Sustainable Southwest Beef

knowledge and tools for ranch and rangeland resilience

Sustainable Southwest Beef CAP Newsletter

September 2020

A Message From The Leadership

Hello all:

This team deserves a big pat on the back for all that we accomplished during the first year of the project as was documented in our first annual report, submitted to NIFA at the end of August.

At the time of our last newsletter, we were just grappling with the new realities of the Covid19 era and how it would change our project. As we worked over the past month to develop our first annual report, we realized just how nimble and creative this team is. While progress on the original objectives and work plans progress very well, many new elements have been added to our project.

In research, the precision ranching team identified several types of information that have potential benefits to ranch management, from changes in cow movement before, during, and after calving to quickly locating injured or escapee animals. The breed comparison team is adapting to drought on the ranch by moving cows to the Clayton Livestock Research Center location

and developing a new research focus of grazing behavior on the wheat pasture. The supply chain team incorporated scenarios on disruption of within the supply chain (such as occurred at meat packing plants during the pandemic) on ranch management and sustainability. Complementary adaptations occurred in the Extension programming, with a new focus on outreach to producers and consumers of grass-finished beef. The education team refocused on support to on-line learning resources and support as face-to-face classrooms closed down.

This newsletter shares updates about many of these new focus areas. Read about future leaders who are networking through the project, advances in the supply chain research, new Extension efforts, and much more below.

Again, congratulations and thank you to all for the many accomplishments of our first year. Great things are yet to come!

Save the Date

We are developing plans for our Annual Meeting. All Project participants are requested to attend. The sessions will be virtual during December 2-3, with possible team pre-meetings. In addition, our international network of collaborative researchers will meet virtually on December 4 and interested persons will be invited to join this bi-lingual exchange.

Supply Chain Options

The Supply Chain Options Team continues to compare the environmental and economic outcomes of several different approaches to producing beef with

cattle born on Southwestern ranches. The team is working to understand not only current supply chains, but also how disruption of production due to social distancing, and widespread adoption of heritage genetics and precision ranching, may affect supply chains of the future. As a first step, we are documenting the number and seasonal timing of exports of weaned calves from Southwestern ranches to the Texas High Plains for feeding and finishing. Thanks to the New Mexico Livestock Board, Texas Animal Health Commission, and the Arizona Department of Agriculture for collecting and providing such useful data. Meanwhile, Dr. Al Rotz of USDA-ARS continues to engage with ranchers and feedyard producers to inform the Integrated Farm Systems Model, which will be used to estimate net returns and environmental footprints of multiple production approaches. In addition, new team member Dr. Anastasia Thayer, an Assistant Professor at Utah State University has partnered with Dr. Gregory Torell of New Mexico State University to develop a "non-linear dynamic mathematical programming model" to evaluate future cattle, wheat, and corn profitability in the Texas High Plains while accounting for declining levels of the Ogallala Aquifer and a changing climate. That model is designed to examine the impacts of heritage genetics on water use in feedyards in the Texas High Plains, and the impacts of the choice between grass-finishing in the Southwest and grain-finishing in the Texas High Plains. The Supply Chain Options Team holds monthly meeting with a team of experts who provide guidance on the development of research, as well as advice on how to best present our results to our stakeholders who include producers, industry leaders, and policy makers.

