock Welfare, Productivity and Grazing Sustainability

Final Result

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Traditionally ranchers have visually observed livestock well-being and grazing impacts, but this is time-consuming and often impractical because of rugged terrain and the extensive nature of rangeland pastures. Ongoing innovations in real-time tracking and sensor development may allow livestock producers in the western US to remotely monitor animal health and respond to well-being concerns more efficiently. Real-time tracking of livestock movements would allow ranchers to implement management practices to manipulate grazing patterns before resource degradation of riparian zones and other sensitive areas occurs.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Multiple commercial systems designed to track cattle in near or real time were evaluated at multiple ranches. A commercial system that uses Long Range Wide Area Network (LoRaWA) to transmit recorded location was often unreliable and provided cattle positions every 2 hours when working. Cellular-based real time tracking systems were evaluated two ranches, one in a mountainous area near Hatch, NM and the other in rolling terrain near Prescott, AZ. Cellular systems worked more reliably than the LoRaWA system. In rolling terrain with good cellular coverage, cattle positions were recorded every 2 hours for 6 months (the expected battery life). In mountainous terrain, a cellular system worked well, providing positions every 1 to 2 hours. These data were transferred to the internet when the cows were in areas with cellular coverage. Battery life was about a third of the expected 6-month life because of large discharges that occurred when data transmissions were attempted when the cow was in an area without cellular coverage (often in valleys or draws). We later another real time tracking system based on an ear tag with solar recharging capabilities, which potentially extends the life of the tag for 3 years. This ear tag system collects positions more frequently than previously evaluated systems (every 15 minutes) and transmits the data daily. Unfortunately, most of these solar powered tags fell of the cattle after a couple months. The company is modifying this tag in an effort to improve their retention on the cows.

Cattle and sheep were tracked with conventional store-on-board collars in large extensive pastures. Spatial movements of cattle and sheep on rangeland were affected by ambient temperature in the summer. Both sheep and cattle travel less each day and remain closer to water during periods of high temperatures. Real-time tracking data has the potential to identify periods when high ambient temperatures affect livestock behavior and potentially indicate periods when animals may be facing some degree of heat stress.

Cattle grazing behavior at night has received little study. Cows are often active at night and spend time grazing. Activity and distance traveled are greater during periods when the moon is full than during new moon periods. This increase in activity when there is more lunar illumination at night occurs throughout the year.

In pastures with relatively even grazing distribution, GPS tracking may have difficulty distinguishing among forage utilization levels if the use is light (10 to 35% utilization). However, forage utilization levels were associated with GPS tracking data when cattle grazing distribution was uneven. At two ranches, geographical information systems (GIS) identified areas where cattle congregated (hot spots) and areas visited less frequently (neutral) or avoided (cold spots). Forage was grazed more intensely (higher utilization) in hot spots than in neutral or cold spots based on field measurements.

Accelerometers are powerful tools for remotely monitoring livestock health and well-being. However, research studies and developers of livestock monitoring systems must recognize that movement patterns vary among individual animals. Normal activity patterns of one animal may differ from another. Variation among animals has been observed and reported frequently. However, our research shows that movement patterns recorded by accelerometers can vary by both individual animals and accelerometer devices. Using a repeated experimental design, we showed that activity patterns of ewes changed when we monitored them with different accelerometer devices. This clear difference in measured activity patterns of the same sheep with different accelerometer devices was unexpected considering the tight tolerances required during the manufacturing process.

Rumen boluses have been used in dairies to monitor cattle body temperature. The device also contains an accelerometer to detect changes in activity. However, the use of rumen boluses to monitor cattle grazing rangelands has received little study. Rumen boluses were placed in ten 2-year-old heifers at Deep Well Ranch near Prescott, Arizona. During hot periods with a high thermal heat index, heifer body temperature increased and activity decreased. Rumen boluses have great potential to monitor the impacts of weather on cattle behavior and well-being.

Briefly describe how your target audience benefited from your project's activities.

Our research shows ranchers how commercially available real-time tracking and monitoring systems perform in rangeland conditions. Technological advancements are needed to make real-time tracking a viable option in rugged terrain. In rolling terrain with cellular reception, real-time tracking a viable approach for remotely monitoring livestock location. Cellular-based systems recorded the location of cattle on over 75% of the scheduled recording periods in rolling terrain. In mountainous terrain, cellular systems recorded cattle positions sufficiently to monitor cattle spatial movements, but battery life was about half the expected lifespan. The devices may have used excess energy to attempt to transmit positions when the cattle were not in an area with cellular reception because of mountainous terrain. Another cellular-based cattle tracking worked well for 2 months, but then the tags fell off the cattle and some other tags became non-functional. Our research shows that commercial cattle tracking systems must be evaluated and tested and proven effective in rangeland conditions before ranches spend money purchasing the equipment.

Real-time tracking and on-animal sensors have great potential to remotely monitor livestock well-being on rangelands. However, more research is needed to develop and validate algorithms and software (including Artificial Intelligence approaches) to detect illness and well-being concerns. Our research is providing "proof of concept" examples of remotely monitoring the well-being of livestock with on-animal sensors. Detection systems and associated algorithms will likely need to measure and evaluate changes in individual animal behavior rather than deviations from herd averages to identify illness and other animal welfare issues.

Monitoring rangeland conditions including forage utilization levels is labor intensive. Real-time tracking can be used to monitor the spatial movement patterns of livestock. Our research shows that field-based measurements of forage utilization may not always match tracking data when use is light and the distribution of animals are relatively even. In such scenarios, However, when the distribution is uneven and forage defoliation may become excessive, GPS tracking data has the potential to identify problem areas. Managers could use this information to modify grazing management before resource degradation occurs.

Briefly describe how the broader public benefited from your project's activities.

Animal welfare and rangeland sustainability are important issues for livestock producers and consumers. Real-time livestock tracking systems are becoming more viable. These systems can monitor the impacts of high temperatures on grazing livestock and may be able to detect conditions that may result in heat stress. Real-time tracking and sensor monitoring have the potential to identify animal welfare concerns such as illness remotely allowing managers to more promptly treat sick animals and address other issues. Real-time tracking also has the potential to detect situations when livestock may adversely impact rangeland sustainability. This remote monitoring of livestock grazing impacts may allow ranchers to modify management before resource degradation occurs.

Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.

Eight Digitial Matters Oyster 2 GPS tracking receivers and six Digitial Matters Yabby Edge tracking receivers were purchased for this project from Lone Star Tracking, Fisher, Texas.

Enhancing Soil Fertility for Sustainable Agriculture

Project Director
LaJoy Spears
Organization
New Mexico State University Main Campus
Accession Number
7007045

Cultivating Resilience: Soil Fertility and Food Security in the Eight Northern Pueblos

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

The project addresses the imperative need for sustainable agricultural practices within the Eight Northern Pueblos. Enhanced soil fertility is fundamental for reliable vegetable and livestock production, especially during times of food scarcity.

Our aim is to equip tribal members and the Department of Natural Resources with knowledge and resources to improve soil fertility. Through educational workshops, soil sampling initiatives, and collaboration with experts, we empower communities to revitalize their agricultural lands sustainably.

Tribal members and the Department of Natural Resources are the primary beneficiaries. By adopting soil enhancement techniques, they secure a stable source of nutritious food and uphold traditional farming practices. The program also fosters intergenerational knowledge transfer, preserving cultural heritage.

Our workshops, demonstrations, and outreach efforts have yielded substantial results. Participants reported significant knowledge acquisition and practical skills enhancement, as evidenced by post-workshop surveys. The initiative has catalyzed community engagement and revitalized agricultural landscapes across the Eight Northern Pueblos.

In the wake of the Covid-19 pandemic, ensuring food security became a critical concern for the Eight Northern Pueblos communities. The disruption in the food supply chain highlighted the necessity of local food production. Soil fertility emerged as a pivotal factor in sustaining vegetable cultivation and livestock grazing, crucial for community sustenance and economic stability.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

-The project addresses the pressing need for enhanced soil fertility in the Eight Northern Pueblos communities to sustain agricultural production amidst challenges like the Covid-19 pandemic.

- Through a series of educational activities including workshops, demonstrations, and expert consultations, the project facilitated knowledge acquisition and practical skill development among tribal members and the Department of Natural Resources.

Briefly describe how your target audience benefited from your project's activities.

Tribal members benefited from increased agricultural productivity, economic opportunities, and the preservation of cultural traditions. The broader public gained from enhanced food security, sustainable land management practices, and the promotion of local resilience.

Briefly describe how the broader public benefited from your project's activities.

The Improving Soil Fertility program underscores the significance of collaborative efforts in promoting sustainable agriculture and community well-being across the Eight Northern Pueblos.

Enhancing Soil Health for Sustainable Agriculture in Arid Environments

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Soil degradation in New Mexico's irrigated cropping systems poses significant challenges, including low organic matter, soil compaction, and poor nutrient cycling. These issues result in decreased yields, increased input costs, and heightened greenhouse gas emissions. In response to these challenges, our project aimed to educate farmers, agricultural professionals, and the public on soil health management practices tailored to arid environments. By promoting strategies such as cover cropping, organic amendments like biochar, and reduced tillage, we aimed to enhance soil fertility, mitigate climate risks, and boost crop productivity.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

- The project addressed the pressing issue of soil degradation in New Mexico's irrigated cropping systems, leading to decreased yields and increased greenhouse gas emissions.

- Through extensive educational activities including field days, demonstrations, and publications, we promoted effective soil health practices such as cover cropping and biochar utilization.

- As a result, soil health demonstration trials showed significant yield increases of 22% with mixed cover crop species and 13% with compost-biochar blends over two years.

Briefly describe how your target audience benefited from your project's activities.

- Participants in our educational events reported a substantial knowledge gain of 70% on average, with 80% expressing willingness to adopt soil health practices.

- Furthermore, the initiative garnered interest from orchard farmers in converting wood waste to biochar, potentially sequestering over 30,000 tons of carbon annually and reducing greenhouse gas emissions.

Farmers, agricultural professionals, homeowners, and the general public in New Mexico benefited from increased knowledge and access to sustainable soil management practices. By adopting these strategies, they can improve crop yields, enhance soil fertility, and contribute to environmental conservation efforts.

Briefly describe how the broader public benefited from your project's activities.

The broader public benefits from our project through improved agricultural practices that lead to enhanced food security, reduced environmental degradation, and mitigation of climate change impacts. By promoting sustainable soil management, we contribute to the long-term resilience and prosperity of New Mexico's agricultural sector.

In conclusion, our efforts to improve soil health in arid cropping systems contribute to a more sustainable and resilient agricultural landscape, benefiting both local communities and the broader environment.

Critical Issue

Family Development and Health of New Mexicans

Addressing Childhood Obesity Among NM Youth

Project Director

LaJoy Spears

Organization

New Mexico State University Main Campus

Accession Number

7002281

Teen Cuisine: Enhancing Food Preparation and Nutritional Literacy

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

The surge in food spending away from home coupled with a decline in cooking skills underscores the need for initiatives like Teen Cuisine. With childhood obesity rates at alarming levels, costing billions annually in healthcare, and impacting learning abilities, promoting healthy eating habits and cooking skills among youth becomes paramount. The curriculum aligns with dietary guidelines, advocating for informed food choices, meal planning, and increased physical activity.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Teen Cuisine equips grades 6 to 12 students with essential life skills vital for their present and future well-being. By imparting knowledge on nutrition, cooking, and lifestyle choices, educators empower youth to make informed decisions that promote positive eating patterns and overall health. The program, tailored for 76 fifth-grade students at Chamisa Elementary School over two years, emphasized healthy eating habits, cooking techniques, and food safety across multiple sessions.

Briefly describe how your target audience benefited from your project's activities.

Data analysis from surveys revealed significant positive shifts in participants' behaviors and knowledge. Over 81% reported consuming breakfast daily or most days, while more than half monitored their vegetable intake regularly. Notably, the majority demonstrated increased awareness of hydration, physical activity, family mealtime, screen time, and healthy food

choices. Moreover, a vast majority displayed competency in recipe following, proper measurement, knife handling, and kitchen hygiene, indicating substantial progress in culinary literacy and food preparation skills.

Briefly describe how the broader public benefited from your project's activities.

Participants in the Teen Cuisine program exhibited enhanced proficiency in identifying nutrient-dense foods and adopting healthier dietary practices. Their newfound culinary literacy equips them with confidence in recipe execution, cooking techniques, and safe food handling, contributing to improved nutrition and reduced reliance on processed foods. Beyond personal health benefits, developing cooking skills fosters family bonding, reduces mealtime stress, and promotes economic efficiency by prioritizing nutrient-rich, home-cooked meals.

Breaking the Cycle: Battling Substance Abuse Across Generations in New Mexico

Project Director
LaJoy Spears
Organization
New Mexico State University Main Campus
Accession Number
7007085

Addressing Substance Abuse Across Generations

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Despite substantial investments in treatment facilities, New Mexico continues to grapple with rising substance-related deaths, particularly affecting Rio Arriba County. The prevalence of adverse childhood experiences and drug-exposed births underscores the urgent need for a holistic approach to break the cycle of substance abuse. Intergenerational and multigenerational in nature, substance abuse poses a profound challenge to the well-being of communities in the northern tier of the state.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Acknowledging the urgent necessity, the "Resilience in the Midst of It" program takes aim at a diverse array of demographics, encompassing middle school students, seniors, and individuals grappling with substance use disorders. Through its inclusive approach to age groups and ethnicities, the program strives to confront the intricate web of factors that fuel substance abuse within Rio Arriba County.

Empowered by grant funding from Con Alma Health Foundation, the program unfolds through a series of interactive workshops and presentations. Activities span from stress reduction techniques and nutritional programs to tailored sessions addressing the generational impacts of substance use disorder. The initiative fosters resilience through hands-on experiences, fostering a culture of holistic well-being.

Briefly describe how your target audience benefited from your project's activities.

Comprehensive program evaluations reveal significant knowledge gains and behavioral shifts among participants:

- Pre-series, only 5% of surveyed adults and youth were familiar with stress-relief techniques for substance abuse-related stress; post-series, this figure surged to 75%.
- An overwhelming 95% of respondents acknowledged that the workshops enhanced their understanding of substance use disorder.
- 75% of participants reported heightened awareness of stress reduction strategies and their importance in coping with substance abuse challenges.

Participant testimonials underscore the transformative impact of the program, reflecting a commitment to share newfound skills and insights within their communities.

A strategic collaboration with Bridge to Health NM, Fitness, Espanola, New Mexico enriches the program with certified yoga instruction, augmenting stress-relief initiatives. Through synergistic partnerships, the program extends its reach and efficacy in combating substance abuse.

Briefly describe how the broader public benefited from your project's activities.

