2024
ANNUAL REPORT

REX E. KIRKSEY AGRICULTURAL SCIENCE CENTER

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College of Agricultural, Consumer and Environmental Sciences
Agricultural Experiment Station

Rex E. Kirksey
Agricultural Science Center at Tucumcari

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

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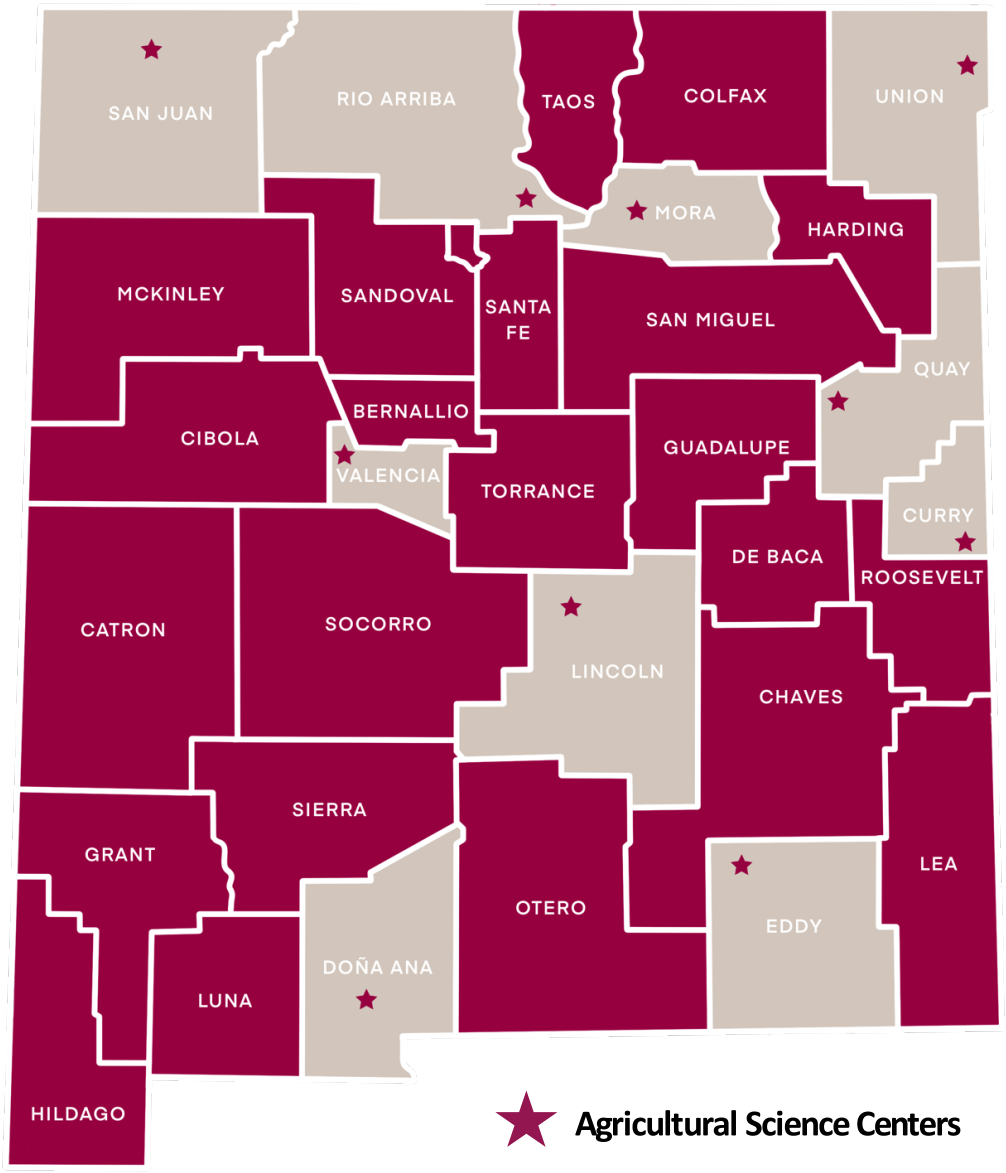
Agricultural Science Center Locations Map



Executive Summary

With a vision to lead innovative, water-smart crop and livestock research to help farmers in semi-arid environments adapt to the changing climate for agriculture, the New Mexico State University Rex E. Kirksey Agricultural Science Center at Tucumcari (REKASCT) conducts locally driven, globally relevant research related to crop (including forages) and livestock production under irrigated and dryland conditions. These efforts focus on improving the quality, safety, and reliability of food and fiber products, which enhances agricultural profitability; stimulates economic development using natural resources; sustains the environment and protects natural resources with sound practices; and improves the quality of life for the people of New Mexico.

In 2024, the planning and design process began for shop renovation at the Rex E. Kirksey Agricultural Science Center at Tucumcari, a high-priority building upgrade for the center. Additionally, in 2024, a variable rate irrigation sprinkler system was installed, and research equipment to measure soil greenhouse gas emissions was purchased. The Tucumcari Feed Efficiency Testing Facility was also expanded by the private partners to increase capacity for individual animal intake measurements from 160 animals to 288 animals.

