

**Testimony of Kimberly R. Stackhouse-Lawson, Ph.D.**

**on the issue of**

**“Sustainability in the Livestock Sector: Environmental Gain and Economic Viability”**

**before the**

**U.S. House Committee on Agriculture  
Subcommittee on Livestock and Foreign Agriculture**

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Chairman Costa, Ranking Member Johnson and Members of the Subcommittee, thank you for inviting me to speak to you today. I am Kim Stackhouse-Lawson, Director of AgNext and a Professor of Animal Sciences at Colorado State University. AgNext at Colorado State University is a leader for research in animal and ecosystem health while enhancing profitability of the supply chain and serves as the crossroads for producers, industry partners, and researchers to come together to innovate real-time solutions for sustainability in animal agriculture. Our research focuses on advancing the science of animal agriculture to ensure a continued safe, secure, and nutritious food supply. Our mission is to identify and scale innovation that fosters the health of animals and ecosystems to promote profitable industries that support vibrant communities.

Prior to leading AgNext, I served as the Director of Sustainability for JBS USA where I was responsible for coordinating the company's corporate sustainability program and strategy. In this role, I served as the Chair of the U.S. Roundtable for Sustainable Beef. Prior to my time with JBS USA, I was the Executive Director of Global Sustainability at the National Cattlemen's Beef Association where I developed the beef checkoff sustainability research program and the U.S. Roundtable for Sustainable Beef. I believe strongly in engaging with the value chain and demonstrate this commitment through active leadership that fosters strong private-public partnerships.

### **Livestock Agriculture is a Complex System**

Due to the complexity and importance of animal agriculture systems, we must consider interactions and potential unintended consequences of solutions towards enhanced sustainability. Sustainability may be best described as a "wicked" problem as no definitive formulation of the problem exists. It does not have one solution and stakeholders often have different frames of reference or perspectives (Kebreab, 2013). An integrated science-based approach is necessary when assessing sustainability, where multiple aspects of the system should be considered to understand the tradeoffs when the system is altered. For example, those solutions developed to reduce greenhouse gas emissions, should only be implemented if they do not sacrifice (and ideally improve) different ecosystem elements. Those elements include, but is not limited to, land, air, and water quality, water use, food security, animal health and well-being, worker safety and satisfaction, impacts on public health, racial and gender equality, and value chain profitability. We must consider unintended consequences and trade-offs as we start to explore sustainability in livestock systems.

### **Sustainability Defined**

Sustainability is a term used across many industries and it has increased in interest and research over the last 20 years. However, the complex nature of sustainability and its varying interpretations makes a definitive definition elusive. In the broadest of terms, it can be defined as meeting the needs of the society today, without compromising the ability of future generations to meet their needs (EPA, 2021). However, over the past decade the most cited definitions of sustainability have advanced to include the three pillars: social, economic and environmental. Each pillar is dependent on the other and no one pillar is more important. The overlap between the pillars (socio-economic, eco-environmental, and socio-environmental) are equally critical to

prioritize because it is within these complexities that systems must function (see Figure 1). Further complicating this topic is the importance that an individual places on the different aspects of sustainability, which adds an emotional element. Generally, sustainability includes aspiration focused on continuous improvement across all aspects; however, measuring and tracking that progress is challenging due to the complex nature of the topic itself.

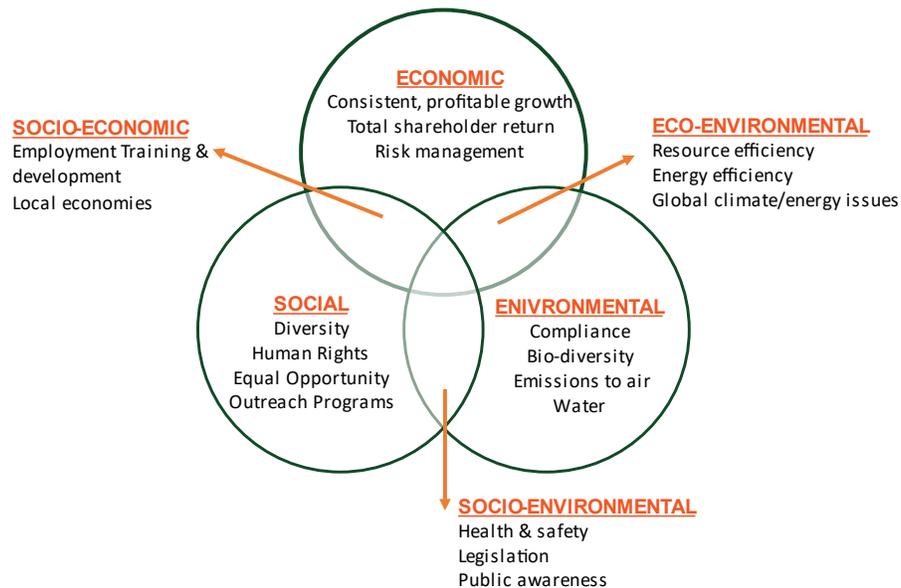


Figure 1: Schematic detailing the complexities of sustainability, please note this does not include an exhaustive list of metrics.

Further complicating this area of study, is the pace at which the space of sustainability is growing in importance. Many leading companies and industries have announced aggressive sustainability goals, including NetZero targets (defined as climate or carbon neutral) that will have real and lasting impacts on food systems as we know them today. Many of these commitments are directly in line with the recommendations released in the 6th assessment report from International Panel on Climate Change which suggests a crucial need to focus specifically on reducing global temperature through greenhouse gas (GHG) reduction. Additional research will be critical for the livestock industry to make progress toward GHG reductions.

### **Livestock’s Contribution to Food System Resiliency and Food Security**

In food production, sustainability is generally described alongside our need to feed a growing population. By 2050, our planet’s population will increase by 2.2 billion requiring food production to increase by 70%. Estimates suggest that animal agriculture production will need to increase 100% to ensure adequate nutrition to this rapidly growing population. There is no question that this will be the greatest challenge of our lifetime. Providing this nutrition and doing so within the bounds of our planetary resources in an equitable way should be our focus.

The livestock production system in the U.S. is based largely on family-owned ranches that produce beef, dairy and lamb. These livestock operations are a critical element of the affordable,

high-quality protein food production systems for domestic and international consumers. Particularly in the highly variable arid and semi-arid climates of the United States, the ability of ruminant livestock to convert non-human consumable forage to human-edible food on lands unsuitable for crop production presents an opportunity for sustainable intensification, while achieving multiple social-ecological objectives (Booker et al. 2013, Sayre et al. 2017).

Ranching-based livestock systems are the dominant land use in much of the North American Great Plains. These ecosystems have experienced less conversion to cropland compared to the wetter, more mesic systems of the eastern part (Augustine 2019) and represents largely intact native ecosystems still exist in western ecoregions. These ecosystems are suited to both livestock production and provision of multiple ecosystem services, including biodiversity and habitat connectivity, carbon sequestration, grassland bird habitat, and cultural services such as open space, tourism opportunities, and recreation.

Livestock food production is an essential food system; however, it is often criticized for its environmental impact, especially its impact on climate change. The critical nature and timeliness of ensuring food security and doubling food production while also meeting GHG emission reductions is no small task. We need to focus on solutions that also consider the social, environmental and economic tradeoffs and the impact that extreme decisions could have on the system as a whole. In sustainability, silver bullets do not exist, we must take a more inclusive a systematic approach to ensure we do not solve one problem and create three more.

### **GHG Impact from Livestock Systems**

The livestock accounts for 3.8% of U.S. greenhouse gas emissions and enteric methane accounts for approximately 30% of methane emissions in the U.S. (EPA, 2021). To curb continued increases in temperature, President Biden has committed to Net Zero emissions in the U.S. by 2050 and a reduction in methane emissions by 30% by 2030 relative to a 2020 baseline. Additionally, numerous food companies in the animal agriculture supply-chain have committed to NetZero emissions by 2040 or 2050 and there is further pressure from financial institutions and investors to demonstrate improved performance related to GHG emissions. However, minimal research on emissions from cattle has occurred in production environments or exploring the additive effect of current technologies, thereby necessitating a first step of baselining emissions of livestock in a production environment.

Over the past several decades, large improvements in production efficiency and land utilization have occurred in the livestock industry. This has been driven by innovations in feeding management and diet formulation, improvements in animal health and welfare, animal genetics and utilization of feed additives. Relative to 1977 production practices, cattle production produced 81% of the manure, 82% of the methane, and 88% of the nitrous oxide, all while producing more human edible protein with less animals (Capper, 2010). While sustainability has become a major focus recently, it is critical to acknowledge that this livestock industry has been dedicated to continuous improvement for several decades and has already set audacious net zero emission goals across multiple livestock sectors.

Livestock systems are incredibly diverse. There is tremendous variability across industries from dairies to ranches to feedyards and differences within each industry. Practices that are implemented on livestock operations in one region will vary greatly from another because of the resources available and climatic differences. For example, dairies in Pennsylvania are different than in Colorado. A ranch in Florida is distinctly different than a ranch in Idaho. Sustainable solutions for mitigating environmental impact will vary greatly based on the location, size and scale of the livestock operation. It is critical that the U.S. conducts research across multiple segments of the supply chain and across geographical regional differences so that we can develop solutions that are practical for the region, practical for farmers and ranchers to adopt, and applicable to that operation.

There is a significant gap in this research, especially related to livestock's contribution to climate change. Greenhouse gases from livestock are difficult to measure, and until the last decade scientists did not have a non-invasive method to quantify enteric methane emissions in production environments. This means that models utilized to quantify emissions were not developed from animals behaving normally and in normal environments. Furthermore, quantifying other important greenhouse gases related to livestock (ie. nitrous oxide) is extremely expensive and difficult due to the impact the weather conditions and topography can have on the ability to quantify these emissions. Filling this knowledge gap will allow both the livestock industry and climate scientists to have a better understanding of how food production interacts with the environment by improving the current models.

### **Economic Impacts from Livestock Systems**

Livestock producers, feeders and processors also play a critical role in the U.S. economy and support rural economies. A successful agriculture sector supports economic growth overall while also providing a safe and nutritious food supply. An additional component of this research must focus on scalable solutions that are also profitable for producers to promote economic growth, while ensuring that the food system can produce the amount of nutrient dense food that will be required to meet the nutritional needs of a growing population over the coming decades. As we move toward researching sustainable solutions for the livestock industry it is critical that any solutions generated are economically viable and scalable across a wide range of operations.

### **Sustainable Solutions in Livestock Systems**

The livestock industry and academic community are actively exploring how to effectively measure, validate and continually improve its overall sustainability in a holistic and comprehensive way. This is not easy as a one size fits all approach which is not applicable to biological systems like food production. Currently, there is limited access to federal funding, grants, and private investments to research sustainability and greenhouse gas emissions in livestock systems. The equipment needed to conduct this critical research is available, but in order to gain access to this cutting-edge technology more funding will be required to begin to thoroughly understand the baseline of GHG emissions from livestock systems.

