2024
ANNUAL REPORT

SUSTAINABLE AGRICULTURE SCIENCE CENTER AT ALCALDE

THE NMSU AGRICULTURAL EXPERIMENT STATION SUPPORTS RESEARCH THAT ADDRESSES REAL-WORLD PROBLEMS. RESEARCH IS AT THE CORE OF NMSU'S MISSION TO IMPROVE THE LIVES OF PEOPLE GLOBALLY.

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College of Agricultural, Consumer and Environmental Sciences
Agricultural Experiment Station

Clayton Livestock Research Center

NM STATE

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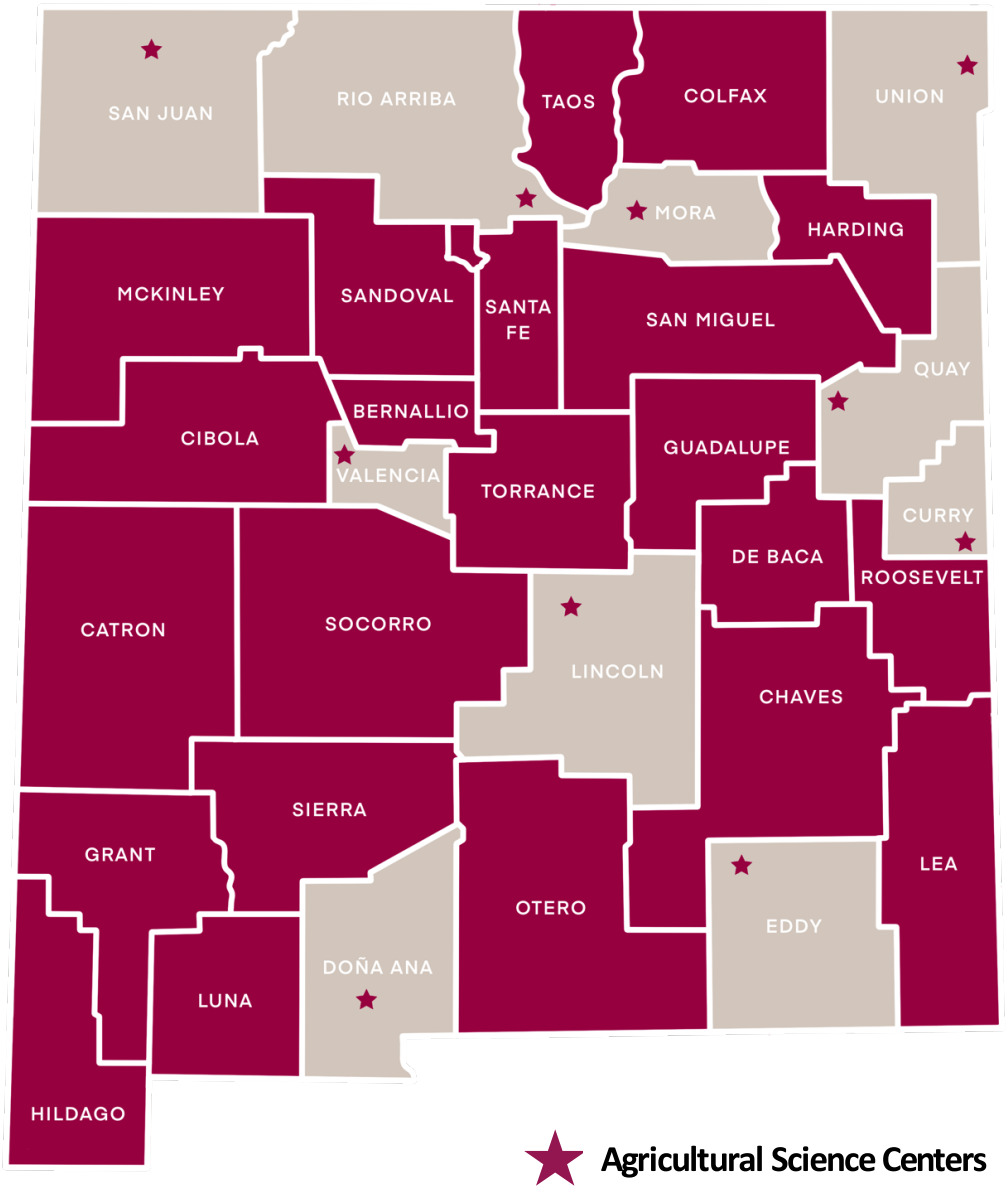
Notice to Users of this Report

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 are authorized for release or publication without the written prior approval of the New Mexico Agricultural Experiment Station.