Extension

Come Rain or Shine Podcasts

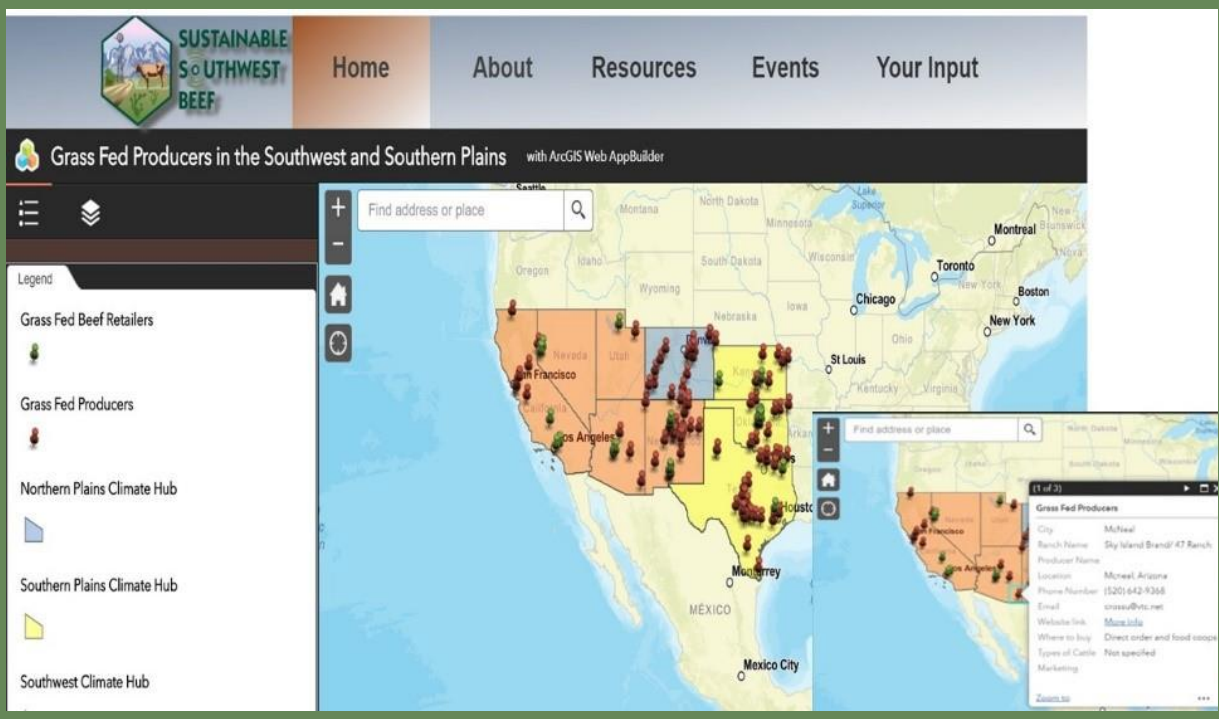
The Sustainable Southwest Beef Project is a 5-year project funded by USDA National Institute of Food and Agriculture, Agriculture and Food Research Initiative's Sustainable Agricultural Systems (SAS) program, grant #2019-69012-29853. Here Drs. Sheri Speigal and Andres Cibils discuss the goals and objectives of the project, the collaborations and partnerships, and some of the planned research and project outputs. There may even be some surprising findings for the links between cattle production practices and the environment. Listen here.

From smartphones to remote-controlled home appliances, the "internet of things" is everywhere. In this episode, Dr. Tony Waterhouse, professor emeritus at Scotland's Rural College (SRUC) discusses virtual fencing, animal location/movement sensors, and other cutting edge precision ranching technologies either in the making or currently being introduced and tested for sheep and cattle ranching operations. Listen here.

Knowledge Co-production – Alternate Supply Chain Options for Beef Production

On July 30th, 2020, The Sustainable Southwest Beef Project collaborated with New Mexico State University Cooperative Extension Services to host a webinar on direct marketing beef from the ranch. This webinar was arranged in direct response to requests from producers who are encountering difficulties marketing their cattle through their usual supply chain routes due to COVID-19 related disruptions and processing-plant bottlenecks. Advisory board member Cindy Tolle shared her experiences in direct marketing to the food service industry, pricing tips and tools, and how she's been creative to get her cattle processed with the backlog at packing plants. Other speakers for the evening included Jeff Witte, Secretary/Director of New Mexico Department of

Agriculture, Mike Callicrate, and NMSU Extension Livestock Specialist Dr. Marcy Ward. The webinar was attended by around 80 participants, and the recorded version is available for viewing here: https://nmbeef.nmsu.edu/covid-19.html.



While recent COVID-19 supply chain disruptions have cornered many producers unexpectedly into a position of being a grass-fed beef producer marketing direct to consumers, many others were doing this well before the pandemic hit. Still others may continue to market grass-fed beef from their ranch as a new avenue even after supply chains return to pre-pandemic operations. The Extension – Knowledge Co-production team has been working to better understand the characteristics of grass-fed operations in the southwest and southern plains regions. Through a survey distributed to grass-fed beef producers, the team hopes to build a better picture of what grass/rangeland/forage-finishing in these regions looks like, and make this information available to producers who might be interested. The results of the

survey will also help guide the types of information that the project produces by creating a better understanding of the needs of producers in the region. As part of this work, Joel Cisneros who worked with the team over the summer created a dynamic map (https://southwestbeef.org/grass-fed-beef) of grass-fed beef producers in the southwest and southern plains regions. If you would like to add your operation to the map, or would be willing to participate in the survey (results will not be linked to the map) please contact Skye Aney (sierra25@nmsu.edu).

Breed Selection

One goal of the SW Sustainable Beef Project is to understand what factors drive breed selection in SW cattle operations as well as identify barriers to changing breeding strategies. The SW Sustainable Beef Project team developed an extensive survey to quantify these factors, and, to date, approximately 115 surveys have been returned. Though survey responses are still being solicited, below is a summary of the information obtained thus far.

