

# CLAYTON



## ANNUAL REPORT — 2021

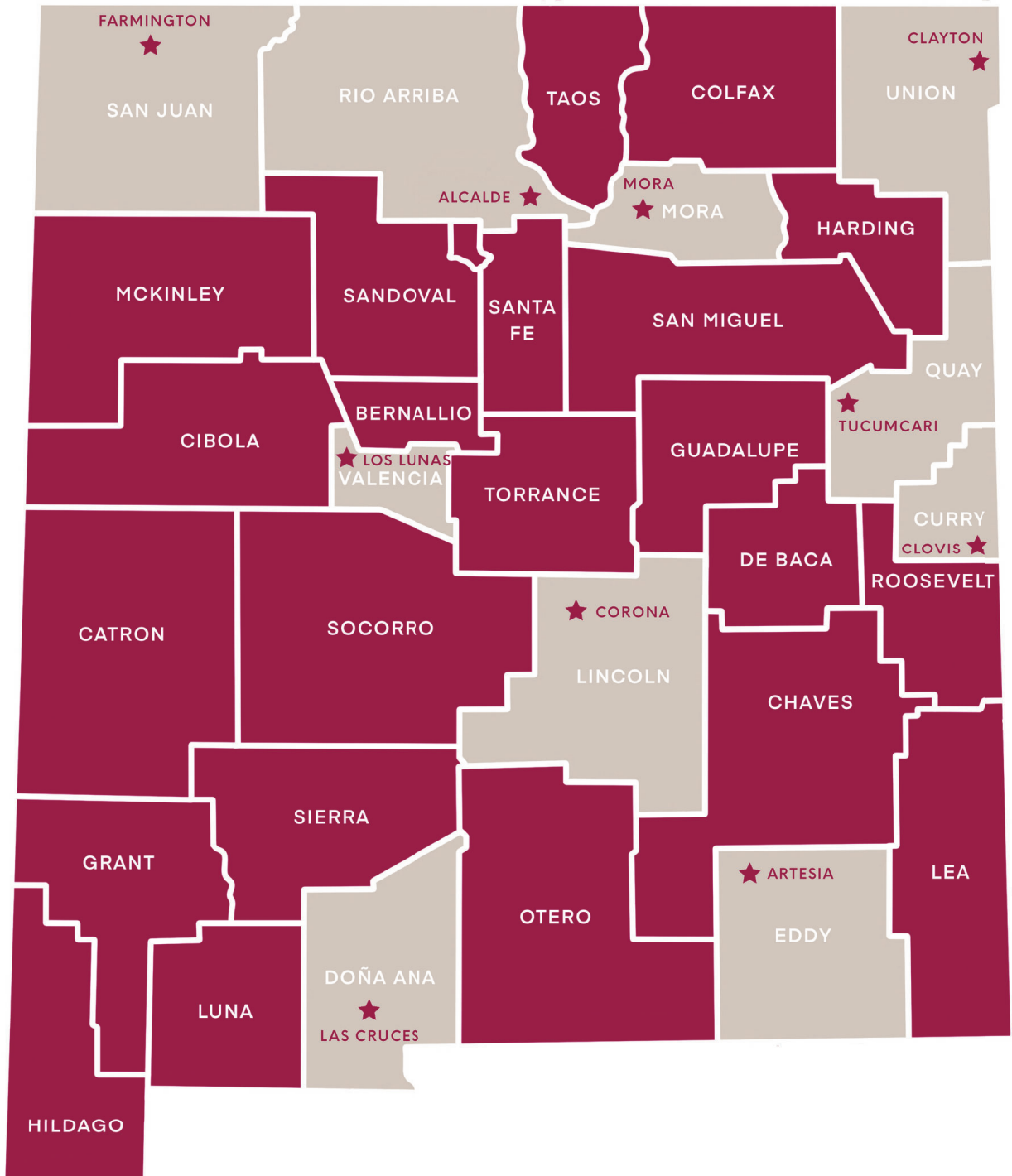
The NMSU Agricultural Experiment Station supports research that is addressing real-world problems. Research is at the core of NMSU's mission to improve upon the lives of people globally.

