The NMSU Agricultural Experiment Station supports research that is addressing real-world problems. Research is at the core of NMSU’s mission to improve upon the lives of people globally.

https://leyendeckersc.nmsu.edu/
Notice to Users of This Report

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

None of the data is authorized for release or publication without the written prior approval of the New Mexico Agricultural Experiment Station.

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MISSION

The mission of the Leyendecker Plant Science Research Center and the Fabian Garcia Science Center is to improve the lives of New Mexicans, the nation, and the world through research, teaching, and Extension. The Leyendecker Plant Science Research Center serves as the outdoor agronomic laboratory for researchers located on the NMSU main campus in Las Cruces; the Fabian Garcia Science Center is oriented toward horticultural research.
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Executive Summary

In 2021, research trials increased over the previous year and crop focus included chile, cotton, alfalfa, onions, pecans, jujube, guar, guayule, corn, wheat, oats, Sudan, and cover crop mixes. Crop breeding/advancement continued for several programs such as alfalfa, chile, onions, and cotton. Plant pathology and insect vector/biological control research also was carried out. Additionally, micro-irrigation technology(sensor studies were installed and remote sensing with drones was conducted on the pecan trees by members of the College of Engineering. Sustainability initiatives continued to grow and progress by the installation of another subsurface drip irrigation system which will provide water to a long-term cover crop rotation/soil health research trial. The coming growing season will see this system become fully automated in its operational capacity. Wireless internet was augmented in both speed and coverage of the center to better accommodate digital agriculture initiatives and drone/remote sensing trials. Irrigation architecture and application continue to be a broad area of concern for New Mexico and thus, is of utmost importance to research efforts at Leyendecker Plant Science Research Center.

Meeting the needs of New Mexico

The Agricultural Experiment Station (AES) system is the research arm of New Mexico State University's (NMSU) College of Agricultural, Consumer, and Environmental Sciences (ACES), consisting of scientists on the main campus and at agricultural science centers (ASCs) throughout New Mexico. The 12 ASCs support fundamental and applied research under New Mexico’s varied environmental conditions to meet the agricultural and natural resource management needs of communities in every part of the state. ASCs consist of two types: 1) facilities without resident faculty, which serve as research support field laboratories for campus-based faculty, and 2) off-campus facilities with faculty stationed at the centers that also serve, in part, as research support field laboratories for campus-based faculty.

The Leyendecker Plant Science Research Center accommodates the field research needs of Las Cruces-based researchers. These scientists are principally from the College of Agricultural, Consumer and Environmental Sciences, with others from the Colleges of Arts and Sciences and Engineering, and the USDA Agricultural Research Service Cotton Ginning Laboratory.
## Financial Summary

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2021

RESEARCH RESULTS
Jujube cultivar trials and marketing

Investigators: Shengrui Yao, Rob Heyduck and Chaddy Robinson

PROJECT OVERVIEW

Jujube cultivar trials was set up in 2017 at NMSU Leyendecker Plant Science Research Center as one of the three cultivar trial sites in New Mexico. We will observe their performance and collect data for 10 years.

MEETING THE NEEDS OF NEW MEXICO

With severe late frosts each year, most tree fruit species do not have reliable crops. While, jujube is a new crop with limited cultivars available but produces annually in New Mexico. Growers and home gardeners would like to have more cultivars for difference purposes. NMSU Alcalde Center imported over 30 cultivars in 2011 and set up cultivar trials at different locations to observe their performance and recommend top-performers to growers.

RESEARCH IMPACTS

Jujube produces reliable crops in New Mexico with nutritious fruit. Its cultural management is relatively simple with minimal pruning and limited or no pest problems. It is a great fruit crop in New Mexico, especially in central and southern New Mexico. Once the newer cultivars are adopted, it will increase the growers' revenue and maintain the sustainability of their operation in New Mexico and the Southwest.

ASSOCIATED LONG-TERM PROGRAM OF RESEARCH

Part of Shengrui Yao's hatch research program. Sustainable fruit production in northern New Mexico.
ALLELOPATHIC COVER CROPS FOR PEST SUPPRESSION IN CHILE PEPPER IN THE SOUTHWEST

Investigators: B. Schutte (PI), E. Lehnhoff, S. Sanogo, R. Creamer, S. Bundy, R. Acharya

PROJECT OVERVIEW

This is a multi-year, multi-site evaluation of ecological techniques for suppressing weeds and soil-borne pathogens. Specifically, this project is evaluating winter cover crops for green manures that suppress pests in chile pepper.