Table 1: Demographic and general production characteristics

Survey Question	Response
Average Producer Age	59 years
Average Experience	19 years
Total Acres Managed (sum of all respondents)	1.8 million Acres
Average Herd Size (highly variable)	261 Head
Average Calf Weaning Weight	550 Pounds
Average Percent Calves Weaned	89%
Predominant Production System	72% Commercial Cow/Calf Operation
Predominant Breed	45% Angus

General Bull Purchasing Considerations

52% of respondents indicated drought influences their breed selection, and

48% reported that drought has forced them to lose valuable genetics through destocking. Approximately 50% of responses indicated that bull purchases were via private treaty and most bulls were purchased at 18 months or younger (76%). Approximately 50% or respondents indicated they purchased bulls from out of state.

Bull Characteristics

Structural soundness/confirmation was selected as either the most important or second most important characteristic influencing bull buying decisions by 78% of respondents. Expected progeny differences (EPDs) were the second leading characteristics driving bull selection with nearly 60% of producers ranking EPDs in the top 3 factors influencing their bull purchasing decision. Breeder location had the least impact on bull purchasing decision with 62% of respondents ranking breeder location in the bottom 3 factors influencing their bull purchasing decision. Genomically-enhanced EPDs, EPD accuracies, bull's sire or dam, and bull breeder reputation/relationship demonstrated highly variable rankings in terms of importance. Birth weight (BW), calving ease direct (CED), and weaning weight (WW) were the top 3 most important EPDs.

Considerations for Changing Breeds

Survey questions regarding breed selection and limitations to changing breeds were open-ended and producers entered their individual responses. From those, general trends were detected across the responses. Breed complementary or compatibility were mentioned as the main considerations for changing breeds and several comments centered on uniform calf crops and marketability. With respect to limitations to changing breeds, comments were less uniform. Some common themes with changing breeds were concerns with marketability, uniformity, docility, and adaptation to the harsh

environment.
Though beyond the scope of this newsletter, the survey also solicited information regarding ranch enterprise characteristics, bull and herd health management practices, calf marketing information, and breeding season/reproductive management. The results observed through 115 responses are encouraging that the survey will yield valuable benchmarks and information for SW beef producers.

Early Career Discussion Group - Carolina Brandani

The SW Beef Discussion Group has been conducted twice a month since June 2020 by graduate students and postdocs on the SW Beef CAP project. The virtual meeting fosters communication, creates opportunities for multidisciplinary interactions, and promotes an exchange of ideas among the diverse group of students. Members take turns leading discussion topics to keep students informed about other areas of the project and identify potential synergies. Most members are geographically distant, and the zoom meetings keep the group familiar/aware of the ongoing projects. The multidisciplinary group creates a great opportunity to transmit knowledge from all fields of the SW Beef CAP project.

Future leaders in sustainability of Southwestern rangelands – Dr. Carolina Brandani, Danielle Duni, Emilia Linley, Dr. Mark Masumba, Matthew McIntosh, Dr. Shelemia Nyamuryekung'e, Keegan Taylor. *Not shown: Micah Funk, Qixu Gong.*

See a short bio of the students and postdocs that have joined the meetings below:

Danielle Duni is an M.S student working with Dr. Cibils on the breed comparison study with Criollo (heritage genetics) and traditional English breeds. Her work involves GPS collars on cattle and diet observations.

Micah Funk joined the SW Beef CAP project in the fall of 2020 as an M.S student in the Department of Animal and Range Sciences at NMSU to work with Dr. Cibils's team on the impact of Raramuri Criollo cattle on rangeland vegetation.

Keegan Taylor is an M.S student in the Department of Animal and Range Sciences at NMSU working with Dr. Craig Gifford in the project related to the Using Corriente Cows as Recipients for Embryo Transfer.

Emilia Linley is a program leader of the special projects at the Asombro. She works on the development of lessons for the Southwest Beef CAP to increase K-12 students' science literacy and knowledge about novel strategies to increase the sustainability of beef production systems and provide teaching and learning strategies and ready-to-use lessons to educators through professional development workshops.

Matthew McIntosh is a graduate research assistant in the Department of Animal and Range Sciences at New Mexico State University (NMSU). He works on the breed comparison team investigating livestock behavior, production, and animal-plant interactions of Brangus vs Criollo cows, as well as on the precision ranching team, where he's helping to develop real-time telemetric tools for extensive ranching applications.

Qixu Gong is pursuing his Ph.D. degree under the guidance of Dr. Huiping Cao in Computer Science at NMSU. He is responsible for designing and implementing the algorithm and the system in the team, such as dashboard design, big data analysis, machine learning, etc.

Dr. Shelemia Nyamuryekung'e is a postdoctoral researcher at New Mexico State University - Department of Animal and Range Sciences and contributes to the Precision Ranching and Breed Comparison research with his expertise in deployment and analysis of wearable telemetry devices like GPS collars, Proximity loggers, and thermal loggers.

Dr. Carolina Brandani is a postdoctoral research associate at New Mexico State University - Department of Animal and Range Sciences. Her research is focused on evaluating soil attributes and vegetation composition in rangelands of the Western United States comparing the environmental footprint of different cattle breeds.