To support additional research, faculty at the center submitted a total of seven grant proposals as principal investigator (PI) or co-principal investigator (Co-PI), with five funded for a total of $203,310 as PI and $1,837,950 as Co-PI. The two non-funded proposals totaled $ 574,401. Also in 2024, a master's level student graduated, and the new grant funding will provide for four new students in 2025 to be advised or co-advised by center faculty.

Research Highlights

Genetic Improvement in the New Mexico Cow Herd

Investigators: Marcy Ward (maward@nmsu.edu), Leonard Lauriault, Jason Box and Tucumcari Feed Efficiency Test (TFET) cooperators.

Project Overview: Housed at the Rex Kirksey Agricultural Science Center in Tucumcari, the TFET has been a collaborative effort with NMSU and cattle producers since 1961. This program allows producers to collect important data on their purebred bulls and heifers. It also allows a way for participating producers to market their purebred animals. In October 2024, cooperators of the bull test invested an additional $85,000 to expand the feed intake technology across the entire facility, thus doubling the test capacity to 288 head.

Meeting the Needs of New Mexico: The New Mexico beef industry contributes $900 million dollars to the gross state product annually. Drought is a significant risk to this economically important industry. Optimizing genetics and animal efficiency by making informed selection decisions can help producers minimize losses due to drought while making their cattle more marketable.

Impacts: Since 2015, the Tucumcari Bull test has almost quadrupled the number of efficiency-tested bulls annually during the winter, from 75 to 288. Participation from producers has grown from 10 in 2014 to 22 from four states in 2024, including two producers from the Laguna Pueblo. The audience for the annual bull sale has expanded from roughly 75 producers attending the live auction to over 250 producers annually from 28 states and Canada; both in person and online. Since 2015, the average value of bulls at the Tucumcari Bull Sale has increased by $700.00 per animal; improving the profitability of New Mexico purebred cattle producers. In 2024, gross sales topped $500,000. The Tucumcari Bull Test now provides performance proven genetics to ranchers across New Mexico, Texas, Colorado, and Oklahoma. Data collected from the TFET has resulted in producers improving the efficiency of their cattle by 40% since its inception in 1961.

2024 Bull Sale.

Growing Winter Cover Crops for Improving Soil Health and Resource Use Efficiency

Investigators: Murali Darapuneni, dmk07@nmsu.edu, Leonard Lauriault, Abdullahi Liman, and Jason Box

Project Overview: Fallow cultivation in New Mexico's semi-arid and dryland cropping systems during winter months can cause significant wind and water erosion, which results in the loss of valuable moisture and nutrients from the topsoil. A study was initiated at the Tucumcari research site that involved planting six treatments of cover crop (grass, legume, and crop mixtures) in winter (mid-September) and early spring (late February or early March) under conventional and no-tillage systems. The first phase of the study was planted in the winter of 2024. The second phase of planting will be done in early March 2025. Data collection is in progress.

Meeting the Needs of New Mexico: Topsoil erosion and soil quality degradation can be effectively controlled by planting cover crops during the winter fallow period. Maintaining living roots through planting cover crops will enhance the management of soil health-related resources such as soil moisture, nutrients, and microbial populations. Planting cover crops in the fallow can also bring significant economic opportunities for NM producers and ranchers by providing feed and fodder to the cattle industry.

Impacts: The introduction of resource use efficient cover crop selection will result in broader diversity in the winter wheat cropping systems. This research will consequently improve the production efficiency of 380,000 acres in NM alone. Cover crops to replace partial fallow in the winter or early spring season will increase the resource use efficiency (especially water and nutrients) and microbiology of the soil. Diversity in dryland cropping systems will not only reduce the risk of system inefficiency in terms of resource use but also increase farm-level income security. The outcome of this project will ensure increased productivity, sustainability, and food and forage security. The scope of work can be extended to similar environments in the US to maximize the research benefit.

Funding Acknowledgement: This research is supported by the New Mexico Department of Agriculture-Healthy Soil Project (HSP) Grant.

Winter cover crop research at Tucumcari during 2024 crop season.

Evaluation of Alternate Cropping Systems in a Semi-Arid Environment of Eastern New Mexico

Investigators: Murali Darapuneni, dmk07@nmsu.edu, Leonard Lauriault, Abdullahi Liman, and Jason Box

Project Overview: Water limited semi-arid cropping systems need strategic planning of appropriate rotation crops in time and space to achieve higher production and resource-use efficiency. A long-term study was initiated in Tucumcari to evaluate the water use productivity of 9 alternate cropping systems that include grasses, millets, and legumes under limited irrigated conditions. The crop rotations include both winter and summer crops. Researchers planted barley, cowpea, guar, and sorghum crops in the summer of 2024. The results showed the highest seed and forage yields in sorghum, followed by cowpea. Barley and guar stands are thin. Data processing is in progress.

Meeting the Needs of New Mexico: The introduction of resource use efficient crop selection will result in broader diversity in the existing cropping systems. Increasing the diversity in the cropping systems will not only reduce the seasonal risk of crop failures due to water scarcity but also increase farm-level income and security. Successful identification of novel alternate cropping systems in semi-arid New Mexico to replace inefficient partial fallow and inefficient crops will not only help the local farming community to achieve higher resource use efficiency (especially water and nutrients) and productivity but also promote investment in infrastructure for processing in-New Mexico - and broader marketing opportunities in New Mexico.