MEETING THE NEEDS OF NEW MEXICO

Current management strategies are not effective against soil-borne diseases and early-season weeds that challenge chile pepper production. Accordingly, soil-borne diseases and early-season weeds reduce crop yields, increase production expenses, and increase the amount of synthetic pesticides used in chile pepper production.

RESEARCH IMPACTS

Increased yields and revenue for chile pepper producers in New Mexico. Reduced pesticide use in chile pepper production in New Mexico. Increased use of winter cover crops, which will enhance agroecosystem biodiversity and promote soil conservation across chile growing regions in New Mexico.

ASSOCIATED LONG-TERM PROGRAM OF RESEARCH

Reductions in weeds, soil-borne diseases, and management expenses in chile pepper production.
ENSURING SAFE AND SUSTAINABLE USE OF A NEW SOIL-APPLIED HERBICIDE FOR CHILE PEPPER PRODUCTION

Investigators: B. Schutte

PROJECT OVERVIEW

My previous research determined that flumioxazin is a promising new herbicide for controlling weeds in chile pepper. This project is evaluating flumioxazin for crop and food safety. Specifically, this research is determining if post-direct, row middle applications of flumioxazin result in chile fruits with residues that are greater than U.S. federal tolerances.

MEETING THE NEEDS OF NEW MEXICO

Although chile production requires near weed-free conditions for prolonged periods after planting, weed control in this crop is challenged by the relatively low number of registered herbicides. The low number of herbicides available for chile is caused, in part, by the limited economic incentive for companies to pursue product registrations in a crop that is considered minor nationally.

RESEARCH IMPACTS

In the short-term, this project will produce the information needed for registration of an effective and efficient weed control tool that is not currently available to chile pepper producers in New Mexico. Improved weed control will both reduce production expenses and increase crop yield. Thus, the medium-term impact of this project is enhanced profits for chile pepper producers. In the long-term, economic stability in chile pepper production will enhance the sustainability of the chile pepper industry in New Mexico.

ASSOCIATED LONG-TERM PROGRAM OF RESEARCH

Reductions in weeds and management expenses in chile pepper production.
DEVELOPING PRACTICAL METHODS FOR REDUCING HAND HOEING REQUIREMENTS IN CHILE

Investigators: B. Schutte (PI), E. Lehnhoff

PROJECT OVERVIEW

The goal of this project is to develop two methods for reducing hand hoeing expenses in chile. To address this goal, we are determining weed, hoeing and yield responses to (1) a new use for the chile-registered herbicide ‘pendimethalin’, and (2) a mustard cover crop terminated at different times before chile seeding.

MEETING THE NEEDS OF NEW MEXICO

Chile pepper production in New Mexico is threatened by high costs for hand hoeing. The need for hand hoeing is partly a consequence of this crop’s inability to rapidly establish competitive advantages over early-season weeds. This project is developing chemical and ecological strategies for controlling early-season weeds and reducing reliance on hand hoeing in chile pepper. Because the proposed methods utilize knowledge gained through our collaborations with chile farmers in New Mexico, this project will generate solutions that are likely to be implemented.

RESEARCH IMPACTS

Reduced reliance on hand hoeing in chile pepper, which will reduce production expenses and increase profits for farmers in New Mexico

ASSOCIATED LONG-TERM PROGRAM OF RESEARCH

Reductions in weeds and management expenses in chile pepper production.
ASSESSING A NEW HERBICIDE FOR YELLOW NUTSEDGE PLANT AND TUBER CONTROL IN CHILE PEPPER

Investigators: B. Schutte

PROJECT OVERVIEW

Yellow nutsedge is a problematic perennial weed found in chile pepper fields in New Mexico. Chemical strategies for controlling yellow nutsedge in chile were recently expanded to include a new herbicide — imazosulfuron. Recommendations and effective use of this herbicide require studies that evaluate imazosulfuron under conditions that resemble commercial chile pepper production in New Mexico.

MEETING THE NEEDS OF NEW MEXICO

By generating information on a new herbicide for yellow nutsedge control, this study will provide chile pepper farmers opportunities to reduce production expenses by using a herbicide in place of hand hoeing, and will enable strategies that eliminate persistent infestations of a perennial, aggressive weed in chile.