Without a robust understanding of baseline emissions, producers and others along the supply chain are faced with the challenge to reduce emissions, but without an understanding of where to

begin, which makes it is nearly impossible to understand if mitigation strategies are effective. Pressure is being placed on producers to mitigate impact and they are being asked to adapt and reduce emissions without the appropriate tools that they need move as quickly as they are being asked to. It is imperative that solutions that are generated are scalable, economically feasible and practical for producers to utilize to encourage high adoption rates.

For enteric methane emissions, a high priority area is to establish baseline emissions and develop practical solutions for producers in grazing systems. These systems are the largest contributor to the footprint of the beef industry but most research on enteric methane reduction strategies occur in controlled feedlot environments and diets. This will require investment in research as emissions and production systems exist as gradient in grazing systems. Forage types, local weather/climate, and individual producer management decisions all influence the emissions from grazing animals.

Developing affordable methods in quantifying nitrogen loss to the environment is a crucial need for food production systems. While we understand how weather events influence nitrogen deposition, we need to improve methods for quantification of nitrous oxide emissions, ammonia emissions, and nitrogen leaching. The development of interventions that reduce nitrogen losses and improve nitrogen use efficiency has the potential to improve the sustainability of both livestock and cropping systems.

Today there is considerable interest in utilizing grazing systems to sequester carbon in the soil to offset emissions from the food supply chain. This includes various carbon markets being developed to incentivize producers to manage their landscapes in a way that improves carbon sequestration and soil health. While the literature does indicate this is possible, arid environments do not appear to have capacity to increase soil carbon stocks due to a lack of moisture. Furthermore, how grazing management influences soil carbon and soil health is very inconsistent. More work is needed to come to a scientific consensus on appropriate grazing management across different climatic gradients.

Often lost in the discussion of sustainable livestock systems is the suite of other ecosystem services that producers offer for society as stewards of the land. This includes culture and leisure, energy, water quality, managing for wildlife habitat, fuel reduction, and biodiversity. Investment in research that quantifies these benefits and offers economic returns to producers can help them improve the sustainability of their operations while providing benefits to greater society.

Climate change is going to have a major impact on our food supply chain. Currently, we expect to see positive changes such an increased growing season and increased forage production. However, we also expect increased climate variability, including the frequency of extreme weather events such as drought and flooding. These changes alone are going to challenge, and require improvements, in the adaptive capacity and resiliency of our producers and rural communities. With further market and political variability, producers need investment from public and private sources to improve their ability to navigate future challenges while continuing to provide a safe and nutrient dense food supply.

Public investing in the space of sustainability is rapidly increasing and evolving faster than ever before. This has led to companies across a multitude of industries, including agriculture, committing to a net-zero future. In his 2022 letter to CEO's, Blackrock CEO and President Larry Fink said "Every company and every industry will be transformed by the transition to a net zero world.... all markets will require unprecedented investment in decarbonization technology. We need transformative discoveries on a level with the electric light bulb, and we need to foster investment in them so that they are scalable and affordable. To develop a truly sustainable solutions all stakeholders need to be engaged and invested in the process, and this includes government entities and policy makers.

Thank you for the opportunity to testify before this panel. I would be glad to address your questions and I look forward to the discussion.

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# CURRICULUM VITAE

**NAME** Kimberly Rose Stackhouse-Lawson

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## **EDUCATION**

- |      |  |
|------|--|
| 2011 | Ph.D. Animal Biology, University of California, Davis.               |
| 2008 | M.S. Animal Biology, University of California, Davis.                |
| 2006 | B.S. Animal Science and Management, University of California, Davis. |

## **ACADEMIC POSITIONS**

(2020 to present) Director of AgNext and Professor of Animal Sciences, Colorado State University  
(2011 - 2012) Postdoctoral Fellow, Beef Cattle Institute, Kansas State University

## **OTHER POSITIONS**

(2016-2020) Director of Sustainability, JBS USA, Greeley, CO  
(2011-2016) Executive Director of Global Sustainability, National Cattlemen's Beef Association, Centennial, CO

## **CURRENT JOB DESCRIPTION**

0% Teaching 15% Research/Creative Activity 10% Service/Outreach 75% Admin

## **HONORS AND AWARDS**

2018, Distinguished Young Alumni, University of California, Davis

## **PUBLISHED WORKS**

### **Refereed Journal Articles:**

1. Dillon, J.A., K.R. Stackhouse-Lawson, G.J. Thoma, S.A. Gunter, C.A. Rotz, E. Kebreab, D.G. Riley, L.O. Tedeschi, J. Villalba, F. Mitloehner, A.N. Hristov, S.L. Archibeque, John P. Ritten, Nathaniel D. Mueller. 2021. Current State of Enteric Methane and the Carbon Footprint of Beef and Dairy Cattle in the U.S. *Animal Frontiers*. 11(4): 57-68.
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12. McGarvey, J.A., K.R. Stackhouse, W.G. Miller, L.H. Stanker, R. Hnasko, F.Mitloehner. 2011. The effects of sodium bisulfate on the bacterial population structure of dairy cow waste. *J. App. Micro.* 111:319-328.
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#### **Refereed Chapters in Books:**

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#### **Non-Refereed Journal Articles/Chapters/Proceedings/Transactions:**

1. Kutz, M., K. Stackhouse-Lawson, L. Thompson. 2021. Soil Carbon: What it is and Why it is important, posted online at [Soil Carbon: What it is and Why it is important | AgNext | Colorado State University \(colostate.edu\)](#)
2. Clark, S., L. Thompson, K. Stackhouse-Lawson. 2021. Ruminants as part of a sustainable agriculture system, posted online at [Ruminants as Part of a Sustainable Agriculture System | AgNext | Colorado State University \(colostate.edu\)](#)
3. Clark, S., L. Thompson, K. Stackhouse-Lawson. 2021. Benefits of Ecosystem Services in Agriculture, posted online at [Benefits of Ecosystem Services in Agriculture | AgNext | Colorado State University \(colostate.edu\)](#).
4. Thompson, L., K. Stackhouse-Lawson. 2021. IPCC Annual Report 6: Physical Science Basis, posted online at [IPCC Annual Report 6: Physical Science Basis | AgNext | Colorado State University \(colostate.edu\)](#)

5. Clark, S., L. Thompson, K. Stackhouse-Lawson. 2021. Sustainability and Animal Agriculture, posted online at [Sustainability and Animal Agriculture | AgNext | Colorado State University \(colostate.edu\)](#).
6. Clark, S., L. Thompson, K. Stackhouse-Lawson. 2021 Schools of Thought & Agriculture Sustainability, posted online at [Schools of Thought & Agricultural Sustainability | AgNext | Colorado State University \(colostate.edu\)](#)
7. Development of the [AgNext website](#), content and update content
8. 2019, 2018, and 2017 [JBS USA Sustainability Report](#) and the 2019, 2018, 2017 and 2016 [Pilgrim's Sustainability Report](#)
9. Stackhouse, K. 2015 How much water does beef really use? Beef Issues Quarterly, posted online at beefresearch.org
10. Beef Checkoff Sustainability Executive Summary. 2014. Printed 9,000 copies for distribution, posted online at beefresearch.org
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12. Beef Sustainability Infographic. 2014. Printed 20,000 copies and 1,500 posters, posted online at beefresearch.org
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17. Stackhouse, K. 2012. Meeting the growing demand for beef, sustainably. Beef Issues Quarterly, posted online at beefresearch.org
18. Mitloehner, F., Stackhouse, K. 2009. Clearing the air: livestock's contributions to climate change. Proceedings of the GABS II Conference, UC Davis

## **CONTRACTS & GRANTS**

### **Externally-Funded Project as PI**

(2021) National Beef Packing Sustainability Program. National Beef Packing Company, LLC, \$232,856.03

(2021) Influence of Propionibacteria Acidilactici on Short Chain Fatty Acid and Methane Production in Fistulated Beef Steers, Logan, Thompson, Octavio Guimaraes, Shawn Archibeque, John Wagner, and Terry Engle, MicroBios, Inc., \$62,371.91

(2021) U.S. Dairy Industry Inventory of Sustainable Practices, Logan Thompson, Pablo Pinedo, Dairy Marketing Institute, \$97,309

(2021) Roadmap to NetZero and development of rangeland grazing principles. Kevin Jablonksi, Logan Thompson, \$230,000

(2021) AgNext has received approximately \$1M in support of our program through donation of equipment and gifted research funds. Monetary support has been demonstrated by: Five Rivers Cattle Feeding (\$600,000 for research equipment), Midwest PMS (\$220,000 for research equipment), Rabo AgriFinance (\$150,000 for research), and C-Lock (\$30,000 for equipment). In-kind support for AgNext was demonstrated from the following organizations: Colorado Cattlemen's Association, Magnum Feedyard, Beatty Canyon Ranch, LeValley Ranch, Brackett Ranches .

### **Externally-Funded Projects as CoPI**

(2021) American Lamb Quality Audit and Assessment Project, Brad Morgan, Phil Bass, Chad Carr, American Lamb Board, \$129,000.

### **Externally-Funded Pending Projects as PI**

(2021) RaboAgrifinance Sustainability Scorecard Proposal, Logan Thompson, RaboAgrifinance, \$27,628.

(2021) How parasitic load impact methane emissions and nitrogen balance of stocker cattle, Logan Thompson, Frank Garry, Ashley McGrew, and Mesa Kutz. Merck Animal Health, \$158,457.50

(2021) Enteric Methane Emissions and Feed Efficiency of Steers Offered Lactipro. Logan Thompson, MS Biotec, \$110,986.86

(2021) Enteric methane emissions and nitrogen balance of steers offered a proprietary *Saccharomyces cerevisiae* fermentation product manufactured by Diamond, Logan Thompson, Terry Engle, Shawn Archibeque, Diamond V, \$119,351.92.

(2021) Proposed Year 1 and Year 2 Greenhouse Gas Benchmark and Mitigation Research Plan for the U.S. Fed Cattle Industry, Beef Alliance, \$500,000.

### **Externally-Funded Pending Projects as Co-PI**

(2021) Smart Farm: Optimizing Precision Data Access, Integration, and Translation into Improved Producer Decision Making, Pablo Pinedo, Kim Stackhouse-Lawson, Logan Thompson, Matt Wallenstein, Dan Zimerle, Stuart Reddick, Bryan Wilson, Keith Paustian, Kevin Jablonski, Jim Ippolito, Sangmi Pallickara, Shrideep Pallickara, Troy Bauder, Jay Ham, Eugene Kelly, Peter Kleinman. USDA NIFA: Farm of the Future. \$3,936,000.

### **Internally-Funded Awards**

(2021) The Reimagine Project: Building a High-Functioning Transdisciplinary Team Culture, Hailey Wilmer, John Sheehan, Jeni Cross, Frank Garry, Jasmine Dillon, Kevin Jablonski, Windy Kelley, Dannele Peck, Dave Pellatz, Travis Mulliniks, Ryan Rhoades, John Scasta, Mitch Stephenson, Dawn Thilmany, Justin Derner One Health Institute and School of Global Environmental Sustainability, \$10,000.