Any reference in this report to any person, organization, activities, products, or services related to such person or organization is solely for informational purposes and does not constitute or imply the endorsement or recommendation of New Mexico State University or any of its employees or contractors. NMSU is dedicated to providing equal opportunities in areas of employment and academics without regard to any protected categories as outlined in federal and state anti-discrimination statutes. The College of Agricultural, Consumer, and Environmental Sciences is an engine for economic and community development in New Mexico. ACES academic programs help students discover new knowledge and become leaders in environmental stewardship, food and fiber production, water use and conservation, and improving the health of all New Mexicans. The College's research and extension outreach arms reach every county in the state and provide research-based knowledge and programs to improve the lives of all New Mexicans.

Agricultural Science Center Locations Map



Executive Summary

In 2024, the Clayton Livestock Research Center (CLRC) made significant strides in research, education, industry engagement, and strategic development, reinforcing CLRC's role as a leader in sustainable livestock production. Researchers at CLRC produced 14 peer-reviewed publications, six abstracts, and two official translations of the National Academy of Sciences *Nutrient Requirements of Beef Cattle*. Research funding efforts were highly successful, with the center securing $230,860.98 in U.S. research funding and $121,558.43 in Brazil. These grants supported interdisciplinary studies on environmental stressors, methane mitigation, and controlled-release feed technologies, contributing to livestock health, productivity, and sustainability.

Research continues under five active grants, further advancing innovation in the field. The second half of 2024 marked a period of strategic growth with the appointment of Dr. Fonseca as Research Director. Under this leadership, CLRC developed a comprehensive budget enterprise system, established a new ruminant nutrition laboratory, and installed a water intake measurement system to enhance research capabilities. Significant infrastructure improvements included acquiring equipment to improve animal welfare at the processing barn and initiating the first research trial on the pivot area in years. Compliance efforts were strengthened through the modification of multiple IACUC protocols, and an international trainee internship program was launched in collaboration with the University of Minnesota-Twin Cities to provide hands-on training for students worldwide.

Strategic planning initiatives included drafting new vision and mission statements, conducting a SWOT analysis, enhancing emergency preparedness, and expanding outreach through the creation of advertising materials and social media channels to increase CLRC's visibility and engagement with industry stakeholders. Mentorship and industry collaboration remained central to CLRC's mission. The faculty directly mentored six graduate students, advised five international visiting scholars, and served on seven thesis and dissertation committees. More than 400 industry stakeholders, producers, and students benefited from 10 outreach presentations covering critical topics such as wildfire smoke effects, water efficiency, and feed technology innovations. The center successfully hosted the 2024 Clayton Livestock Research Center Field Day, providing an opportunity for industry professionals and researchers to engage in knowledge-sharing and practical applications. ~~Additionally, CLRC participated in the NMSU President's Tour, showcasing its contributions to agricultural research and fostering stronger institutional partnerships.~~ With a strong foundation built in 2024, CLRC is poised to expand research funding, strengthen industry partnerships, and drive innovation in livestock sustainability. These efforts will ensure long-term benefits for producers, policymakers, and communities while positioning CLRC as a global leader in sustainable cattle production.

Research Highlights

Effects of Perennial Versus Annual Pasture on Gas (CH_4, CO_2 and O_2) Production of Mature Beef Cows

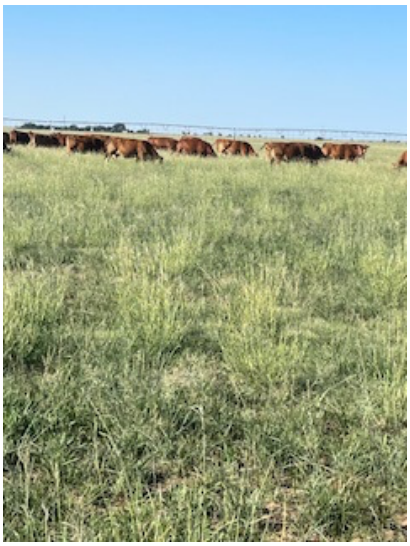
Investigators: Glenn Duff, Mozart Fonseca, Clint Loest, Rick Estell, and Daniel Abreu (Federal University of Mato Grosso, Sinop, Brazil)

Project Overview: With declining Ogallala Aquifer levels, there is a need to evaluate alternative cropping practices on the sustainability of irrigated pastures. There is also limited information on such practices on greenhouse gas emissions. Perennial pastures have an advantage over annuals with no need to till and plant grasses every year. There may also be advantages in water utilization associated with agronomic practices. However, no information on gas production or estimated environmental impacts is available. Researchers at the CLRC used 33 mature beef cattle at a cooperator to measure gas production using GreenFeed Technology, along with IFSM (Integrated Farm Systems Management) to simulate environmental impacts.