Dr. Mark Musumba is an agricultural economist. He has been working on the integrated metacoupled approach to evaluating grass-finished beef supply chain options, aiming to identify trade-offs and synergies over a range of future scenarios (adoption of grass-finishing cattle).

Welcome!

Micah Funk is an M.S student in the Department of Animal and Range Sciences at NMSU and will work with Dr. Cibils's team on the impact of Raramuri Criollo cattle on rangeland vegetation.

Tony Spence, a radio communications engineer, joined the team in April to help troubleshoot communication problems at the CDRRC.

Dr. Ana Thayer, Utah State University agricultural economist joined the Supply Chain modeling team.

Huiying Chen is a PhD student in Computer Science who will be working with Dr. Huiping Cao and Zach Winkler is an MS student in Electrical Engineering working with Dr. Laura Boucheron. Huiying and Zach will be working with the precision ranching team developing sensor data analytics and the rancher dashboard.

Coury Dorn is a Graduate Research Assistant with the USDA Southwest Climate Hub, Jornada Experimental Range. He is assisting with the expansion of knowledge and cataloging of decision support tools that are applied to beef production and consumption.

Kudos

Congratulations to Dr. Shelemia Nyamuryekung'e who completed his doctoral studies in July and began working as a postdoc, playing a key role on the precision ranching team.

Dr. Andres Cibils was selected by USDA National Institutes of Food and Agriculture as a National Program Leader. While we will miss him sorely when he leaves NMSU in January, we look forward to his leadership and support in this new role.

Congratulations to Joel Cisneros who developed the grass-finishing geo-database and map with the Extension team. He recently accepted a permanent position with White Sands Missile Range as a GIS specialist.

Reaching Out

Rancher input sought through Bull Management, Selection & Marketing Survey: https://nmbeef.nmsu.edu/bull-survey.html

Jean Steiner attended the Sustainable Ranchlands Roundtable in Jackson, Wyoming on August 25-26 and presented “Sustainable Southwest Beef Project: Tools for Ranch and Rangeland Resilience”.

Publications

Peer Reviewed

Spiegal, S., Cibils, A.F., Bestelmeyer, B.T., Steiner, J.L., Estell, R.E., Archer, D.W., Auvermann, B.W., Bestelmeyer, S.V., Boucheron, L.E., Cao, H., Cox, A.R., Devlin, D., Duff, G.C., Ehlers, K.K., Elias, E.H., Gifford, C.A., Gonzalez, A.L., Holland, J.P., Jennings, J.S., Marshall, A.M., McCracken, D.I., McIntosh, M.M., Miller, R., Musumba, M., Paulin, R., Place, S.E., Redd, M., Rotz, C.A., Tolle, C., Waterhouse, A., Anthony Waterhouse, 2020. Beef Production in the Southwestern United States: Strategies toward Sustainability. Frontiers in Sustainable Food Systems 4, 114. https://doi.org/doi: 10.3389/fsufs.2020.00114

Abstracts and Presentations

Nyamuryekung'e, S., A. Cibils, R. Estell, A. Gonzalez, M. McIntosh, S. Spiegal, D. Duni. 2020. Influence of monsoon rainfall events on movement patterns of Angus crossbred vs. Raramuri Criollo cattle on desert rangeland. ASAS-CSAS-WSASAS Annual Virtual Meeting & Trade Show, July 19-23, 2020. (Poster)

McIntosh, M., A. Gonzalez, A. Cibils, R. Estell, S. Nyamuryekung'e, S. Spiegal. 2020. A preliminary phenotypic characterization of Raramuri Criollo cattle. ASAS-CSAS-WSASAS Annual Virtual Meeting & Trade Show, July 19-23, 2020. (Poster)

Cibils. A. 2020. A system to monitor cattle in real time. NMSU Innovators in Agriculture Summer Camp (ages 15-18). July 18, 2020. (Virtual Presentation).

Upcoming Events

The project will present one session at the 2020 NMSU Beef/Livestock Research Update. Date to be determined in October or November. Stay tuned for more information.

December 2, 2020 - Producer seminar at the Clayton Livestock Research Center. Agenda and links will be sent later.

December 2-3, 2020 - Annual Meeting. Agenda and Zoom links to be sent later.

December 4, 2020 - Workshop with international partners on breed comparison study. Further information and links to be sent later.

Our mailing address is:
beefsw@gmail.com

This newsletter is based upon work that is supported by the National Institute of Food and Agriculture, U.S Department of Agriculture, under award number 2019-69012-29853, "Novel Strategies to Increase Sustainability of Beef Production Systems in the Western United States."