RESEARCH IMPACTS

Improved control of a perennial weed that challenges production of crops including, but not limited to, chile pepper and onion. Many chile pepper growers also produce onions. Accordingly, this project is expected to increase yields and reduce production expenses for both chile pepper and onion.

ASSOCIATED LONG-TERM PROGRAM OF RESEARCH

Reductions in weeds and management expenses in chile pepper production.
INDUSTRY-SUPPORTED HERBICIDE EVALUATION IN PECAN

Investigators: B. Schutte

PROJECT OVERVIEW

Weeds in pecan orchards reduce resources for trees, serve as refuge for unwanted insects, and interfere with harvesting operations. To control weeds in pecan, growers can use herbicides. This project is contributing to the development of a new herbicide application for pecans in New Mexico. The new herbicide application is expected to improve weed control outcomes and reduce reliance on a herbicide for which resistance in weeds has been reported in New Mexico.

MEETING THE NEEDS OF NEW MEXICO

One herbicide that pecan producers use is Pindar GT (penoxsulam + oxyfluorfen). Currently, Pindar GT can only be applied before pecan trees produce leaves. This project is evaluating the safety and efficacy of Pindar GT applications after pecan trees produce leaves.

RESEARCH IMPACTS

This project produced the information needed for registration of a new herbicide application. The new herbicide application will reduce production expenses and reliance on herbicides for which weeds have developed resistance to. Thus, in the longer term, this project will enhance the economic stability of pecan production in New Mexico by providing pecan producers additional tools for controlling weeds.

ASSOCIATED LONG-TERM PROGRAM OF RESEARCH

Reductions in weeds and management expenses in pecan production.
INITIAL HEMP VARIETY TRIALS ACROSS NM ENVIRONMENTS

Investigators: Catherine Brewer (PI), Rebecca Creamer (PI), Hanah Rheay

PROJECT OVERVIEW
Cultivation of CBD, grain, and fiber hemp varieties at three NMSU ASC representing unique climatic areas throughout the state to evaluate the suitability of varieties to each region.

MEETING THE NEEDS OF NEW MEXICO
Identify varieties suitable for production in the state and identify potential market use for hemp outside CBD in grain/fiber capabilities.

RESEARCH IMPACTS
Develop hemp variety recommendations for area hemp farmers; Identify markets for crop residues/wastes that are typically unused

ASSOCIATED LONG-TERM PROGRAM OF RESEARCH
Establishing Research Support and Recommendations for the NM Hemp Industry
USING ELECTRICITY TO SAFELY AND EFFECTIVELY MANAGE NON-AGRICULTURAL WEEDS

Investigators: Erik Lehnhoff, Leslie Beck, Paul Neher

PROJECT OVERVIEW

Low amperage electricity is being used to prevent weeds in xeriscaping and to prevent weeds from climbing structures. This is a new, innovative to manage weeds without the use of herbicides.

MEETING THE NEEDS OF NEW MEXICO

Weeds are a ubiquitous problem for homeowners, municipalities and utilities such as power companies. They can diminish aesthetic values, cause allergies, reduce property values, and become a fire hazard.

RESEARCH IMPACTS

Developing new weed management technology which can be widely used landscaping situations or for weed control by power distribution companies.

ASSOCIATED LONG-TERM PROGRAM OF RESEARCH

Developing new technology
GENOMICS BREEDING FOR YIELD, AGRONOMIC, AND MACHINE HARVESTABILITY TRAITS IN CHILE PEPPER

Investigators: Dennis Lozada, Danise Coon

PROJECT OVERVIEW

Genome-wide association study (GWAS) was implemented to dissect the genetic architecture of yield and agronomic traits in chile pepper. Field trials were conducted at the Leyendecker Plant Science Research Center for the 2021 growing season.

MEETING THE NEEDS OF NEW MEXICO

Total chile pepper production in the state in recent years has been hampered by suboptimal yield as well the labor and costs associated with manual harvesting. Genomics-assisted breeding is currently being integrated in the NMSU Chile Pepper Breeding pipeline to facilitate the development of varieties with improved yield and amenability to machine-driven harvest.

RESEARCH IMPACTS

The genetic basis of yield and agronomic traits have been assessed and this would direct breeding and selection decisions to develop chile pepper varieties with improved yield, adaptation, and machine harvestability. Molecular markers based on the GWAS scans will be developed for marker-assisted breeding.