Meeting the Needs of New Mexico: Water continues to be an important issue for New Mexico producers. Evaluating alternative crops will provide information on the future sustainability of irrigated pastures. This information can provide producers with alternatives to traditional cereal grains.

Impacts: With declining levels of the Ogallala Aquifer, producers need to evaluate less water intensive crops to remain viable. There is some evidence that now is the time to make changes in practices while water is available to allow the grasses to grow. A common small grain planted in New Mexico will primarily be wheat or oats (may be used as a viable cover crop). Cereal grains include primarily corn. However, corn requires more irrigated water to be beneficial. Limited data are available on gas production with these practices.

Funding Acknowledgement: USDA NIFA SAS CAP



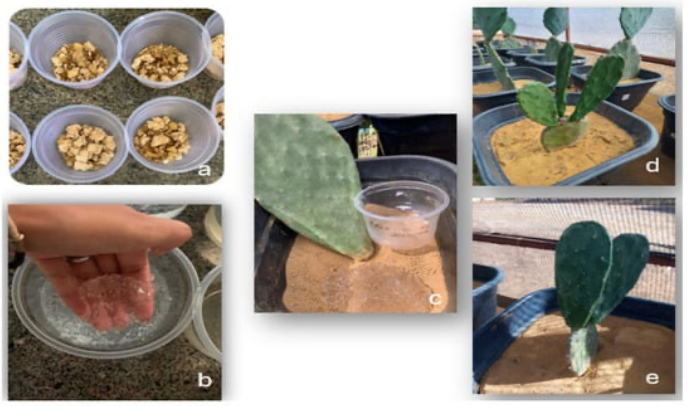
Development of a Cashew Gum Based Hydrogel for Sustainable Irrigation of Cactus Pear Used as Fodder for Animal Feed

Investigators: Dr. Mozart Fonseca, Dr. Leilson R. Bezerra, and Dr. Edson Cavalcanti Silva-Filho

Project Overview: This study evaluates a biodegradable hydrogel derived from cashew gum (Anacardium occidentale) as an eco-friendly alternative to synthetic hydrogels for improving water retention in arid and semi-arid agriculture. The research assesses the effects of this hydrogel on the growth, chemical composition, and mineral content of three cactus pear genotypes, comparing it to a commercial synthetic hydrogel. Results indicate that the biodegradable hydrogel enhances plant growth and nutrient uptake, making it a promising tool for sustainable agriculture. By improving water efficiency and forage quality, this innovation supports climate-resilient farming practices and reduces dependence on non-biodegradable materials.

Meeting the Needs of New Mexico: New Mexico's agriculture is challenged by water scarcity, limiting crop production and livestock forage availability. Cactus pear is a valuable drought-resistant forage, but optimizing water use remains crucial. This study's biodegradable hydrogel offers a sustainable solution to improve water retention, reducing irrigation needs while enhancing plant growth and forage quality. By promoting efficient water use and reducing reliance on synthetic hydrogels, this research supports local farmers, ranchers, and conservation efforts. Implementing this innovation can help sustain livestock production, enhance food security, and improve the economic resilience of agricultural communities in New Mexico's arid landscapes.

Impacts: Water scarcity is a major challenge for agriculture, particularly in arid and semi-arid regions where cactus pear is an essential forage source for livestock. Traditional irrigation methods are inefficient, and synthetic hydrogels, while effective, are non-biodegradable and environmentally unsustainable. Farmers and researchers seek eco-friendly solutions to enhance water retention and crop resilience while reducing environmental impact. This study developed and tested a biodegradable hydrogel derived from cashew gum (Anacardium occidentale) as a sustainable alternative to synthetic hydrogels. The hydrogel was evaluated for its effects on the growth, chemical composition, and mineral content of three cactus pear genotypes, comparing its performance to commercial polyacrylamide-based hydrogels. The biodegradable hydrogel significantly improved plant growth, crude protein accumulation, and mineral content in cactus pears. The sweet genotype showed the highest crude protein accumulation when hydrated with the cashew gum hydrogel, demonstrating its potential for enhancing forage quality and drought resilience. By offering a biodegradable and effective water retention solution, this research supports sustainable agriculture, reduces reliance on synthetic polymers, and improves livestock feed availability in water-scarce regions. The findings benefit farmers, environmental conservation efforts, and long-term agricultural resilience.