Impacts: Identification of resource efficient alternate cropping systems to replace partial fallow in the current semi-arid cropping systems will have a potential production impact on more than 200,000 acres, accounting for approximately 27% of total agricultural production area in New Mexico and the impact can be much more substantial when applied to similar environments globally. Alternate cropping to achieve higher resource use efficiency (especially water and nutrients) and productivity will not only generate higher farm-level income for the producers but also promote broader marketing and economic opportunities in New Mexico.

Funding Acknowledgement: This research is supported by the USDA National Institute of Food and Agriculture as well as by state funds appropriated to the New Mexico Agricultural Experiment Station.

Cropping systems research at Tucumcari during the 2024 crop season.

Biochar as a Soil Amendment Material Used in Forage Sorghum Production

Investigators: Murali Darapuneni, dmk07@nmsu.edu, Abdullahi Liman, Sangu Angadi, John Idowu, and Leonard Lauriault

Collaborating Agricultural Science Centers: Clovis Agricultural Science Center and Fabian Garcia Research Center

Project Overview: Biochar is a carbon-rich pyrolysis product obtained from burning biological materials such as plant biomass and animal waste. Biochar is generally used as an organic soil amendment material for crop production to enhance soil chemistry and water retention, improve plant growth and nutrition, and reduce greenhouse gas emissions. A three-year field experiment was initiated in 2023 at the Rex E. Kirksey Agricultural Science Center at Tucumcari to evaluate the effects of various combinations of biochar and manure on soil chemical characteristics, water use, and crop growth and quality of forage sorghum.

Meeting the Needs of New Mexico: New Mexico crop producers can use biochar as a multi-purpose soil amendment material to enhance water retention, soil physiochemical characteristics, and crop yield and quality. Intense weather and extended drought are important issues that can also be addressed with the soil application of biochar, which can help significantly reduce carbon emissions to the atmosphere. Salt problems in arid and semi-arid soils of New Mexico can be effectively mitigated with the application of biochar which can also lead to increased vegetative growth and yield and water use efficiency of the crops.

Impacts: Second-year research results showed a significant positive impact of biochar on plant growth, biomass yields, and biomass water use efficiency. Biochar's effect on soil characteristics is yet to be analyzed. If biochar application is proven effective in mitigating the salt-affected soils, this practice will improve the agricultural productivity of over 128,000 acres in New Mexico.

Biochar experiment conducted in Tucumcari during the 2024 planting season.

Evaluating Treated Municipal Wastewater for Winter Cover Cropping to Protect the Soil, Promote Soil Health, and Protect Freshwater Sources II

Investigators: Leonard Lauriault (lmlaur@nmsu.edu), Murali Darapuneni, Xiufen Li (PES), Abdullahi Liman, and Jason Box

Project Overview: Winter cover crops planted in September 2023 were sprinkler-irrigated with treated municipal wastewater. After cover crops were terminated in May 2023 with the remaining cover crop biomass left intact, forage sorghum was no-till planted and harvested on October 23, 2024, shortly after heading. Soil samples were collected immediately post planting, after cover crop termination, and after forage sorghum harvest in October 2024 and analyzed for nutrient content by 1-ft depth increments and soil microbial activity in the surface foot. Cover crop and forage sorghum biomass were measured and evaluated for plant nutrient components. Soil water content was measured throughout the study.

Meeting the Needs of New Mexico: New Mexico's municipalities seek uses for their treated municipal wastewater to minimize disposal costs and adverse effects on the state's water bodies and the environment. A study at the Rex E. Kirksey Agricultural Science Center at Tucumcari evaluated the soil nutrient and microbial and crop responses when winter cover crops and the subsequent forage sorghum crop were irrigated with treated municipal wastewater.

Impacts: The use of legumes as a cover crop increased forage sorghum biomass yield, crude protein content, and other nutritive value components. In addition, cover crops protect the soil from wind and water erosion during the winter fallow period for annual summer cropping systems. Furthermore, cover crops maintain a living root during non-cropping periods to promote soil health. In the first study year, this research found differences in forage sorghum nitrogen uptake due to the previous cover crop with forage sorghum following hairy vetch having greater nitrogen uptake than when forage sorghum follows oat, rye, and triticale. Nitrogen uptake by forage sorghum following barley and Austrian winter pea was intermediate. Second-year data have not been summarized.

Funding Acknowledgement: New Mexico Department of Agriculture Healthy Soil Program, $63,198.

Installation of soil moisture measurement tubes after cover crop emergence.

Evaluation of Soil Organic Carbon (SOC) Under Various Cropping Scenarios

Investigators: Leonard Lauriault (lmlaur@nmsu.edu), Rajan Ghimire, Murali Darapuneni, and Jason Box

Collaborating Agricultural Science Centers: Artesia Agricultural Science Center, Clayton Livestock Research Center, Clovis Agricultural Science Center, Farmington Agricultural Science Center, and Los Lunas Agricultural Science Center

Project Overview: Annually cropped (single-cut late maturing sorghum-sudangrass in 2024) areas of continuous annual cropping and terminated alfalfa (2023) and newly seeded alfalfa (2023) were sampled at 0-6 and 6-12 in soil depths for soil nutrient content, SOC, and microbial activity by phospholipid fatty acids (PLFA) analysis in winter 2023-24 and mid-autumn 2024. The 2024 annual crop was no-till planted in mid-June and biomass was measured to ground level at season-end (late October) and submitted for forage nutritive value analysis by near infrared spectroscopy (NIRS).