Sustainable Southwest Beef

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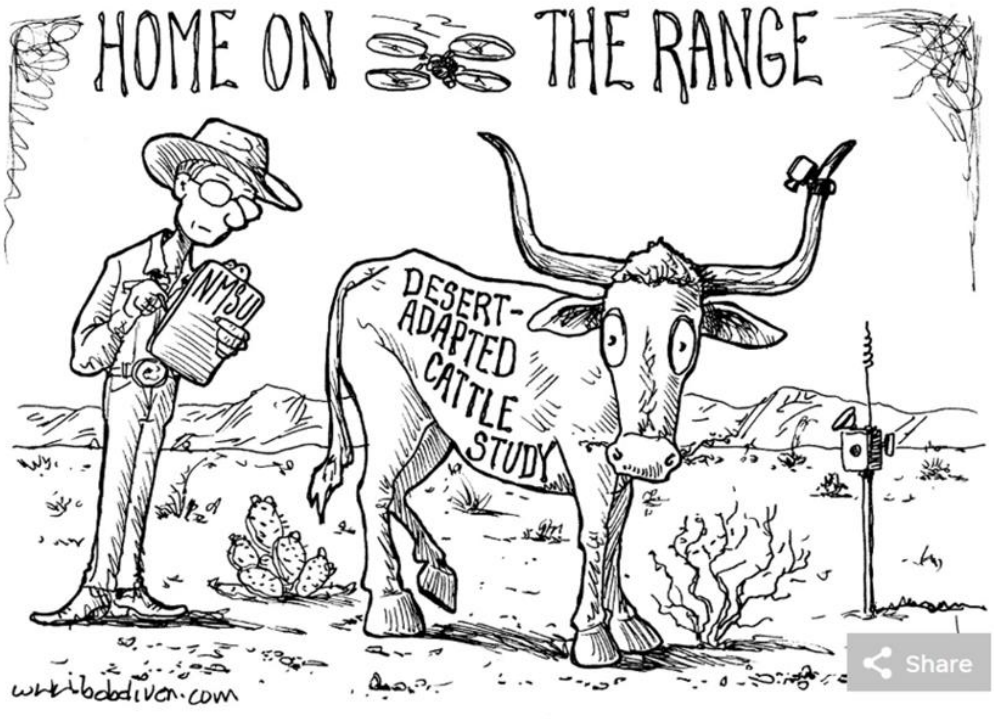
Sustainable Southwest Beef CAP Newsletter

February 2020



Editorial cartoon published Dec. 1, 2019
BOB DIVEN

A Message From The Leadership

Hello all:

Welcome to the first newsletter from the Sustainable Southwest Beef CAP project. We plan to distribute quarterly newsletters to the team and interested stakeholders in order to keep everyone informed about our progress and accomplishments.

This is an exciting 5-year project that brings together researchers and educators from New Mexico State University, Texas A&M University, USDA Agricultural Research Service, Scotland's Rural College as well as ranchers, The Nature Conservancy, and STEM education non-profit organizations to develop and deliver new technologies to enhance sustainability of beef production in this region as well as education for the next generation of researchers, educators and consumers. Since the project was started on August 1, 2019, we have established subcontracts with all of the research, extension, and education partners.

We held our first face-to-face team meeting in Las Cruces in conjunction with the Jornada Symposium on October 23-24, where many of us met for the first time. Team leaders had a chance to share their plans and status with the group as a whole while also having intensive planning time within groups to firm up year-one plans. Some of our students and post-doctoral researchers had already joined the team and were able to participate, while many others will be brought on board throughout the project.

The Extension team came out of the Las Cruces meeting with an ambitious plan to have the first engagement of ranchers and feedlot finishers at the Texas-New Mexico Southwest Beef Symposium in Amarillo on January 29-30. In preparation for that symposium, they finalized three fact-sheets that

describe key aspects of our project that are now available for distribution to stakeholders.