Funding Acknowledgement: Funding in Brazil:
National Council for Scientific and Technological Development (MCTIC/CNPq, Grant n° 406973/2022-9, INCT/Polysaccharide).
Institutional Review Board Statement

Photo credits: https://doi.org/10.1016/j.jaridenv.2024.105311

(CNPq)

An Evaluation Using a Visual Health Scoring System with Vaginal Temperatures of Newly Received Feedlot Heifers on Immune Status

Investigators: Mozart Fonseca, Glenn Duff, and Clint Loest

Project Overview: Newly received feedlot cattle often experience immune function impairment resulting in bovine respiratory disease (BRD), caused by stressors such as marketing and transportation. Morbidity is visually detected and medically treated by implementing a 4-point scoring system based on depression, appetite, respiration, and temperature (**DART**). Immune status also can be measured using a chute-side nanotechnology-based immunity test (**D2Dx**).

Meeting the Needs of New Mexico: Calves from New Mexico are shipped to feedlots outside of New Mexico, primarily in the southern high plains. Respiratory disease can cause approximately $2 billion in losses from Bovine Respiratory Disease. In addition, cattle originating from New Mexico have a reputation for having more sickness than cattle from other regions. Being able to identify sick calves will help with the diagnosis of all cattle received in the feedlot. This in turn will impact the amount of money received for the auction animals.

Impacts: Bovine Respiratory Disease has a major financial impact on the beef industry. Work at the Clayton Livestock Research Center evaluates the impact of management programs on this disease. Researchers traditionally administer antibiotics based on visual observation (DART; depression, anorexia, respiration, temperature); with verification of morbidity and treatment based on body temperature. Immunity was measured using a D3Dx blood analysis. They used newly received beef cattle from the southeastern United States to evaluate using DART scoring; cattle are treated with antimicrobial medications for BRD if they have a rectal temperature (**RT**) ≥ 40°C and a DART = 2 (scale = 1 to 4), or if they have a DART ≥ 3 regardless of the 40°C RT threshold. However, cattle often exhibit visible clinical symptoms of BRD but do not have a RT ≥ 40°C threshold to warrant medical treatment. The objective of this study was to evaluate newly received feedlot heifers on subsequent health status using the DART scoring system and D2Dx concentrations during a 28-d receiving period. Crossbred heifers (n = 198; initial BW = 219 $\pm$ 63 kg) were initially processed, weighed, and allocated to one of 10 soil-surfaced pens (12 $\times$ 35 m; 20 heifers per pen). A blank Controlled Intravaginal Drug Release device attached with indwelling temperature probe (iButton DS1925L) was inserted vaginally into each heifer to record vagina temperature (**VT**) every 10 minutes for 28 days. All heifers were evaluated daily (0700 h) for signs of morbidity by three individuals (blinded from each other) implementing DART scoring. Individual DART evaluations were then pooled prior to the determination of heifers needing further evaluation for medical treatment. Serum was collected on d 1, 28, and when a heifer was brought to the chute and evaluated for medical treatment (**Pulls**). Initial D2Dx values were not different ($P \geq 0.54$) between healthy and morbid heifers upon feedlot arrival. Heifers with DART ≥ 2 that were treated for BRD had decreased ($P \leq 0.05$) D2Dx values than healthy heifers with DART = 0. The D2Dx values were not different ($P \geq 0.15$) between heifers with DART = 2 and DART = 3. Upon feedlot arrival, D2Dx values were low for all heifers and increased ($P \leq 0.05$) by the 1st and 2nd Pulls. By d 28, D2Dx values were greater ($P \leq 0.01$) than both d 0 and all total Pulls. Average VT decreased ($P \leq 0.01$) from d 0 to d 28, implying heifer health status improved by d 28 as D2Dx values increased. In this study, morbidity cannot be determined by D2Dx values upon arrival. Employing the DART scoring method accompanied with the D2Dx immunity test provided an overview of how effective clinical BRD can be diagnosed.

Slow-Release Urea Microencapsulated with Beeswax in Sheep Diets

Investigators: Mozart Fonseca, Leilson R. Bezerra, and Karla N. Rocha

Project Overview: This study evaluates the use of beeswax microencapsulation to create a slow-release urea supplement for ruminants. Urea is a common non-protein nitrogen (NPN) source in livestock diets, but its rapid degradation in the rumen can lead to inefficiencies and risks of toxicity. This research examines how beeswax-encapsulated urea influences nutrient intake, digestibility, and nitrogen balance in sheep. Two formulations were tested, with and without added sulfur, to assess their effects on protein utilization and rumen fermentation. The findings highlight the potential of beeswax as a sustainable encapsulation material, improving nitrogen efficiency and reducing risks in ruminant nutrition.