<https://claytonsc.nmsu.edu/>

# MISSION

The Clayton Livestock Research Center's mission is to conduct research on the health and performance of newly received cattle, mostly lightweight. These cattle may originate in New Mexico or the Southwestern states and are brought to NM for grazing.

# NMSU Agricultural Experiment Stations



★ Station Locations

## **Notice to Users of This Report**

This report has been prepared to aid Science Center staff in analyzing the various research projects from the past year and record data for future reference. These are not formal Agricultural Experiment Station Report research results. Information in this report represents only one year's research. 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 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.

Any reference in this report to any person, organization, or 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 age, ancestry, color, disability, gender identity, genetic information, national origin, race, religion, serious medical condition, sex, sexual orientation, spousal affiliation, or protected veteran status 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.

# Contents

Mission Statement	i
ASC Locations Map	ii
Notice to Users of this Report	iii
Table of Contents	iv
Meeting the Needs of New Mexico	1
Introduction/Executive Summary	2
2021 Financial Summary	3
Results of Research Projects Conducted	4
Community Outreach	9
Faculty and Staff	10
Cooperators/Collaborators	11

# 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 communities' agricultural and natural resource management needs 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, like research support field laboratories for campus-based faculty.

A majority of the cattle in New Mexico are sent to feed yards in the High Plains. Albeit not correct, the perception exists that cattle from New Mexico are not as healthy as cattle from other parts of the country. Several factors contribute to the morbidity and mortality of feedlot cattle. In general, cattle undergo stress during the transportation period. *Mannheimia haemolytica* is a bacteria that is naturally present in the nasal passages. When cattle are stressed (either by natural marketing conditions and/or viral challenges) the pathogens will proliferate and if the animal can't fight off the organism, it proliferates and ends up in the lungs. Cattle then contract bacterial pneumonia, which is a major cause of sickness. In addition to shipping cattle from New Mexico to the feedlots, several producers in the region purchase cattle to import into New Mexico. These cattle have the same health problems as cattle exported out of the state. The Clayton Livestock Research Center continues to focus efforts on improving the health and performance of newly received cattle. These efforts are local, regional and national in scope.

Other areas of research have been initiated to evaluate the performance of Criollo cattle crosses on performance and carcass characteristics. The specific subtype (Ramuri Criollo) that is being evaluated has grazing patterns whereby the cows distribute better on rangelands. However, calves from these old-world Spanish cattle are generally less valuable during marketing than traditional beef breeds. Fewer value results, in part, because of the lack of information on performance and carcass characteristics. Our research is evaluating feedlot performance and carcass characteristics of Angus, Red Angus, and Brangus crosses. Cattle originate from ranches in California, Utah, and southern New Mexico. This project is relevant to New Mexico and on a regional scope for producers interested in evaluating alternative breeds on semi-arid lands.

Finishing research at the CLRC evaluates feed additives and management factors to improve the performance and carcass characteristics of feedlot cattle. This type of research applies to local, regional, and national audiences. Plans continue to be developed to concentrate a portion of research on dairy beef production. This important segment of both the dairy and beef industries will provide information for New Mexico, regional and national audiences.

# Executive Summary

The Clayton Livestock Research Center was established on 320 acres of Kiowa National Grassland, Cibola National Forest, and located 7 miles east of Clayton, NM on Highway 56/64/412. The New Mexico Legislature first appropriated funds in 1972 for the construction and operation of the Center. A special use permit was approved by the Cibola National Forest in 1973 for construction and approved by Cibola National Forest in 1975. Construction began shortly thereafter. The research focus at the Clayton Livestock Research Center has been to improve the health of newly received lightweight calves. These cattle may originate in New Mexico or the Southwestern states and be brought to New Mexico for grazing. These cattle then go on to finish in feed yards in the high plains region. The health of New Mexico ranch calves shipped outside the state for placement on grass or into the feed yards has been a long-standing priority of the research station.