(2021) Decision support tools for Western Region Livestock Disease outbreak response: Pilot study of Colorado foot-and-mouth disease vaccination plan, Frank Garry, Reagan Adams, Logan Thompson, Kim Stackhouse-Lawson, Lindsay Beck-Johnson, Sangeeta Rao, Joshua Keller, Colleen Webb, Kevin Jablonski, Maggie Baldwin, CSU-Office of the Vice President of Research, \$199,095.00

### **Un-Funded Projects as PI or Co-PI**

(2021) Setting sensible guardrails for Scope 3 GHG accounting in the agriculture sector, John Sheehan, The Nature Conservancy, \$102,411.

(2021) Improving U.S. Beef Industry Resilience through True Cost Accounting, Becca Jablonski, Kevin Jablonski, Frank Garry, Ryan Rhoades, Jasmine Dillon, Michael Carolan, Naidia El-Hage Scialabba, Barbara Jackson, Barry Carpenter, USDA NIFA, \$10,000,000.

(2021) Quantifying ammonia emissions of a dietary supplement and pen surface intervention applied individually or in tandem to finishing beef cattle, Logan Thompson, Shawn Archibeque, Terry Engle, National Cattlemen's Beef Association and Elanco Animal Health, \$168,979

(2021) Defining Metrics to Assess Livestock-Based Regenerative Agriculture Practices. Sue VandeWoude, Lorann Stallones, Becca Jablonski, Danone, \$25,000.

(2021) Reimagining sustainability for ranching and rural communities in the Western Great

Plains (The Reimagine Project), Hailey Wilmer, John Sheehan, Jeni Cross, Frank Garry, Jasmine Dillon, Kevin Jablonski, Windy Kelley, Dannele Peck, Dave Pellatz, Travis Mulliniks, Ryan Rhoades, John Scasta, Mitch Stephenson, Dawn Thilmany, Justin Derner, USDA NIFA \$10,000,000.

(2021) Optimizing Carbon Management for Regenerative Crop and Livestock Systems through Integrated Biogeochemical, Social, and Economic Analyses, Matt Wallenstein, Nathan Mueller, Keith Paustian, Michael Carolan, Jasmine Dillon, Kelsey Ducheneaux, Dana Hoag, Dale Manning, Francesca Cortufo, Jennifer Soong, Jason Rowntree, Megan Machmuller, USDA-NIFA, \$10,000,000.

(2021) Net Zero Emissions through Re-Optimized Systems (NetZEROS), Tom Richard, Alexander Histroy, Juliana Vasco-Correa, Mary An Bruns, Heather Karsten, Carly Becker, Marty Matlock, Greg Thoma, Shawn Archibeque, Terry Engle, Joh Wagner, Sybil Sharvelle, Joceyln Lavalee, Arnab Bhowmik, Laurent Ahiablame, Kent Messer, Alan Rotz, Michel Cavigelli, USDA-NIFA, \$10,000,000.

(2021) Meat and Poultry Food Systems Resiliency Project, Jenn Rieskamp, Logan Thompson, USDA Meat and Poultry Food Resiliency Program, \$82,913.

(2021) Comparing animal productivity, land use efficiency, and Carbon/Nitrogen cycling in cropping systems with and without livestock integration, Logan Thompson, National Beef Packing Company, \$1,000,000.

(2021) Develop a ranch sustainability scorecard to enhance the sustainability of Kansas beef production, Logan Thompson, National Beef Packing Company, \$750,000.

(2021) Benchmarking and optimizing soil health metrics, ecosystem services, and greenhouse gas emissions across a gradient of management and locations in Kansas, Logan Thompson, National Beef Packing Company, \$2,000,000.

(2021) Monitoring and mitigation of N emissions from confined animal feeding operations, Logan Thompson, National Beef Packing Company, \$2,000,000.

(2021) Quantifying N and CH<sub>4</sub> emissions from finishing cattle implanted with a long-lasting implant (Revalor-XS), Logan Thompson, Merck Animal Health, \$170,954.

(2021) Impact of Safeguard with and without implants on animal performance, CH<sub>4</sub> emissions, and parasite load in stocker cattle, Logan Thompson, Merck Animal Health, \$125,850.

(2021) Diamond V Nature Safe Experiment 1, Logan Thompson, Cargill, \$123,228.03.

(2021) Diamond V Nature Safe Experiment 2, Logan Thompson, Cargill, \$212,877.82.

(2021) A Roadmap to a NetZero Colorado Beef Supply Chain. JBS USA. \$250,000.

(2021) Meat and Poultry Food Systems Resiliency Summit. USDA. \$82,819.

(2021) Exploring Microalgae for Methane Mitigation Experiment 1. Logan Thompson, Terry Engle, Shawn Archibeque, Tyson Foods. \$72,751.

(2021) Exploring Microalgae for Methane Mitigation Experiment 2a. Logan Thompson, Terry Engle, Shawn Archibeque, Tyson Foods. \$321,803.

(2021) Exploring Microalgae for Methane Mitigation Experiment 2b. Logan Thompson, Terry Engle, Shawn Archibeque, Tyson Foods. \$481,703.

(2021) Exploring Microalgae for Methane Mitigation Experiment 3. Logan Thompson, Terry Engle, Shawn Archibeque, Tyson Foods. \$198,000.

(2021) Exploring Microalgae for Methane Mitigation Experiment 4. Logan Thompson, Terry Engle, Shawn Archibeque, Tyson Foods. \$431,243.

(2021) Exploring Microalgae for Methane Mitigation Experiment 5. Logan Thompson, Terry Engle, Shawn Archibeque, Tyson Foods. \$271,826.

(2021) ILS Environmental Footprint Tool. Jasmine Dillon, Logan Thompson, ILS, \$175,346.77.

(2021) A Proposed Approach to lead in Sustainability, Sustainable Beef, \$83,405.

(2021) Develop a ranch sustainability scorecard to enhance the sustainability of Colorado beef production, Logan Thompson, JBS USA, \$750,000.

(2021) Benchmarking and optimizing soil health metrics, ecosystem services, and greenhouse gas emissions across a gradient of management and locations in Colorado, Logan Thompson, JBS USA, \$2,000,000

(2021) Monitoring and mitigation of N emissions from confined animal feeding operations, Logan Thompson, JBS USA, \$2,000,000

### **PAPERS PRESENTED/ SYMPOSIA/ INVITED LECTURES/ PROFESSIONAL MEETINGS/ WORKSHOPS**

1-5-21, Sustainability: Opportunities and Challenges for the Beef Industry, Beef University, virtual\*

12-16-21, AgNext: Sustainable Solutions for Animal Agriculture, Tyson Food, Fayetteville, AK\*

12-9-21, The Changing Sustainability Landscape, American Gelbvieh Association National Convention, Oklahoma City, OK\*

12-1-21, Looking toward the future: How do we build consensus and fill gaps? AgNext Research Summit, Fort Collins, CO\*

11-30-21, Sustainability: Opportunities and Challenges for the Food Supply Chain, CattleFax Outlook and Strategies Seminar, Denver, CO\*

11-19-21, The Changing Sustainability Landscape, Colorado Farm Bureau Ag is Always Open 2021 Annual Meeting, Denver, CO\*

11-18-21, Greenhouse Gases and Genetic Selections, American Hereford Association Research Direction Meeting, virtual\*

11-15-21, Sustainability in Animal Agriculture: Walk the Talk, Merck Sustainability and Animal Welfare Advisory Council Meeting, Orlando, FL\*

11-12-21, Sustainability in Animal Agriculture: What's Ahead? JBS USA Cattle Buyers Annual Management Meeting, Grand Island, NE\*

11-5-21, AgNext: Sustainable Solutions for Animal Agriculture, CSU Fall Focus Engagement Collaborative Conversations, Fort Collins, CO\*

10-28-21, Opening Remarks, Protein PACT Summit, San Antonio, TX\*

10-28-21, Sustainability on the Farm Supply Chain Partners Discussion, Protein PACT Summit, San Antonio, TX\*

10-26-21, AgNext: Sustainable Solutions for Animal Agriculture, Michigan State University Regenerative Agriculture Meeting, East Lansing, MI\*

10-21-21, AgNext: Sustainable Solutions for Animal Agriculture, Visit from Danone, Fort Collins, CO\*

10-20-21, AgNext: Sustainable Solutions for Animal Agriculture, Visit from Representative Boesenecker, Fort Collins, CO\*

10-18-21, Sustainable Solutions for Animal Agriculture, Cattle and Sheep Symposium Western Section of American Society of Animal Science, Fort Collins, CO\*

10-16-21, Sustainability in Animal Agriculture: What's Ahead, 2021 Young Farmer & Rancher Leadership Conference, Bozeman, MT\*

10-14-21, Making Milk Greener, Connect Summit, virtual\*

10-11-21, Greenhouse Gas Emissions from Feedyards and Other External Pressures to Consider, Five Rivers Cattle Feeding Executive Committee and Board Meeting, Loveland, CO\*

10-7-21, Sustainability and Innovation in the Livestock Industry, Colorado Plateau Science and Management Forum & Colorado Section of the Society for Range Management 2021 Meeting, Grand Junction, CO\*

10-6-21, An Update on the Sustainability Landscape for Animal Proteins, Animal Science General Seminar,

Fort Collins, CO\*

10-1-21, Greenhouse Gas Emissions from Feedyards and Other External Pressures to Consider, K-State and Syngenta Sustainable Livestock Dialogue, Manhattan, KS\*

9-29-21, Update on AgNext Program, CSU Soil and Crop Science and Ag Bio Departments, virtual\*

9-28-21, Update on AgNext Program, CSU Board of Governor's Presentation, Fort Collins, CO\*

9-23-21, Update on AgNext Program, FFAR, virtual\*

9-22-21, Food Security and Beef's Path Forward to Feeding the World, Beef Leadership Summit Webinar, virtual\*

9-15-21, An Update on the Sustainability Landscape, Progressive Beef Board of Directors, virtual\*

9-14-21, Sustainable Solutions for Zero Hunger by 2030: A Vision for Animal Agriculture Conference, virtual\*

9-10-21, An Update on the Sustainability Landscape, Indiana Stockmanship and Stewardship, Indianapolis, IN\*

8-30-21, Defining Sustainability Panel, iFeeder sustainability webinar, virtual\*

8-26-21, An Update on the Sustainability Landscape, U.S. Meat Export Federation Latin American Showcase, Costa Rica\*

8-25-21, An Update on the Sustainability Landscape, Certified Angus Beef Feeder Quality Forum, Fort Collins, CO\*

8-24-21, Growing a Regenerative Crop Production System, Sustainable Agronomy Conference & Conservation in Action Tour – Growing a Regenerative Crop, virtual\*

8-23-21, Beef Industry Sustainability, Red Angus Association, virtual\*

8-18-21, Update on AgNext, Dairy Farmers of America, Denver, CO\*

8-10-21, The Changing Sustainability Landscape, Cattle Feeders Alliance, Nashville, TN\*

7-26-21, GHG accounting and benchmarking in the beef supply chain, Syngenta Beef Conference, Fort Collins, CO\*

6-23-21, Update on the SLSC, Colorado Cattlemen's Convention, Grand Junction, CO\* 6-18-21, Beef and Climate 101, U.S. Roundtable for Sustainable Beef, virtual\*

6-17-21, Farm Foundation Virtual Roundtable Sustainable Solutions for Animal Agriculture: Taking the Supply Chain 360 (moderator), virtual\*