Meeting the Needs of New Mexico: New Mexico's livestock sector operates in semi-arid environments where protein supplementation is critical due to seasonal variations in forage quality. Traditional urea supplementation can be inefficient and pose risks of ammonia toxicity. This project provides an innovative, cost-effective solution by using beeswax microencapsulation to slow nitrogen release, improving its utilization in ruminants. By increasing feed efficiency and nitrogen retention, this technology can help New Mexico's cattle and sheep producers optimize their feeding strategies, reduce dependence on costly protein sources, and enhance sustainable livestock production. The approach aligns with water conservation efforts and nutrient management goals in the region.

Impacts: Efficient nitrogen utilization is crucial in ruminant nutrition, particularly in water-limited regions where protein-rich forage is scarce. Traditional urea supplementation can lead to nitrogen losses and potential toxicity, limiting its effectiveness in livestock diets. Sustainable solutions are needed to improve nitrogen retention, reduce waste, and enhance animal performance. This study developed and tested a slow-release urea system using beeswax microencapsulation, evaluating its impact on nutrient intake, digestibility, and nitrogen balance in sheep. The research also compared formulations with and without added sulfur to determine optimal nutrient release dynamics. The findings demonstrate that beeswax microencapsulation improves nitrogen utilization, reduces ammonia toxicity risks, and enhances fiber digestibility. The 2:1 formulation without sulfur exhibited the best efficiency and stability. This research benefits livestock producers by providing a sustainable, cost-effective feed solution that enhances protein efficiency and nitrogen retention. It supports New Mexico's agricultural resilience by reducing feed costs, improving animal performance, and promoting environmentally responsible livestock management.

Carnauba Wax Microencapsulation of Urea for Slow Release in Ruminant Nutrition

Investigators: Mozart Fonseca, Leilson R. Bezerra, and Karla N. Rocha

Project Overview: This project explores the use of carnauba wax to microencapsulate urea, creating a slow-release nitrogen source for ruminant livestock. Urea is a common non-protein nitrogen supplement in cattle feed, but its rapid degradation in the rumen can lead to inefficiencies and potential toxicity. By encapsulating urea with carnauba wax, this research aims to control nitrogen release, improve nutrient utilization, and enhance animal safety. The study evaluates different encapsulation formulations and their effects on nitrogen release, rumen degradation kinetics, and overall feed efficiency. The findings highlight a sustainable and regionally sourced solution for improving cattle nutrition and productivity.

Meeting the Needs of New Mexico: New Mexico's livestock industry faces challenges related to nutrient efficiency and feed costs, particularly in semi-arid environments where forage quality varies seasonally. Traditional urea supplementation can result in nutrient losses and safety concerns, limiting its effectiveness. This project offers a cost-effective and sustainable solution by using carnauba wax to slow the release of nitrogen, improving its utilization in the rumen and reducing risks of ammonia toxicity. By enhancing feed efficiency and promoting more stable nitrogen availability, this innovation supports local cattle producers, reduces reliance on expensive protein sources, and aligns with sustainable agricultural practices crucial for New Mexico’s dryland farming systems.

Impacts: Efficient nitrogen utilization in ruminant diets is a key challenge for cattle producers, especially in arid and semi-arid regions where forage protein levels fluctuate. The rapid breakdown of traditional urea supplementation in the rumen can lead to nitrogen losses and even toxicity, limiting its efficiency as a feed additive. Sustainable, controlled-release solutions are needed to improve nitrogen retention, enhance cattle performance, and reduce environmental impacts.This study developed a slow-release urea supplement using carnauba wax microencapsulation. Researchers evaluated different encapsulation ratios, analyzing their effects on rumen degradation, nitrogen release profiles, and bioavailability in ruminants.
The findings demonstrate that carnauba wax encapsulation effectively controls nitrogen release, reducing the risk of toxicity while improving nutrient absorption. The 2:1 formulation showed the best balance between efficiency and controlled release. This research supports New Mexico’s livestock industry by providing a cost-effective, regionally sourced, and environmentally sustainable nitrogen supplementation strategy. It enhances feed efficiency, reduces costs for producers, and minimizes nutrient waste, contributing to more resilient and productive cattle systems.