Research pens, with a capacity of approximately 960 head are constructed from pipes, with fence-line concrete bunk with Richie heated waters. Cattle handling equipment in an enclosed barn includes a working-chute system, scales for weighing individual animals. The system contains a "Bud Box" designed for truly low-stress handling conditions. A loading chute and scales for weighing trucks or groups of cattle are near the processing barn. An evaporation pond and a debris basin are located east of the cattle pens to contain run-off. A metal, 40 x 120-foot shed contains a machine-repair shop and feed storage area. The office laboratory building provides office space, a conference room, as well as laboratories for nutrition research.

One of the important factors at the Center is a center pivot irrigation system on 120 acres. The use of irrigated pasture to alleviate stress for newly received cattle and reduce costs of gain will be researched. Construction of the feed mill was completed in December 1978. It provides storage of feed ingredients, contains a steam-flaker and dry-roller for grains, and mixing of experimental diets. The roughage boxes have been upgraded with the assistance of the College of Agriculture and Environmental Sciences (ACES).

Guidance for research direction and cooperation from New Mexico Cattle Growers has long been the backbone of research conducted at the Clayton Livestock Research Center. Our goal is to improve the profitability of the cattle industry and specifically New Mexico cattle. The focus of the Clayton Livestock Research Center (CLRC) is to research improving the health and performance of newly received beef cattle and the nutrition and management of cattle to harvest. The center also has an irrigated pasture and has a small area of native grass. The irrigated pasture (120 acres) has traditionally been planted in small grains. The new irrigation well (approximately 550 feet deep) was replaced in 2020 after the existing well collapsed. This well pumps approximately 800 GPM. There have been proposals with other science centers (Farmington and Tucumcari) to evaluate alternative forages on the irrigated circle.

The CLRC was opened in 1978 and to remain viable over the next 40 years, we will need to seek funding for deferred maintenance at the center. Another major obstacle at the center is labor. Funding has been kindly provided by the state and we have started to increase our federal (USDA NIFA CAP grant) in the form of industry support. Infrastructure to allow personnel of the center to teach distance education courses has been completed. Currently, two courses are taught via distance education including a stocker/feedlot course and a dairy production course. With this new technology, graduate students should be able to take Animal and Range Science graduate courses via distance technology. This will help provide an educational opportunity for the students. Currently, our irrigated pasture is planted to triticale. We have Criollo and Brangus cows from the Chihuahua Desert Research Center (College Ranch). These cows were transferred to the research center due to limited forage in southern New Mexico.

## 2021 Clayton Financial Report

### Clayton Livestock Res Ctr

Fiscal Year:

2021

Fiscal Period:

30-Jun-21

Department	Acct Type	Account Index Desc	Revenue YTD	Expense Budget	Expense YTD	Budget Balance Available YTD	Fund Balance Dr/(Cr)
Clayton Livestock Res Ctr	NOVEL STRATEGIES TO INCREASE SUSTAI	FEEDLOT BREED COMPARISON DUFF	\$8,867.88	\$759,879.76	\$8,867.88	\$751,011.88	
		<b>Total Restricted Funds</b>	<b>\$8,867.88</b>	<b>\$759,879.76</b>	<b>\$8,867.88</b>	<b>\$751,011.88</b>	
Clayton Livestock Res Ctr	SALES & SERVICE	CLAYTON REVOLVING ACCOUNT	\$1,897,695.84	\$130,000.00	\$2,180,557.34	(\$2,050,557.34)	\$990,357.87
		<b>Total Sales and Service Funds</b>	<b>\$1,897,695.84</b>	<b>\$130,000.00</b>	<b>\$2,180,557.34</b>	<b>(\$2,050,557.34)</b>	<b>\$990,357.87</b>
Clayton Livestock Res Ctr	STATE APPROPRIATIONS	CLAYTON RESEARCH CNTR-SALARY		\$438,124.91	\$479,207.85	(\$41,082.94)	
Clayton Livestock Res Ctr	STATE APPROPRIATIONS	CLAYTON ADMIN		\$61,748.00	\$71,500.66	(\$9,752.66)	
		<b>Total State Appropriated Funds</b>		<b>\$499,872.91</b>	<b>\$550,708.51</b>	<b>(\$50,835.60)</b>	

This report is reflective of FY21 financial data. The figures are based on an overall NMSU budget balance and may not reflect the exact budget at varying times of the year for the Clayton Livestock Research Center.