6-14-21, The Changing Sustainability Landscape, Mississippi Farm Bureau Federation Southern Region Commodity Conference, virtual\*

6-10-21, The Changing Sustainability Landscape Sands Butler County, virtual\*

6-1-21, What you need to know about climate change and beef cattle, Colorado State University and Colorado Cattlemen's Association Webinar, virtual\*

5-4-21, Is Sustainable Livestock and Oxymoron Mesa County 4-H, virtual\*

5-4-21, Drought Impacts on Livestock Production in Rural Communities (moderator), CSU One Health and School of Global Environmental Sustainability Panel, virtual\*

4-29-21, Leading Innovation in Sustainability Panel, CSU Demo Day, virtual\*

4-24-21, Sustainability and Animal Agriculture CSU Animal Health Advocates in a Changing Climate Meeting, virtual\*

4-23-21, Is Sustainable Livestock and Oxymoron, CSU International Markets Class, virtual\*

4-22-21, Environmental Panel (moderator), National Institute for Animal Agriculture (NIAA) Conference Exploring Sustainability in Animal Agriculture: A Comprehensive Approach, virtual\*

4-21-21, Economic Viability in Animal Agriculture, National Institute for Animal Agriculture (NIAA) Conference Exploring Sustainability in Animal Agriculture: A Comprehensive Approach, virtual\*

4-17-21, An Update on the Sustainability Landscape, Five Rivers Managers Meeting, Colorado Springs, CO\*

4-15-21, The SLSC and GHG from Animal Agriculture, Colorado Air Quality Control Commission, virtual\*

4-13-21, The SLSC and GHG from Animal Agriculture University of Wisconsin Madison Food Research Institute, virtual\*

3-31-21, Is Sustainable Livestock and Oxymoron, CSU Sheep Systems Class, Fort Collins, CO\*

3-30-21, An Update on the Sustainability Landscape, Integrated Livestock Systems Board of Directors, virtual\*

3-30-21, Sustainable Food Systems Roundtable, Swift, virtual\*

3-9-21, Update on the SLSC, CSU Department of Ecosystem Science and Sustainability, virtual\*

3-5-21, Update on the Sustainability Landscape, Colorado Cattlemen's Association Property Rights and Resources Stewardship, virtual\*

3-4-21, Update on the SLSC, Cargill, virtual\*

3-5-21, Update on the SLSC, Beef Marketing Group and Integrated Livestock Services, virtual\*

3-11-21, The Future of Antimicrobials in Food Animal Production – The Consumer Perspective, Boehringer Ingelheim, virtual\*

3-11-21, Colorado Agriculture, Colorado Governors Fellows, virtual\*

2-25-21, Regenerating Colorado's Rangelands One Acre at a Time Panel, CSU School of Global Environmental Sustainability Panel, virtual\*

2-3-21; Update on SLSC, American Lamb Board, virtual\*

1-14-21, Update on the SLSC, CSU Animal Science Alumni, virtual\*

12-2-20, Update on the SLSC, CSU Extension Agents, virtual\*

12-4-20, Improving Sustainability in Animal Protein Supply Chains, Faegre Drinker, virtual\*

11-20-20, Update on the SLSC, CSU Zoetis Incubator Steering Committee, virtual\*

11-4-20, Update on the SLSC, CO Beef Quality Assurance Advisory Meeting, Fort Collins\*

10-29-20, Update on the SLSC, CAS Ag Industry Leadership Council, virtual\*

10-21-20, Update on the SLSC, Meeting with the CSU Office for Vice President and Infectious Disease Research Center Team Deep Dive on African Swine Fever and other Research Underway at CSU, Fort Collins\*

### **Prior to employment with CSU**

Previous to employment at CSU, I have been invited to give more than 130 presentations on sustainability to producers, academics, students, influencers, government, media, retail/food service, and non-governmental organizations. A selection of presentations is listed below:

- Food and Culinary Dietetic Practice Group, Napa, CA\*
- University of Nevada Dietetic Association Meeting, Las Vegas, NV\*
- Beef Improvement Federation, Biloxi, MS\*
- Agribenchmark Global Symposium, Valledupar, Colombia\*
- American Veterinary Consultant Meeting, Denver, CO\*
- Ecological Science Association, Baltimore, MA\*
- Food Marketing Institute Sustainability Meeting, Denver, CO\*
- Midwestern Food and Agribusiness Executive Seminar, Lafayette, IL\*
- Canadian Roundtable for Sustainable Beef Annual General Meeting, Saskatoon, Canada\*
- Texas Society for Range Management Meeting, Wichita Falls, TX\*
- National Grazing Lands Coalition Meeting, Dallas, TX\*
- Beef industry Food Safety Council, Dallas, TX\*
- Sustainable Ag Innovation Forum, Washington D.C.\*
- Sustainable Agriculture Summit, Denver, CO\*
- Global Roundtable for Sustainable Beef Conference, Kilkenny, Ireland\*
- University of Nebraska, Lincoln, NE\*
- Iowa Select Annual Production Meeting, Aimes, IA\*
- NCBA Sustainability Engagement Forum, Denver, CO\*
- International Production and Processing Expo (IPPE), Atlanta, GA\*
- U.S. Roundtable for Sustainable Beef, Fresno, CA\*
- Women in Agribusiness, Minneapolis, MN\*
- PEPSICO Sustainability Forum, Mexico City, Mexico\*

- Academy of Veterinary Consultants, Des Moines, IA\*

### **ENGAGED SCHOLARSHIP**

Co-hosted with Colorado Cattlemen's Association a Webinar titled: What you need to know about climate change and beef cattle. Organized speakers, save the date, invitation list and webinar recording.

Conducted a needs assessment surveying more than 200 participants regarding strategic sustainability priorities related to animal agriculture.

Partnered with Syngenta and Amy Kremen with Soil and Crop Sciences to host a Syngenta Beef Sustainability Field Day.

Participated in a listening session as a guest speaker for the Colorado Land Steward Conversation, specifically for Southwest Colorado landowners. The intent was hear from landowners about the issues and challenges you're facing as a steward of working lands.

AgNext and Five Rivers Cattle Feeding co-hosted the AgNext [Research Summit](#) on December 1st. This event brought 150 academics, industry leaders, and financial organizations together for an important discussion about the future of agriculture and the importance of funding projects that make the industry more sustainable. As a result, AgNext gained new strategic partnership support and funding to continue pushing forward to find sustainable solutions for animal agriculture. I planned and coordinated the event and served as the facilitator.

Host quarterly [AgNext Industry Innovation Group](#) meetings to provide updates and garner feedback from animal agriculture industry stakeholders. Strong external partnerships are a key component to the success and innovation of AgNext. This group provides input on strategic initiatives and programs, acts as a soundboard for new ideas and opportunities, promotes the AgNext in the livestock community, helps recruit talent and elevates AgNext on a global scale.

Participated as a strategic partner and host at the Michigan State Regenerative Agriculture Conference that brought together 65 diverse stakeholders to discuss challenges and opportunities for further research and collaboration.

Review of sustainability approach for meat, poultry and dairy supply chains for the following Companies/Organizations:

- US Foods
- Shake Shack
- Performance Food Groups
- Porter Road
- Chick-fil-a
- Restaurants International
- Beef Alliance
- Progressive Beef
- DSM
- World Wildlife Fund
- The Nature Conservancy
- Harris Ranch
- Texas Cattle Feeders Association
- JBS USA

Kansas Livestock Association  
National Cattlemen's Beef Association  
Marble  
Sustainable Beef  
Tyson  
Zoetis  
Green Plains Cattle  
Five Rivers Cattle Feeding  
HerdX  
Pat O'Toole  
Colorado Livestock Association  
Colorado Beef Council  
Colorado Cattlemen's Association  
VAS  
Global Roundtable for Sustainable Beef  
Xiant  
Unilever  
American Lamb Board  
MacNab, LLC  
Certified Angus Beef  
Rabo Bank  
Integrate Livestock Services  
Beef Marketing Group  
Growers Tech  
Superior Farms  
Diamond V  
National Beef Packing, LLC  
Rockland and Dutton  
Proteus  
Petri  
National Milk Producers Federation  
Dairy Marketing Institute  
Hearst Ag Properties  
Meyer Natural Meats  
Vanguard  
OSI  
Carbon Culture  
Red Angus Association  
Tom Brink  
U.S. Climate Alliance  
Merck  
IdentiGEN  
AgriWebb  
Farm Journal Foundation  
CattleFax  
Beef Northwest  
Carbon Neutral Beef  
JBS Food Company  
The Nature Conservancy  
High Plains Feedyard  
Leachman of Colorado

Danone  
AgFunder  
Colorado Department of Agriculture  
Animal Health International  
Midwest PMS  
Farm Credit Services  
MetLife  
Chicago Mercantile Exchange  
Cargill  
Trust in Food  
Champion Feeders  
Dairy Max

### **COLLABORATIVE, INTERCOLLEGIATE & INTERDISCIPLINARY SCHOLARSHIP**

The Food Foundation for Agriculture Research AgMission team convened a multi-day "sprint" workshop to expand thinking around the Climate Activation Platform. The workshop brought together a cross-functional team from across sectors in agriculture to explore concepts and develop an initial prototype that can be used to aid in our research efforts. The goal of the workshop was to quickly make informed decisions, openly explore new ideas, and get real-time feedback and buy-in from experts in order to maximize the impact of the Climate Activation Platform. I was a member on the workshop.

I participated as an author on a research strategy to move U.S. agriculture to net negative carbon emissions. The U.S. Farmers and Ranchers in Action (USFRA) and the Foundation for Food and Agriculture (FFAR) sponsored this effort. The publication will be reviewed by a committee appointed by the Board on Agriculture and Natural Resources of the National Academies of Science, Engineering, and Medicine (NASEM). We anticipate this document will have a high impact on future research priorities across many agencies and organizations in the next decade and is especially timely as the next U.S. Administration begins its plans.

The CLEAR Center at UC Davis, in collaboration with The World Food Center at UC Davis, convened a virtual, Independent Dialogue to support U.S. contributions to the 2021 United Nations Food Systems Summit (UNFSS) The Dialogue was entitled: Roadmap to Climate Neutrality in the Beef and Dairy Sectors. I was invited to participate in the session on: The U.S. Beef and Dairy sector can be climate neutral. The question is, how soon? Official feedback form from the dialogue was submitted to the UNFSS: *Roadmap to Climate Neutrality in the Beef and Dairy Sectors*.

In partnership with the Global Meat Alliance, I participated a UNFSS Independent Dialogue held on, ‘The role of the global meat sector in future sustainable food systems’. This was convened in partnership with Meat & Livestock Australia and the International Meat Secretariat. The outcomes from this dialogue were compiled the UNFSS Dialogue Feedback Report and submitted to the UNFSS: *The Role of The Global Meat & Livestock Sector in Future Sustainable Foods Systems*.

I participated in a symposium designed to discuss, and gather scientific consensus, on the current state of the art of on-farm greenhouse gas (GHG) emissions measurement technologies and methods hosted by the Dairy Management Inc (DMI) and the Innovation Center for US Dairy Environmental Stewardship. The objective for this symposium was to align on an on-farm gas measurement approach that will be deployed on a number of large-scale national pilots, including those recently announced with [Nestle](#) and [Starbucks](#), to determine baseline emissions for each of the major GHG footprints in selected dairies (Enteric, Manure Management and Feed Production) and measure the effects of

practice or technology interventions over the 5-year life of the Dairy Scale for Good pilot program within the Net Zero Initiative.