ASSOCIATED LONG-TERM PROGRAM OF RESEARCH

Hatch Project
REGENERATIONS OF SHORT-DAY ONIONS

Investigators: C. Cramer

PROJECT OVERVIEW
Seed regeneration of short-day onion plant introduction accessions.

MEETING THE NEEDS OF NEW MEXICO
Preserving onion germplasm that one day may be beneficial in combating future onion disease and pest issues.

RESEARCH IMPACTS
Preserved germplasm will be available for future research to address future onion production challenges.

ASSOCIATED LONG-TERM PROGRAM OF RESEARCH
Onion Genetic Improvement

DEVELOPMENT OF ONION CULTIVARS RESISTANT TO FUSARIUM BASAL ROT

Investigators: C. Cramer

PROJECT OVERVIEW
Onion stakeholders have identified Fusarium basal rot as a serious disease threat to onion yield and economic sustainability. Onion germplasm is being developed and evaluated that is less impacted by Fusarium basal rot.

MEETING THE NEEDS OF NEW MEXICO
Reducing the impact of Fusarium basal rot on onion production in NM through the development of onion germplasm that is resistant to the disease.

RESEARCH IMPACTS
When inoculated with the disease causing pathogen, our breeding lines exhibit a lower Fusarium basal rot (FBR) incidence and severity than a commercial FBR-resistant cultivar. Our breeding efforts have shown a reduction in FBR disease severity and incidence with each cycle of selection.

ASSOCIATED LONG-TERM PROGRAM OF RESEARCH
Onion Genetic Improvement; Hatch Multistate: W3008: Integrated Onion Pest and Disease Management
CHARACTERIZATION OF ONION PHENOTYPES EXHIBITING FEWER IRIS YELLOW SPOT (IYS) SYMPTOMS AND RELEASE OF ONION GERMPLASM FOR IYS MITIGATION

Investigators: C. Cramer (PI), I. Guzman (PI)

PROJECT OVERVIEW

Onion stakeholders have identified onion thrips and Iris yellow spot virus as the greatest pest and disease threats to onion yield and economic sustainability. Onion germplasm is being developed and evaluated that is less impacted by onion thrips and Iris yellow spot.

MEETING THE NEEDS OF NEW MEXICO

Reducing the impact of onion thrips and Iris yellow spot on onion production in NM through the development of onion germplasm that is impacted less by these two problems.

RESEARCH IMPACTS

Based upon a conducted economic analysis, onion germplasm resistant to onion thrips and/or IYS could increase profits by $1,000 per ha per year when compared with current marketable yields and management practices. Based up the annual hectarage of onions grown in the US, the promising resistant breeding lines from our program could increase grower profits for the US industry by $54 million while also reducing the economic and environmental impact of these production issues and improving the productivity and economic feasibility of this crop for millions of producers worldwide.

ASSOCIATED LONG-TERM PROGRAM OF RESEARCH

Onion Genetic Improvement; Hatch Multistate: W3008: Integrated Onion Pest and Disease Management
THRIPS AVOIDANCE ON COTTON

Investigators: S. Bundy (PI)

PROJECT OVERVIEW
Trials conducted with Bayer to determine efficacy of a cotton gene targeting sucking insects.

MEETING THE NEEDS OF NEW MEXICO
Early season injury to cotton seedlings by thrips feeding.

RESEARCH IMPACTS
Thrips injury to cotton is sporadic but can be severe under certain conditions. This cotton variety can greatly reduce injury from sucking pests such as thrips.

MICRO-GRAVITY DRIP IRRIGATION FOR INCREASING WATER USE EFFICIENCY

Investigators: Manoj Shukla (PI)

PROJECT OVERVIEW
From 2020, we have started a project on water use efficiency with two Israeli companies (NDrip and Tal-Ya). NDrip has installed a micro gravity drip irrigation (fertigation, <0.87 psi or 0.06 bar) system in the Leyendecker Science Center. Tal-Ya water technologies ltd, another Israeli company provided trays for Pecans and chile. Both systems have the potential to increase plant water use efficiency.

MEETING THE NEEDS OF NEW MEXICO
Increasing scarcity of fresh surface water for irrigation to sustain crop production in NM.