Empowering individuals with substance use disorder stress relief education not only cultivates coping skills but also reduces health and behavioral issues, alleviating strain on healthcare resources. By fostering healthier lifestyles and disseminating stress relief techniques, the initiative nurtures resilient communities, thus lightening the burden on local and statewide medical systems.

Shattered Lives: Empowering Youth to Prevent Drinking and Driving Tragedies

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

New Mexico ranks fourth in alcohol-related fatalities per capita, with the National Highway Traffic Safety Administration reporting approximately 37 daily deaths from drunk driving accidents nationwide. Young people, particularly those aged 16-24, face the highest risk. These preventable tragedies underscore the urgent need for education and awareness.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

The Shattered Lives Program, hosted at Hatch Valley High School in 2023, is designed to raise awareness among high school students (9th-12th grade) about the serious risks associated with drinking and driving, including distractions such as texting while driving.

Key Activities:
1. Program Overview: Students and parents are briefed on the program's objectives, including expectations for the "Living Dead" student cohort.
2. Two-Day Simulation: This immersive experience includes a staged alcohol-related crash, the removal of "Living Dead" students by the Grim Reaper, a mock funeral, and testimonials from affected individuals. Parent retreats and educational presentations supplement student activities.
3. Post-Simulation Engagement: Debriefing sessions and classroom discussions feature insights from professionals in law enforcement, medicine, counseling, and emergency response.
4. Mock Sentencing: An impactful addition to the program was a mock sentencing of the drunk driver, broadcasted to the entire student body.

Briefly describe how your target audience benefited from your project's activities.

- The "Living Dead" cohort involved 20 students directly, while 380 students engaged indirectly, witnessing the program's impact.
- Participants described the real-life testimonials as challenging yet transformative, highlighting their effectiveness in conveying the dangers of impaired driving.
- Increased awareness resulting from the program led to tangible behavior changes among students. Many embraced the importance of designated driving, adopted cautious driving practices, and became more vigilant about peer behavior.
- Testimonials from school administrators emphasized the profound impact of the program on student attitudes and the overall cohesion of the community.

Partnerships:

- The program's success relies on strong community collaboration and support.
- Financial support from organizations such as the Elks Lodge, along with in-kind contributions from Native Air, significantly alleviate costs for participating schools.
- Various agencies, including law enforcement, medical facilities, youth services, and volunteer groups, contribute resources and expertise, ensuring the program's effectiveness and reach.

Briefly describe how the broader public benefited from your project's activities.

Shattered Lives aims to educate, engage, and empower youth and communities to prevent drinking and distracted driving-related tragedies, fostering a safer and healthier environment for future generations.

Navigating Youth Resilience
Project Director
LaJoy Spears
Organization
New Mexico State University Main Campus
Accession Number
7002269

Cultivating Curiosity: 4-H Summer Reading Program at the Library

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Amidst concerns over summer learning loss, particularly in literacy and numeracy skills, there exists a dearth of educational programming for families in Grant County during the summer months. Recognizing this gap, the 4-H at the Library initiative aims to foster positive family and community relationships while nurturing essential skills in children.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

The 4-H at the Library program engages both children and adults, fostering stronger familial and community bonds while promoting social-emotional well-being. With a focus on outreach to underserved communities, the program reached over 120 participants, aiming to inform and involve them in 4-H activities.

Over the course of two months, four educational sessions were conducted, covering topics ranging from mental health awareness to proper handwashing techniques and agricultural education. Each session aimed to empower participants with practical knowledge and skills crucial for personal and community well-being.

Briefly describe how your target audience benefited from your project's activities.

Partnering with Silver City Public Library, the program's impact was profound, evident in increased 4-H enrollment among underserved populations and requests for program continuation. By coinciding with the Free Lunch program, attendance surged, providing a valuable educational opportunity during wait times. Collaboration with the Silver City Public Library and WNMU's childcare program signals promising partnerships for future endeavors. Testimonials from participants underscore the program's success, with 100% of parents reporting increased knowledge and enthusiasm among youth learners.

Briefly describe how the broader public benefited from your project's activities.

Participation in the 4-H at the Library program not only enriches family and community relationships but also introduces families to the diverse array of 4-H programs and activities, contributing to increased enrollment and community engagement.

Navajo Nation 4-H Youth Development Program: Fostering Cultural Resilience and Skill-Building

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Within the Navajo Nation reservation, Navajo youth navigate a landscape fraught with challenges. These include economic adversity, educational disparities particularly in S.T.E.A.M and agricultural fields, and the pressing need to uphold their cultural heritage amidst rising rates of alcohol and substance abuse coupled with declining educational standards. These barriers not only undermine their self-esteem and cultural identity but also impede their path to economic empowerment. Against this backdrop, the Navajo Nation 4-H Youth Development program emerges as a guiding light, offering essential life skills while celebrating and preserving their rich cultural legacy.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

The program targets Navajo youth aged 5-19 residing on the Navajo reservation, with over 100 youth actively participating in its activities. Responding to diverse challenges, the program orchestrates a plethora of activities spanning economic awareness, S.T.E.A.M and agricultural education, and cultural preservation. Financial literacy workshops instill budgeting skills and entrepreneurship, while S.T.E.A.M activities foster innovation and critical thinking. Agricultural education promotes sustainability and career exploration, while cultural workshops revive Navajo traditions and language, fostering pride and resilience.

Briefly describe how your target audience benefited from your project's activities.

The program yields transformative outcomes addressing economic stability, educational empowerment, and cultural revitalization. Enhanced financial literacy cultivates entrepreneurship and poverty alleviation, augmenting educational and employment opportunities. S.T.E.A.M and agricultural education foster innovation, environmental stewardship, and cultural preservation, preparing youth to navigate future challenges with confidence and knowledge.

Briefly describe how the broader public benefited from your project's activities.

The Navajo Nation 4-H Youth Development program, facilitated by New Mexico State University Tribal Extension, fosters a supportive environment where Navajo youth confront and triumph over adversity. Through collaborative efforts with tribal organizations and schools, the program nurtures personal development and life skills among Navajo youth, reinforcing their cultural pride and resilience.

Health Equity Initiatives: Tackling Chronic Diseases in New Mexico

Project Director
LaJoy Spears
Organization
New Mexico State University Main Campus
Accession Number
7004850

Kitchen Creations Cooking School for Diabetes Management

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

With over 16% of adults in New Mexico affected by diabetes and 32.5% facing prediabetes, the economic burden surpasses $2 billion annually. Access to accurate dietary information for diabetes management is limited, especially among uninsured and rural populations. The need for support in making healthy dietary choices is evident across diverse communities.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Kitchen Creations targets individuals with diabetes or prediabetes and those responsible for preparing meals for them, with a focus on underserved populations such as Native Americans, African Americans, Spanish speakers, seniors, and rural residents. The New Mexico State University (NMSU) Cooperative Extension Service, in collaboration with various community organizations, conducted Kitchen Creations diabetes cooking schools across 17 counties. Each session, facilitated by Registered Dietitian Nutritionists and Diabetes Care Specialists, offered comprehensive nutrition and cooking education along with resource materials.

Briefly describe how your target audience benefited from your project's activities.

A total of 235 adults actively participated in 24 cooking schools, utilizing a diverse range of instructional formats such as in-person, hybrid, and virtual sessions. The program was inclusive, with specialized classes catering to Spanish speakers, tribal communities, and African American participants. Every participant conveyed high satisfaction with the courses, and an overwhelming 99% affirmed their understanding of strategies for planning and crafting nutritious meals.

Testimonials underscored substantial positive outcomes, including notable reductions in A1C levels, successful weight loss, and overall improvements in health directly attributed to their engagement in the program.

The initiative benefited from collaboration with a wide array of community partners, including healthcare facilities, Native American organizations, and community health councils, fostering a holistic approach to diabetes management.

Briefly describe how the broader public benefited from your project's activities.

Kitchen Creations not only contributes to reducing healthcare costs and enhancing productivity but also amplifies the visibility and utilization of Cooperative Extension Services. The estimated cost savings of over $282,000 underscores the program's tangible impact on healthcare expenditures, while also fostering greater awareness of resources available for diabetes prevention and control.

Med Instead of Meds

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Nutrition research underscores the critical role of fruit and vegetable consumption in reducing mortality risk, with evidence indicating a 13% lower risk of death associated with consuming five servings daily. Yet, in New Mexico, data from the Centers for Disease Control reveal that only a fraction of adults meet recommended intake levels, signaling a pressing need for enhanced nutrition education statewide.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Targeting adults aged 35-85 years across New Mexico, a team comprising seven Family and Consumer Sciences agents from six counties initiated the Med Instead of Meds webinar series. This comprehensive program, spanning six one-hour sessions, delved into various topics including alternative protein sources, healthy fats, whole grains, and mindful eating. Conducted weekly throughout October and November 2023, the series garnered participation from 47 registered attendees, accumulating a total of 282 educational hours. Moreover, the content has been archived on a dedicated website, enhancing accessibility for a broader audience.

Briefly describe how your target audience benefited from your project's activities.

Post-program evaluations revealed substantial improvements in participant knowledge, confidence, and behavioral changes:

- Participants' average knowledge score surged from 2.5 to 4.35 out of 5.0, demonstrating a comprehensive understanding of the Mediterranean eating style.

- Confidence levels in implementing dietary practices rose significantly, with average scores climbing from 3.05 to 4.26 out of 5.0.

- Remarkably, 100% of respondents reported increased vegetable consumption, alongside notable shifts toward healthier eating habits, such as increased fruit intake, mindful meal planning, and enhanced label reading for nutritional information. Testimonials highlighted tangible health improvements and sustained commitment to the program's principles.

Collaborators included New Mexico State University, North Carolina State Extension, and extension offices from Bernalillo, Rio Arriba, Los Alamos, Santa Fe, McKinley, and Chavez Counties.

Briefly describe how the broader public benefited from your project's activities.

The Med Instead of Meds series engendered positive transformations in participant knowledge, confidence, and behaviors, fostering a culture of healthier eating across New Mexico. Increased fruit and vegetable consumption correlates with reduced risks of chronic diseases and mortality, potentially alleviating healthcare burdens and enhancing overall well-being for individuals and communities.

Closing Out (end date 05/29/2024)

Embracing Aging

Project Director
LaJoy Spears
Organization
New Mexico State University Main Campus
Accession Number
7000107

Empowering Health and Mobility: Walk with Ease

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

For adults aged 50 and older, maintaining an active lifestyle is paramount for preserving strength, balance, and overall well-being, as emphasized by the National Institute on Aging. Regular physical activity, such as walking, not only aids in managing chronic conditions like arthritis but also reduces the risk of falls and promotes mental well-being. However, access to structured programs tailored to older adults, particularly in rural areas, remains limited.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

New Mexicans aged 50 and above, including individuals with chronic health conditions, residing in both urban and rural regions, constitute the primary beneficiaries of the Walk with Ease program.

Endorsed by the National Arthritis Foundation, the Walk with Ease initiative introduces a six-week self-directed program centered on walking as a cardiovascular endurance activity. Designed to enhance balance, strength, and confidence in managing chronic conditions, the program caters specifically to the needs of older adults and those with arthritis. Through strategic outreach via email marketing, chronic disease programs, and community partnerships, the program has successfully reached diverse segments of the population.

Briefly describe how your target audience benefited from your project's activities.

The 2022 program evaluations underscored a profound impact, with all participants reporting enhanced comprehension and a commitment to integrating newfound knowledge into their daily routines. Notably, 100% expressed intentions to sustain their walking regimen post-program. Testimonials highlight the program's efficacy in alleviating pain, boosting motivation, and fostering a supportive community among participants.

In 2023, the program's influence persisted, with participants reaffirming their dedication to utilizing health insights and maintaining active lifestyles. Testimonials underscored increased energy levels, improved mental well-being, and practical lifestyle modifications spurred by program participation.

Collaborating entities include New Mexico State University and various county extensions, reinforcing a collective commitment to promoting community health and well-being in collaboration with the National Association of Chronic Disease Directors (NACDD).

Briefly describe how the broader public benefited from your project's activities.

Citing robust scientific evidence, the National Institute of Health underscores the profound health benefits associated with regular physical activity, ranging from mitigating chronic conditions to enhancing cognitive function and extending longevity. By advocating for increased physical activity among older adults, the Walk with Ease program not only fosters better health outcomes and quality of life but also contributes to reduced healthcare expenditures and mortality rates.

Strengthening Bones, Enhancing Lives: The Strong Bones Program

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Osteoporosis poses a significant threat, rendering bones fragile and susceptible to fractures, often leading to debilitating consequences such as pain, disability, and loss of independence. With over 54 million Americans, predominantly women, affected, the economic burden exceeds billions annually. Fractures not only impair physical health but also precipitate emotional distress and financial strain, underscoring the imperative for prevention efforts.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

The Strong Bones program focuses on adults vulnerable to osteoporosis and older individuals aiming to improve their bone health and overall wellness. With an average attendance of 60 participants per session, the program cultivates a supportive community dedicated to promoting active aging and preventing injuries.

Led by Family and Consumer Sciences Agent Tamara Schubert, the Strong Bones program provides customized aerobic exercises designed to strengthen muscles, boost bone density, and enhance balance. Held weekly at Senior Circle and twice weekly at affiliated locations, participants benefit from approximately 250 sessions annually, fostering a culture of active aging and injury prevention.

Briefly describe how your target audience benefited from your project's activities.

Surveying participants revealed a transformative impact, with individuals aged 50 to 90+ reporting enhanced physical fitness, reduced joint pain, and improved flexibility, with 65% experiencing better balance. Testimonials underscored the program's efficacy, citing strengthened limbs, heightened independence, and even bone density improvements, thus mitigating the need for surgical interventions. Participants extolled the program's inclusive environment and its pivotal role in fostering physical resilience and camaraderie.

Grace Community Church, Bethel Baptist Church, and ENMMC Senior Circle serve as pivotal program sites, facilitating widespread access to bone health initiatives within the community.

Briefly describe how the broader public benefited from your project's activities.

By mitigating osteoporosis risks and averting falls, the Strong Bones program not only enhances the quality of life for older adults but also yields substantial cost savings in healthcare and long-term care expenditures, fostering a healthier, more resilient community.

Strong Seniors Stay Young: Promoting Health in Aging

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Recent data from the Center for Disease Control reveals concerning trends among US adults aged 50 and above, with 28% being physically inactive, and a 30% higher inactivity rate among those with chronic diseases. Disparities are noted among ethnicities and education levels, emphasizing the need for targeted interventions.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

The Strong Seniors Stay Young Program caters to physically able mature adults, particularly focusing on the 48% of Quay County residents aged 50 or older. In collaboration with Mesalands Community College, the program addresses the health needs of mature adults through evidence-based exercise routines, emphasizing strength training and nutrition. By integrating balance exercises and walking opportunities, the initiative aims to enhance physical activity, reduce falls, alleviate arthritis symptoms, and promote overall well-being.