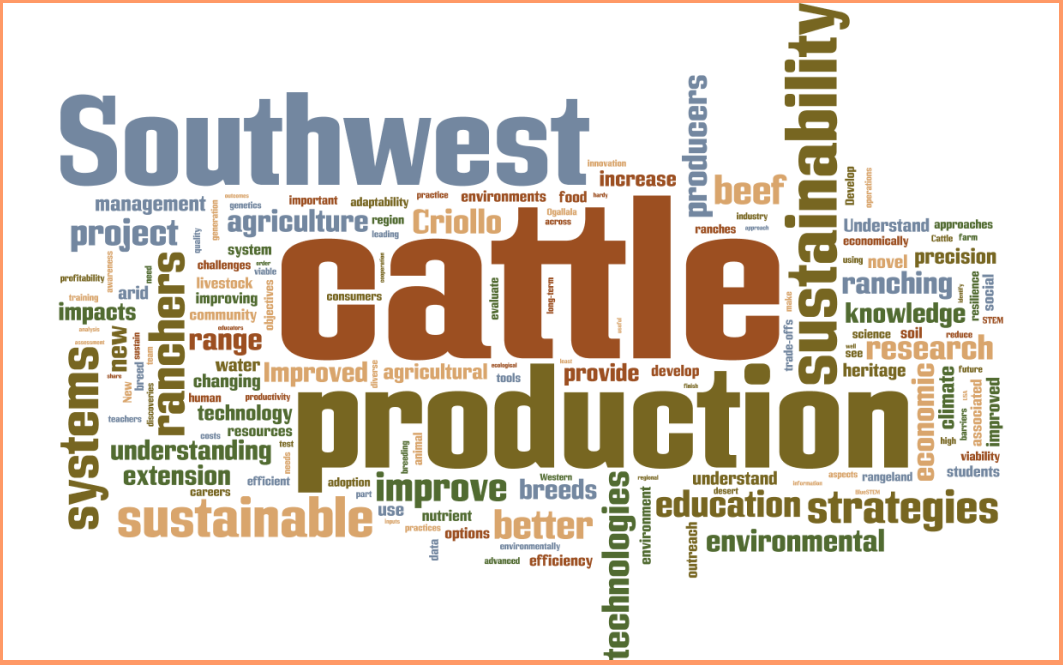
A particularly exciting hire was Melissa Spence who joined the team as our Coordinator on January 2. Melissa came to us from the Athletic Training Program, College of Education at NMSU.

Work is underway across the project – some of which is described below and some of which will be highlighted in upcoming newsletters. Jean Steiner and Melissa Spence will co-edit the newsletters, so please keep them informed about new team members who come onboard, events that are organized, team updates, publications, or other information that can be shared.

Thanks to all for the hard work underway and I look forward to great things to come from our collaboration.

In September, the Southwest Beef CAP steering committee launched a survey to gather project team members' thoughts and perspectives on the purpose and values of the project. The goal of the survey was to provide information to assist in creating Southwest Beef CAP vision and mission statements. Vision and mission statements can be used to communicate the goals and purpose of a project and assist with strategic planning. The web-based survey was developed collaboratively with the Office of Educational Innovation and Evaluation (OEIE) and sent to 31 project team members. Overall, 19 people responded to the survey for a 61.3% response rate. OEIE analyzed the survey data and presented themes of the results during the Southwest Beef CAP Kick-Off Meeting on October 24, 2019 in Las Cruces, New Mexico. Survey data was also used by the OEIE evaluation team, at the request of the steering committee, to create the word cloud below. Word clouds are a way to visualize or display text data in terms of word usage and frequency. In this word cloud, the size of the word

denotes the frequency with which the word (or concept) appeared in responses, with more common responses represented as larger text. Results from the survey are being used by the steering committee to develop mission and vision statements for the Southwest Beef CAP and will be used on the project website as a graphic representation of the project's vision and mission.



Amarillo Kick-Off Meeting - January 22-23, 2020.

In January the Sustainable Southwest Beef CAP team had its kickoff outreach event at the Southwest Beef Symposium. The symposium, held in cooperation with New Mexico State University and Texas A&M University, was attended by approximately 125 ranchers, exhibitors, and speakers. Symposium attendees came from a number of different states, some from as far as California, Illinois, and Missouri. Among those at the symposium were ranchers, feedlot operators, and a variety of others connected to the beef cattle industry. During the Sustainable Southwest Beef project sponsored dinner, symposium attendees heard talks on heritage genetics, precision ranching and alternative supply chain options. Producers completed a baseline survey that will guide the project over the next five years. Project director, Dr. Andres Cibils of NMSU, and producer Cindy Tolle of Evergreen Ranching and Livestock LLC introduced the project. Other

team members -- Dr. Emile Elias, Dr. Jean Steiner, Dr. Craig Gifford, Dr. Brent Auvermann, Skye Aney, Keegan Taylor, Dr. Kristy Ehlers and Ann Marshall -- were on hand throughout to answer questions. Our exhibit table had quite a few visitors who asked questions and showed interest in the project. Hats off to Craig from the Extension team who helped to plan and organize the symposium – no small task! A big thank you also to everyone else who helped make this event a success. Whether it was preparing and delivering talks, manning the exhibit table, or working behind the scenes, it took a real team effort to make this event successful, so congratulations and well done team!