RESEARCH IMPACTS
Because of the simplicity, ease of operation, of the micro-gravity drip system, it is expected that more and more growers will use it for irrigating their crops. This system has the potential to shift irrigation from flood to more efficient micro-gravity drip irrigation system

ASSOCIATED LONG-TERM PROGRAM OF RESEARCH
Hatch; Nakayama Endowment
LOWER RIO GRANDE LAND MANAGEMENT PRACTICES FOR UNCULTIVATED AGRICULTURAL FIELDS

Investigators: Manoj Shukla (PI)

PROJECT OVERVIEW

From 2021, the project proposal could provide information on the effect of using leased water from uncultivated agricultural lands elsewhere on water table management while sustaining soil health.

MEETING THE NEEDS OF NEW MEXICO

Increasing scarcity of fresh surface water for irrigation to sustain crop production in NM

RESEARCH IMPACTS

Leaving agricultural fields unplanted is an option to save and lease surface water from the land to be utilized elsewhere, decrease pumping, prevent groundwater depletion, and help relieve pressure on our dwindling water availability for irrigation while sustaining agriculture in the Lower Rio Grande valley.

ASSOCIATED LONG-TERM PROGRAM OF RESEARCH

NMDA and ISC
SUSTAINABLE BIOECONOMY FOR ARID REGIONS

Investigators: John Idowu (PI), Mohammed Omer

PROJECT OVERVIEW

Guar and guayule are alternative crops that are well adapted to the arid and semiarid climate. Guar is an annual legume that has low nutrient requirements compared to many other field crops. Guayule is a perennial crop that can be harvested multiple times with relatively low nutrient requirements. Therefore, guar and guayule are potential alternative crops that producers in NM can grow to diversify their cropping systems for resiliency.

MEETING THE NEEDS OF NEW MEXICO

Crop production is under pressure in New Mexico due to increases in input prices and non-commensurate increases in product prices. For NM farmers to remain viable, there is a necessity to engage in the production of alternative crops such as guar and guayule. Guar can serve as an alternative industrial crop due to the guar gum that is extracted from guar beans, while guayule is a perennial, rubber-producing crop. Agronomic trials were conducted to optimize the production of guayule and guar in NM.

RESEARCH IMPACTS

Information on agronomic conditions necessary for growing guar is now available for different production regions of New Mexico. Demonstration trials with guayule have shown that it can be successfully produced in southwestern New Mexico. Research is ongoing to expand the range of guayule production beyond southwestern New Mexico by developing cold-tolerant cultivars for other ecoregions in NM. Growing guayule and guar in NM can help farmers diversify their cropping systems by producing high-value industrial crops, consequently improving their farm profit.

ASSOCIATED LONG-TERM PROGRAM OF RESEARCH

Alternative Crops for New Mexico
ESTABLISHING LONG-TERM SOIL HEALTH DEMONSTRATION, TRAINING, AND RESEARCH SITE AT LEYENDECKER PLANT SCIENCE CENTER IN LAS CRUCES, NEW MEXICO

Investigators: John Idowu (PI), Mohammed Omer

PROJECT OVERVIEW

The goal of this project is to establish a long-term soil health demonstration site that will assist with training crop producers, agriculture support professionals, and New Mexico stakeholders on soil health management principles and practices, thereby building resilient agriculture and enhancing adaptation to climate change in the region.

MEETING THE NEEDS OF NEW MEXICO

The arid agroecosystems of New Mexico are prone to degradation because of the poor quality of their soils. Soils in this region are characterized by low levels of organic matter, poor water and nutrient retention, compaction, and erosion. Strategies to improve soils in the irrigated arid cropping systems of New Mexico are needed to build resiliency into the cropping systems in the face of recurrent droughts and weather variability. Developing long-term trials testing combinations of soil health practices will help producers identify approaches that can be used to address soil health degradation issues in the quickest possible way.

RESEARCH IMPACTS

The Long-term Soil Health Site was established at the Leyendecker Plant Science Center in the spring of 2021. The field is about 0.8 ha (2 ac) block and is being maintained in different soil health practices including tillage, organic amendments, and cover crops. The field is fitted with an automated drip irrigation system, that will allow for different water regimens to be applied to experimental plots. The field will be used for yearly training of agricultural support professionals and farmers in southwestern NM on soil health practices that can enhance sustainable crop production, sequester carbon, reduce irrigation water application, and conserve the environment.