Meeting the Needs of New Mexico: Selecting crops adapted to limited water conditions that provide economic and environmental benefits could enhance soil C sequestration and water use efficiency in arid and semi-arid regions. More research on C sequestration and water use efficiency for dry environments is needed to enhance agricultural sustainability and economic profitability for New Mexico's agricultural stakeholders. Agricultural practices such as no-till, crop rotation, and perennial cropping can increase soil C storage. They may also provide several co-benefits, including enhanced soil quality, water conservation, and farm productivity. For instance, soil C helps maintain soil structure, healthy microbial communities, soil water retention, and greater crop yield.

Impacts: Water scarcity, soil degradation, and global warming are the most challenging issues facing sustainable agriculture and food security. These issues are more severe in arid and semi-arid regions as climate change is adding pressure on marginalized communities and vulnerable ecosystems. Any strategy for sequestering atmospheric carbon (C) in agricultural landscapes must also ensure sufficient, nutritious food for the growing population while supporting biodiversity and ecosystem services. Carbon input and cycling rely on soil water in arid and semi-arid regions, where water is the primary driver of crop and livestock production. Therefore, management strategies that ensure "more carbon per drop" are most relevant for enhancing crop production, water and energy conservation, and economic profitability. Consequently, understanding the complex nexus between carbon, food, energy, and water in diverse agricultural systems will help in the development of sustainable and productive arid and semi-arid agriculture in New Mexico.

Funding Acknowledgement: USDA-NIFA Hatch Capacity: NMSU Carbon-Food-Energy-Water in New Mexico Agricultural Systems Umbrella Project

Collecting soil samples.

Evaluation of Double Cropping Selected Winter Cereal Forages and Summer Sorghum Forage Production on Field Bindweed Control

Investigators: Leonard Lauriault (lmlaur@nmsu.edu), Murali Darapuneni, Abdullahi Liman, and Jason Box

Project Overview: Winter barley, oat, rye, and triticale were planted into a conventionally tilled seedbed in a heavily field bindweed-infested area on September 26, 2023, and irrigated to promote growth. In early May, all plots were sampled for biomass, observed for bindweed plants, and swathed for baling. In mid-June, after the winter forages were baled, a late-maturing sorghum-sudangrass was no-till drilled, irrigated, and then sampled for biomass in mid-October. At that time the number of bindweed plants was again noted, and the test area was swathed for baling. After field curing and baling, the winter cereals were no-till drilled into the same plots as before in early December.

Meeting the Needs of New Mexico: Large areas of eastern New Mexico's cropland are infested with field bindweed, which is a strongly rhizomatous perennial that begins growth about one month before the frost-free date for summer annuals and can continue growth about two months after the recommended planting date for winter crops. Thus, field bindweed is highly competitive with annual crops. Using no-tillage and competitive cropping strategies when field bindweed is dormant or growth is reduced could potentially reclaim New Mexico's annually cropped areas that are infested with field bindweed and return the land to its agricultural potential without the use of herbicides.

Impacts: Deep tillage is known to reduce bindweed competition, but no-tillage practices in semi-arid regions are encouraged. Using winter cereal cover crops planted in early autumn after conventional tillage that can be harvested for forage in late spring may interfere with spring growth of bindweed, limiting its competition with summer crops. Sorghums are known to exhibit allelopathy against other plants and compete by shading as a taller-growing species. No-tilling sorghum-sudangrass soon after winter cereal harvest may allow the sorghum forage to gain a competitive advantage over the bindweed and continue competition by shading until harvest. This double cropping sequence could continue potentially depleting the established bindweed and prevent new seedlings from becoming established. While pre-study field bindweed averaged 8.6 plants per square yard, no plants were found in spring after the initial cereal seeding into a conventionally tilled seedbed or in autumn after the no-till seeding of sorghum-sudangrass.

Field bindweed root mass to 12 inches (l); no bindweed after winter (r).

Performance of Irrigated Alfalfa Varieties in New Mexico

Investigators: Leonard Lauriault (lmlaur@nmsu.edu), Koffi Djaman, Robert Flynn, Mark Marsalis, Ian Ray (emeritus), Jason Box, and Abdullahi Liman

Collaborating Agricultural Science Centers: Artesia Agricultural Science Center, Farmington Agricultural Science Center, Leyendecker Plant Science Center, and Los Lunas Agricultural Science Center

Project Overview: Variety selection is a critical first step in producing high alfalfa yields with high nutritive value at the same production costs. Alfalfa varieties (15 entries planted in 2023) were grown at Tucumcari under irrigation and harvested twice for hay in 2024 due to early and late season grazing by mule deer (six cuts would be typical). Statewide testing, coordinated by the Rex E. Kirksey Agricultural Science Center at Tucumcari was also conducted at Agricultural Experiment Station research facilities at Las Cruces, Artesia, and Los Lunas.