## **ADVISING:**

### **STUDENT ADVISING/GRADUATE SUPERVISION**

#### **UNDERGRADUATE STUDENTS:**

Grace Sandberg  
Rebecca Crook

#### **GRADUATE STUDENTS:**

Current Graduate Advisees:

Ashley Shilling (MS)  
Mesa Kuntz (MS)  
Samanatha Clark (MS)  
Lauren Newman (MS)  
Lauren Besser (MBA)

#### **POSTDOCTORAL STUDENTS/RESEARCH ASSOCIATES:**

Current:

Logan Thompson (PhD)  
Jenn Rieskamp, AgNext Manager of Communications  
Andy Runyan, AgNext Administrative Assistance (30% time)

#### **Evaluations from Faculty and Professional Peers**

Calendar Year Ending December 31, 2020: Research, scholarship, & Creative Activity: Meets Expectations; University/Professional/Public Service & Outreach: Exceeds Expectations; Overall Evaluation: Exceeds Expectations.

#### **Descriptions of Mentoring Activities**

CSU's impact MBA program provides a track in sustainability. In 2021, we hosted an MBA student, Lauren Besser for her summer internship. Her final report is attached in the appendix.

CSU's impact MBA program provides a track in social entrepreneurship. In 2020, I served as an advisor to the "Seagraze" start-up team.

Poster Judge for CVMBS Virtual Research Symposium

## **COMMITTEES**

Strategic Planning for the College of Agriculture and Environmental Sciences: Regenerative Ag Group.

RAMS Innovation Labs Working Group

Chaired a multi-disciplinary team to evaluate the impact of Proposition 16 (PAUSE) on Colorado Agriculture and Residents, 2021.

Meat Industry COVID Response Working Group

AgNext Communication Committee, Chair, 2021

AgNext Faculty Meetings, Chair, 2021

AgNext Manager of Communication Hiring Committee, Hiring Authority, 2021

AgNext Industry Innovation Group, Chair, 2021

AgNext Steering Committee, Chair, 2021

Dairy Systems Assistant/Associate Professor, Animal Science, Search Committee Chair  
Feedlot Systems Assistant/Associate Professor, Animal Science, Search Committee Member  
Livestock Economist, DARE, Search Committee Member

### **PROFESSIONAL AFFILIATIONS AND ACTIVITIES**

American Society of Agricultural and Biological Engineers  
American Dairy Science Association  
American Society of Animal Science  
Society for Range Management  
Beef Cattle Research Center, Canada, Grant Reviewer  
Peer Review, Translational Animal Science  
Peer Review, American Society of Agricultural and Biological Engineers

### **SERVICE WITH EXTERNAL PARTNERS AND COMMUNITIES**

University of California, Davis Dean of College of Agriculture and Environmental Sciences Advisory Committee  
U.S. Roundtable for Sustainable Beef, Board of Directors  
U.S. Roundtable for Sustainable Beef, Goals Development Committee Member  
Global Roundtable for Sustainable Beef, LCA Metric Development Committee Member  
Beef CARE, Expert Committee Member  
North American Meat Institute, PACT Committee Member  
National Prok Board Sustainability Goals Committee Member  
Marble Technologies, Advisor  
CSU Strategic Sustainability Goal Stakeholder Feedback Session  
Sustainability Overview with Senator Boesenecker and tour of ARDEC  
Sustainability Overview and Review with Danone  
Invited Member of Costco Animal Welfare Committee  
Rabograinfinance and Five Rivers Cattle Feeding Beef Blockchain Traceability Working Group  
Five Rivers Cattle Feeding Training Program Development

### **OTHER ACTIVITIES/ACCOMPLISHMENTS – SERVICE/OUTREACH**

Developed business plan, memorandum of understanding, request for proposals and formal memos for AgNext 12 tenure faculty member cluster hire.

Participated in media interviews:

- Wall Street Journal, January 7, 2021
- Meat and Poultry Podcast, published December 10, 2021: [link here](#)
- Denver Business World, December 6, 2021
- Drovers, published December 9, 2021: [link here](#)
- Feedlot, published November 11, 2021: [link here](#)
- Hereford World, November 3, 2021
- The Pulse WHYY Podcast with NPR, iOctober 20, 2021
- Working Ranch Podcast for October, 2021: [link here](#)
- The Denver Post, published September 19, 2021: [link here](#)
- National Geographic, published June 29, 2021: [link here](#)
- Meat and Poultry, Published October 9, 2020: [link here](#)
- Bloomberg, August 3, 2021
- The Fence Post, February 16, 2021

**APPENDIX**

Annual evaluation:

**COLORADO STATE UNIVERSITY: ANNUAL FACULTY EVALUATION - SUMMARY REPORT**  
CALENDAR YEAR ending December 31, 2020

Name: Kim Stackhouse-Lawson Evaluating Department/Unit: Animal Sciences  
 Tenured/Tenure Track  Non-Tenure Track \_\_\_\_\_ Appt.: 9 mo. \_\_\_\_\_ 12 mo.  Other Administrative work 65%  
 Rank: Professor  Assoc. Professor \_\_\_\_\_ Assist. Professor \_\_\_\_\_ Master Instructor \_\_\_\_\_ Senior Instructor \_\_\_\_\_ Instructor \_\_\_\_\_

**Please check one:  COVID Impact Statement Attached \_\_\_\_\_ Faculty Member chose not to attach a COVID Impact Statement**

<b>Rating</b> (Select one rating for each category)	<b>Instruction, Advising, &amp; Mentoring</b> Effort Distribution: <u>0</u> % (Next year expected: 0 %)	<b>Research, Scholarship, &amp; Creative Activity</b> Effort Distribution: <u>35</u> % (Next year expected: 35 %)	<b>University/ Professional/ Public Service &amp; Outreach</b> Effort Distribution: <u>65</u> % (Next year expected: 65%)	<b>Overall Evaluation</b>  (100% of Effort)
Superior Exceeds Expectations Meets Expectations Below Expectations Unsatisfactory	N/A	Meets Expectations (2.8)	50% admin. 15% service Exceeds Expectations (3.8)	Exceeds Expectations (3.5)

Summary Comments (include comments for each category):

- Your efforts to initiate visible activity & producer engagement for the newly-formed SLSC are appreciated. By beginning a strategic plan, assigning an industry advisory group, & beginning to submit grant proposals, the trajectory for this program should make it successful.

Signatures:

I have received and read this annual evaluation:

\_\_\_\_\_  
Department Chair- Date

\_\_\_\_\_  
Faculty Member-Date

\_\_\_\_\_  
College Dean-Date

\_\_\_\_\_  
Faculty member's comments on evaluation included on reverse side

**Faculty Member's Comments, if any:**

Signature & Date:

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Summer 2021

Lauren Besser

## Fellowship & Company Profile

**Project Summary:** My fellowship was with CSU AgNext – a new collaborative from the College of Agricultural Sciences and the College of Veterinary Medicine and Biomedical Sciences focused on addressing 21<sup>st</sup>-century challenges faced in livestock industries as well as training current and future livestock industry professionals. I helped CSU AgNext with departmental goal setting and established sustainability framework alignment. Much of my fellowship was used to assist a major funder for CSU AgNext, National Beef Packing LLC. I assisted National Beef with developing materiality topics for future corporate responsibility reporting as well as with drafting the company's 2021 CDP report.

**Output:** During my fellowship I was able to contribute to three high quality presentations in which our team presented to several executive level employees at National Beef. Two of these slide decks were spearheaded and presented by me. Additionally, I helped to prepare the rough draft of the 2021 CDP Climate Change report in its entirety. Recommendations regarding CO2 level benchmarking, materiality assessments and establishments, and subsequent company alignment were all made to executive level employees at National Beef Packing. We are still developing ways for the CSU AgNext collaborative to produce meaningful resources and information sharing to those in the livestock industry.

**Outcomes:** The presentations we delivered to National Beef helped to jumpstart the executive-level conversation regarding sustainability and establishing a concrete plan. The company is currently searching for a Chief Sustainability Officer to manage and continue the current momentum. National Beef Packing submitted a CDP report based on the information and answers that I had compiled for them. An audited score from CDP is expected to be published before the end of the year.



## Company Report

### **Introductory Information**

The CSU AgNext collaborative is an interdepartmental effort between the College of Agricultural Sciences and the College of Veterinary Medicine and Biomedical Sciences. The AgNext collaborative has not publicly launched as of the time of this report; however, efforts to reach out and offer resources and information to those in the livestock industry have already begun. Most AgNext collaborative business, including meetings with internal and external stakeholders, project research, and data compilation has taken place in the Animal Sciences building on the main CSU campus in Fort Collins, Colorado.

National Beef Packing is one of the largest beef processing companies in the United States. The main corporate headquarter offices are located in Kansas City, MO. National Beef Packing has international sales offices in Chicago, IL, Tokyo, Japan, Seoul, South Korea, and Hong Kong. The company has two major processing plants located in Western Kansas, as well as six other processing facilities located across the Midwest and Southeastern portions of the United States. National Beef Packing operations include: beef processing, further beef and byproduct processing, leather-tannery operations, and fleet transportation.

### **NAICS and SIC Coding**

The North American Industry Classification System (NAICS) code is a system used throughout North America in order to classify businesses based on the primary work type that the business performs. NAICS codes are used for the following reasons: to contend for grants and purchase contracts from the government, to become Small Business Association (SBA) certified if applicable, to acquire other applicable leadership-based certifications, to apply for commercial business loans, and to compare a business to other businesses within the same industry. The Standard Industrial Classification (SIC) code is another indication used to signify the type of business the company operates. SIC codes are based of financial filings and standard auditing processes including who the company reports to and how financial information is distributed.

The CSU AgNext collaborative falls under Colorado State University for NAICS and SIC coding purposes. Colorado State University is classified under the NAICS code 611310 – Colleges, Universities, and Professional schools. The SIC code for Colorado State University is 8221 – Colleges, Universities, and Professional Schools. National is Beef Packing, LLC is classified under the NAICS code 311611 – Animal (except Poultry) Slaughtering. The SIC code for National Beef Packing is 2011 – Meat Packing Plants.

### **General Business Facility Descriptions**

The CSU AgNext collaborative conducts the majority of business operations in the Animal Science building on the main Colorado State University campus. The animal sciences building has classrooms, functioning meat laboratories for research and teaching purposes, multiple professional conference meeting rooms, and sufficient administration office space. The building underwent significant renovations through 2017 which included the addition of the Gary and Kay Smith Global Food Innovation Center and the Temple Grandin Animal Handling and Education Center. These centers within the building include an animal handling and education center, a harvesting facility, and culinary areas.

Because the collaborative has not publicly launched, there are no annual revenues from CSU AgNext thus far.