ASSOCIATED LONG-TERM PROGRAM OF RESEARCH

Impacts of Reduced Tillage and Organic Amendments on Soil Quality and Crop Performance in Irrigated Arid Farming Systems
BIORATIONAL APPROACHES FOR CONTROL OF SOILBORNE PATHOGENS

Investigators: Soum Sanogo & Quaid Dobey

PROJECT OVERVIEW

This project addresses chile wilt caused by a wide array of plant pathogens in chile peppers. Biorational approaches are being explored as sustainable strategies for reducing the economic impact of these plant pathogens.

MEETING THE NEEDS OF NEW MEXICO

To assist New Mexico agricultural producers and industries, research is being conducted on the use of biorational approaches for combating soilborne diseases, which include microbial formulations, botanical extracts, bioactive crop residues, cover crops, and genetic soil disinfestation.

RESEARCH IMPACTS

Crops such as chile, onion, peanut, cucurbits, alfalfa, cotton, and pecan generate annually more than $300 million dollars to the state of New Mexico. Production is significantly reduced by several soilborne diseases, which can cause yield loss up to 100% (crop failure). The Soilborne Disease Research Program, alone and through collaborative work, is providing New Mexico agricultural producers and industries with information on the use of microbial formulations, bioactive crop residues, cover crops, and genetic soil disinfestation in managing soilborne diseases, and improving soil health. Other impacted target audience includes consultants, research scientists, graduate and undergraduate students, and K-12 educators.
MARKER ASSISTED BREEDING IN ELITE ALFALFA GERMPLASM TO ENHANCE BIOMASS PRODUCTIVITY DURING DROUGHT

Investigators: Ian Ray and Chris Pierce

PROJECT OVERVIEW

Major goal is to develop and utilize molecular tools to accelerate breeding of alfalfa varieties with enhanced yield potential, forage quality, and suitable fall dormancies for drought-prone regions of the U.S. In this regional project, 215 elite NMSU alfalfa families have been genetically characterized with 12,884 DNA markers. These materials are also being evaluated for biomass productivity and other traits under deficit irrigation management conditions over 3 years in NM (Leyendecker PSRC), CA, and WA. Integrated analysis of DNA marker and biomass data are being conducted using association mapping and genomic selection modeling to identify plants with the greatest genetic potential to improve alfalfa drought resilience.

MEETING THE NEEDS OF NEW MEXICO

Limited water resources threaten New Mexico’s $153 million alfalfa industry.

RESEARCH IMPACTS

Improve agricultural sustainability and water conservation by developing alfalfa cultivars that can remain productive under optimum and deficit irrigation management strategies.

ASSOCIATED LONG-TERM PROGRAM OF RESEARCH

Hatch project: 1012275, Genetic Improvement of Alfalfa Germplasm for New Mexico
NM ALFALFA VARIETY EVALUATION TRIALS

Investigators: Ian Ray and Chris Pierce

PROJECT OVERVIEW

Evaluate forage yield performance of 24 commercial varieties and advanced NMSU breeding lines under standard irrigation management (trial 1) and summer irrigation termination management (trial 2) over 3 to 4 years. Goal is to identify populations that can perform well under variable irrigation management to help NM farmers conserve water.

MEETING THE NEEDS OF NEW MEXICO

Limited water resources threaten New Mexico’s $153 million alfalfa industry.

RESEARCH IMPACTS

Improve agricultural sustainability, yield stability, and water conservation. Identify currently available alfalfa varieties that NM farmers can grow and which can be productive under highly variable soil moisture conditions, including deficit irrigation management.

ASSOCIATED LONG-TERM PROGRAM OF RESEARCH

Hatch project: 1012275, Genetic Improvement of Alfalfa Germplasm for New Mexico
PROXIMAL SENSING FOR MODELING DEVELOPMENT CURVES AND ACCELERATED BREEDING OF CLIMATE RESILIENT CROP VARIETIES

Investigators: Ian Ray and Chris Pierce

PROJECT OVERVIEW

The goal of this proposed research is to develop tools and approaches that can accelerate breeding for crop resilience to changes in climate. We will collect multispectral aerial imagery data, as well as forage yield and nutritional quality data from 24 alfalfa varieties grown under well-watered and deficit-irrigation management over two years. These data will be integrated with extensive DNA marker genotype data for each alfalfa variety for use in building open source software to extract and store high throughput phenotyping information and fit genotype specific growth curves throughout the growing season in optimum and drought-stressed environments. Data will be analyzed to determine the extent to which crop aerial imagery data correlates to stable performance in varying environmental conditions.

MEETING THE NEEDS OF NEW MEXICO

Limited water resources threaten New Mexico’s $153 million alfalfa industry.