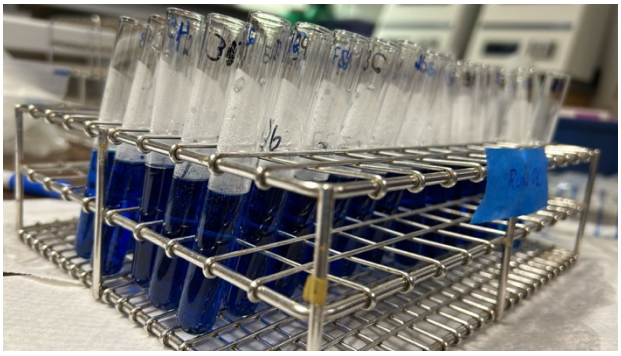
Advancing Sustainable Livestock Production in New Mexico: Optimizing Nitrogen Utilization and Reducing Greenhouse Gas Emissions Through Slow-Release Urea Technology

Investigators: Mozart Fonseca, Leilson R. Bezerra, Karla N. Rocha, and Nelcino F. de Paula

Project Overview: This project aims to develop and evaluate slow-release urea (SRU) derived from polysaccharides to enhance nitrogen utilization in ruminant diets while reducing greenhouse gas emissions. Conducted in collaboration with the Clayton Livestock Research Center, this study assessed the impact of SRU on ruminal fermentation, microbial activity, and methane production using in vitro techniques. By optimizing nitrogen availability, this innovation sought to improve livestock efficiency and environmental sustainability of cattle operations. The findings support the advancement of biodegradable feed technologies, benefiting both producers and policymakers seeking sustainable solutions for climate-smart agriculture.

Meeting the Needs of New Mexico: This project directly benefits New Mexico's agricultural sector by enhancing sustainable livestock production through improved feed efficiency and reduced environmental impact. By developing slow-release urea (SRU) from polysaccharides, the research aims to optimize nitrogen utilization, leading to lower feed costs and enhanced cattle productivity—critical factors for New Mexico's ranchers and feedlot operators. Additionally, by reducing methane emissions, the project supports climate-smart agriculture, aligning with state and federal sustainability goals. The outcomes will contribute to better resource management, benefiting local producers, policymakers, and consumers by ensuring a more resilient and environmentally responsible cattle industry in New Mexico.

Impacts: New Mexico's livestock industry faces challenges in optimizing nitrogen utilization while mitigating greenhouse gas emissions, particularly methane, from ruminants. Producers and policymakers seek sustainable solutions to enhance feed efficiency while reducing the environmental footprint of cattle production. This project develops slow-release urea (SRU) from polysaccharides, improving nitrogen retention in ruminants and reducing methane emissions. Through in vitro evaluations at the University of Nevada, Reno, the research assesses SRU's impact on ruminal fermentation and microbial activity. Results indicate that SRU enhances feed efficiency, decreases nitrogen waste, and lowers methane output, contributing to climate-smart agriculture. These findings support sustainable cattle management, benefiting New Mexico's producers, policymakers, and consumers by ensuring economic viability and environmental responsibility. By advancing biodegradable feed technologies, this project strengthens resource efficiency, climate resilience, and agricultural sustainability, addressing critical issues in livestock production and benefiting both the local and global communities.



Effects of Dietary Fiber and Starch Levels with and Without Supplemental Iso-Acids on Measures of Ruminal Fermentation, Digesta Kinetics, Site and Extent of Digestion, Microbial Protein Synthesis and Markers of Gut Inflammation and Integrity in Finishing Beef Cattle

Investigators: Mozart Fonseca, Glen Duff, and Lucas Mota

Project Overview: Isoacids are the branched ketoacids resulting from the natural rumen degradation of their corresponding amino acids. Isobutyric, isovaleric and 2-methylbutyric are produced in the rumen primarily by oxidative deamination and decarboxylation of the amino acid's valine, leucine, and isoleucine respectively. To understand how the supplementation through the diet can change the metabolism in finishing cattle evaluate the effects of type of diets and isoacids on measures of ruminal fermentation, microbial protein production, nutrient digestibility, digesta kinetics and intake, microbial species diversity in dairy x beef steers fed finishing diets of differing starch and fiber levels.

Meeting the Needs of New Mexico: Understanding how the supplementary isoacids and different starch and fiber levels in finishing can change the metabolism in finishing animals brings information for feedlots in New Mexico to adjust better diets for finishing cattle, which makes the operation more efficient and profitable. These results can bring more money for the feedlot which results in the conversion to state as tax, and also reduces the cost of beef production which can affect the price of the beef in the grocery store.

Impacts: The data analyzed so far shows that at a moderate starch concentration in the finishing diet, there is a decrease in the ruminal pH when isoacids were supplemented. However, no significant changes were observed when isoacids were supplemented in a high starch level diet. The opposite is true for fecal pH, in which the diet containing a higher starch concentration showed a decrease when isoacids were supplemented, but for moderate starch no changes were observed.