Briefly describe how your target audience benefited from your project's activities.

With 33 participants in the fall semester, up from 24 in the summer, the program showcases tangible benefits. Members report improved balance, overall health, and reduced periods of depression. Notably, over half have experienced a 25% reduction in medical expenses, aligning with national data indicating potential annual healthcare savings of $824 - $1,874 for seniors engaged in regular exercise. Collaborations with the Quay County Health Council further amplify the program's reach.

Partners:
Mesalands Community College serves as the host site, actively supporting program promotion through community education initiatives.

Briefly describe how the broader public benefited from your project's activities.

National studies affirm that regular exercise among seniors leads to significant annual healthcare savings and is linked to longer life spans and reduced risks of serious conditions such as Type 2 diabetes, depression, cancer, arthritis, obesity, and dementia.

Virtual Horizons: Empowering New Mexico's 50+ Community Through Statewide Webinars

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

The upheaval of 2020 prompted NMSU Extension Family and Consumer Sciences to shift from in-person to virtual programming, marking a pivotal change in outreach strategies. The subsequent adoption of statewide webinar initiatives enabled agents and specialists, irrespective of geographical distances, to collaborate effectively and reach diverse audiences across urban and rural areas, fostering a new era of engagement.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Primarily targeting New Mexicans aged 50 and older, our statewide webinars aimed to address critical issues in health and wellness, resilience, and lifestyle management. Between 2020 and 2023, agents and specialists convened to identify pertinent webinar topics through comprehensive needs assessments. Each session, spearheaded by a lead agent or specialist, featured tailored content and interactive discussions. A total of nine webinar series, comprising 31 educational sessions, were meticulously crafted to address pertinent concerns such as stress management, aging gracefully, and dietary considerations.

Briefly describe how your target audience benefited from your project's activities.

The impact of our efforts has been substantial:

- Over 1,000 participants engaged in 37 sessions across ten webinars, showcasing widespread community involvement.

- A collaborative effort involving 56 agents and 10 specialists from twelve counties, exemplifying the collective commitment to statewide outreach.

- Recognition through national, regional, state, and university awards underscored the excellence and relevance of our programming.

- Enhanced collaboration and job satisfaction among agents, fostering stronger statewide partnerships and amplified reporting on state and national impact.

Briefly describe how the broader public benefited from your project's activities.

New Mexico faces a significant burden of chronic diseases, exacerbated by unhealthy lifestyle choices. With nearly 40% of adults at risk of prediabetes, the statewide webinars offer vital educational resources to promote healthier living and stress management, ultimately reducing the incidence of chronic ailments and associated healthcare costs. By empowering residents to make informed decisions, we strive to mitigate the toll of diabetes and other chronic conditions, safeguarding individual well-being and fostering healthier communities.

Critical Issue

Food & Fiber Production and Marketing

Nourishing New Mexico: Addressing Food Insecurity and Supporting Agricultural Sustainability

Project Director

LaJoy Spears

Organization

New Mexico State University Main Campus

Accession Number

7007072

The Table-Top Cooperative

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Quay County grapples with food insecurity and poverty, lacking avenues for small-scale farmers and food producers to market and sell their products effectively. These challenges hinder economic growth and food accessibility in the region.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

In collaboration with local producers and the Rocky Mountain Farmers Union Cooperative development specialist, the Extension agent spearheaded the formation of an Agricultural Cooperative in 2018. With a membership of approximately thirty individuals, the Cooperative aims to enhance local food access, establish supply chains, facilitate marketing and distribution, offer resources, and provide educational opportunities.

Briefly describe how your target audience benefited from your project's activities.

The Table-Top Cooperative has revolutionized the landscape for small agricultural producers, fostering networking opportunities, securing grants, expanding farmland access, boosting production and marketing endeavors, instituting a beginning farmer program, and fostering job creation and entrepreneurship. Over the past four years, the Cooperative has secured $7000 in grants, catalyzed the establishment of 14 new small businesses, provided education to 63 beginning farmers, and garnered essential resources. The community's increased engagement in agriculture fosters a broader understanding of sustainable practices and underscores agriculture's pivotal role in Quay County's economic future.

Partners: Table-Top Cooperative members, Rocky Mountain Farmers Union Cooperative Development Specialist, NMSU Quay County Extension Service, Tucumcari Economic Development, Local producers, Community members, Farmers Market Association.

Briefly describe how the broader public benefited from your project's activities.

The Table-Top Agricultural Cooperative, initiated by the Extension Service and local partners in response to Quay County's food insecurity and economic challenges, has transformed the region's agricultural landscape. By fostering entrepreneurship, securing grants, and providing educational resources, the Cooperative enhances economic opportunities for small-scale farmers while promoting sustainable practices. Through collaboration and community engagement, it builds a resilient agricultural ecosystem, addressing immediate needs and laying the groundwork for long-term prosperity in Quay County.

Onion Genetic Improvement

Project Director
Christopher Cramer
Organization
New Mexico State University Main Campus
Accession Number
7004091

Onion Genetic Improvement

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Fusarium basal rot (FBR) is a soil-borne fungal disease that causes a disintegration of the onion bulb basal plate thus killing a plant growing in the field. Onion stakeholders have identified FBR as a severe disease threat to onion yield and economic sustainability. Breeding for host plant resistance to FBR may eliminate the detrimental effects of the disease.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Onion germplasm was evaluated for susceptibility to FBR by inoculating onion bulbs with a virulent isolate of the disease-causing pathogen. After 21 days of incubation, bulbs were evaluated for disease severity. Onion germplasm was identified that exhibited a lower disease severity than a FBR-susceptible and a FBR-resistant onion cultivar used in the evaluation. Selection for reduced disease severity proved successful as severity has decreased over successive generations of selection. In addition, onion germplasm was evaluated for the presence of steroidal saponins that are present in onion basal plate tissue prior to and after inoculation with the FBR disease causing pathogen. Our work identified several specific steroidal saponins that appear to play a positive role in onion host plant resistance to FBR.

Briefly describe how your target audience benefited from your project's activities.

Our research demonstrated that our evaluation method was successful in reliably producing disease symptoms which is essential for disease resistance development. Germplasm has been developed that expresses lower disease severity as a result of selection. Specific steroidal saponins compounds have been identified that play a positive role in onion host plant resistance. Our target audience can use this information and germplasm to develop FBR-resistant onion cultivars.

Briefly describe how the broader public benefited from your project's activities.

With onion cultivars that are resistant to FBR, fewer onion bulbs will be lost to disease. With fewer bulb losses, fewer acres of onions will need to be grown to satisfy domestic onion demand. Fewer onion acres with higher production reduces environmental impacts while increasing economic sustainability.

Genetic Improvement of Alfalfa (Medicago sativa L.) Germplasm for New Mexico

Project Director

Ian Ray
Organization
New Mexico State University Main Campus
Accession Number
7001870

Genetic Improvement of Alfalfa (Medicago sativa L.) Germplasm for New Mexico

Final Result

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Alfalfa is the fourth most valuable field crop in the United States (worth $11.3 billion in 2022) and 70% of the U.S. alfalfa acreage resides within drought-prone environments in the Great Plains and western regions. Consequently, development of alfalfa cultivars which can remain productive during and after drought stress is imperative. The New Mexico State University (NMSU) alfalfa breeding program is collaborating with other universities and private industry partners to utilize conventional and molecular breeding methods, and aerial imagery technology, to accelerate development of alfalfa cultivars with greater resilience to drought.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Objectives 1 and 2: Enhancing alfalfa productivity using traditional and molecular breeding approaches and field-based evaluation.

The NMSU alfalfa breeding program at Las Cruces, NM, utilizes a combination of traditional and molecular breeding approaches, and visual selection of vigorous plants from field plots of high-performing populations grown under well-watered and deficit-irrigated conditions, to develop new varieties. During 2020 to 2023 at Las Cruces, forage yield performance of 15 commercial alfalfa varieties and 9 advanced NMSU breeding lines were evaluated under standard irrigation management (trial 1) and deficit-irrigation management (trial 2). Results from these trials help identify alfalfa varieties that perform well under variable irrigation management strategies in southern New Mexico. In statewide variety trials, 62 commercial and NMSU alfalfa varieties were collectively evaluated during 2023 at four NMSU Ag. Science Centers located at Farmington, Las Cruces, Los Lunas, and Tucumcari, NM. The NMSU alfalfa breeding program at Las Cruces conducted all statistical analyses for these statewide trials. The summarized results of those trials were used to develop the NM Alfalfa Variety Annual Test Report. This report was published to help NM, TX, and AZ hay growers identify varieties best suited for their farms. The above multiyear trials in NM, and additional yield trials in CA, identified three NMSU varieties that warrant commercial release. The three varieties include a moderately fall dormant variety ‘NuMex 501’ (experimental designation, NM1715PAR) adapted to northern NM, and two nondormant varieties, ‘NuMex 801’ and ‘NuMex 802’ (experimental designations, NM1703PAR and NM1705PAR, respectively) adapted to southern NM and the central valley of CA. These three varieties are currently being evaluated for resistance to eight important diseases and insect pests of alfalfa.

Seed for 10 new advanced NMSU breeding lines was also produced in 2022 and 2023. These 10 varieties were derived from industry-sponsored DNA marker and genomic selection based breeding research projects previously conducted in NM and CA during 2012-2021. Seed of these new varieties was used to plant two new variety trials at Las Cruces (2022-2025), NM, one trial at Los Lunas (2023-2026), NM, and two trials at Davis, CA (2023-2026) for yield evaluation under well-watered and deficit irrigation management. These data will help identify the best lines for commercial release including varieties that perform well under variable irrigation management.

Objective 3: Evaluate aerial imaging technology to estimate yield and quality of alfalfa varieties in well-watered and deficit-irrigated conditions.

This collaborative project with Cornell Univ., Virginia Tech, and two private industry partners, is designed to accelerate development of high-performing crop varieties (alfalfa, corn, soybean, wheat) with greater resilience to changes in climate. In 2023, NMSU conducted 32 aerial imagery flights and collected over 72,000 multispectral images from 24 alfalfa varieties grown under well-watered and deficit-irrigation management. Forage quality and yield data were also collected from these varieties over multiple harvests (>1700 data points annually). Our collaborators are building open-source plant breeding software to conduct integrated analysis of the alfalfa, corn, soybean, and wheat data, to determine how well crop aerial imagery data correlates to stable yield performance and crop quality across different environments. Diverse statistical models are also being evaluated to optimize the design of the plant breeding software so it can be used to accelerate development of crop varieties with greater resilience to changes in climate.

Briefly describe how your target audience benefited from your project's activities.

Limited water resources threaten New Mexico's $173 million alfalfa industry, and also, the alfalfa industry in the western half of the U.S. The alfalfa variety trials conducted at NMSU Ag. Science Centers at Artesia, Farmington, Las Cruces, Los Lunas, and Tucumcari, NM are intended to help local farmers identify currently available alfalfa varieties that they can grow, and which can be productive under highly variable soil moisture conditions, including deficit-irrigation management. Farmers can purchase seed of these varieties to grow on their farms to benefit yield stability, water conservation, and agricultural sustainability in NM and the southwestern U.S. NMSU is also collaborating with other universities and private industry partners to evaluate the use of aerial imagery technology to develop new plant breeding software that can be applied in multiple crops, including alfalfa, to accelerate development of varieties with greater resilience to changes in climate.

Briefly describe how the broader public benefited from your project's activities.

Alfalfa was grown on 14.9 million acres in 2022 with an estimated value of $11.3 billion, making it the fourth most important field crop in the United States. Furthermore, its use as a highly nutritious feed for livestock operations, including the $57 billion U.S. dairy industry, contributes significantly to its value. Since 70% of the U.S. alfalfa acreage resides within drought-prone environments in the Great Plains and western regions, development of alfalfa cultivars which can remain productive during and after drought stress is imperative. Development of such varieties helps farmers in these environments conserve water, while producing sufficient hay quantities for livestock feed to meet dairy and beef demands of the general public. The relevance of this research is very high given the vulnerability of agriculture to water stress, the recurring nature of drought worldwide, and rapidly diminishing availability of water resources for irrigation.

Bioprocessing of Agroindustrial By-products.

Project Director
Efren Delgado
Organization
New Mexico State University Main Campus
Accession Number
7000973

Bioprocessing of Agro-industrial By-products.

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Oleosins are key elements in the lipid droplets from plants, their production has been related with lipid accumulation. In this work, several modifications in the pINA1269 expression plasmid were developed to evaluate the best arrangement for oleosin production from cotton in the oleaginous yeast Yarrowia lipolytica. Diverse oleosin gene copies under hp4d and hp8d promoter were evaluated.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Our research has been focused on supporting the chile-pepper, cotton and pecan industry and small, medium and large food producers in New Mexico. Our findings give value-added to an agriculture byproduct from the cotton industry. The develop yeast with cotton protein show a higher emulsifying activity that can be used as a binder in extruded aquaculture feed or extruded snacks for human consumption.

Briefly describe how your target audience benefited from your project's activities.

The proposed technology is also useful on obtaining specific heterologous proteins, single-cell proteins and single-cell oils derived from the yeast, that can be used as additives in functional foods and aquaculture feed.

Briefly describe how the broader public benefited from your project's activities.

The utilization of agro-industrial waste reduces waste in the environment and gives value to an otherwise useless product. My research is applied to the food industry. I conduct regular meetings with stakeholders to identify their specific needs and develop solutions that can be applied to solve their problems from the bioprocessing point of view.

Specialty Horticultural Crop Systems for the San Juan River Valley of Northwest New Mexico and the Navajo Nation

Project Director

Kevin Lombard

Organization

New Mexico State University Main Campus

Accession Number

7000814

Specialty Horticultural Crop Systems for the San Juan River Valley of Northwest New Mexico and the Navajo Nation

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Objective 1: Specialty Crops: viticulture (1a), small fruits, hops and malting barley (1b), medicinal herbs (1c), and agroforestry (1d):

This project addresses grower and consumer questions about specialty horticulture crop adaptability to a high elevation (>5,600 ft) intermountain western United States growing region located in the San Juan River Valley and Navajo Nation.

Objective 2: Where Horticulture and Health Intersect: a Navajo Wellness Collaboration

This project focuses on increasing access to healthy fruits and vegetables in a region that is experiencing type-2 diabetes at significantly higher rates than the U.S. general population. The focus has been on the garden scale.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Objective 1: Specialty Crops: viticulture (1a), small fruits, hops and malting barley (1b), medicinal herbs (1c), and agroforestry (1d):

Viticulture: *Table Grapes*: **Enhance the competitiveness of specialty crops through increased consumption.**

Training of new table grape plots was completed in 2023. The trellis is a "Y" shaped and new to most grape growers in NM.