RESEARCH IMPACTS

This proposed research will provide tools and approaches that will be evaluated for their potential to accelerate breeding for crop resilience in the face of climate change.

ASSOCIATED LONG-TERM PROGRAM OF RESEARCH

Hatch project: 1012275, Genetic Improvement of Alfalfa Germplasm for New Mexico
SEED INCREASE FOR REGIONAL EVALUATION OF COMMERCIAL POTENTIAL FOR ADVANCED NMSU ALFALFA BREEDING LINES

Investigators: Ian Ray and Chris Pierce

PROJECT OVERVIEW

Conduct bee-pollinated breeder seed production under cage isolation for multiple elite NMSU alfalfa populations to ensure sufficient seed is available to evaluate these materials for commercial acceptability in statewide and regional variety trials.

MEETING THE NEEDS OF NEW MEXICO

Determine suitability of advanced NMSU breeding lines of alfalfa for commercial release to provide NM farmers with new drought-resilient varieties that can help them conserve water and meet the livestock industry's feed demands.

RESEARCH IMPACTS

Improve agricultural sustainability, yield stability, and water conservation. Populations that perform well over diverse NM environments will be released as cultivars. We will seek exclusive licensing agreements with industry partners to help commercially market seed of these cultivars to NM farmers. NM farmers will benefit from greater forage yield stability under highly variable soil moisture conditions that occur throughout New Mexico.

ASSOCIATED LONG-TERM PROGRAM OF RESEARCH

Hatch project: 1012275, Genetic Improvement of Alfalfa Germplasm for New Mexico
PECAN CLONAL ROOTSTOCK TRIALS

Investigators: Jennifer Randall and Richard Heerema

PROJECT OVERVIEW

Clonal pecan rootstock trees that were derived from micropropagation are planted into two field trials at Leyendecker. On June 3, 2019, we planted approximately 130 rootstocks of three individual genotypes. These were grafted for further studies during Spring 2021. An additional rootstock trial was planted Spring 2021 with an additional 150 rootstock trees with several more genotypes. These trees will be grafted during the Spring/Summer 2022.

MEETING THE NEEDS OF NEW MEXICO

Pecan rootstock trial is aimed at testing genetically clonal trees in a replicated trial for graft ability, nutrient uptake, and etc.

RESEARCH IMPACTS

Clonal rootstock trials will result in knowing which rootstock is optimal for future commercialization.

FLOWERING GENETICS

Investigators: Jennifer Randall and Richard Heerema

PROJECT OVERVIEW

Mature pecan protandrous and protogynous trees (Western and Wichita) at Leyendecker have been used for various studies including elucidating gene networks for flowering.

MEETING THE NEEDS OF NEW MEXICO

Alternate bearing is a horticultural issue that impacts consistent pecan production

RESEARCH IMPACTS

Work is essential in the effort to mitigate alternate bearing.
OPERATIONAL SUPPORT TO THE NATIONAL MESONET PROGRAM

Investigators: David DuBois

PROJECT OVERVIEW

The NM Climate Center operates a network of real-time weather stations that is used by the weather forecasting community, water managers, emergency managers and others. We operate a weather station at the Leydendecker Science Center as part of this network.

MEETING THE NEEDS OF NEW MEXICO

Information collected at this site is used operationally in the National Mesonet Program to improve weather forecasts and warnings to the public. Data from this station has also been used by several students at NMSU and other universities to support their research.

RESEARCH IMPACTS

Our data has been used by the National Weather Service in Santa Teresa during every precipitation event. Our data appears in the maps from Mesowest that is used during weather events.
Activities

2021 Leyendecker PSRC Field Day
Water Resource Advocates tour
Model of Architecture Serving Society class tour
Precision Agriculture course for undergraduates
Principles of Agriculture course for undergraduates

Cooperators/Collaborators

Artesia ASC
Los Lunas ASC
Clovis ASC
AgReliant
Helena
N-Drip
Tal-Ya
Bridgestone
Faculty and Staff

Dave Lowry
*Program Operations Director - Farming Enterprise*
*Superintendent*
*Acting Farm Manager*

Autumn Martinez
*Administrative Assistant*

Orlando Moralez
*Farm Supervisor*

Wade Robinson
*Ag Science Center Laborer*

Pablo Holguin
*Ag Science Center Laborer*

Rick Ogaz
*Ag Science Center Laborer*