**2021**

**RESEARCH RESULTS**

# EFFECTS OF PRECONDITIONING (VALUE-ADDED PROGRAMS) ON HEALTH, PERFORMANCE, *MANNHEIMIA HAEMOLYTICA*, AND *PASTURELLA MULTOCIDA* IN CATTLE RECEIVED ON WHEAT PASTURE.

Investigators: J. M. Brooks. Master of Science, Animal Science. G C. Duff, Chair.

## BACKGROUND

Bovine respiratory disease (BRD) is the deadliest and costliest disease in the North American and global cattle industries despite more than a century of extensive research, numerous collaborations, and hundreds of millions of private and government dollars allocated to reduce the prevalence of the disease in beef calves as they progress across beef production segments. Many health interventions have been advanced to mitigate BRD in calves including low-stress handling, proper nutrition, judicious use and timing of antimicrobials and vaccines, early disease detection methods, accurate health records, improved communication between production segments, and prevention of market failure, among others. Preconditioning is a calf health management strategy that combines many of these health interventions at the cow-calf level and is designed to prepare calves for the immunological challenges and stressors inherent in beef cattle production beyond the ranch of origin. Early studies investigating the effects of preconditioning showed little to no advantages in calf health, performance, and value realized by producers. After adjusting for advancements made in technology, science, and economics, more recent studies consistently show improved calf health, performance, and value of preconditioned (PRECON) calves compared to nonpreconditioned (NONPRE) calves and commingled (COMM) calves. However, much of this research focuses primarily on cattle received in feedlots or compares preconditioning programs to each other (i.e., dry lot versus pasture preconditioning programs) with a paucity of peer-reviewed literature focused on the effects of preconditioning on stocker cattle received on winter wheat pasture. Furthermore, understanding the dynamics of bacterial pathogens in the nasopharynx of calves assists researchers and veterinarians design more efficacious antimicrobial products and treatment protocols but much of the research concerning the prevalence of primary BRD bacterial pathogens *M. haemolytica* and *P. multocida* is largely focused on feedlot calves or through post-mortem lung examinations of calves at the abattoir.

## OBJECTIVE

The objective of the present study was to investigate the effects of preconditioning on the health and performance of stocker calves received in winter wheat pasture and model the prevalence of *M. haemolytica* and *P. multocida* serotypes during arrival at the wheat pasture.

## METHODS AND RESULTS

At the commencement of the study, PRECON (n = 70) and NONPRE (n = 75) steers were purchased from the Cattlemen's Livestock Commission Company in Dalhart, Texas, and transported the same day 51 miles to the winter wheat pasture at the New Mexico State University Clayton Livestock Research Center (NMSU CLRC) during early November 2018. Upon arrival, steers were penned, provided ad libitum access to forage and water, and allowed to rest. On Day 0, during processing, weights and deep nasopharyngeal swabs (NS) were collected and steers were randomly allocated to PRECON (n = 50), NONPRE (n = 50), and commingled (COMM, n = 45) treatment groups then turned out to wheat pasture in three separate paddocks with a common water source. Weights and NS were collected again on Day 2, and weights were collected on Day 90 and Day 112 (end of study). Steer health and performance were modeled over time. Overall morbidity and mortality rates were 36 and 13 percent, respectively. Morbidity rates were higher in PRECON (42 percent) and COMM (44 percent) steers compared to NONPRE (24 percent) steers while mortality rates were similar for all treatments. More NONPRE (n = 44) steers were retroactively identified as healthy compared to PRECON and COMM steers. Due to technical errors and reduced production of the wheat pasture, performance data were only analyzed from Day 0 to Day 90. COMM steers had significantly greater weight gains compared with PRECON (P = 0.04) and NONPRE (P = 0.02) steers while no differences were observed between PRECON and NONPRE steers (P = 0.97). Nasal swab DNA was isolated from samples collected on Day 0 and Day 2. Samples were analyzed using PCR to detect *M. haemolytica* and *P. multocida* and associated serotype distributions by treatment groups across Day 0 and Day 2 samples and by calf health status. For *M. haemolytica*, serotypes of interest included A1, A2, A6 and were detected in 5.56, 35.07, and 2.78 percent of all DNA samples.