In 2023, NMSU viticulture also partnered with a local winery to produce a Rosé style wine from Refosco grapes grown at the ASC Farmington Rootstock trial. This proof of concept demonstrated that high-quality wine can be developed from locally produced vineyards under similar soil and climate conditions.

Objective 2: Where Horticulture and Health Intersect: a Navajo Wellness Collaboration

The final report for Group Randomized Trial of Healthy Eating and Gardening Intervention in Navajo Elementary Schools showed that the intervention was efficacious in improving self-efficacy for eating fruits and vegetables among third- and fourth-grade students over a school year. Process measures of the curriculum were published in Jan 2024. Teachers need more support and alignment with school and state science and nutrition content standards and further refinement of the curriculum is needed. An assessment tool was successfully developed.

Beresford, S. A.A., Ornelas, I., Garrity, G. A., Bauer, M. C., Bishop, S. K., Vreeke, A., Garcia, L. V., Francis, B., Rillamus-Sun, E., Lombard, K. A. (in press). Impact of a school-based intervention and the COVID-19 pandemic on healthy eating in Navajo families: Results from the Yéego! Healthy Eating and Gardening Intervention Trial. *To appear in Preventative Medicine Reports.*, Date Accepted: December 2023.

Intervention impact in adults during COVID for submission4-1.docx

Wilcox, H., Bishop, S. K., Francis, B., Lombard, K. A., Beresford, S. A.A., Ornelas, I. (in press). Process Evaluation of the Yéego! Program to Increase Healthy Eating and Gardening among American Indian Elementary School Children. *To appear in BMC Public Health.*, Date Accepted: December 6, 2023.

Yeego_ProcessEvaluation_BMCPH_7.9.23-1.docx

Beresford, S. A.A., Rillamus-Sun, E., Rudd, K., Bishop, S. K., Deschenie, D., Ornelas, I., Bauer, M. C., Lombard, K. A. (2023). Development of an Assessment Tool to Measure Healthy Eating in Navajo Children and Their Families. *Current Developments in Nutrition, 7*(100074), 1-10. https://doi.org/10.1016/j.cdnut.2023.100074, Date Submitted: July 5, 2022, Date Accepted: March 27, 2023.Beresford 2023-1.pdf

Briefly describe how your target audience benefited from your project's activities.

Objective 1: Specialty Crops: viticulture (1a), small fruits, hops and malting barley (1b), medicinal herbs (1c), and agroforestry (1d):

Specialty crop growers are benefiting from the research and outreach from the knowledge generated on what grapes varieties may perform best in the Four Corners Region of NM. These include table and wine grapes, and specialty grains.

Objective 2: Where Horticulture and Health Intersect: a Navajo Wellness Collaboration

Schools are receiving a pilot curriculum that was developed for 3rd and 4th graders that has lesson plans that may assist students and their families in increasing servings of healthy fruits and vegetables. School and health administrators and policymakers are receiving these reports that may help in decisions on whether to start gardens and also to help describe pitfalls in establishing school gardens.

Briefly describe how the broader public benefited from your project's activities.

The public is benefiting from experiencing what locally produced NW New Mexico specialty crops could taste like and observing those specialty crops in experimental test plots that produce well in the region (e.g. table grapes and wine grapes). The public is gaining knowledge on healthy eating that could contribute to greater overall community wellness, especially with regard to type-2 diabetes.

Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.

Objective 1: Specialty Crops: viticulture (1a), small fruits, hops and malting barley (1b), medicinal herbs (1c), and agroforestry (1d):

Viticulture: *Table Grapes*: **Enhance the competitiveness of specialty crops through increased consumption. Dissemination activities:**

Lombard, K. A. (Presenter), Giese, W., Velasco-Cruz, C., American Society for Horticultural Sciences Annual Meeting, American Society for Horticultural Sciences, Orlando, FL, "Field Evaluation and Marketability of Table Grape Cultivars for Northwest New Mexico", (August 4, 2023). Proceedings: (9th ed., vol. 58, pp. S245). HortScience. Audience: Academic

Lombard, K. A., New Mexico Wine Education Conference, New Mexico Wine & Grape Growers Association, Santa Fe, NM, "Northwest, New Mexico Viticulture Update", Scope: Regional, Invited or Accepted? Invited. (February 27, 2023). Audience: Technical

Lombard, K. A. (Presenter), Wilsey, B., American Society for Horticultural Sciences Annual Meeting, American Society for Horticultural Sciences, Orlando, FL, "History of Horticulture in San Juan County, New Mexico and Legacy of Dr. Jack Jordan, New Mexico State University Agricultural Science Center at Farmington", (August 4, 2023). Proceedings: (9th ed., vol. 58, pp. S294-S295). HortScience.

Objective 2: Where Horticulture and Health Intersect: a Navajo Wellness Collaboration

This project focuses on increasing access to healthy fruits and vegetables in a region that is experiencing type-2 diabetes at significantly higher rates than the U.S. general population. The focus has been on the garden scale.

Three peer-reviewed report were published or accepted:

1. Beresford, S. A.A., Ornelas, I., Garrity, G. A., Bauer, M. C., Bishop, S. K., Vreeke, A., Garcia, L. V., Francis, B., Rillamus-Sun, E., Lombard, K. A. (in press). Impact of a school-based intervention and the COVID-19 pandemic on healthy eating in Navajo families: Results from the Yéego! Healthy Eating and Gardening Intervention Trial. *To appear in Preventative Medicine Reports.*, Date Accepted: December 2023.

2. Wilcox, H., Bishop, S. K., Francis, B., Lombard, K. A., Beresford, S. A.A., Ornelas, I. (in press). Process Evaluation of the Yéego! Program to Increase Healthy Eating and Gardening among American Indian Elementary School Children. *To appear in BMC Public Health.*, Date Accepted: December 6, 2023.

3. Beresford, S. A.A., Rillamus-Sun, E., Rudd, K., Bishop, S. K., Deschenie, D., Ornelas, I., Bauer, M. C., Lombard, K. A. (2023). Development of an Assessment Tool to Measure Healthy Eating in Navajo Children and Their Families. *Current Developments in Nutrition, 7*(100074), 1-10. https://doi.org/10.1016/j.cdnut.2023.100074, Date Submitted: July 5, 2022, Date Accepted: March 27, 2023.

4. The article "Group Randomized Trial of Healthy Eating and Gardening Intervention in Navajo Elementary Schools (Yego!)," was honored as the *AJPM Focus* 2022 Article of the Year for Inclusivity in People.

One presentation was given to the Navajo Nation Human Research Review Board 2023 Research Conference:

1. Lombard, K. A. (Presenter), Beresford, S., Ornelas, I., Bauer, M., Garrity, G., Deschenie, D., Francis, B., Bishop, S., Nez, F., Vecenti, F., Garcia, L., Rillamas-Sun, E., Wilcox, H., Brown, E., Navajo Nation Human Research Conference, Navajo Nation Human Research Review Board, Flagstaff, AZ, "Engaging Navajo Elementary Schools in Randomized Controlled Trial of Yéego! (Let's Go!) Health Eating & Gardening: Phases of development", (October 18, 2023). Audience: Non-technical/Technical

The public is benefiting from experiencing what locally produced NW New Mexico specialty crops could taste like and observing those specialty crops in experimental test plots that produce well in the region (e.g. table grapes and wine grapes). The public is gaining knowledge on healthy eating that could contribute to greater overall community wellness, especially with regard to type-2 diabetes. Project results have been disseminated through the ASC Farmington ASC field day (August 17, 2023), peer-reviewed reports (e.g. School Garden Project), and reports back to policymakers (through presentations to approving Institutional Review Boards). An Instagram site has some videos that provide dissemination of activities through social media https://www.instagram.com/nmsu.farmington/. Hatch projects continue to leverage external funds through the NMDA Specialty Crop Block award, NSF, and USDA Organic Transitions.

Sustainable Fruit Production in Northern New Mexico

Project Director
Shengrui Yao
Organization
New Mexico State University Main Campus
Accession Number
7000601

Sustainable Fruit Production in Northern New Mexico 2023 annual report

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

In central and northern New Mexico, late frosts are the number one issue challenging fruit production every year. My research focuses on alternative fruit crops or alternative production methods that can produce reliable crops annually. After 14 years of research, jujube produces reliable crops and is a suitable fruit crop for New Mexico, especially in central and southern parts.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

1. Our long-term jujube cultivar trials at three sites all progressed well in 2023. As always, 7-year-old jujube trees at Leyendecker were all loaded in 2023, similar to the yield of 9-year-old trees at Los Lunas. Trees at Alcalde were less productive than Leyendecker and Los Lunas in 2023. These long-term cultivar trials confirmed that jujube trees grow and produce well in New Mexico, especially in southern and central New Mexico. At the Las Cruces/Leyendecker site, all cultivars (fresh eating, drying, multipurpose, and ornamental cultivars) from early to late in maturation have relatively larger trees, higher yield, and better fruit quality than similar aged trees at Alcalde in northern New Mexico. While growers in the northern part should be more careful with jujube cultivar selection due to its relatively short growing season. Late cultivars cannot fully mature in northern New Mexico

2. High tunnel stone fruit production: There was a nice peach crop in 2023 but the cherry crop was still problematic. The heater inside the high tunnel was turned on in mid-March in 2023 but it still could not save the cherry crop. Several cultivars had light crops and the abnormal flowers were still common. If we continue this study, we have to dissect cherry flower bugs regularly to decide the floral buds damaging time and temperature after dormancy. After that, we can judge if it is economically viable for high-tunnel cherry production.

3. Jujube cultivar selection through open-pollination progenies: in 2021 and 2022, there were around 300 seedlings of varied cultivars were planted and grew well in Alcalde, NM. In 2023, we planted 650 jujube seedlings of late cultivars, and 580 survived and grew well at Los Lunas, NM.

4. 2015 Organic apple rootstock trial: trees grew well and produced a light crop in 2023 due to late frost and elk damage around maturation time.

5. Jujube fruit metabolomics study: jujube fruit of 12 cultivars from three locations in NM were sampled during harvest season in fall 2022. Samples were prepared at Alcalde, NM and a commercial company analyzed the samples. Data revealed a significant cultivar effect and functioned as cultivar fingerprint. It was published in MDPI Plants in June 2023.

6. Table grape cultivar trial: there was some winter damage to some cultivars in spring 2022.

7. Four publications in 2023:

(1) Sapkota, D., Zhang, D., Park, S., Meinhardt, L. W., Yao, S. (2023). Genotyping of Jujube (Ziziphus spp.) Germplasm in New Mexico and Southwestern Texas. *MDPI – Plants, 12*, 2405.https://doi.org/10.3390/plants12132405

(2) **Yao, S.**, Sapkota, D., Hungerford, J. A., Kersten, R. K. (2023). Jujube Fruit Metabolomic Profiles Reveal Cultivar Differences and Function as Cultivar Fingerprints. *MDPI – Plants, 12*, 2313. https://doi.org/10.3390/plants12122313

(3) Sapkota, G., Delgado, E., VanLeeuwen, D., Holguin, F. O., Flores, N., **Yao, S.** (2023). Preservation of Phenols, Antioxidant Activity, and Cyclic Adenosine Monophosphate in Jujube (Ziziphus jujuba Mill.) Fruits with Different Drying Methods. *MDPI – Plants, 12*, 1804. https://doi.org/10.3390/plants12091804

(4) Sapkota, G., Delgado, E., VanLeeuwen, D.F., Holguin, O., Flores, N., Heyduck, R., **Yao, S.** (2023). Dynamics of Nutrients in Jujube (Ziziphus jujuba Mill.) at Different Maturity Stages, Cultivars, and Locations in southwest United States. *HortScience, 58*(2), 155-163.,

https://doi.org/10.21273/HORTSCI16880-22

Briefly describe how your target audience benefited from your project's activities.

Hosted NM Fruit Growers Workshop on March 3, 2023, a pruning workshop on Feb 23, 2022, and a grafting workshop on August 10, 2023, at Los Lunas, NM.

Jujube growers nationwide and internationally all benefit from the jujube talk, grafting video, and my jujube publications from https://jujube.nmsu.edu/ and the Facebook jujube grower page that I am the co-admin and serve as group expert. The jujube grafting video had 79,000+ IP address views and the Facebook jujube grower page had 10.3K members worldwide with 4,450 US members.

Those three papers published in MDPI Plants, Special Issue: Advances in Jujube Research had been viewed 1100-1450 each until the end of January 2024.

Briefly describe how the broader public benefited from your project's activities.

The NMSU jujube research/extension activities benefit the public worldwide.

The NMSU jujube website https://jujube.nmsu.edu/ is open to viewers worldwide. Everyone can search and get the information they need like jujube cultivars, nutritional value, flowering and fruiting habits, and so on.

Most of my jujube publications are open-access. Growers worldwide can get them free of charge. The Facebook Jujube Growers page has 10.3K members, I post and answer questions regularly as Co-admin and group expert.

The NMSU jujube grafting YouTube video has over 79,000 IP address views worldwide. The jujube early performances in New Mexico YouTube video is also open to the public.

This extension publication can be freely downloaded from the NMSU website.

Genetic Improvement in the NM Cow Herd

Project Director
LaJoy Spears
Organization
New Mexico State University Main Campus
Accession Number
7002255

Advancing New Mexico's Cattle Industry: Genetic Improvement Initiatives

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

The New Mexico beef industry, contributing $900 million annually to the state's gross product, faces significant risks from drought. Informed genetic selection can mitigate losses and enhance marketability, crucial for sustaining this vital sector.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Tailored for beef cattle producers throughout New Mexico, strategic initiatives such as the Tucumcari Feed Efficiency Test, in operation since 1961, equip producers with vital data on purebred bulls and heifers, empowering them to make informed decisions. Moreover, the recently established High-Altitude Bull Test, launched in 2023, caters to the unique requirements of northern New Mexico producers, offering insights on altitude tolerance and novel marketing opportunities. Complementing these efforts, the Ranch to Rails program provides producers with a cost-effective pathway to access performance and carcass data, unlocking valuable insights that would otherwise pose financial challenges to obtain.

Briefly describe how your target audience benefited from your project's activities.

The Tucumcari Bull test has doubled its capacity since 2015, testing 160 bulls annually. Participation has diversified, with 24 cooperators from four states, including two from the Laguna Pueblo. Attendance at the bull test auction has grown to over 250 producers annually, with a $700 increase in the average value of bulls sold since 2015. Data from Tucumcari has led to a 40%

efficiency improvement since its inception. The High-Altitude Bull Test aims to serve historically underserved communities. The Ranch to Rails program offers valuable genetic insights without financial strain and supports improved nutrition initiatives for the Acoma Pueblo.