National Beef Packing has various operations primarily across the Midwest and Southeastern regions of the United States. The beef processing plants for National Beef Packing are located in Dodge City, KS; Liberal, KS; and Tama, IA. The packing plants for retail-ready products are located in Hummels Wharf, PA and Moultrie, GA. Further processing facilities include Kansas City Steaks located in Kansas City, KS and a patty processing plant located in North Baltimore, OH that supplies beef patties to McDonald's restaurants in the Upper Midwest, Northeast, and mid-Atlantic regions of the United States. The company has a wet blue tannery located in St. Joseph MO. National Beef has a direct-to-consumer distribution center in Kansas City, KS. National Beef also has an international sales office located in Chicago, IL. During my fellowship, all business between CSU AgNext and National Beef Packing was conducted at National Beef Packing headquarters in Kansas City, MO, and at the Animal Sciences building on the main CSU campus in Fort Collins, CO.

National Beef Packing is the fourth largest beef processing companies in the United States as well as the leader in the production of certified Angus beef. The company processed over 3.5 million heads of cattle in 2020 with the majority of cattle transportation to National Beef Packing processing facilities averaging under 200 miles in transportation distance. The company employs over 9,300 people across all plants and facilities.

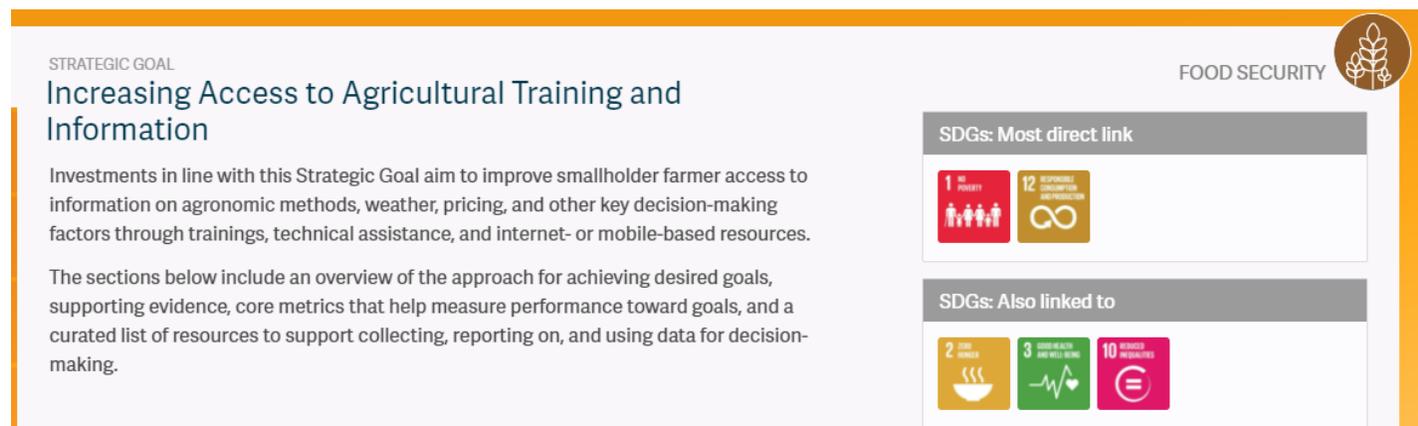
### **Primary Sustainability Challenges Explored Throughout the Fellowship & Reasoning for Pursuit**

The CSU AgNext department was created to address the changing environmental and sociopolitical situations and positions the agricultural industry is facing in the 21<sup>st</sup> century. There is increased social awareness about climate change as well as increased scrutiny towards the agricultural industry. There are many politically charged and varying messages available to both those in the agriculture industry as well as the general public at large. CSU AgNext was developed to help provide educational resources and help individuals and entities scale profitable, innovative ideas with best animal welfare practices and land stewardship principles in mind. CSU AgNext has three pillars of focus: resiliency, regenerative, and efficiency. The collaborative aims to help advance ecosystem health while simultaneously improving food security within communities that have been made stronger and more equitable through resiliency development. The collaborative hopes to create efficient and innovative strategies that help to reinvigorate our natural resources and provide benefits to various ecosystems. A lot of dedicated work has been put into ensuring that CSU AgNext provides benefits and services in a meaningful way to the communities it serves.

Much of the work I did this summer for CSU AgNext involved helping the collaborative to learn about, and potentially align with, leading sustainability frameworks such as the United Nations Sustainability Development Goals (UN SDGs) and the Global Reporting Framework (GRI). The UN SDGs were developed in 2015 by the United Nations Development Programme as a worldwide call to action for both countries and entities to end poverty, protect the planet, and ensure peace, prosperity, and justice for all by 2030. The SDGs have gained momentum recently and the UN has declared 2020 – 2030 to be the decade of action. Alignment with the SDG's was a top priority of the collaborative as the goals are clear, well established, and globally used.

To begin the alignment process, I used a UN recommended website developed by the Global Impact Investing Network (GIIN) called IRIS+. IRIS is an acronym for Impact Reporting and Investment Standards – the website helps investors and entities establish and upgrade impact measurement systems and protocols. The IRIS+ website allows you to establish goals and align them to UN SDGs by offering a variety of impact categories based on different industries such as agriculture, education, and infrastructure. Once an impact category is chosen, a more specific impact theme is chosen. For example, agriculture has the following impact themes: Food Security, Smallholder Agriculture, and Sustainable Agriculture. Once an operationally relevant impact theme is chosen, IRIS+ provides a large portfolio for the newly created strategic goals related to the relevant impact theme as well as directly and indirectly linked SDG goals. The portfolio includes an overview of the strategic goal, evidence based on academic field research, core metric sets established through the Navigating Impact Project, IRIS+ guidance, additional recommended resources, and core metric sets. Below in figure 1 is a view of the summary page for the strategic goal of “Increasing Access to Agricultural Training and Information” related to the impact theme of food security.

Figure 1: IRIS+ Strategic Goal Dashboard View



Additionally, my work with CSU AgNext involved researching various sustainability and agriculture programs and collaboratives featured at different universities such as: Arizona State University – who boast the first sustainability degree programs in the nation, University of California at Davis, and Texas A&M – two very prominent and credible agriculture universities in the country. We wanted to see how other universities were addressing both sustainability and agriculture to ensure that we were not forgetting to address any issues or concerns that may arise as the collaborative grows. We also wanted to see if there were viable partnerships to pursue or technologies to implement. One such technology we considered was a program called Match.Graze developed by the South Dakota Grazing Exchange that has been implemented by UC Davis. The program is implemented at a state-wide level and helps to match landowners who require grazing services with cattle owners. At UC Davis, this is mostly marketed as a fire-preventative action as grazed lands tend to act as a fire-block due to the lack of dried vegetation and other natural fire accelerants. We are still exploring whether or not Match.Graze or a program of a similar nature would be the best course of action for CSU AgNext.

The majority of my summer was spent helping National Beef Packing with strategizing and developing a sustainability plan to be rolled out company-wide as soon as possible. The first aspect of developing a sustainability plan involved an in-depth analysis of the meat-industry and the current

industry goals and progress related to sustainability, social equity, and corporate governance. National Beef has three major competitors in the meat-packing sector of the meat-industry, Tyson, Cargill, and JBS USA. National Beef Packing also conducts operations distributing retail-ready pre-packaged meats to direct-to-consumer distributors. Because of this, we considered it important to include Smithfield and Hormel in the competitor analysis. All of the mentioned companies have released annual ESG (Environmental Social Governance) reports for the last several years. The annual ESG reports varied in detail and transparency regarding progress against projected goals, current sustainability efforts, and the level of negative company exposure included within the report. However, there were several common materiality topics chosen by many of the analyzed competitors including: Food Safety, Animal Welfare, Environment, Community, and Employee Wellbeing. The materiality pillar Employee Wellbeing was titled differently by the various organizations researched.

Common food safety goals among National Beef Packing’s main competitors include enhancing quality and nutrition of the organization’s product offerings, increasing food access for a growing global population, and continuous improvement and innovation of product offerings. Common animal welfare goals among competitors include implementation of the Five Domains Model or the Five Freedoms Model (as explained in Figure 2.), and ensuring certification and/or auditing processes of partners in the value chain to establish proper animal care. Common community goals formed among competitors include various community support initiatives such as large-scale food bank donations, community scholarship programs, and cash or like-kind donations towards hunger relief programs. Common employee wellbeing goals among competitors include injury or incident reductions, improvement of safety index scores, and improving yearly retention rates.

Figure 2: Five Freedoms Model & Five Domains Model

Five Freedoms	Five Domains
From hunger and thirst	Nutrition
From discomfort	Environment
From pain, injury disease	Health
To express normal behaviour	Behaviour
From fear and distress	Mental state

Environmental goals among competitors were mostly segmented into water-related goals, waste-related goals, and energy & emission reduction goals. Water intensity and usage as well as general water-stewardship are major factors of sustainability considered by the organizations analyzed in the competitor analysis. All competitors analyzed have goals of reducing greenhouse gas emissions. Some of the organizations have additional supply chain emission reduction goals as well. Competitor organizations had varying waste reduction goals showing there are many ways to approach waste reduction implementation across different organizational structures. All of the organizations evaluated additionally had various diversity, equity, and inclusion goals – however, the majority of these are very new goals set in place by these organizations in response to the social equity movement developments in 2020.

The organizations analyzed in the competitor analysis strategically used partnerships to establish, implement, and advance their various materiality goals. The CSU AgNext collaborative has agreed to help National Beef Packing with some of the aspects of developing and implementing an extensive and meaningful sustainability plan with ambitious but achievable goals. However, some aspects of a ESG plan are out of the scope range of the collaborative and other partnering organizations must be brought in. The analyzed competitor organizations shared some of the same partnering organizations who offer credibility from different sets of stakeholders. Venn Diagrams of competitor partnerships I created for executive presentations can be seen in figures 2 and 3.

Figure 2: Partnering Organizations & Collaborations Among Meat Packers



Figure 3: Partnering Organizations & Collaborations Among Retail-Ready Meat Producers



Along with a competitor analysis, I also conducted a customer analysis to include in the presentations. Customers of National Beef Packing has customers in several food industries such as grocery stores and fast food restaurants. The grocery stores included in the analysis had strong goals involving waste reduction and ambitious hunger relief programs. The fast food companies included in the analysis varied in their commitments to environmental stewardship and the level of ESG reporting taking place in the company. Many of the retail customers of National Beef Packing have the same food quality, community/employee welfare, and environmental stewardship goals which offer a place for potential partnership or cooperative behavior by other organizations in the value chain.

McDonald's has the most comprehensive approach and extensive reporting out of the restaurant customers analyzed. The company releases three annual ESG reports – including a report called the “Beef Sustainability Report”, has a sustainability sub-section on their website with frequent press releases and news, and they report on all CDP report responses. McDonald's has also been a member of the Global Roundtable for Sustainable Beef since 2011 and has various partnerships with charitable hunger relief organizations. The Beef Sustainability Report has seven major impact areas: #1. Advancing Economically Viable Farming #2. Preserving Forests, #3. Addressing Climate Change, #4. Reducing Food & Packaging Waste, #5. Respecting Human Rights, #6. Promoting the Health & Welfare of Animals, and #7. Protecting Water. The company has four materiality topics: Food Quality & Sourcing, Community Connection, Jobs & Inclusion/Empowerment, and Our Planet. Packaging, climate change mitigation, and renewable energy are all focus points for energy and environmental stewardship mentioned within McDonald's CSR reports.