Funding Acknowledgement: Zinpro Corporation

Cactus Pear as Sustainable Resources for Leveraging Animal Production Systems in Semi-Arid Environments

Investigators: Mozart Fonseca, Leilson R. Bezerra, and Edson Cavalcanti Silva-Filho

Project Overview: This study explores the use of forage cactus (Opuntia ficus indica) as a sustainable alternative to traditional cattle feed such as alfalfa and orchardgrass. Given its high water content and digestibility, cactus may help reduce cattle water intake, lower methane emissions, and maintain performance. Researchers conducted in vitro digestion trials and computer simulations to assess how replacing conventional forages with cactus impacts greenhouse gas emissions, water use, and feed efficiency. The findings suggest that cactus improves digestibility, enhances rumen fermentation, and significantly decreases water footprint, making it a viable feed option for arid and semi-arid regions.

Meeting the Needs of New Mexico: New Mexico faces persistent drought and water scarcity, posing challenges for cattle production. Traditional forages like alfalfa and orchardgrass require substantial water, making them less sustainable in dry climates. This research evaluates forage cactus as a water-efficient feed alternative that could reduce irrigation needs while maintaining cattle performance. By integrating cactus into livestock diets, ranchers can lower water usage and mitigate methane emissions, promoting environmentally friendly and cost-effective beef production. The study supports sustainable agriculture in New Mexico, helping producers adapt to water limitations while ensuring long-term livestock productivity and economic stability.

Impacts: New Mexico's cattle industry depends on water-intensive forage crops, creating challenges in water-scarce regions. Livestock producers seek sustainable feed options that reduce water use while maintaining animal health and productivity. Additionally, methane emissions from cattle contribute to environmental concerns, requiring innovative solutions. This study investigated the potential of forage cactus as a water-saving feed alternative. Researchers assessed its impact on methane emissions, rumen fermentation, and water intake by conducting in vitro digestion trials and water footprint simulations. The findings indicate that cactus diets reduce methane emissions, improve digestibility, and significantly decrease water intake and footprint. Compared to traditional hays, cactus-based diets enhance rumen fermentation efficiency and propionate production, making it a practical, eco-friendly alternative for cattle. This research directly benefits New Mexico ranchers by providing a drought-resilient, sustainable feed option that conserves water while maintaining cattle performance. It supports environmental sustainability, reduces reliance on irrigated forages, and lowers greenhouse gas emissions, ultimately benefiting producers, consumers, and policymakers.

Funding Acknowledgement: Funding in Nevada:
National Institute of Food and Agriculture (NIFA) through grant NEV00755

By the Numbers

Research Publications

- Barros, D., Edvan, R., Pessoa, J. P., Nascimento, R., Camboim, L. F., Silva, S., Pereira Filho, J. M., Sousa, H., Silva-Filho, E., **Fonseca, M.**, & Bezerra, L. 2025. Biodegradable hydrogel based on cashew gum (Anacardium occidentale) enhances the growth and chemical composition of cactus genotypes. Sustainability **2025**, 17, 501. https://doi.org/10.3390/su17020501
- PSVI-12 Comparison of a Visual Health Scoring System with Vaginal T temperatures of Newly Received Feedlot Heifers Mackenzie M Smithyman, Glenn C Duff, Consuelo Sowers, Robert Steiner, Clint A Loest
  Journal of Animal Science, Volume 101, Issue Supplement_3, November 2023, Pages 416–417, https://doi.org/10.1093/jas/skad281.493
- Silva, A. E., Macias Franco, A., Solomon, J., Freiria, L., Moura, F. H., Mazza, P., Birkenstock, B., Bezerra, L. R., Shenkoru, T., **M. A. Fonseca**. Cactus (*Opuntia ficus-indica*) diets reduce voluntary water intake, water footprint and enteric methane production improving ruminal fermentation in steers. Journal of Arid Environments. Volume 227, March 2025, 105311. https://doi.org/10.1016/j.jaridenv.2024.105311

Grants and Contracts

- USDA-NIFA CAP Grant Award # 2019-69012-29853
- Funding in Brazil:
  National Council for Scientific and Technological Development (CNPq) (MCTIC/CNPq, Grant n° 406973/2022-9, INCT/Polysaccharide).
  Institutional Review Board Statement
- Funded in Brazil:

  2024-current: CNPq/MCTI/FNDCT Nº 22/2024 - Support for Network Projects with Brazilian Researchers Abroad. PI- Leilson Rocha Bezerra. Federal University of Campina Grande, Paraiba, Brazil. CNPq proposal #:444521/2024-0. International research network for the improvement of meat quality of lambs through protection of long-chain omega-3 polyunsaturated fatty acids. Amount requested: R$600,000.00. Amount Funded (CNPQ-MCTI-444521/2024-0): R$532,750.00 Award Date: 09/13/2024. Start: 01/01/2025; End: 01/01/2027. 2025-2027

- 2024-current: CNPq proposal # 402490/2024-0: Innovative rumen-protected fat technology for sheep diets focusing on improving meat lipids. Amount requested: R$300,000.00. Amount Funded (CNPQ-MCTI-402490/2024-0): R$ R$ 201,751.63 Award Date: 04/08/2024. Start: 01/01/2025; End: 01/01/2027. 2025-2027

- Zinpro, Amount: U$ 35,000, Status: Current, Funding Period: 2024-2025.