Meeting the Needs of New Mexico: In 2024, alfalfa hay production was estimated at 585,000 tons with estimated gross returns from alfalfa hay totaling over $149 million, which, although a 37% decrease from 2023, sustains alfalfa hay's position as New Mexico's number one cash field crop. Besides its value for hay, alfalfa also is the legume of choice in irrigated perennial pastures. Whether used as pasture or hay, the value of alfalfa to New Mexico is greatly magnified by its contribution to livestock production and receipts from the sale of meat, milk, and other products generated by New Mexico's livestock enterprises.

Impacts: Water scarcity, soil degradation, and a warming climate are the most challenging issues facing sustainable agriculture and food security. To assist New Mexico's alfalfa growers in selecting varieties, results from statewide testing in 2024 and previous years are available at the NMSU College of Agricultural, Consumer and Environmental Sciences County Cooperative Extension Service Offices as well as their Specialty Publications website (https://pubs.nmsu.edu/specialty/index.html). Based on the estimated average 2024 price of $255/ton for alfalfa hay, differences between the highest- and lowest-yielding varieties at Tucumcari (0.65 tons/acre) led to a difference in gross returns of $166/acre for two cuttings of irrigated hay at Tucumcari. Yield differences in established, irrigated tests statewide ranged from 0.56 to 1.01 tons per acre in 2024. If sold as hay, this translated to a potential difference in returns of $143 to $258 per acre due to variety, or an increase of at least $18.5 million for New Mexico's alfalfa industry.

Alfalfa variety test.

Performance of Irrigated Upland Cotton Varieties in New Mexico

Investigators: Leonard Lauriault (lmlaur@nmsu.edu), Robert Flynn, Naveen Puppala, Jinfa Zhang, and Jason Box

Collaborating Agricultural Science Center: Artesia Agricultural Science Center, Clovis Agricultural Science Center, and Leyendecker Plant Science Center

Project Overview: Variety selection is a critical first step in producing high yields of cotton with high quality at the same production costs. Nine cotton varieties were grown in Tucumcari in 2024 under irrigation. While a late hailstorm greatly reduced initial boll numbers, sufficient bolls of early maturing varieties did mature and were collected in mid-November to evaluate lint quality. The results of that analysis were not available when this summary was prepared.

Meeting the Needs of New Mexico: Cotton has been a staple crop throughout eastern and southern New Mexico that has helped sustain local economies.

Impacts: Results from statewide testing conducted in 2024 will be provided to sponsoring companies that market cotton varieties.

Cotton performance evaluation.

Forage Sorghum Cultivar Performance at Two Contrasting Environments in New Mexico

Investigators: Leonard Lauriault (lmlaur@nmsu.edu), Robert Flynn, Jason Box, and Abdullahi Liman

Collaborating Agricultural Science Center: Artesia Agricultural Science Center

Project Overview: Variety selection is a critical first step in producing high yields of sorghum forage with high nutritive value at the same production costs. Forage sorghum (4 entries) harvested once for silage was grown at Tucumcari in 2024 under irrigation.

Meeting the Needs of New Mexico: Livestock production for meat or milk is the goal of sorghum forage production, as driven by forage yield and nutritive value. New Mexico's forage growers can increase gross returns at nearly the same input costs when production is increased through variety selection.

Impacts: Dry matter yields differed among varieties by a range of 23.0 to 32.7 tons of 65% moisture forage for ensiling, but there were no differences in nutritive value. Based on November 2024 prices of $51/ton of 65% moisture forage sorghum silage, a 9.7 wet ton/acre yield difference measured in 2024 at Tucumcari would increase gross returns by $495/acre to the producer if they use the highest yielding variety rather than the lowest yielding variety.

Forage sorghum plots ready for harvest.

Winter Malting Barley Cultivar Performance at Two Contrasting Environments in New Mexico

Investigators: Leonard Lauriault (lmlaur@nmsu.edu), Kevin Lombard, and Jason Box

Collaborating Agricultural Science Center: Farmington Agricultural Science Center

Project Overview: Variety selection is a critical first step in producing high yields of winter malting barley at the same production costs. Thirty winter malting barley entries provided by the University of Minnesota as part of a nationwide evaluation program were planted at the Rex E. Kirksey Agricultural Science Center in September 2023 and harvested for grain in July 2024. Twenty-nine entries were planted in September 2024 for harvest in 2025. All entries were heavily grazed by wildlife over winter 2023-24, which may have influenced grain production.

Meeting the Needs of New Mexico: New Mexico has experienced considerable growth in its craft brewing industry in recent years with substantial economic returns. This has resulted in a need to produce grain ingredients for the industry, including malting barley and hops. Consequently, stakeholders in the grain-producing region of eastern New Mexico are interested in the local adaptation of winter malting barley as a potential alternative crop to winter wheat.

Impacts: Statewide, New Mexico experienced a 344% increase from 2016 to 2019 in jobs in the craft brewing industry, which had a $391 million impact in New Mexico in 2019. Grain yield differences among winter malting barley varieties at Tucumcari ranged from 30.3 to 76.1 bu/ac, with a study average of 42.1 bu/ac. At the August 2024 farm price of $6.70/bu, this would return from $203 to $510/ac. Since winter cereal grazing is commonly practiced for dual-purpose production, if producers desire to include grazing, they are encouraged to follow the same recommendation as for dual-purpose wheat to remove livestock at the first hollow stem to protect grain production potential and receive the added value from livestock production.