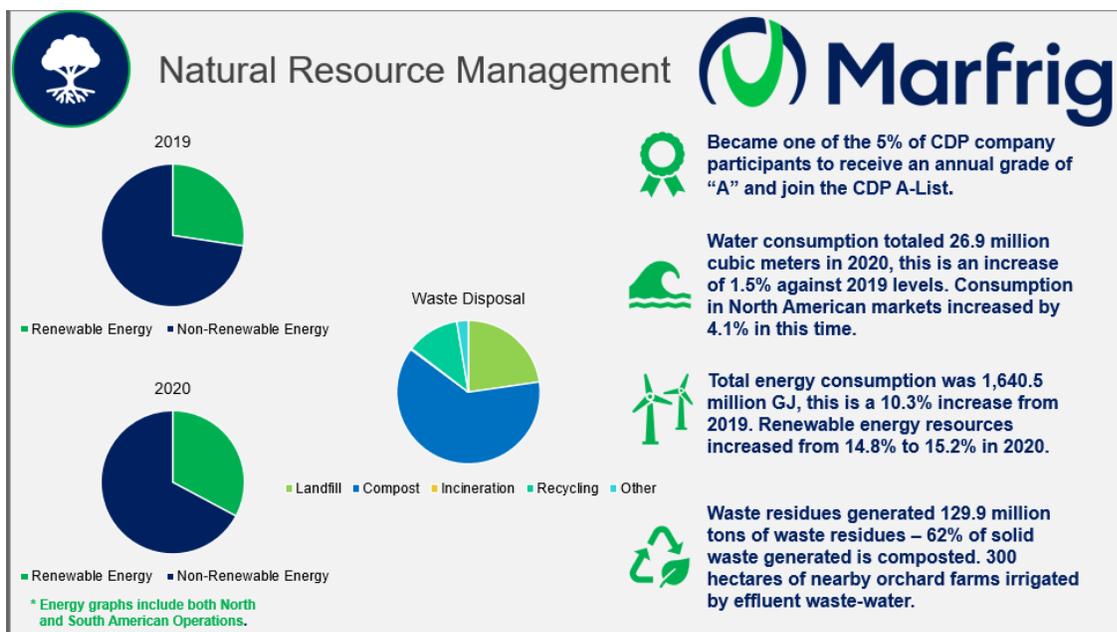
Kroger designed bold zero-waste and zero-hunger social impact plans in 2017 to end hunger and eliminate in communities served by Kroger by 2025. Kroger has become efficient enough through continued sustainability efforts to divert 80% of their waste – or 2.3 million tons away from landfills. The company has also given over \$205 million to hunger relief charities. These actions show their commitment to the social impact plans the company designed. Kroger releases annual reports that adhere to SASB, GRI, and SDG reporting metrics and standards.

A detailed analysis of National Beef Packing's controlling shareholder, Marfrig was also conducted in order to align business strategies between the two organizations as much as possible. Marfrig is the second largest international-scale food processing company based in Brazil, behind JBS SA. Marfrig operates in over 20 countries and has customer bases in over 100 countries. The organization has a large presence in Europe where consumers and stakeholders alike expect high levels of transparency and accountability from companies they conduct business with. Because of their large market reach and strict food safety regulations in several of their export markets, Marfrig publishes annual reports to the requirements of major ESG reporting frameworks, namely GRI (Global Reporting Initiative) standards and SASB (Sustainable Accounting Standards Board) standards. Marfrig also submits 3 annual CDP (Carbon Disclosure Project) reports – Climate Change, Water Security, and Forestry Management. Marfrig was one of the 5% of companies filing in 2020 to receive a score of “A” on their report for Water Security. Marfrig received a grade of “A-” on both their Climate Change and Forestry Management reports for the 2020 filings. Upon later reading the reports submitted to CDP by Marfrig, I noticed that a decent amount of National Beef Packing operational information was being included in the Water Security and Climate Change reports – and the information was elevating Marfrig's scores! Marfrig has additionally aligned with 13 out of 17 of the UN SDG's – which is not a course of action we recommended for National Beef Packing. Because of strict requirements from European markets and

high levels of corruption within companies headquartered in Brazil, Marfrig has participated in higher levels of ESG disclosure than what would be required of National Beef Packing.

Marfrig releases detailed 100+ page annual sustainability reports. They have a variety of materiality topics covered within their annual report, namely: Supply Chain Management, Animal Welfare, Food Quality & Safety, Team Health & Safety, Reduction of Greenhouse Gases, Natural Resource Management, and Corporate Governance and Responsibility. An example of one of the slides presented at the first executive level meeting can be found in Figure 4. The slide is about current operational efforts for better natural resource management as well as the future plans Marfrig has to lessen their impact on the environment via resource usage and disposal. The slide includes water consumption levels, energy consumption levels, and waste residues generated.

Figure 4: Marfrig Example Slide



Marfrig has released 15 consecutive sustainability reports to date. Extensive reporting requirements placed on Brazilian companies are not necessarily applicable to companies operating in the United States. If National Beef Packing were to adhere to all of the reporting standards and metrics reported by Marfrig, it may come across as disingenuous and green-washing to major stakeholders of the organization in the United States.

The executive level presentation included detailed information about the materiality topics covered in Marfrig’s 2020 annual ESG report. Through this analysis, we were able to determine and communicate which materiality topics National Beef Packing should adopt from Marfrig’s topics as well as which topics will not have relevancy – due to operational, ethical, and cultural differences amongst the two organizations. We were able to determine that Corporate Governance & Responsibility, and Supply Chain Management were not applicable materiality topics for National Beef Packing. Corporate Governance & Responsibility is generally shown throughout organizational ESG reports via declaration of auditing processes, certifications achieved by the company or its employees, and shown in other published documents including annual accounting records (10K filings and taxation records). The Supply

Chain Management materiality topic is mostly a tool used by Marfrig to track and deter deforestation practices which are prevalent in the Amazon and Cerrado biomes in Brazil and surrounding South American countries. There are few to no instances of deforestation or malevolent land practices conducted by suppliers in the markets in which National Beef Packing participates in. We also determined that Natural Resources and Reduction of Greenhouse Gas Emissions materiality topics established by Marfrig would be better addressed by National Beef Packing as one materiality topic addressing the environment and climate change as a whole.

The initial presentations with several executive level employees at National Beef Packing also required explanations and walk-throughs of the various standards and frameworks used within the sustainability reporting world. The most commonly used and accepted reporting frameworks include the aforementioned GRI framework and disclosure standards, the SASB standards, and the UN SDG's. CDP is not a reporting framework, but is an actual report submitted to be evaluated and scored by CDP professional auditors who base the score on transparency, disclosure, and self-awareness displayed by the organization through their answers. A comprehensive color-coded guide to GRI standards, the most comprehensive of frameworks, was provided to the National Beef Packing employees present during the meeting. The color-coded guide showed what disclosures were recommended that Marfrig additionally reported on, which disclosures were recommended that Marfrig did not report on, and disclosures that Marfrig did report on that are not relevant to the operations performed at National Beef Packing. Slides addressing the complexities of each framework and reporting system were presented and explained during the meeting. There are two examples of framework guidance slides developed for the executive meetings listed and shown below. A slide going over the difference in GRI Disclosure types is presented in figure 5 below while a slide going over the SASB standards framework is presented in figure 6. Both slides were created by me and presented by other members of the CSU AgNext team and myself.

Figure 5: GRI Disclosure Types

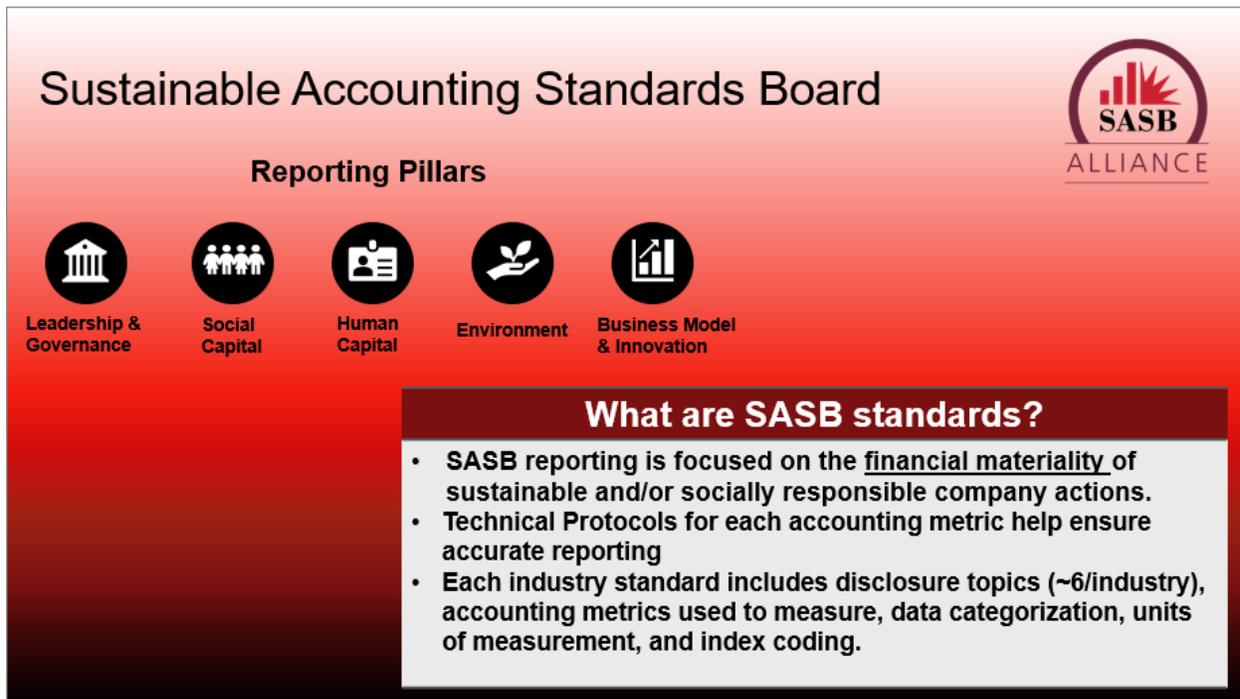
## GRI Disclosures

- GRI 101 offers principles for defining the report content and quality at levels deemed acceptable by GRI standards.
- GRI 102 is comprised of general disclosures that provide background information about the organization. Certain 102 disclosures are required for core and comprehensive GRI reporting.
- GRI 103 provides reporting requirements for disclosing the management approach taken to address material topics in GRI 200, 300, & 400 the organization has chosen to report on.

The diagram illustrates the GRI Standards structure. It is divided into two main sections: Universal Standards and Topic-specific Standards. Under Universal Standards, there are three categories: Foundation (GRI 101), General Disclosures (GRI 102), and Management Approach (GRI 103). GRI 101 is described as the 'Starting point for using the GRI Standards'. GRI 102 is for 'To report contextual information about an organization'. GRI 103 is for 'To report the management approach for each material topic'. Under Topic-specific Standards, there are three categories: Economic (GRI 200), Environmental (GRI 300), and Social (GRI 400). A note indicates to 'Select from these to report specific disclosures for each material topic'.