- Funding in Nevada:
  National Institute of Food and Agriculture (NIFA) through grant NEV00755.

Outreach Activities

- **2024-2024:** Ag Explorer Day – *Raton Convention Center, NM, October 22, 2024*. (Service to the Department and College)
- **2024-2024:** Ag Explorer Day – *Clayton Junior High, Clayton, NM, May 14, 2024*. (Service to the Department and College)

Events/workshops at the Center:

- **FONSECA, M. A.**, OLIVEIRA, W. L., BARNES, M., DILLON, D., G. DUFF. Clayton Livestock Research Center Field Day. College of Agriculture, Consumer and Environmental Sciences. New Mexico State University. 9/16/2024. (N = approx. 40-60 participants)

Outreach presentations open to the public:

- **FONSECA, M. A.**, OLIVEIRA, W. L., BARNES, M., DILLON, D., G. DUFF. Clayton Livestock Research Center Field Day. College of Agriculture, Consumer and Environmental Sciences. New Mexico State University. 9/16/2024. (N = approx. 40-60 participants)
- SMITHYMAN, M. M. (Presenter), **DUFF, G.** (Co-Chair), LOEST, C. A. (Co-Chair), ASAS-CSAS-WSASAS Annual Meetings, American Society of Animal Science, Calgary, Canada, "An evaluation using a visual health scoring system with vaginal temperatures of newly received feedlot heifers on immune status.".
- **FONSECA, M. A.** 2024. Beef Cattle Implants. ZOO 796: Special Topics III: Advanced Topics in Beef Cattle Production. Graduate Program in Animal Sciences. Federal University of Viçosa, Viçosa, Minas Gerais, Brazil. *ONLINE, June 28, 2024*.
- **FONSECA, M. A.** 2024. Livestock Nutrition. Beginner Farmers and Ranchers: Farm to Fork – Level 1 Certification Programs and Workshop. University of Nevada Cooperative Extension & College of Agriculture, Biotechnology and Natural Resources. *ONLINE, March 27, 2024*.
- **FONSECA, M. A.** 2024. Research Updates from Clayton Livestock Research Center. Southwest Beef Conference. New Mexico State University & Texas A & M AgriLife Extension. *Roswell, NM. In person, March 8, 2024*.

People

Cooperators and Collaborators

NMSU

- Clint Loest, Animal and Range Scinces
- Rajan Ghirmire Clovis Ag Science Center
- Leonard Lauriault Tucumcari Ag Science Center

Other Universities

- University of Nevada, Reno, Nevada, USA
- Dr. John Richeson West Texas A & M
- Dr. Vinicius Gouvea, Texas A & M AgriLife
- Dr. Rhonda Miller, Texas A & M University
- Dr. Ty Lawrence, West Texas A & M
- Dr. Andrew Foote, Dr. Britt Hicks, Dr. Paul Beck Oklahoma State University
- Dr. Michael Galyean Texas Tech University
- Dr. Aaron Hoshide, University of Maine

Research Centers

- Rick Estell, USDA Jornada Experimental Range
- Sherry Spiegel, USDA Jornada Experimental Range
- Brandon Bestelmeyer, USDA Jornada Experimental Range

International Partners

- Dr. Leilson R. Bezerra, Federal University of Campina Grande, Patos, PB, Brazil
- Dr. Karla N. Rocha, Federal University of Campina Grande, Patos, PB, Brazil
- Dr. Daniel C. Abreu, Federal University of Mator Grosso, Sinop, MT, Brazil
- Dr. Nelcino F. de Paula, Federal University of Mator Grosso, Cuiaba, MT, Brazil
- Ms. Leticia P. Zamberlan, Federal University of Viçosa, Viçosa, MG, Brazil

Industry Partners

- Dr. Wade Nichols and John Hutheson, Merck Animal Health
- Dr. Mark Branine, Zinpro
- Dr. Mike Socha, Zinpro
- Dr. Sara Capik, Texas Animal Health Commission
- Dr. Eben Oooshysen and Kurt Landis, Nutritional Consultants
- Drs. Mark and Don Reif, Clayton Veterinary Consultants
- Curtis Lockhart, Cattlemen's Livestock Commission, Dalhart, TX

Graduate Students

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- Lucas Mota – Animal and Range Sciences, PhD
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