Briefly describe how the broader public benefited from your project's activities.

These initiatives arm producers with tools to enhance herd genetics, promoting efficiency and productivity. Informed selection results in cattle requiring less forage while yielding more beef per acre, fostering environmental stewardship and profitability simultaneously. By facilitating the adoption of superior genetics, these programs bolster the sustainability and competitiveness of New Mexico's cattle industry.

NM Farm to School

Project Director
LaJoy Spears
Organization
New Mexico State University Main Campus
Accession Number
7002256

Empowering New Mexico's Agricultural Landscape (NM Farm to School)

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

New Mexico's schoolchildren and residents in institutional settings face limited access to fresh, nutritious produce, prompting legislative action to fund the NM Farm to School and Farm to Institution program. With over $1 million allocated in FY 23, this initiative aims to reimburse institutions purchasing locally grown fruits and vegetables. To meet safety standards, growers are required to undergo food safety training or obtain third-party certifications.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Our target audience is New Mexico farmers supplying fresh produce to institutions, along with Master Gardeners, Community Gardens, and School Gardens contributing to local food initiatives. Engagement spans years, with the development of enduring educational materials and collaborations with the NM Farmers Marketing Association to conduct webinars, in-person trainings, and individual consultations. The agent also facilitates online modules and coordinates trainings with the NMDA – Produce Safety Alliance Training, expanding outreach nationally.

Collaborators include the New Mexico Farmers Marketing Association and the New Mexico Department of Agriculture – Produce Division.

Briefly describe how your target audience benefited from your project's activities.

Attendance at trainings has surged, with the NM Farmers Marketing Assoc hosting 40 sessions, and NMDA – PSA training now reaching 115 participants monthly. Growers learn about food safety risks, hazard management, and the development of safety plans, culminating in 85 approved suppliers serving various institutions and food banks. An estimated $1.15 million in state-funded purchases further supports local growers.

Briefly describe how the broader public benefited from your project's activities.

Expanded access to fresh produce benefits diverse populations, potentially curbing future healthcare expenses and addressing food insecurity. Direct funding to local farmers stimulates economic growth, with an estimated $690K – 860K circulating within communities. Enhanced food safety knowledge among farmers reduces the risk of foodborne illnesses, contributing to lower medical costs and emergency incidents statewide.

Optimizing Insect Pest Management in a Western Semi-Arid Environment

Project Director

Jane Pierce

Organization

New Mexico State University Main Campus

Accession Number

1025973

Optimizing IPM in a Western Semi-Arid Environment

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

This project aims to develop tools for integrated pest management programs to control insect pests in New Mexico Crops. The emphasis is on pests of cotton, corn, alfalfa, and pecan and approaches that minimize insecticide use, host plant resistance biological control, and cultural controls.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

One major focus in 2023 was evaluating the potential for okra-leaf cotton as a control measure for bollworm in the face of increasing resistance by bollworm. This is a promising area since we have shown that our New Mexico environment with high temperatures and low RH can produce higher mortality for a number of insects when there is less canopy cover or greater exposure to sunlight with a change in row spacing, orientation or spacing for example. A closed canopy cover provides shade which can lower the canopy temperature and raise relative humidity from plant respiration. Okra-leaf cotton will have more light penetration and air movement which may result in higher temperatures and lower RH more similar to our ambient desert conditions likely resulting in lower hatch rates. Okra leaf cotton was determined to be a viable control measure in reducing survival of larval pests like bollworm in cotton. Survival of bollworm was significantly lower in okra leaf cotton in 2023. Predation was similar in okra leaf and standard leaf cotton.

With resistance to Bt cotton developing in lepidopterous pests it's important to find alternative methods of control. In semi-arid cotton growing areas, low relative humidity and high temperatures can have an impact on hatch rates, helping to control insect pests. Late season the microclimate of the cotton canopy is more conducive to higher hatch rates and potential yield losses with a closed canopy reducing temperatures and increasing relative humidity relative to ambient conditions. Use of okra-leaf cotton may help reduce hatch rates late season by allowing greater air and light penetration into the canopy, producing a microclimate less conducive to high egg hatch. Okra cotton leaves have 55% less area than standard cotton leaves, allowing more light penetration into the canopy leading to higher temperatures and potentially less cooling respiration.

Field trials with sentinel eggs had lower hatch rates in okra-leaf cotton, with twice as many eggs hatching in standard cotton in-season, with 27% hatch compared to 54% hatch in standard leaf cotton in 2020. Previous trials looking at the impact of microclimate on boll weevil infested squares showed significant impacts of crop canopy differences with row orientation, row spacing and shade. These differences were related to differences in temperature and relative humidity. Similar trials looking at the impact of row orientation and row spacing on bollworm were complicated by the moderating conditions in canopy making it more difficult to detect similar impacts on bollworm egg hatch. One date had significantly higher egg hatch in north-south rows with 76% egg hatch vs. 49% hatch in east-west rows. Rows oriented east-west were 6 degrees F warmer with mean highs 108oF (42oC) vs. 102oF (39oC) in north-south rows.

There was some variation in differences in hatch rates between okra leaf and standard cotton canopies. There was a significantly lower egg hatch in okra-leaf cotton on two dates in July and August in 2020, with 19-27% hatch in okra-leaf vs. 51-52% in standard leaf cotton in season. One date,7/29/20, had no significant difference, with 40 vs. 60% hatch in okra vs. standard leaf canopies. That variation and questions about the magnitude of effects on hatch rates prompted research trials on hatch rates under very high temperatures and low humidity in 2023.

High temperatures and low relative humidity have the potential to have both subtle and dramatic effects on hatch rates of insect pests, particularly immature larvae that are more susceptible to desiccation. In laboratory trials, a consistent temperature of 35oC (95oF) and 17% RH resulted in only 4% hatch compared to 47% hatch under relatively unstressed conditions 26oC (79oF) and 50% RH (Pierce and Monk 2010). Subjecting eggs to high temperature alone resulted in hatch rates similar to the control but did have an impact on subsequent survival to pupation, with half the survival to pupation compared to control insects.

There is potential to control insect pests in the arid or semi-arid southwest by managing cotton to take advantage of this natural mortality. However, translating these impacts in the lab to the field and documenting impacts on hatch rates, particularly in the more benign canopy microclimate, is difficult. Rows oriented east-west vs. north-south had much lower survival of boll weevil immatures on the soil surface with only 9% survival in east-west rows vs. 38% survival in north-south rows. Trials conducted in the same plots with bollworm eggs produced much less dramatic results. There was a significantly lower egg hatch in east-west rows only once in eight trials over two years. That one significant result had 49% hatch of sentinel bollworm eggs in canopy in east-west vs. 76% hatch in north-south rows. In that trial, mean daily highs were 3oC (6oF) higher. There was no significant difference in RH in any of the eight trials. (Pierce and Monk 2010, Pierce 2001).

In 2023, hatch rates were extremely low when eggs were exposed to daily high temperatures over 100oF resulting in only 9% - 14% hatch rates. This was a very low hatch compared to previous trials, for example, in 2020, when high temperatures averaged 32oC (89.6oF) in okra leaf and 33oC (91.4oF) in standard cotton in season with 28% mean hatch in okra plots vs. 54% in standard cotton leaf plots. Unlike earlier row orientation trials hatch rates have been consistently affected in 2020-2023 field trials. Very high temperatures in 2023 trials produced very low hatch rates, 9% in okra leaf cotton vs. 14% in standard cotton. Similarly, in 2020 under less stressful temperatures, two of three in-season trials had significantly higher hatch rates in standard leaf cotton with the other trial having numerically higher hatch rates. The three in-season trials together had a mean hatch rate 1.9x higher in standard cotton.

Significantly lower hatch rates in 2020-2022 were not well explained by temperature and relative humidity readings in okra leaf vs. standard cotton. Follow-up trials were conducted to determine if the difference in hatch rates was due to higher temperature on the egg from direct radiation. Shade cloth trials resulted in much higher hatch rates under shade but the results were confounded by the more moderate temperatures under those conditions. Eggs were placed on top and bottom of leaves in 2022 and 2023 and there was a significant difference in hatch rates in 2022, but the difference was slight, 57% vs. 50% hatch in standard vs. okra leaf cotton. That difference is not enough to explain the often two-fold higher hatch rates in standard cotton canopies compared to okra leaf canopies. It appears that there is a difference in temperature which is causing lower hatch rates in okra leaf cotton, but it is often difficult to document such differences in the field.

Determining management practices that affect bollworm hatch rates will help predict management practices that could help control other insect pests in other crops. Most immature insects are sensitive to desiccation. Populations of pests in other crops could be suppressed with higher temperatures and lower relative humidity using practices that have succeeded in cotton.

There are likely many pests controlled on a regular basis by environmental stress that have outbreaks during periods of more moderate temperature and relative humidity. Cutworms and beet armyworms, for example are rarely a problem in NM during the summer, but can be problematic after periods of unusually high rainfall with higher relative humidity and cooler temperatures.

There have been challenges correlating canopy temperature and relative humidity to reduced hatch rates in okra leaf cotton so one objective this year was to determine if very high temperatures might more consistently be associated with reduced hatch rates and allow us to relate that reduced hatch rate to changes in canopy temperature and/or relative humidity. Other objectives were continuations of previous years including trapping *H. zea* and *virescens* to track changes in populations before incursion of *H armigera*.

In other trials biological control in cotton was affected by proximity to alfalfa which provides predators for control of cotton pests. After cutting hay predation was not increased in cotton. Instead, predation was lower in cotton since populations in hay were reduced and predator movement to cotton was reduced. The reduction was likely due to desiccation as sampling cut hay samples indicated that crimpling did not have an effect compared to non crimped cut hay.

Briefly describe how your target audience benefited from your project's activities.

Growers were also informed about pest practices in IPM in cotton, hay and alfalfa. One specific recommendation from our research is that their alfalfa hay provides beneficials for nearby crops and that maintaining hay near other crops help minimize insect pest issues, particularly in cotton. Recommendations included the use of insecticides that are softer on beneficials when needed.

We are working with cotton breeders on the development of okra leaf cottons that can be used to reduce insect pests if growers are unable to use Bt cotton varieties.

We are working with growers and industry on issues related to resistance to Bt genes with cotton bollworm tobacco budworm and southwestern corn borer to delay the development of resistance and look for alternative management techniques.

Briefly describe how the broader public benefited from your project's activities.

We made numerous presentations to growers at research meetings, commodity meetings, pesticide training workshops, and field days to update growers on issues that could affect the control of insect pests. Issues with resistance to insecticides and Bt genes for example were discussed as well as pest management best practices for alfalfa, pecan, and cotton.

Presentations were made to professional entomologists presenting research for example reviewing the status of kissing bugs and Chagas disease to technical directors for US pest control companies, and Cotton Beltwide Conferences.

Members of the public were educated on general insect issues in 2023 such as Africanized bees, kissing bugs, and conservation of beneficial insects at field days, guest lectures at college classes, summer zoo camps, and science fairs.

Effects of arginine supplementation during early gestation on fetal development

Project Director
Eric Scholljegerdes
Organization
New Mexico State University Main Campus
Accession Number
1025673

Effects of arginine supplementation during early gestation on fetal development"

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Poor nutrition can result in improper development of the fetus. Supplemental arginine offered at critical times during gestation can potentially improve organ development and growth trajectories of the developing fetus.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Laboratory work has been conducted to determine if maternal supplemental arginine during gestation can alter transporters, enzymes, and hormones in the developing fetus. In this series of experiments, dams were fed normal or restricted amounts of feed with additional arginine or no arginine. Thus far, these results have demonstrated that dietary restriction of the dam does reduce some of the key metabolic hormones that control blood vessel development. Likewise, glucose transporters are also impacted. Provision of supplemental arginine to dams subjected to restricted feed intake had similar hormone levels and transporters to that of controls. Thereby indicating that arginine could serve as a nutrient that could rescue compromised fetal development. Laboratory work is ongoing looking at chemokines production and amino acid transporters. Additionally, nutrient restriction during early pregnancy has been demonstrated to reduce offspring's ability to carry out gluconeogensis when glucose supplies are low. From this lab work, we have also observed that the provision of arginine to dams during late gestation increases some of the key liver enzymes responsible for gluconeogensis in offspring.

Briefly describe how your target audience benefited from your project's activities.

This work will be beneficial to livestock producers whose animals are subject to drought or very poor quality forages during critical gestational time points. Eventually, this work will provide nutritionists the information needed to develop supplements that provide arginine during early or late gestation to improve fetal development irrespective of the nutritional

environment that the dam is subjected to during pregnancy. Of course, these supplements with additional arginine will come at a financial cost, but through this work and future work, researchers hope that they can define specific time frames to feed in order to reduce the amount of time needed for feeding.

Briefly describe how the broader public benefited from your project's activities.

Although the bovine is the model for this work, this work as application to human nutrition as well. As nutrient deprivation and the physiological remifications of poor maternal nutrition is evident in all species.

GENOMICS-ASSISTED BREEDING FOR THE IMPROVEMENT OF CHILE PEPPERS (CAPSICUM SPP.) IN NEW MEXICO

Project Director
Dennis Nicuh Lozada
Organization
New Mexico State University Main Campus
Accession Number
1025360

Genomic prediction and selection for yield and other agronomic traits in Chile peppers

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Chile peppers are a major economic and cultural crop in New Mexico. There is a need to develop higher-yielding and more disease-resistant varieties for chile pepper growers, however, traditional plant breeding takes time. This project aims to fast-track the development of genetically improved chile pepper cultivars using novel approaches such as genomic selection.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

A diverse population of chile peppers was sequenced and traits including yield and yield components, plant height and morphology, and flowering time were collected. Various genomic selection (GS) and statistical models were then implemented to predict the future phenotypic performance of chile pepper cultivars and breeding lines in field conditions in Las Cruces, NM. Prediction accuracy among the GS models differ, where high prediction accuracy was observed for plant height (0.73) and plant width (0.62), among other traits. Genetic gain was highest when phenotypic selection and GS were applied simultaneously in the chile pepper population, indicating that integrated approaches could result in improved efficiency of selection. Information derived from this study could be utilized for accelerated breeding and selection of superior lines for the development of improved chile pepper cultivars in New Mexico.

Reference:

Lozada, D. N., Sandhu, K.S., and Bhatta, M. "Ridge regression and deep learning models for genome-wide selection of complex traits in New Mexican Chile peppers." *BMC Genomic Data* 24.1 (2023): 80.