NONPRE steers had the greatest frequency of A2 while A1 was greater in PRECON and COMM steers on Day 0 and Day 2. Serotype A1 was greater in unhealthy steers (62 %) compared to healthy steers (37 %). DNA samples positive for A1 were analyzed using qPCR. Healthy steers had decreased concentrations of A1 compared with unhealthy steers on Day 0 but concentrations were similar on Day 2. *P. multocida* was greater in healthy (68%) steers compared to unhealthy (32 %) steers but *P. multocida* serotype A:3 was not detected in any of the DNA samples submitted for analysis. More research is needed to provide insight into the effects of preconditioning and serotype distribution of *M. haemolytica*, and *P. multocida* for stocker calves received on winter wheat pasture.

Josiah completed his MS degree and presented the above study at the Western Section American Society of Animal Science. We are planning on submitting the information for publication in 2022.

# EFFECTS OF A SUPPLEMENTAL WATER SOURCE AND TRACE-MINERAL BASED ELECTROLYTE DRINKING SOLUTION ON THE PERFORMANCE AND HEALTH OF NEWLY RECEIVED FEEDLOT CALVES

Investigators: Mackenzie M. Smithyman\*, Vinícius N. Gouvêa, Dayna L. Campbell\*, Glenn C. Duff\*, Clint A. Loest\*, Mark E. Branine‡

## BACKGROUND

Newly received feedlot cattle are frequently subjected to prolonged periods of restricted access to feed and water due to marketing and transportation. The significant loss of water and other key nutrients from the body can put the animal at risk for respiratory disease and other stress-related disorders. It is hypothesized that rapidly rehydrating calves upon arrival can aid these animals in making a healthy and easy transition to the feedlot while also avoiding a loss in profit due to decreased performance.

## OBJECTIVE

The objective of this study was to rapidly replenish water and key nutrients in newly received feedlot calves by assessing water intake (WI) and administering a supplemental water source or a novel nutritional rehydration solution during the first three days after arrival.