Winter malting barley plots in early spring.

By the Numbers

Research Publications

Peer Reviewed Journal Articles (underlined indicates graduate student)

- **Darapuneni, M. K.**, **Lauriault, L. M.**, Martinez, G. K., Djaman, K., Lombard, K. A., Dodla, S. (2024). Alfalfa response to various potassium fertilizers in a moderately low-potassium soil in arid New Mexico. *MDPI Agronomy, 14*(117), 10 pp. https://doi.org/10.3390/agronomy14010117 **(Collaboration with NMSU's Farmington faculty)**
- **Darapuneni, M. K.**, **Lauriault, L. M.**, Trostle, C. L., Flynn, R. P. (2024). Evaluation of pre-plant incorporated manure and phosphorus fertilizers on alfalfa yield, nutritive value, and residual soil characteristics. *Journal of Plant Nutrition, 47*(12), 1969-1980. https://doi.org/10.1080/01904167.2024.2325959 **(Collaboration with NMSU's Artesia faculty and faculty at TX AgriLife – Lubbock faculty)**
- Djaman, K., **Darapuneni, M. K**., Puppala, N. (2024). Plant Nutrient Removal and Soil Residual Chemical Properties as Impacted by Maize Planting Date and Density. *PlosOne*, 29. https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0299193 **(Collaboration with NMSU's Clovis and Farmington faculty)**
- **Lauriault, L. M.**, Angadi, S., Duff, G., Scholljegerdes, E. J., Darapuneni, M. K., Martinez, G. K. (2024). Influence of grazing on canola grain and forage yield and beef cattle performance. *MDPI Animals, 14*(371), 12 pp. https://doi.org/10.3390/ ani14030371 **(Collaboration with NMSU's Clayton, Clovis, and Las Cruces faculty)**
- **Lauriault, L. M.**, **Darapuneni, M. K.**, Martinez, G. K. (2024). Sorghum – legume mixtures to improve forage yield and nutritive value in semiarid regions. *MDPI Grasses, 3*, 163-173. https://doi.org/10.3390/ grasses3030012
- **Lauriault, L. M.**, Marsalis, M. A. (2024). The performance of an alfalfa-sainfoin mixture in the semiarid Southern High Plains of the USA. *MDPI Crops, 4*, 514–522. https:// doi.org/10.3390/crops4040037 **(Collaboration with NMSU's Los Lunas faculty)**
- Macolino, S., Pornaro, C., Pignata, G., **Lauriault, L. M.** (2024). Dhurrin content and biomass yield in sorghum hybrids throughout plant growth cycle. *Agrosystems, Geosciences & Environment, 7*(20472), 10 pp. http://dx.doi.org/10.1002/agg2.20472 **(International collaboration)**
- Paye, W., Acharya, P., **Lauriault, L. M.**, Ghimire, R. (2024). Soil carbon and nitrogen responses to forage cropping systems following irrigation retirement. *Agronomy Journal, 116*, 489-503. DOI: 10.1002/agj2.21523 **(Collaboration with NMSU's Clovis faculty)**
- Ramos-Coronado, L., Miller, F., Angadi, S., **Lauriault, L. M.** (2024). Evaluating the economic merit of guar as a forage replacement crop during drought-induced water restrictions. *MDPI Agronomy, 14*(1092), 11 pp. https:// doi.org/10.3390/agronomy14061092 **(Collaboration with NMSU's Clovis and Las Cruces faculty)**

- Shrestha, B., Stringam, B., **Darapuneni, M. K**., Lombard, K. A., Sanogo, S., Djaman, K., Higgins, C. (2024). Effect of Irrigation and Nitrogen Management on Potato Growth, Yield, and Water and Nitrogen Use Efficiencies. *Agronomy, 14(3), 560,* https://www.mdpi.com/2073-4395/14/3/560 **(Collaboration with NMSU's Farmington and Las Cruces faculty)**

Conference Proceedings and Abstracts (not peer-reviewed)

- Marsalis, M. A., **Lauriault, L. M.** (2024). *Alternative forage options* (pp. 9 pp). Sacramento, CA: Proceedings, 2023 Western Alfalfa & Forage Symposium/California Alfalfa and Forage Association. https://alfalfasymposium.ucdavis.edu/+symposium/2023/index.aspx **(Collaboration with NMSU's Los Lunas faculty)**
- **Lauriault, L. M.**, **Darapuneni, M. K.** (2024). *Forage pearl millet - cowpea planting arrangements*. Madison, WI: Western Society of Crop Science Annual Meeting, July 17-18, 2024, California State University Monterey Bay.