Jornada Symposium - October 2019

The 2019 Jornada Symposium was held at the Jornada Experimental Range on October 23, 2019. Over 100 scientists, land managers, producers, and students attended. Following the presentations, attendees from various disciplines, generations, and countries gathered to reflect on the day. They explored the murky, but critical, topic of sustainability: what it is, how it

should look into the future, and where the Jornada can improve achieving it. Sustainability, or meeting societal needs without compromising ecological or economic integrity, is vital to ensuring harmony among people and the environment now and for generations to come. Attendees noted how change – whether on the landscape, in climate, or among people – can challenge the prospect of sustainability, requiring solution-based thinking to adapt successfully to an increasingly variable world. They assessed the trade-offs associated with management solutions presented throughout the day, such as the challenges of creating a market for Criollo cattle breeds, identifying incentives for operators to make the switch from other breeds, and the feasibility of maintaining livestock-based lifestyles. While no solution is ironclad, attendees agreed that sustainability concerns should guide innovations, technologies, and collaborations at the Jornada. As we look forward, attendees urged us to accelerate information sharing and idea implementation to ensure that the public is ready for the future's challenges.

Laura Burkett (Ecologist) Long-term vegetation change and restoration in the Chihuahuan Desert.

Matt McIntosh (NMSU Graduate Student) and Alfredo Gonzales (Animal Scientist) present Precision Ranching Hardware. LoRa GPS trackers for cattle, LoRa drinker level sensor, LoRa antenna and gateway.

Asombro Institute for Science Education

New Classroom Lesson Teaches 3rd Graders about Raramuri Criollo

“Can we play the game again, and can I be a criollo next time?” the third grader eagerly asked the Asombro Institute for Science Education educator. This student and his classmates had just participated in an outdoor game that models foraging behavior of Raramuri criollo and Angus cows foraging in an arid environment. The seven- and eight-year-olds quickly realized what scientists and ranchers have learned: that Raramuri criollos’ ability to travel farther from water sources gives them an advantage, especially when

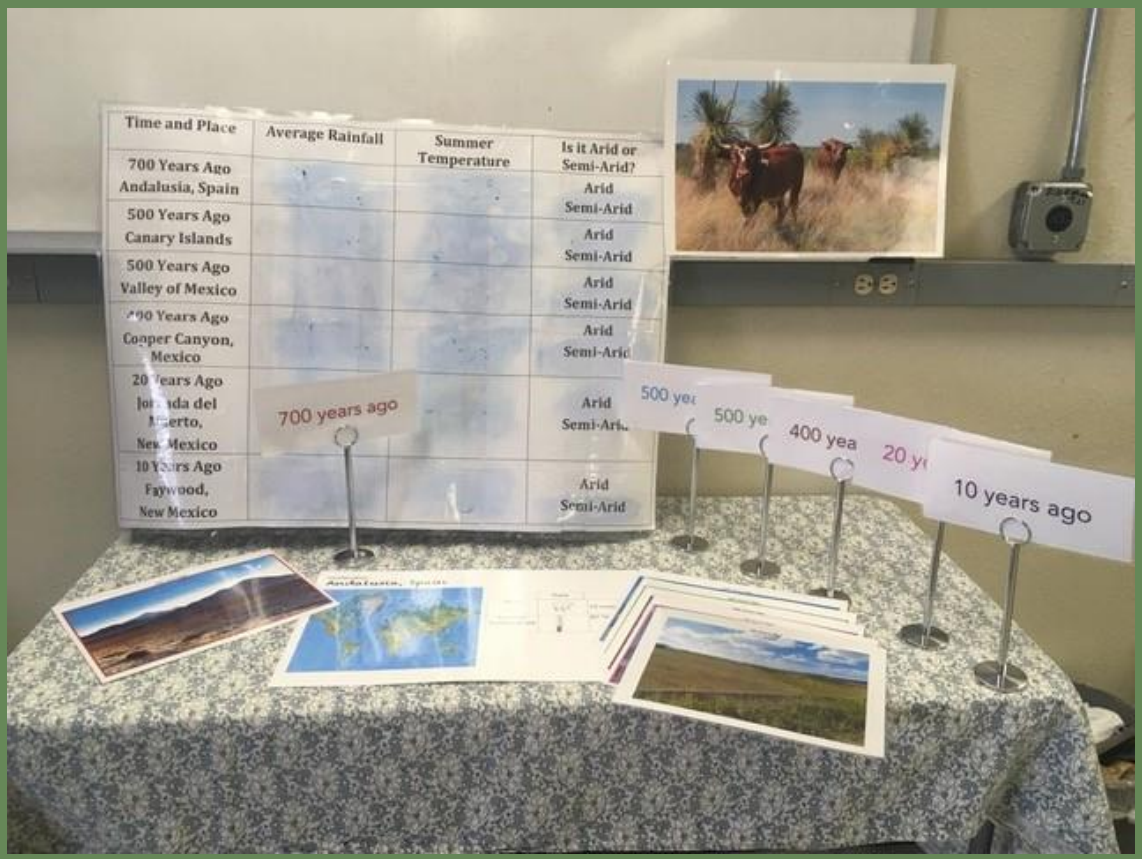
resources are scarce.