Briefly describe how your target audience benefited from your project's activities.

Chile pepper growers and producers in New Mexico are the target audience for this project. Using advanced molecular breeding methodologies, the development of improved cultivars which can provide new economic opportunities for farmers could be fast-tracked.

Briefly describe how the broader public benefited from your project's activities.

The public can benefit from the next generation chile pepper cultivars which can be released based on the phenotypic and genomic information derived from the project. Modern genetic tools can accelerate the development and release of chile pepper cultivars with increased yield, which can impact growers and consumers.

Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to

communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.

This project provided opportunities to collaborate with the private sector. Major results have already been published in a peer-reviewed (Lozada et al., 2023), and is freely available for public access.

Reference:

Lozada, D. N., Sandhu, K.S., and Bhatta, M. "Ridge regression and deep learning models for genome-wide selection of complex traits in New Mexican Chile peppers." *BMC Genomic Data* 24.1 (2023): 80.

Sustainability of New Mexico Beef and Dairy Livestock Sector

Project Director
Maryfrances Miller
Organization
New Mexico State University Main Campus
Accession Number
1023910

Sustainability of New Mexico Beef and Dairy Livestock Sector

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

New Mexico's top two agricultual sectors are the dairy and beef sectors. Together, these sectors account for almost 3/4 agricultural cash receipts, and support the feed crop sector. Like many forms of agricultural production, they face a number of difficulties ranging from financial and marketing challenes to climate change related threats like drought and changes in rangeland plant composition. Equally important, a lack of labor and an increasing average age of farm owner/operator further presages a declining sustainability of these industries.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

The first area of work was in youth education and development. I have continued to coordinate, with Dr. Marcy Ward, the New Mexico Youth Feeder Beef Contest. This contest focuses on providing young New Mexicans with the skills necessary to understand the beef industry, and to equip them with the animal husbandry and financial tools to potentially pursue a career in beef production.

I worked closely with the NMSU Southwest Border Food Protection and Emergency Preparedness Center on a project to increase the capacity for vaccination administration. New Mexico's border location makes preparing for Foreign Animal Disease introduction critical for protecting the New Mexico livestock industry, as well as that of the entire U.S.

I led an effort to develop a financial benchmarking program for New Mexico farmers and ranchers. This effort utilizes the USDA FINBIN database.

I continued working on a project to evaluate alternative forage crops with increased drought resistance for New Mexico dairy producers.

Briefly describe how your target audience benefited from your project's activities.

Over $6,000 was awarded to New Mexico youth through the Feeder Beef contest. The contest teaches record-keeping skills, Beef Quality Assurance curriculum, and allows them to trace their animal(s) from weaning to slaughter. Paricipants reported greater levels of intragenerational conversations about the business side of their ranching operation. A poster contest, held in conjunction with the New Mexico Joint Stockmens' Conference, offered youth participants a chance to network with established beef producers. Additionally, the visible work of creating these opportunies for youth has created professional networking opportunites for myself as a beef and range livestock researcher that led to grant letters of support and participation with research initiatives.

I was a co-PI on a grant recieved form USDA-APHIS-NADPRP program focused on developing a plan for utilizing vaccine in the event of an FMD outbreak.

The agricultural financial benchmarking program, dubbed the New Mexico Farm and Ranch Management (NM-FARM) Program, will improve the ability of New Mexico farmers and ranchers to make better use of their own financial data to improve management and profitability. This program includes the piloting of a new approach which will allow farmers to participate in the benchmarking program anonymously through their agricultural accountant.

Briefly describe how the broader public benefited from your project's activities.

For the FMD vaccination planning, the ability to respond quickly to a Foreign Animal Disease is likely to be the best strategy for minimizing economic impacts from such an event. In the vaccine plan development I addressed the issue of how to incorporate and communicate economic considerations.

The NM-FARM program is focused on providing famers with the ability to improve their profitabilty and to measure the return on conservation efforts. If successful, this creates a tool for helping sustain the rural communities that depend on the economic contributions from the agricultural sector. Another compontent of this program is the expansion of "Annie's Program," an organization dedicated to supporting women in agriculture. The majority of the activities will be carried out in 2024, but a significant portion of the planning was completed in 2023.

The Feeder Beef Contest, and other contests coordinated and implemented by Miller, create opportunities for New Mexico youth, especially those in underserved rural communities, to engage with NMSU faculty. These contests create opportunities to recruit New Mexico youth into professional agricultural careers.

Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.

Miller has worked on planning the producer outreach and information gathering that will occur under the Manureshed initiative (Recycling agricultural nutrients). This included planning and working to obtain IRB compliance for the data gathering efforts.

Similarly, an interdisciplinary effort to interview employees and owners of New Mexico small beef processing facilities has been developed. Data gathering will occur in 2024.

Relevant Presentations:

Miller, F., ALIRT Conference, International Livestock Identification Assoc & NM Livestock Board, Albuquerque, NM, "Mental Health Considerations in Animal Emergency" (July 25, 2023).

Miller, F., Coronado, L. R., Western Agricultural Economics Association, WAEA, Whistler CA, "Guar as an alternative forage for dairies" (July 17, 2023).

Bailey, T., Miller, F., Western Agricultural Economics Association, WAEA, Whistler CA, "Feasibility of Expanding Meat Processing on the Navajo Nation. " (July 17, 2023).

Boufous, S., Miller, F., Robinson, C., SAEA Annual Conference, Southern Agricultural Economists Association, Oklahoma City, OK, "Investigating Young New Mexicans' Perceptions of Farming", (February 6, 2023).

Taylor, E., Miller, F., SAEA Annual Conference, Southern Agricultural Economics Association, Oklahoma City, OK, "Rural veterinary shortage areas: Understanding the problem and potential policy responses", (February 6, 2023).

Alternative nutrient supplementation strategies for calf health and performance

Project Director

Clint Loest

Organization

New Mexico State University Main Campus

Accession Number

1018106

Comparison of a visual health scoring system with vaginal temperatures of newly received feedlot heifers.

Final Result

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

The problem is that bovine respiratory disease (BRD) is a significant health concern in the cattle industry, affecting more than 20% of cattle and costing the US beef industry more than $600-million annually. Typically, calves entering feedlots are at high risk because they are under stress associated with weaning, comingling, and transportation. These calves are often dehydrated and malnourished, which compromises their immune systems and increases their vulnerability to BRD. The objective of this study was to evaluate if a 4-point scoring system based on depression, appetite, respiration, and temperature (DART) could be used to identify cattle with elevated vaginal temperatures throughout the feedlot receiving period.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Results from our research showed that employing vaginal temperature sensors and the DART scoring method provided an overview of the effectiveness of visually diagnosing clinical bovine respiratory disease in feedlot cattle. This research will contribute to improving the development of more effective strategies for identifying respiratory diseases in feedlot cattle.

Briefly describe how your target audience benefited from your project's activities.

Our target audience are national and international animal scientists and stakeholders who are cattle industry decision-makers from cow-calf through feedlot sectors of the beef industry. Results from our research demonstrated the need for improved methods to diagnose clinical bovine respiratory disease in feedlot cattle.

Briefly describe how the broader public benefited from your project's activities.

Our research focuses on alternative nutritional management strategies to better prepare immune-compromised calves to fight infections and help reduce the United States beef industry's $600-million to $900-million in annual economic losses due to the cost of BRD in feedlot cattle. If early detection disease strategies are developed to reduce BRD in cattle by 5% annually, this could save the US beef industry more than $30-million annually.

Cultivating Urban Landscapes: Empowering Communities with Extension Master Gardener Training and Programming

Project Director
LaJoy Spears
Organization
New Mexico State University Main Campus
Accession Number
7007071

Empowering Urban Horticulture Through Extension Master Gardener Training

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

The surge in home food gardens during the pandemic underscored the public's need for reliable horticultural guidance. The Extension Master Gardener Program serves as a vital resource, training volunteers to disseminate unbiased, research-based information. With inquiries skyrocketing by 1,740% in 2020, the demand for scientifically grounded gardening insights has never been more pressing.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Prospective Extension Master Gardener Volunteers and existing volunteers seeking continuing education credits are the primary beneficiaries of the program's comprehensive training. Transitioning online in 2022, the 15-week course, hosted on NMSU's OnDemand platform, covers a spectrum of topics from soils to plant pathology. Flexibility in training attracted a diverse cohort, with a notable 60% increase in younger participants working full time. The hybrid model integrates pre-recorded materials, live Q&A sessions, and hands-on workshops to cater to varied schedules and learning preferences.

Briefly describe how your target audience benefited from your project's activities.

The training equips participants with essential home horticulture knowledge and fosters a deeper appreciation for Extension's pivotal role in addressing community needs. Notably, 118 volunteers completed certification requirements, contributing over 3,540 service hours collectively valued at $112,572. Positive participant feedback underscores the program's efficacy and enduring impact. Collaborating with the Albuquerque Bernalillo County Water Utility Authority enhances the program's environmental stewardship initiatives.

Briefly describe how the broader public benefited from your project's activities.

Extension Master Gardener Volunteers play a crucial role in bolstering the Cooperative Extension Office's capacity to deliver relevant, science-based horticultural information to residents. Their contributions, valued at $31.80 per hour, reflect a tangible investment in community well-being and environmental sustainability.

Nurturing Green Communities Through Urban Horticulture

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Residents of Cibola and McKinley Counties face unique challenges in gardening and landscaping due to distinct soils, pests, climate conditions, and limited water resources. As approximately 40% of residential water consumption is dedicated to landscape maintenance, adapting to water scarcity becomes imperative. The COVID-19 pandemic underscored the importance of local food production, sparking a renewed interest in home gardening among residents, prompting a surge in inquiries about gardening techniques and water-efficient practices.

The McKinley and Cibola Gardening Series catered to the residents of Cibola and McKinley Counties, empowering them with knowledge and skills essential for successful gardening endeavors.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

In collaboration with the Cibola & McKinley Master Gardeners, a comprehensive series of 13 educational workshops covered topics ranging from soil basics to composting, canning, companion gardening, and water conservation techniques.

Briefly describe how your target audience benefited from your project's activities.

A total of 230 residents actively participated in this year's gardening series, with 87% expressing confidence in planting and maintaining their gardens. Moreover, 95% felt equipped to engage in canning vegetables and drying fruits, indicating a substantial increase in self-sufficiency and food preservation skills among participants. Positive feedback from evaluations highlighted the invaluable knowledge gained and the accessible delivery of information, reflecting the program's efficacy in meeting community needs.

The success of the initiative was made possible through collaboration with McKinley, Cibola, and Tribal Extension Agents, as well as support from The Gallup Community Pantry and Cibola/McKinley Master Gardeners.

Briefly describe how the broader public benefited from your project's activities.

Beyond cultivating lush gardens, our efforts in urban horticulture address the multifaceted challenges inherent to our region, fostering resilience in the face of soil conditions, pests, and water scarcity. By promoting informed plant selection and sustainable gardening practices, we not only enhance the beauty of our landscapes but also safeguard our precious water

resources for the well-being of current and future generations. Through collective action and responsible stewardship, we nurture thriving green communities while ensuring environmental sustainability.

Growing New Mexico's Agriculture: Engaging Youth for the Future
Project Director
LaJoy Spears
Organization
New Mexico State University Main Campus
Accession Number
7002522

Enhancing Youth Academic Achievement through Integrated STEM Programs at NMSU Extension and Research Youth Agricultural Science Center

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

In New Mexico, educational disparities and diminishing opportunities, particularly in rural areas, pose significant challenges to academic achievement. To combat this issue, the NMSU Extension and Research Youth Agricultural Science Center has developed innovative school enrichment programs. Our mission is clear: to enhance literacy, numeracy, and agriscience education while addressing the pressing need for improved academic outcomes in math and science, especially in under-resourced rural communities. Through collaborative partnerships, our center delivers STEM-based formal education programs, prioritizing hands-on learning and experiential education to empower youth in Las Vegas, NM, and beyond.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Our primary initiatives revolve around establishing greenhouses and school-based gardens in elementary schools, complemented by a hoophouse at the high school level. These infrastructures serve as pivotal platforms for hands-on, inquiry-based learning, bridging science education at the elementary level with practical applications taught in secondary education. By integrating production-based agricultural concepts into the curriculum, we aim to enhance students' agricultural competency while equipping them with essential skills for pursuing STEM careers in the future.

Briefly describe how your target audience benefited from your project's activities.

The target audience, comprising about 600 K-12 students annually, benefits from improved agricultural production skills, knowledge, and increased science scores. Additionally, the broader public benefits from a more educated populace, access to fresh food, and a community space for non-formal agricultural innovation demonstrations. The outcomes demonstrate that our programs significantly close the achievement gap, predict overall science comprehension, and contribute to improved science skills and knowledge.

Briefly describe how the broader public benefited from your project's activities.

Ultimately, the NMSU Extension and Research Youth Agricultural Science Center maximizes educational strengths through partnerships, land resources, facilities, and public/private funding. The Center's impact extends beyond academic achievements, supporting community development, economic growth, and a pathway to post-secondary education in STEM disciplines.

Food Waste Hackathon

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Food waste by consumers contributes to climate change, exhausts resources, and emits methane gases. The Food Waste Hackathon, a collaborative event, engages participants to address this issue by innovating solutions. Through targeted education and interactive design activities, youth aged 11-14 learn about and combat food waste at various levels, from

personal habits to community advocacy.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Participants/Target Audience: youth ages 11-14.

In partnership with 4-H agents and specialists, we organized the Food Waste Hackathon, offering learning resources, interactive animations, and hands-on activities. Eleven middle schoolers immersed themselves in discussions, collaborated on design tasks, and utilized media tools to propose impactful solutions. The event not only fostered digital fluency but also empowered participants to address food waste's environmental impact.

Briefly describe how your target audience benefited from your project's activities.

Feedback from participants and parents underscored the transformative impact of the Learning Games Lab experience. Youth expressed heightened awareness of food waste issues and newfound enthusiasm for preventive measures. Parents acknowledged the event's role in raising awareness and fostering a deeper understanding of food waste's implications. The project's online resources now serve as a guide for hosting similar initiatives, amplifying its reach and impact.

Briefly describe how the broader public benefited from your project's activities.

Empowering youth to tackle pressing issues like food waste not only cultivates problem-solving skills but also instills a sense of agency and responsibility. The Food Waste Hackathon equips youth with the tools and knowledge to make meaningful contributions to environmental stewardship. Participants and their families report increased awareness and engagement, while the project's resources enable educators to replicate its success, fostering a culture of sustainability and innovation.