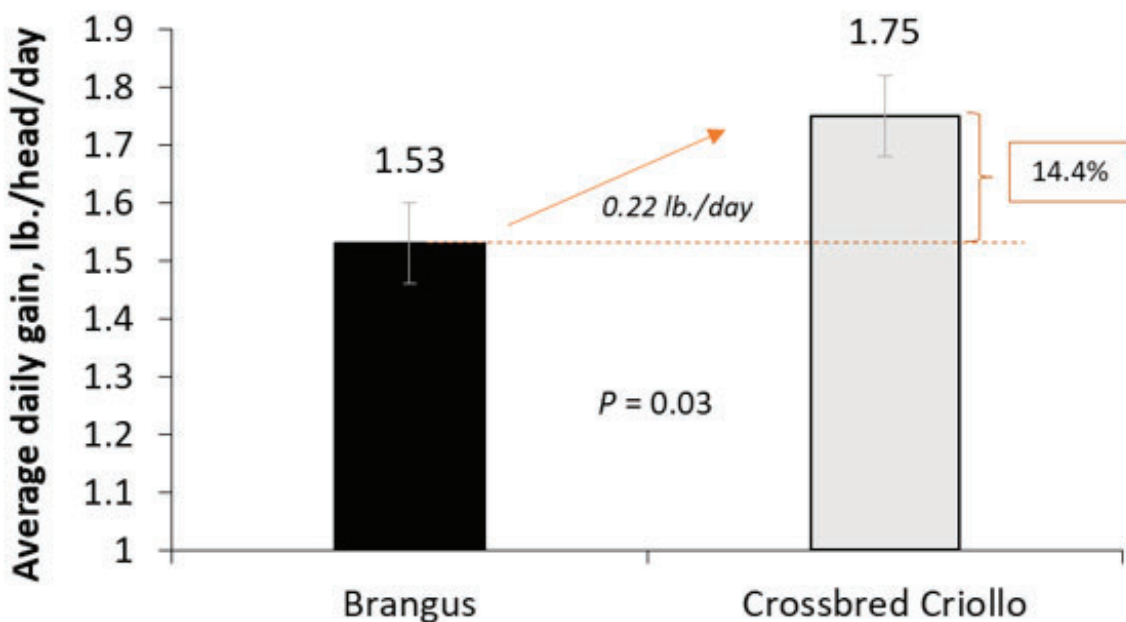
## METHODS AND RESULTS

A total of 270 crossbred heifers (initial BW = 512 ± 36 lb) were blocked by the truckload (n = 2 Run 1; n = 1 Run 2), ranked by initial BW, and allocated to one of 6 pens within the block. Three experimental treatments were randomly assigned to pens of cattle (pen was the experimental unit). Therefore, there were 18 pens, with 6 pens per treatment. Treatments were: 1) Control (CON): water provided through standard in-pen automatic waterer only (Richie CM480; one waterer/pen); 2) Supplemental water (SWS): CON + water provided with one additional 110-gallon stock tank/pen; 3) Nutritional rehydration solution (NRS): trace-mineral based drinking solution provided with one stock tank/pen as the only water source. Treatments were provided from days 1 to 4 after which supplemental tanks were removed. From days 5 to 56, all heifers had access to CON, the standard in-pen automatic waterer only. The WI was measured daily throughout the trial, and BW was recorded on days 1, 4, 14, 28, and 56. The DART scoring system was employed during the 56-day experiment to monitor health. Performance data were analyzed using the MIXED procedures. Morbidity and mortality data were analyzed using GLIMMIX procedures. Treatment × experimental period interaction was observed for DMI, ADG, and WI ( $P \leq 0.03$ ), a tendency for BW ( $P = 0.061$ ), and an experimental period effect on FE ( $P < 0.001$ ). Increased DMI was reported for both SWS and NRS from days 5 to 15 ( $P \leq 0.013$ ), and SWS had greater intake than CON from days 16 to 29 ( $P = 0.013$ ). The NRS reported no increase in ADG ( $P = 0.011$ ) from days 1 to 4; however, no effect of treatment on ADG was observed from days 5 to 56 ( $P \geq 0.117$ ). There was an effect of the experimental period on BW and FE where BW increased after day 14 in all periods. FE was greatest during experimental periods 5 to 15 ( $P < 0.001$ ), but not from periods 1 to 4 and 16 to 56. Both SWS and NRS had greater WI than CON from experimental days 1 to 4 ( $P \leq 0.001$ ), but not from days 5 to 56 ( $P > 0.36$ ) when supplemental tanks were removed. There was no effect of treatment on morbidity and mortality ( $P > 0.203$ ) during the duration of the study. The results indicate that providing receiving calves with a supplemental source of water upon arrival is an effective strategy to increase total WI during the initial three days and increase performance during the entirety of the receiving period.