Experiment Station Publications (not peer-reviewed)

- **Lauriault, L. M.**, Ray, I., Pierce, C., Djaman, K., Flynn, R. P., Marsalis, M. A., Havlik, C., West, M. (2024). *The 2023 New Mexico Alfalfa Variety Test Report* (pp. 13 pp.). Las Cruces, NM: Agricultural Experiment Station and Cooperative Extension Service, New Mexico State University. https://pubs.nmsu.edu/variety_trials/AVT23.pdf **(Collaboration with NMSU's Artesia, Farmington, Las Cruces, and Los Lunas faculty)**

Extension Publications (peer-reviewed)

- Marsalis, M. A., Hagevoort, G. R., Turner, J. L., **Lauriault, L. M.** (2024). *Circ 711, Hay Nutritive Value, Quality, Sampling, and Testing*. Las Cruces, NM: Agricultural Experiment Station and Cooperative Extension Service, New Mexico State University. https://pubs.nmsu.edu/_circulars/CR711.pdf **(Collaboration with NMSU's Clovis, Las Cruces, and Los Lunas faculty)**
- Beck, L. L., Marsalis, M. A., **Lauriault, L. M.** (2024). *Guide A-325 (revised), Managing Weeds in Alfalfa*. Las Cruces, NM: Agricultural Experiment Station and Cooperative Extension Service, New Mexico State University. https://pubs.nmsu.edu/_a/A325.pdf **(Collaboration with NMSU's Las Cruces and Los Lunas faculty)**

Grants and Contracts

- Idowu, O. J., **Darapuneni, M. K**., Angadi, S. (2024). AquaSteady, an alginate-based hydrogel for sustainable agriculture in a changing climate. NSF (Collaboration: Pratt Institute). Total Grant Amount: **$5 Million**; NMSU Share: **$792,092;** Program Share: **$261,390**. Status: Awarded (January 2024-December 2025).
- Idowu, O. J., **Darapuneni, M. K**. (2024). Opuntia Cactus: Climate-responsive production of food ingredients and agrochemicals to enhance rural health and economic development. USDA-NIFA-SAS (Collaboration: Texas A&M University). Total Grant Amount**: $10 Million;** NMSU Share**: $969,379;** Program Share: **$387,751.** Status: Awarded (January 2022-January 2030).
- **Darapuneni, M. K., Lauriault, L. M.** (2024). Growing winter cover crops during fallow period for improving soil health and resource use efficiency in winter wheat-based cropping systems. NMDA-HSP. Grant Amount: **$94,997.** Status: Awarded (August 2024-May 2025).
- **Darapuneni, M. K., Lauriault, L. M.** (2024). Growing red bell pepper and roma tomato crops for chili processing industry in New Mexico. USDA-SCBGP. Grant Amount: **$108,313**. Status: Awarded (October 2024- September 2026).
- Salmasi, S., **Darapuneni, M. K**., Djaman, K., Heyduck, R. (2024). Chickpea, a high value, low input specialty crop for New Mexico. USDA-SCBGP. Grant Amount: $**76,542;** Program Share: **$23,676**. Status: Awarded (October 2024- October 2026).

Outreach Activities

- **Annual Tucumcari Feed Efficiency Test Annual Bull Sale**: In-person and online auction participants (March 9, 2024).
- **Youth Beef Feeder Contest**: Offered an alternative livestock project to show at county fairs to help participants learn about the New Mexico Beef industry and experience beef production using the Tucumcari Feed Efficiency Testing Facility (spring and summer 2024; led by Marcy Ward NMSU Extension Livestock Specialist).
- **Rex E. Kirksey Agricultural Science Center Field Day**: Open to the community to learn about the operations of the center and receive an update about ongoing research and other topics of interest. (August 6, 2024).
- **Rex E. Kirksey Agricultural Science Center Farm Day:** Exposed Tucumcari Schools 4th and 5th Graders to various aspects of agriculture through six brief presentations. (September 26, 2024).
- **Field Trips and Presentations:**
    - USDA-FAS/NMSU Science Exchange Program Sustainable Forage Solutions for Drought Resilience in African Livestock Systems at Los Lunas, Clovis, Tucumcari, NM. (June 17, 2024).
    - Quay County 4-H Senior Agronomy and Horticulture Teams to prepare for agricultural equipment components of state competitions. (July 5, 2024).

FAS Fellows from Africa at Tucumcari ASC.

2024 Field Day.

2024 Farm Day.

People

1954 Field Day at Agricultural Science Center at Tucumcari

Cooperators and Collaborators

NMSU Campus-based faculty:

- Agricultural Business and Agricultural Economics, including Extension: Ram Acharya, Frannie Miller, Luis Ramos-Coronado (graduate student), Alexander Wilson
- Animal and Range Sciences: Eric Scholljegerdes, Luis Ochoa (student)
- Center for Learning and Training Development: Vanetta Busch
- Entomology, Plant Pathology, and Weed Science: Steve Hanson, Chanz Robbins, Soum Sanogo, Dave Thompson, Erik Lehnhoff
- Extension Animal Sciences and Natural Resources: Sam Fernald, Marcy Ward
- Extension Plant Sciences: Leslie Beck, Richard Heerema, John Idowu, Bernd Leinauer, Ciro Velasco-Cruz, Phillip Lujan
- Economics, Applied Statistics & International Business: Robert Steiner, Dawn VanLeeuwen
- Family and Consumer Sciences, including Extension: Efren Delgado, Nancy Flores
- Plant and Environmental Sciences: Julius Anchang, David DuBois, Kenneth C. Carroll, Ryan Goss, Lois Grant, Kulbhushan Grover, Yvette Guzman, Niall Hanan, Omar Holguin, Njoki Kahiu, Sophia Li, Geno Picchioni, Rich Pratt, Ian Ray , Manoj Shukla, Caitriana Steele, Blair Stringam, April Ulery, Emily Creegan (graduate student), Abdullahi Liman (graduate student - Tucumcari), Mohammed Omer (Post-Doc)