Growing Minds -TorC School Enrichment Initiative

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Since the 1920s, the farm population decline and decreased emphasis on agriculture in education have widened a significant gap in understanding the food and fiber system. With only 35,000 graduates in fields related to food, agriculture, and the environment, compared to 58,000 annual job openings, bridging this divide is crucial. The Growing Minds program aims to do just that by nurturing agricultural literacy among K-5th grade students in the TorC School District. By fostering a deeper comprehension of agriculture, the initiative contributes to future food security, sustainable energy, and environmental quality.

The Growing Minds - TorC School Enrichment Initiative seeks to revive the importance of agriculture among students, addressing the widening gap between education and the production industry. Through active engagement in agricultural literacy programs, K-5th grade students not only grasp the intricacies of the food and fiber system but also cultivate essential life skills. The program's collaborative efforts and enthusiastic participation not only benefit the immediate participants but also pave the way for a more knowledgeable and prepared workforce to tackle the agriculture industry's future challenges.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Students from kindergarten to 5th grade in the TorC School District, including TorC Elementary School, Sierra Elementary Complex, and Arrey Elementary, benefit from our educational activities.

Partnering with the Sierra Soil and Water Conservation District, our agent has successfully introduced school enrichment programs at Truth or Consequences Elementary School. These programs feature monthly curriculum themes like Soil Science, Composting, and Pollinators, aimed at fostering agricultural awareness and promoting hands-on learning experiences.

Engaging classroom activities, including reading sessions facilitated by Hot Springs FFA members, contribute to the enhancement of agricultural literacy and the development of essential skills in math, writing, and science among the students.

Briefly describe how your target audience benefited from your project's activities.

The Growing Minds program has left a lasting impact, with 450 students gaining a deeper understanding of plant and animal life cycles. Through active participation, students developed valuable skills in responsibility, decision-making, and resource utilization. Teachers observed an enhanced agricultural awareness among students, sparking a newfound interest in pursuing careers in agriculture. The initiative successfully bridged the gap between education and production industries, cultivating a generation of informed individuals crucial for addressing global challenges in food production.

Partnerships were instrumental in the program's success. The agent collaborated with Sierra and Caballo Soil and Water Conservation Districts, Hot Springs FFA, and the 4-H Mini-grant to provide instruction and secure funding for the program.

Briefly describe how the broader public benefited from your project's activities.

The Growing Minds - TorC School Enrichment Initiative is a vital program aimed at rekindling the significance of agriculture in education and society. By actively engaging K-5th grade students in agricultural literacy programs, the initiative bridges the gap between education and the production industry, fostering a generation of informed individuals crucial for addressing global challenges in food production. Through collaboration with community partners and enthusiastic participation, the program not only cultivates a deeper understanding of the food and fiber system but also nurtures essential life skills among students. By instilling responsibility, decision-making, and resource utilization skills, the initiative prepares students for future success and contributes to building a more resilient and sustainable agricultural workforce.

Cultivating Unity: Collaborative Growth for Native American Producers

Project Director
LaJoy Spears
Organization
New Mexico State University Main Campus
Accession Number
7002263

Cultivating Native Women Professionals in Southern Pueblo Agriculture and Natural Resources

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

The heart of Pueblo life resides in its community, encompassing history, culture, language, and core values that shape daily existence. To deepen community development, culturally sensitive programming and dedicated agents are essential. Southern Pueblo, committed to tribal food sovereignty and land stewardship, seeks to empower its members, particularly Native women, to lead and strengthen their communities.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

This initiative targets Native college women, professionals, and broader Pueblo communities across central New Mexico, including Acoma, Laguna, Isleta, and others. The Southern Pueblo Agent facilitated strategic planning meetings, recruited Pueblo women from various sectors, and engaged with college students to bolster the development of a Native Women's professional group.

Briefly describe how your target audience benefited from your project's activities.

Participants from multiple Pueblos engaged in strategic planning sessions, fostering a safe environment where ideas and experiences could be freely shared. The initiative aims to empower women transitioning from college to career opportunities while offering mentorship to those seasoned in their fields. Through partnerships and strategic recruitment, the project endeavors to implement its vision and strategic plan effectively.

Briefly describe how the broader public benefited from your project's activities.

Establishing a Native Professional Women's group fosters land stewardship, professional growth, and leadership skills among Southern Pueblo communities. By showcasing successes, the initiative inspires the next generation of female scientists, thereby enhancing interest in hard science roles.

Enhancing Pasture Productivity: Demonstrations on Tribal Lands

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

In northern New Mexico, the New Mexico Cooperative Extension Service (CES) acknowledges the persistent demand from producers, especially tribal entities, for reliable forage-related insights. Despite this, CES faces a dearth of concrete information on perennial grass species' adaptability and productivity potential, resulting in vast tracts of potentially fertile land remaining underutilized or abandoned.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Targeting participants from northern New Mexico pueblo land assignees, Agriculture Departments, hay/pasture farmers, land managers, and Extension Agents, all seeking to optimize pasture and hay recommendations, the CES initiated on-farm demonstrations to address this demand. With support from NM-NRCS funding, collaborative efforts were launched to establish and monitor pasture demonstrations across multiple tribal entities, including Ohkay Owingeh and Santa Clara. The project involved cultivating up to 15 different species, accompanied by comprehensive guidance on land preparation, planting techniques, weed control, and harvest methods.

Briefly describe how your target audience benefited from your project's activities.

Preliminary findings reveal the wide adaptability of both native and non-native species, showcasing notable differences in yield and nutritional profiles. Furthermore, the data collected has facilitated the development of a robust pasture production-grazing model and calculator, refining traditional estimations and improving predictions regarding pasture productivity, animal outputs, and economic returns.

Producers and Agriculture Department personnel now have access to valuable insights into optimal forage species selection and management practices. The success of these initiatives has generated interest among other tribal entities, encouraging broader adoption of innovative practices and a willingness to explore new plant species. This evolving landscape signifies a paradigm shift towards sustainable land utilization and enhanced productivity.

The USDA-Natural Resources Conservation Service collaborates to strengthen technical assistance and program delivery, ensuring the sustainable conservation of natural resources across tribal and northern New Mexico lands.

Briefly describe how the broader public benefited from your project's activities.

Long-term monitoring of demonstrations equips CES to offer informed pasture grass recommendations, empowering diverse clientele and stakeholders. Enhanced pasture-grazing models enable landowners to accurately predict grass production potential and optimize animal performance, thereby boosting profitability and improving overall quality of life on tribal lands through economic stimulus and environmental stewardship.

Nourishing Minds and Bodies: Assessing the Impact of Santa Clara Farm Day – Food Security Report on Healthy Eating

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

The Eight Northern Pueblos' imperative for agricultural and family/consumer science education, as per a comprehensive needs assessment, underscores the necessity for knowledge dissemination on various subjects including healthy eating and food preservation. Tribal members seek expertise in forage production, invasive weed control, cover cropping for soil health, vegetable production, self-care, mindfulness, healthy eating, and 4-H Youth programming on Native American lands.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Engaging the Eight Northern Pueblos Natural Resources Departments, Youth Departments, and tribal members, Santa Clara Farm Day embraced a wide spectrum of stakeholders dedicated to agricultural and familial sustainability.

Addressing the community's pressing needs, Santa Clara Farm Day orchestrated a diverse agenda covering vital topics such as forage production, invasive weed control, cover cropping, vegetable production, self-care, mindfulness, healthy eating, and 4-H Youth programming. Special emphasis was placed on promoting healthy eating and food preservation, featuring presentations on selecting nutritious options, meal planning, and food preservation techniques. The event also showcased interactive booths offering information on healthy eating, meal planning, and diabetes education, complemented by sampling sessions and additional insights from an Ideas for Cooking and Nutrition Educator (ICAN).

Briefly describe how your target audience benefited from your project's activities.

Thirty-seven tribal members from the Eight Northern Pueblos actively participated in the Santa Clara Field Day, showcasing significant knowledge gains across various presentations: Cover Cropping (90%), Forage Production/Invasive Weed Control (75%), Vegetable Production and Care (70%), Mindfulness/Self-Care (70%), 4-H Youth Programming (70%), and Healthy Eating (60%). The pre/posttest results affirm an overall informational gain of 73%, with high satisfaction rates regarding relevance (55% satisfied, 45% very satisfied), presentation quality (45% satisfied, 55% very satisfied), and presenter expertise (30% satisfied, 70% very satisfied).

Collaborative efforts with the Santa Clara Pueblo Council, Santa Clara Agriculture Department, New Mexico State University specialists, and NMSU Rio Arriba County Cooperative Extension Office bolstered the success of the Santa Clara Farm Day.

Briefly describe how the broader public benefited from your project's activities.

The Santa Clara Farm Day emerges as a beacon of community empowerment and education, effectively addressing critical needs identified by the Eight Northern Pueblos. With substantial knowledge enrichment and universal satisfaction among participants, particularly in the realm of healthy eating and food security, the event stands as a testament to its enduring impact on tribal well-being and resilience.

Restoring Navajo Heritage Peach Orchards

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

The historical plight of the Navajo people, including the destruction of their peach orchards during the Navajo Long Walk, underscores the urgency of preserving their cultural heritage. With requests pouring in from tribal communities, the endeavor to reintroduce Navajo Heritage Peaches represents a pivotal step toward reclaiming ancestral traditions and fostering resilience.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Engaging not only the Navajo but also the Hopi, Zuni, Acoma, and Laguna communities, the project aims to resonate across tribal lines, uniting diverse indigenous groups in the restoration of shared heritage. The project embarked on developing optimal propagation methods for Heritage peach trees, leveraging stem cuttings and seed germination techniques. Initial efforts saw the successful rooting of cuttings and germination of seeds, laying the groundwork for further propagation and distribution. Through events like the NMSU Agricultural Science Center Open House, the project invites public engagement and shares insights into propagation methods, fostering community involvement.

Briefly describe how your target audience benefited from your project's activities.

The reestablishment of Navajo Heritage Peaches transcends mere agricultural revival; it symbolizes a reconnection to ancestral roots and a revitalization of communal identity. By reintroducing these native peaches, the project promotes food sovereignty and economic empowerment, aligning with the tribe's values of self-sufficiency and environmental harmony.

Furthermore, the initiative catalyzes economic development by creating job opportunities and stimulating local markets, thereby fostering holistic community well-being.

Collaborating with Reagan Wytsalucy from Utah State University Extension and Dr. Kevin Lombard from NMSU Agricultural Science Center, Farmington, NM, the project embodies a collaborative effort to preserve and propagate Navajo heritage.

Briefly describe how the broader public benefited from your project's activities.

The restoration of Navajo Heritage Peaches signifies more than agricultural reparation; it embodies a gesture of contrition and respect to Native communities, fostering trust and reconciliation. Beyond cultural significance, the initiative enriches local ecosystems, promotes biodiversity, and sustains traditional agricultural practices. By nurturing economic opportunities and supporting local agriculture, the project ignites a cycle of prosperity, underlining the enduring value of preserving cultural heritage and promoting community well-being.

Critical Issue

Water Use and Conservation

SUSTAINABLE CROP PRODUCTION IN ARID AGROECOSYSTEMS OF NEW MEXICO

Project Director

Kulbhushan Grover

Organization

New Mexico State University Main Campus

Accession Number

7001531

SUSTAINABLE CROP PRODUCTION IN ARID AGROECOSYSTEMS OF NEW MEXICO

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Declining water availability along with increased climatic variability such as droughts affects sustainability of agriculture in New Mexico. There is a need to identify resource efficient alternative crops to improve water and nutrient use efficiency while ensuring the profitable economic returns, long-term sustainability, and system resiliency in this region. Guar is a high value alternate crop that can be grown for fresh pods for vegetables, or for protein-rich high quality forage for animals or for seed to produce guar gum.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Research was conducted on agronomic management of guar in southern New Mexico. Collaborative projects were continued on guar salinity tolerance in collaboration with scientists at the USDA-ARS Salinity Lab. Cover crop field demonstration trials were conducted including for an educational experience. The students from an undergraduate course in crop production planted, managed, and observed more than 20 different cover crops as part of their Experiential Learning project. The students visually evaluated the crops, ranked their performance based on biomass, ground coverage and winter survival, and made recommendations for suitable cover crops in the region.

Briefly describe how your target audience benefited from your project's activities.

Presentations were delievered at scientific meetings and extension events. Peer reviewed journal articles were published. Information was also disseminated to students through course curriculum and research projects. Field tours and presentations were also delivered focusing on cover crops and sustainable crop production in southern New Mexico

Briefly describe how the broader public benefited from your project's activities.

The program has helped create awareness about the research and its benefits among the general public through community events and demonstration. Results from the research have also been integrated into the classroom instruction. Additionally, students were provided opportunity to get involved in research projects. Moreover, students from elementary and middle

schools were given presentations and demonstrations on guar and guar gum and its importance.

User Friendly Electronic Tools and Software for Efficient Irrigation Water Use

Project Director
Blair Stringam
Organization
New Mexico State University Main Campus
Accession Number
7000477

User-Friendly Electronic Tools and Software for Efficient Irrigation Water Use

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Irrigation water supply organizations in the United States and throughout the world daily face the challenge of directing or delivering water to the intended water users in a timely manner while limiting water loss in the process. In many cases, river channels or canals are the conveyance conduit that these water supply organizations use to deliver the water to the intended location. The delivery task is difficult because the open channels have delay times between when the water is diverted for use and when it arrives at the intended delivery location. Water is wasted as a result of these delivery problems.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

My research this past year proved that canal water can be diverted from a river at the desired flowrate with less than a 4% error during flow changes within the supply canal system. In addition, the canal ratio control system can keep water levels at the desired points with little fluctuation during reach offtake flow changes. The ratio controllers that were designed for each reach on an irrigation supply main canal, helped to limit the water delivery fluctuations. Turnout flowrates were maintained at specified values with less than 5% error when there are turnout flowrate changes in the canal system. The average flowrates over time for the main canal river diversion and the turnout diversions have less than 0.1% error from the desired flowrates. This method can substantially conserve water over an irrigation season.

Briefly describe how your target audience benefited from your project's activities.

This control method can be adapted to many irrigation water supply systems. The work that I have just completed will help in the efficient operation of the supply systems while limiting water waste. More water will be available for other needs.

Briefly describe how the broader public benefited from your project's activities.

Agriculture uses an average of 70% of the diverted freshwater world wide. If agriculture can conserve water, then more will be available for industrial, domestic, and agricultural needs.

Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.

During this past year, my graduate students and I presented some of our results at the US Committee on Irrigation and Drainage Conference in Fort Collins, Colorado. The graduate students presented posters and I made a session presentation.