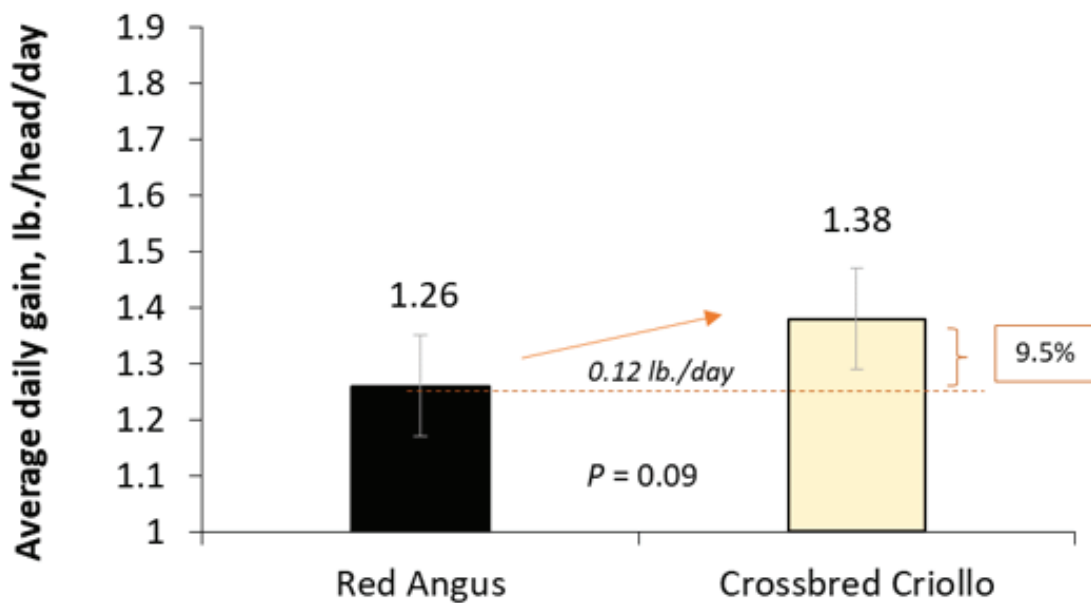
M. M. Smithyman, MS Student, conducted the prior research study as part of her MS degree.



### College Ranch (NMSU)



### Dugout Ranch (UT)





Year 1 Heritage breed crossbreeding finishing program was completed. Cattle were grazed on wheat pasture, finished at NMSU and Texas AgriLife, Amarillo, and sent to Tyson Meats for harvest. Loin samples were collected and sent to Texas A & M for taste panel evaluation.

Year 2 cattle were received in November 2021. Cattle are currently grazing wheat pastures planted with TAM 204. Cattle will again be finished at the Clayton Livestock Research Center and Texas A & M AgriLife, harvested at Tyson, and samples sent to Texas A & M for analysis.

## **Outreach/ Community Engagement**

The CLRC hosted a field day in August 2021. Topics included updates by graduate students, manure application on rangeland, and a demonstration by Asombro on Teacher Training workshops and grade school lesson plans.

## Faculty and Staff

Glen Duff, Ph.D. Animal Health and Management  
*Professor and Superintendent*

Michael (Mike) Barnes, B.S.  
*Farm/Ranch Manager, Maintenance*

Consuelo (CiCi) Sowers, M.S.  
*Farm/ Ranch Manager, Livestock Manager*

Devin Dillon  
*Farm/ Ranch Supervisor, Livestock*



**Figure 1.** Left to right: Devin Dillon, Mike Barnes, Glenn Duff, and CiCi Sowers

# Cooperators/Collaborators

## Individuals

1. Mr. Leonard Laurialt, Superintendent, Tucumcari Agricultural Science Center
2. Dr. Kevin Lombard, Superintendent, Farmington Agricultural Science Center
3. Dr. Andres Cibils, Professor, Animal and Range Sciences, NMSU, Las Cruces
4. Dr. Clint Loest, Professor, Animal and Range Sciences, NMSU, Las Cruces
5. Dr. Sergio Soto-Navarro, Professor, Animal and Range Sciences, NMSU, Las Cruces
6. Dr. John Richeson, Associate Professor, West Texas A & M University
7. Dr. Brent Auverman, Resident Director, Texas Agri-Life, Amarillo
8. Dr. Jackie Rudd, Professor, Texas Agri-Life, Amarillo
9. Dr. Sara Capik, Assistant Professor, West Texas A & M University
10. Dr. Fernando Batistel, Utah State University
11. Dr. Mark Branine, Zinpro

## Institutions

1. New Mexico State University, Las Cruces
2. Agricultural Science Center Tucumcari
3. Agricultural Science Center Farmington
4. Jornada Experimental Range USDA Las Cruces
5. West Texas A & M University
6. Texas A & M University
7. Utah State University
8. Texas Cattle Feeders Association (TCFA)

## Industry

1. Zinpro
2. Cargill
3. Merck Animal Health
4. Biomin



# CLAYTON