This is one of the three activities students participate in during the one-hour lesson developed by Asombro as part of the Southwest Beef CAP project. Students also learn about everyday products that come from cows and then "time travel" to different places and times to trace the history of the criollo from Spain to New Mexico. The entire lesson is aligned with a 3rd grade standard from the Next Generation Science Standards: "use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing."

So far, more than seven classes of 3rd graders (126 students) have participated in the new lesson, which has been met by rave reviews from both students and teachers. One teacher wrote, "Excellent program. Love all the interaction. Super engaging!"

Our education team is now putting the finishing touches on a field trip activity that will introduce students to criollo at the Jornada Experimental Range and then engage them in activities to learn about trait differences. We are excited to develop a total of ten lessons that teach K-12 students about the research methods and discoveries of the Southwest Beef CAP project.


AM ANGUS
TEAM CRIOLLO


Time and Place
Average Rainfall
Summer Temperature
Is it Arid or Semi-Arid?
700 Years Ago Andalusia, Spain
Arid
Semi-Arid
500 Years Ago Canary Islands
Arid
Semi-Arid
500 Years Ago Valley of Mexico
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Arid
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700 years ago
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Kudos

Congratulations to Emile Elias, our Extension team co-leader, who was selected as the USDA Southwest Climate Hub Director, and to Sheri Spiegal, Co-Project Director, who started a new position with the USDA-ARS Rangeland Management Research Unit in Las Cruces.

Congratulations to Andres Cibils, our Project Director, who received the New Mexico Section of the Society of Range Management 2019 President's Award for 'Outstanding Teacher, Mentor, and Scientist'.

Reaching Out

Malpai Bordelands Group Science Conference. Rodeo, NM. January 9, 2020. Presentations by Shelemia Nyamuryekung'e on *Criollo cattle: Landscape use, heat tolerance, mothering style & range finishing* and Cindy Tolle on *Sustainable Southwest Beef Project using the Integrated Farm System Model*.

National Agricultural Research, Extension, Education and Economics Advisory Board Meeting. Jornada Experimental Range. Las Cruces, NM. January 29, 2020. Andres Cibils presented an overview of the *Sustainable Southwest Beef CAP Project.*

New Mexico Section of the Society for Range Management Winter Meeting. Las Cruces, NM. January 31, 2020. Shelemia Nyamuryekung'e presented *Why Do Criollo and British Beef Breeds Use Chihuahuan Desert Landscapes Differently?* and Matthew McIntosh *Novel Strategies to Increase Sustainability of Beef Production Systems in the Western United States.*

Publications

Three fact sheets were developed by the Extension Team to describe our project to stakeholders. Links to the pdf files are here:

Raramuri Criollo
Precision Ranching
Supply Chain Options

Peer-reviewed:

1. Nyamuryekung'e, S., A.F. Cibils, R.E. Estell, D. VanLeeuwen, C. Steele, O. Roacho Estrada, F. Rodriguez Almeida, A. Gonzalez, S. Spiegal. 2020. *Do young calves influence movement patterns of nursing Raramuri Criollo cows on rangeland?* Rangeland Ecology and Management 73:84-92.

Proceedings paper:

1. A. Cibils, R. Estell, A. Gonzalez, S. Spiegal, et al. 2019. *El rol del bovino Criollo Raramuri como herramienta de adaptación al cambio climático en los desiertos del SO de los EE.UU*. XII Simposio Internacional de Recursos Genéticos para Las Américas y el Caribe. December 8-11, Rocha, Uruguay, p. 22.

Presentations:

1. Cibils, A. *Sustainable Southwest Beef Project.* Southwest Beef Symposium. Amarillo, Texas. January 22-23, 2020.
2. Tolle, C. *The Sustainable Southwest Beef CAP and producers: How we can help each other.* Amarillo, Texas. January 22-23, 2020.

3. Cibils A. et al. *Foraging behavior of Criollo vs. beef cattle breeds on rangeland.* Southwest Beef Symposium. Amarillo, Texas. January 22-23, 2020.

Upcoming Events

Tony Waterhouse, SRUC (Scotland's Rural College), will present a seminar, "*What might the future be for precision beef farming technologies?",* New Mexico State University, Wooton Room 105, **February 25, 2020**, at **12:00 pm**. Meeting will be accessible through Zoom.
Join Zoom Meeting
https://zoom.us/j/418882804?pwd=V3I5UmtFWjJXNVcwVDVmaklXZi9HQT09

Meeting ID: 418 882 804
Password: 420488
One tap mobile
+14086380968,,418882804# US (San Jose)
+16699006833,,418882804# US (San Jose)

Dial by your location
+1 408 638 0968 US (San Jose)
+1 669 900 6833 US (San Jose)
+1 646 876 9923 US (New York)
Meeting ID: 418 882 804

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