NMSU Off-Campus Research Facilities:

- Alcalde: Rob Heyduck, Del Jimenez, Shengrui Yao, Saeid Salmasi
- Artesia: Jane Breen-Pierce, Robert Flynn
- Clayton: Glenn Duff, Bianca Birkenstock (graduate student)
- Clovis: Sangu Angadi, Rajan Ghimire, Robert Hagevoort, Abdel Mesbah, Naveen Puppala, Pramod Acharya (Post-doc), Paramveer Singh (graduate student), Harjot Sidhu (graduate student)
- Corona: Shad Cox
- Farmington: Samuel Allen, Koffi Djaman, Kevin Lombard, Gasper Martinez, Margaret West, Bhimsen Shrestha (graduate student)
- Los Lunas: Mark Marsalis, Marisa Thompson, Charles Havlik

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Other University, Federal, State, and Industry Partners and Collaborators:

- Arch Hurley Conservancy District: Franklin McCasland, Tucumcari
- Canadian River Soil and Water Conservation District, Tucumcari
- Cindie Kehlet, Pratt Institute, Brooklyn, NY
- City of Tucumcari
- Colorado State University: Jessica Davis, Jeffrey Davidson, Kevin Larson, Sophia Linn, Daniel Mooney, Srinivas Pinnamaneni
- Greater Tucumcari Economic Development Corporation, Tucumcari
- Louisiana State University, Baton Rouge: Syam Dodla
- Marie Nava, Rancho Alma Linda
- Mesalands Community College, Tucumcari
- Mississippi State University: Rocky Lemus

- Natural Resources Conservation Service: Relissa Nials and Team 6, Tucumcari
- New Mexico Economic Development Department
- New Mexico Environment Department
- New Mexico Hay Association: Board of Directors
- Phillip & Kathleen Box, Box Farms, Tucumcari
- Quay County Cotton Boll Weevil Control District, Tucumcari
- Quay County Government: County Commission and manager, Tucumcari
- Quay County Sun, Tucumcari
- Quay County TableTop Food Co-op, Tucumcari
- Sam Gonzales, Los Terrenos Ranch, Farmington
- Southwest Quay Soil and Water Conservation District, Tucumcari
- Texas AgriLife Research and Extension: Calvin Trostle (Lubbock)
- Texas A&M University, College Station: Susanne Talcott
- Tim & Andrea Clark, Clark Farms, Tucumcari
- Tucumcari Feed Efficiency Test, LLC (TFET, dba Tucumcari Bull Test)
- Tucumcari Public Schools
- Tucumcari/Quay County Chamber of Commerce
- University of Arizona: Debankur Sanyal
- University of Nebraska, Scottsbluff: Gary Hergert, Jeff Bradshaw, and Robert Harveson
- USDA: Sultan Begna (ARS, Parlier, CA), Wooiklee Paye (ARS, Florence, SC), Prasanna Gowda (ARS, Stoneville, MS)
- West Texas A&M University, Canyon: Brock Blaser, Elora-Danam Ellison (student), and Marty Rhodes

International Partners and Collaborators:

India:

- University of Agricultural Sciences, Raichur: M.R. Umesh

Italy:

- Department of Agronomy, Food, Natural Resources, Animals, and Environment (DAFNAE), University of Padova, Legnaro, Italy: Stefano Macolino and Cristina Pornaro
- Padana Sementi Elette s.r.l., Padova, Italy: Guido Pignata

Punjab:

- The Islamia University of Bahawalpur

United Kingdom:

- Anglo American Crops, Scarborough: Brad Farber, Rachel Fields

Advisory Committee

- Mr. Phillip Box
- Mr. Will Cantrell
- Mr. Donald Carter
- Mr. Paul Estrada, emeritus

- Mr. Cooper Glover
- Ms. Janet Griffiths
- Mr. Devin Kanapilly
- Mr. Robert Lopez, Chair
- Mr. Franklin McCasland, Vice Chair
- Ms. Marie Nava
- Mr. Jim Norris
- Mr. Cedar Rush
- Mr. Elmer Schuster, emeritus
- Mr. Tom Sidwell
- Mr. Donald Walker

Graduate Student

- Abdullahi Liman, MS

ASC Personnel

- Leonard Lauriault, College Professor/Research Director and Forage Crop Management Scientist
- Murali Darapuneni, PhD, Associate Professor/Semiarid Cropping Systems Specialist
- Patricia Cooksey, Administrative Assistant
- Jason Box, Farm/Ranch Manager
- Ram Miller, Assistant Farm Manager
- Curtis Gonzales, Science Center Laborer
- Carlos Sandy, Science Center Laborer

L-R: Leonard Lauriault, Curtis Gonzales, Murali Darapuneni, Carlos Sandy, Patricia Cooksey, Ram Miller, Jason Box, and Abdullahi Liman