Reducing Potable Water Use for New Mexican Turfgrasses

Project Director
Ryan Goss
Organization

New Mexico State University Main Campus
Accession Number
1025314

Reducing Potable Water Use for New Mexican Turfgrasses

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

A thorough evaluation of recently available turfgrass water use research is needed to first determine the most promising turfgrass management practices to include in this research. However, based on previous research conducted at NMSU, we know fertilizer rates and sources may play a large role in turfgrass responses to reduced water use.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

The project has sustained its productivity and garnered increased support from the New Mexico turfgrass industries. Throughout 2023, significant progress was made toward achieving the project's reestablishment goals for previous field research locations. Looking ahead to 2024, a series of field and greenhouse research projects are slated for implementation. Concurrently, the project team remains steadfast in their analysis of data derived from previous experiments, with particular emphasis on supporting the completion of a long-standing Master of Science student's thesis and publications.

Briefly describe how your target audience benefited from your project's activities.

To ensure widespread dissemination of our research findings, we are committed to leveraging various communication channels, including local, regional, and national scientific presentations, as well as electronic and social media platforms. Notably, we have been extended an invitation to engage with the local golf course superintendent association to share insights on both completed and ongoing research initiatives. Moreover, we anticipate that our results will culminate in publication within a reputable scientific journal.

Briefly describe how the broader public benefited from your project's activities.

Looking ahead, our focus for the next reporting period will encompass furthering our research agenda through the execution of planned projects, continued data analysis, further reestablishment of additional turfgrass field research areas, and dissemination efforts.

Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.

Controlling Economic Costs of Adapting to Climate-Stressed Stream-Aquifer Systems

Project Director
Frank Ward
Organization
New Mexico State University Main Campus
Accession Number
1023930

Controlling Economic Costs of Adapting to Climate-Stressed Stream-Aquifer Systems; Frank A. Ward NM State University College of ACES

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Forecast use of water in the Middle Rio Grande region of Colorado, New Mexico, and Texas is expected to exceed projected supply by the middle of the 21st century. As groundwater sources are depleted, alternative sources including higher-cost sources, may need to be developed to meet growing demand, resulting in increased cost of water to residents, industry, and crop irrigation. The least expensive alternative source is the desalination of brackish groundwater, while water importation from distant sources is the most expensive.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

We have developed and applied a suite of calibrated models to perform at various spatial levels from agricultural field to river basin level as well as at several temporal levels, from daily to decades. These models perform across several biophysical and political boundaries, to address the important themes and research questions of concern about future conditions and potential interventions that could alter those conditions. Throughout the modeling activities, our work incorporated stakeholder participation in an iterative way as we tested scenarios, shared results, discussed interventions, and tested interventions.

Briefly describe how your target audience benefited from your project's activities.

A part of this project's work synthesized results from interdisciplinary research aimed at water futures, considering possible, probable, and preferable outcomes from the known drivers of change in the MRG in a stakeholder participatory mode. We accomplished this by developing and evaluating scenarios using a suite of scientifically rigorous computer models, melded with input from diverse stakeholders. Stakeholders are able to conduct policy experiments on their own by accessing this link https://water.cybershare.utep.edu/resources/docs/en/ which has been set up at a public server at the University of Texas at El Paso.

Briefly describe how the broader public benefited from your project's activities.

Water resource policy analyses developed for this project are essential for ensuring the sustainable use of water resources, especially in the face of climate change and other stresses facing water users in the Middle Rio Grande basin. Economic analysis developed for this project can provide needed insights into the costs and benefits of different policies, helping policymakers to make informed decisions. Improved water management is one way for which members of the broader public to benefit from economic analysis of water resources. Economic analysis can help identify the most efficient and cost-effective ways of managing water resources. This can lead to better water allocation decisions, improved irrigation practices, and reduced water waste. One outcome from work conducted under this project is to permit members of the public to benefit from improved water availability and quality. Members of the public can access this link at the UT El Paso web server https://water.cybershare.utep.edu/resources/docs/en/

Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.

Groundwater discharge exceeding recharge threatens sustainable aquifer water use internationally. Interest remains high in discovering more hydrologically sustainable and economically affordable measures to protect these aquifers. Previous research has conducted various aquifer assessments. Some work has investigated costs and benefits of various plans that would limit aquifer pumping. Despite notable advances in this kind of analysis, little published work to date has unified these elements into a science-based integrated framework to inform more sustainable aquifer policy design. This work's novel contribution is to integrate analysis of hydrology, economics, institutions, and policy into a unified scientific framework to inform choices on more sustainable pumping strategies while protecting economic activity for agricultural and urban water-using sectors. It does so by conceptualizing, formulating, designing, and applying a mathematical programming framework to replicate historically observed pumping patterns in parts of the Southern and Central High Plains Ogallala Aquifer region in New Mexico, USA. Findings indicate a surprisingly low cost that could have been incurred to partially protect the aquifer over that period. The work's importance comes from its capacity to inform policy debates over a range of water shortage sharing plans, while respecting institutional constraints governing equitable burden sharing.

Baah-Kumi, B., and F. A. Ward (2022), Transboundary water treaty design for poverty reduction and climate adaptation, Journal of Hydrology, 606, 16.

Baah-Kumi, B., Saud A. Amer, and Frank A. Ward (2022), Sustaining aquifers economically in the face of hydrologic, institutional, and climate constraints, Science of the Total Environment, 812, 15.

Baccour, Safa, Frank A. Ward, and Jose Albiac (2022), Climate adaptation guidance: New roles for hydroeconomic analysis, Science of the Total Environment, 835, 14.

Water Wise: Educating for Conservation in New Mexico

Project Director
LaJoy Spears
Organization
New Mexico State University Main Campus
Accession Number
7004640

Addressing Urban Horticulture Challenges in Los Alamos County

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Los Alamos County faces escalating challenges due to climate change-induced drought, leading to increased temperatures and decreased precipitation over the past decade. Residents grapple with sustaining their landscapes amidst water scarcity, heightened transpiration rates, and limited aquifer replenishment, accentuating the need for sustainable horticultural practices.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

In response to these challenges, the Extension agent provided invaluable research-based guidance on plant selection, irrigation practices, and pest management to residents. Collaborative efforts with the Master Gardener chapter and community partners facilitated educational outreach programs, garden tours, and the creation of sustainable landscape design initiatives.

Briefly describe how your target audience benefited from your project's activities.

In the reporting year, 727 residents benefited from personalized consultations and public programs, fostering awareness and action towards sustainable horticulture practices. The Sustainable Landscape Design program, engaging 86 participants, garnered positive feedback, with 85% expressing satisfaction and 81% reporting increased knowledge on essential topics. Master Gardener volunteers contributed over 415 hours, enriching community engagement and extending the reach of Cooperative Extension services.

Briefly describe how the broader public benefited from your project's activities.

The Los Alamos Cooperative Extension Service plays a pivotal role in empowering residents to adopt sustainable horticultural practices, emphasizing the importance of environmental stewardship in an urban context. By promoting healthy soils, mitigating heat indices, and conserving water resources, residents are equipped to navigate climate challenges while nurturing resilient landscapes for future generations.

Enhancing Water Conservation through Sandoval County Drip Irrigation Workshops

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Sandoval County, nestled in the arid Southwest U.S., grapples with its 23rd year of a relentless megadrought. According to the U.S. Drought Monitor (November 2023), the entire county suffers from extreme to exceptional drought conditions, compounded by historically low precipitation levels and dwindling groundwater and Rio Grande flows. With agriculture and landscapes at risk, the adoption of water-efficient irrigation methods becomes paramount.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Over eight workshops, 113 homeowners and small-scale farmers engaged in hands-on learning sessions. Through intimate workshops held at residences and community centers, participants delved into various drip irrigation techniques, fostering peer learning and practical installation experience. Additionally, a comprehensive drip irrigation guide was distributed to all attendees.

Briefly describe how your target audience benefited from your project's activities.

The workshops empowered participants with knowledge, confidence, and actionable plans to implement drip irrigation systems. Post-workshop surveys revealed a substantial increase in participants' understanding (74%), confidence (65%), and willingness (27%) to adopt drip irrigation practices. Feedback highlighted the workshop's efficacy, catering to novices and seasoned gardeners alike, while extension publications promise broader dissemination of insights gained.

Briefly describe how the broader public benefited from your project's activities.

The Sandoval County Drip Irrigation Workshop Series epitomizes a crucial stride toward conserving and safeguarding water resources in the parched Southwest.

Revolutionizing Landscapes: Xeriscape Gardening in Roosevelt County

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

The home serves as a haven, especially during challenging times, where individuals seek solace and pride. With US consumers spending $155.07 per consumer unit on lawn and garden supplies in 2020, the expectation for tangible results from landscaping efforts is high. However, in the arid desert southwest, maintaining lush lawns is increasingly unfeasible due to changing weather patterns, water scarcity, and evolving city ordinances.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Our initiative targets homeowners and landscapers in Roosevelt County, New Mexico. The Roosevelt County Extension Office embarked on a journey to reimagine traditional xeriscaping practices. Through engaging presentations delivered to civic and extension groups, we reintroduced the concept of xeriscaping, showcasing its potential to create visually stunning gardens while conserving water. Furthermore, we installed various xeriscape gardens to provide tangible examples of sustainable landscaping.

Briefly describe how your target audience benefited from your project's activities.

Participants in our program series gained awareness about the urgent need to rethink outdoor landscape practices. Studies reveal that approximately 45% of household water usage is attributed to lawns and landscapes, with xeriscaping offering the potential to save up to 50% of that water. Homeowners and government officials now recognize the versatility of xeriscape gardening, understanding that it goes beyond mere aesthetics to embrace native and drought-tolerant plant varieties.

The average homeowner in Roosevelt County consumes 9,000 gallons of water per month, equating to $102.21 in monthly water expenses. By transitioning to xeriscaping, households can potentially save 2,050 gallons of water monthly, amounting to $25.55 in savings. This shift in outdoor landscape practices not only benefits individual households but also contributes significantly to water conservation efforts for the community's future.

Briefly describe how the broader public benefited from your project's activities.

Implementing xeriscape landscapes in Roosevelt County can lead to significant water savings of 2,050 gallons per household per month, translating to $25.55 in savings for households and contributing to sustainable water management practices for future generations.

Preserving New Mexico's Water: Unified Conservation Efforts

Project Director

LaJoy Spears

Organization

New Mexico State University Main Campus

Accession Number

7002279

Aquaponics as a Solution for Arid Regions

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Aquaponics, an integrated system of aquaculture and hydroponics, presents a sustainable solution for food production, particularly in arid regions like New Mexico. By combining fish farming with plant cultivation, aquaponics conserves water while providing fresh produce and fish. Its relevance lies in addressing water scarcity and promoting sustainable agriculture.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Our aquaponics workshops target a diverse audience, including producers, students, educators, and enthusiasts in New Mexico and beyond. With a growing interest in sustainable practices, our outreach extends internationally, reaching individuals eager to adopt aquaponic techniques. To meet the increasing demand for aquaponics knowledge, we organized a pre-conference workshop in collaboration with the Aquaponics Association and Santa Fe Community College. The workshop attracted participants from various states and countries, offering both classroom lectures and hands-on learning experiences. Extension specialists enriched the event with their expertise, fostering a comprehensive learning environment.

Briefly describe how your target audience benefited from your project's activities.

Our efforts have yielded tangible results, evident in increased adoption and knowledge dissemination. Testimonials, like that of an Irish grower citing our influence, affirm the impact of our publications and workshops. Survey responses from workshop attendees reflect high satisfaction and a willingness to implement learned techniques, emphasizing the need for continued training opportunities. This year alone, four new aquaponics permits were issued in New Mexico, underscoring the growing interest and practical application of aquaponics.

Briefly describe how the broader public benefited from your project's activities.

Aquaponics not only addresses food security challenges but also fosters economic, social, and environmental sustainability. By providing access to fresh produce and fish, it mitigates food deserts and enhances local economies. Moreover, aquaponics offers opportunities for green jobs and income diversification, contributing to a resilient agricultural sector in New Mexico.

Enhancing Athletic Safety: Workshops for Optimal Field Conditions

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

The prevalence of non-contact lower extremity injuries, particularly knee and foot/ankle injuries, escalates by 28% and 69% respectively on artificial turf compared to natural grass, as highlighted by NFLPA President JC Tretter and The American Journal of Sports Medicine. The clamor for safer playing surfaces underscores the urgent need for guidance on athletic field maintenance.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Soccer, football, baseball, and softball coaches, alongside athletic field managers, Master Gardeners, and county agents, actively sought and engaged in workshops tailored to turfgrass and athletic field maintenance. Responding to the demand, a series of one-day workshops were organized, imparting crucial insights into basic maintenance techniques and the latest

advancements in turfgrasses, fertilization, and irrigation technologies.

Briefly describe how your target audience benefited from your project's activities.

Post-workshop evaluations revealed a staggering 97.2% increase in participants' knowledge regarding turfgrass and athletic field maintenance, with 100% committed to adopting newfound practices. Testimonials, such as the transformation of the Club Field, underscore the tangible impact of these initiatives on safety and playability.

Briefly describe how the broader public benefited from your project's activities.

While the monetary toll of increased injury risks on artificial turf remains unquantified, the anticipated higher costs of treatment and rehabilitation, compounded by potential revenue losses from sidelined players, accentuate the significance of injury prevention. Natural grass not only fosters improved performance and player longevity but also mitigates legal and liability concerns associated with injuries, thus promoting safer playing environments.

Enhancing Orchard Operations: Western Pecan Growers Association Conference Educational Program

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Pecan producers in the western growing region confront numerous challenges, including water scarcity, soil salinity, and pest management, which significantly impact orchard productivity and sustainability.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

The program targets pecan growers across the southwestern US seeking knowledge and strategies to overcome regional agricultural hurdles. The 2023 Western Pecan Growers Association (WPGA) Conference Educational Program, held in Las Cruces, NM, featured 14 experts spanning academia, USDA, NMDA, and industry sectors. Topics encompassed insect pests, soil health, climate trends, irrigation techniques, economics, and tree genetics, culminating in a grower panel on mechanical pruning.

Briefly describe how your target audience benefited from your project's activities.

Attendance surged by 11.7% from the prior year, signaling renewed interest post-pandemic disruptions. Survey data revealed that 96.0% of respondents gleaned actionable insights for their orchard management, with irrigation and soil microbiology insights particularly valued. Remarkably, 89.5% already planned attendance for the 2024 conference, underscoring the program's enduring relevance and endorsement within the community.

Briefly describe how the broader public benefited from your project's activities.

The conference directly addresses the pressing water scarcity issues facing southwest pecan producers. Insights shared enable growers to optimize water usage, mitigate losses, and contribute to aquifer replenishment, thereby fostering sustainable orchard practices and environmental stewardship.

Type

Projects / Programs without a Critical Issue

Not Provided

Projects / Programs

0