Colorado State University

Figure 6: SASB Standards and Reporting Pillars



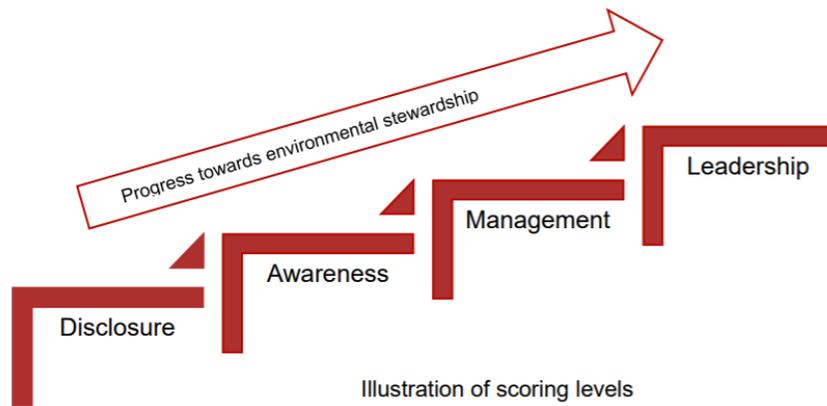
After initial presentations with executive level members of National Beef Packing, more research and analysis regarding sustainability program establishment, corporate governance structures, and goal progress for the major meat packing competition – Tyson, Cargill, and JBS, were requested. JBS was the first of the meat packers to establish baseline emissions and conduct a corporate materiality assessment in 2015. Tyson followed suit with a baseline emission assessment and corporate materiality assessment in 2016 with a realignment of climate goals based on Science-Based Target initiatives (SBTi's) in 2018. Cargill conducted a corporate materiality assessment as well as a baseline emission assessment in 2017. All three companies have ambitious ESG goals set for 2025, 2030, and beyond. Both JBS and Tyson have announced Net Zero 2040 and Net Zero 2050 goals, respectively. All three companies have approached many of their set goals through partnerships, grant funding, and research & development funding within their own organizations and partnering organizations.

After our initial sustainability analysis presentations, I was also asked to help draft a CDP Climate Change Report questionnaire response for National Beef Packing. National Beef Packing submitted their first CDP response in July of 2020 at the request of an important customer in their value chain. Information about electricity usage, emissions, and waste produced was sourced from data workbooks provided by Marfrig and filled out by National Beef Packing. All emissions data was calculated using the EPA (Environmental Protection Agency) Greenhouse Gas Calculator. Responses were formatted based on answer-formatting from Marfrig CDP report submissions from 2020 and other CDP reports in the same or relevant industries with high scores.

CDP scoring metrics have several layers of point allocation. These allocated points serve as indicators for the CDP analyst to assign a score to the reporting organization. The allocation levels are disclosure, awareness, management, and leadership. In order to get points at a new allocation level, reporting organizations must get all available points for the previous allocation level. A graphic

explaining this further is provided in figure 7. CDP disclosures are written reports submitted by an organization as opposed to a framework to be followed for an annual ESG report submission like GRI or SASB. Detailed reports with explanation for past and present actions and with insight looking into the future are likely to receive higher scores on CDP reports.

Figure 7: Illustration of CDP Scoring Levels



All questions responded to in the CDP report are scored first based on the disclosure level, which simply addresses that the reporting organization acknowledges and responds to the question presented. At the awareness level, evaluations are expected to include the impacts from business activities on the environment as well as the impacts the environment can and does have on business activities. Actions taken involving the intersection of business and environmental issues beyond screening and assessment are not evaluated at the awareness level of scoring. Points are given at the management level for responses that provide evidence of actions taken associated with environmental management and stewardship. At the leadership level of assessment, organizations are required to provide verified greenhouse gas statements and reduction implementations through certified partners of the CDP. Companies being scored at the leadership level show high scores at all other disclosure levels and have taken actions to prove that they are leaders in sustainability. Figure 8 below shows the scoring percentages needed at one assessment level to be scored at the next level for each CDP response questionnaire.

Figure 8: Score Banding for CDP Reports

Level	Climate Change	Water	Forests	Score band
Disclosure	1-44%	1-44%	1-44%	D-
	45-79%	45-79%	45-79%	D
Awareness	1-44%	1-44%	1-44%	C-
	45-79%	45-79%	45-79%	C
Management	1-44%	1-44%	1-44%	B-
	45-79%	45-79%	45-79%	B
Leadership	1-79%	1-79%	1-79%	A-
	80-100%	80-100%	80-100%	A

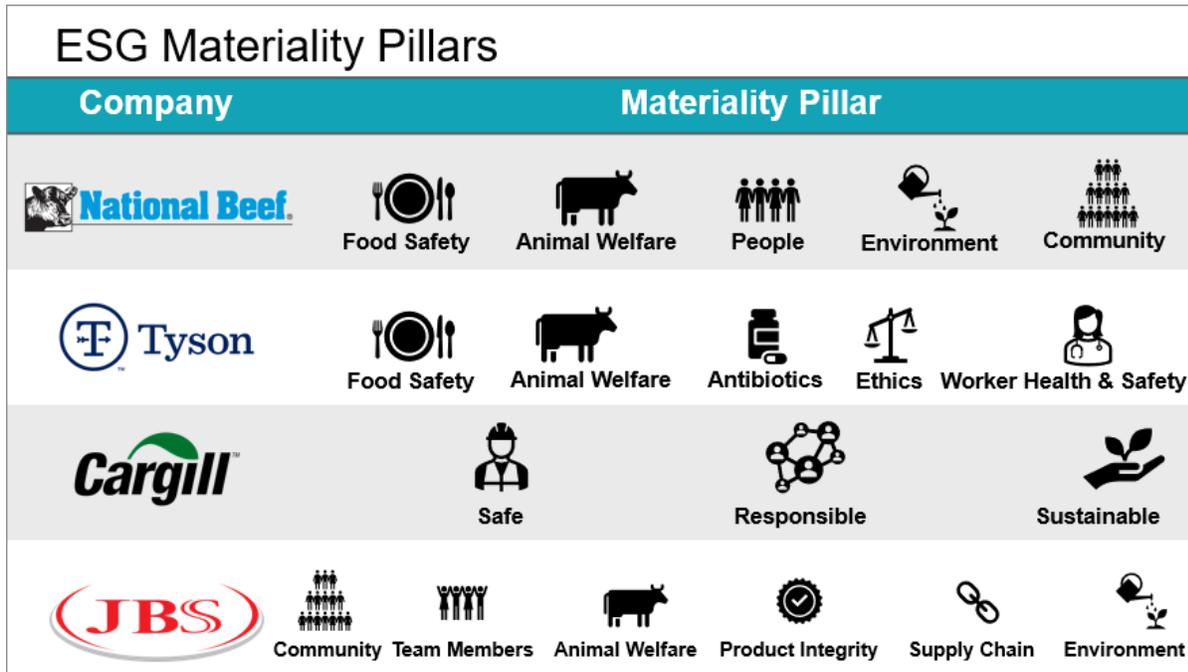
National Beef Packing was not preparing to introduce a sustainability plan at the time of the first CDP response they submitted in 2020. The company had been asked to submit a CDP report by a major

customer and obliged. Between that CDP submission and this one, a lot had changed and National Beef Packing has made serious strides towards developing and implementing an ambitious, but realistic, ESG plan. Through the process of developing a sustainability plan, executives at National Beef Packing realized that there are many sustainability efforts and initiatives the company had already been implementing such as installing new energy-efficient equipment at the plants in Dodge and Liberal, KS, or rendering biogas captured at the plant and using it as a self-generating power source.

I was able to use information gathered by National Beef Packing in 2020 and used within Marfrig's reports in order to calculate energy type and usage, fleet truck mileage, and other greenhouse gas emissions data which was included in the 2021 CDP Climate Change response. We were also able to determine what data could be tracked during the 2021 fiscal year that could be included in the report submissions for CDP in 2022. The workbooks provided by Marfrig are used in order to gather information for their ESG published reports including annual organizational ESG reports and CDP questionnaire responses for all three CDP categories. Through several meetings with executive level employees at National Beef Packing, we determined that a decent amount of the data requests within the Marfrig workbooks are applicable to operations and could be reported on in future ESG publishing released by the firm.

National Beef Packing is currently in the process of gathering data to determine if they can retroactively declare a baseline year for emissions reporting based on data from prior business years. Emissions reporting was more comprehensive this year than it has ever been before, however, there is more information that can be tracked and disclosed. Tracking and disclosing this data will lead to more consumer trust as well as increased efficiency and stability within operations. The executive level team understands the importance of the data and improving efficiencies across all operations. National Beef is currently working on establishing current and future goals at both the individual plant level as well as at the executive and corporate level that align with the materiality pillars established this summer. The materiality pillars chosen by National Beef can be seen in figure 9 alongside the materiality topic pillars for the organization's main competitors.

Figure 9: Materiality Pillars for US Based Meat Packers



National Beef Packing is also in the process of establishing an official board or committee for ESG issues, goals, and accountability. To lead this committee and help promote sustainability across the company, National Beef Packing is currently in the process of looking for and hiring a Sustainability Director – an inaugural position within the firm.

The momentum has built within the leadership team at National Beef Packing over the time of the partnership with CSU AgNext. We expect to see improved CDP Climate Change and Forestry Scores for 2021 filings, a comprehensive and cohesive sustainability plan, and many more exciting future plans and endeavors in the ESG field. 2021 CDP filings are expected to be released prior to December 31<sup>st</sup>, 2021. With the development of materiality pillars and the momentum and excitement built up regarding these sustainability initiative rollouts makes for an exciting ESG future for National Beef Packing.

**Summary Recommendations Table**

Recommendations	Change Type	Waste Reduced	Cost of Implementing	Cost Saving	Payback Period	Other Outcomes
Tracking and disclosing further scope 3 emissions. Emissions to be tracked and/or disclosed are air travel emissions from business	Procedural and Material	N/A	The cost of implementing data tracking would mostly fall under human resources costs as much of the data that would be available for	N/A	N/A	By tracking and disclosing more of the organization's carbon footprint, more realistic and reliable future ESG

<p>travel and purchased livestock enteric emissions.</p>			<p>the organization to track would need to be compiled together and calculated based on EPA calculation standards. These tasks would probably fall under the Sustainability Director that National Beef is looking into hiring.</p>			<p>goals and plans will be able to be set by National Beef Packing. Disclosing the information will also give the company more credibility in the eyes of the stakeholder.</p>
<p>Increased capture and usage or refinement and further resale of biogas produced and captured within National Beef Packing processing plants.</p>	<p>Procedural and Material</p>	<p>Increased capture and refinement of biogas will lead to overall lower greenhouse gas emissions in both scope 1 and scope 2 accounting.</p>	<p>Improvements to existing or manufacturing new manure lagoons could be a strategy implemented at processing facilities in order to catch more biogas. These technologies would range in price point. Anaerobic digestors range from \$200 to \$550 per 1000 lbs. of live animal weight according to the Environmental and Energy Study Institute.</p>	<p>Monthly electricity bills at facilities could be greatly reduced with the increased usage of biogas capture technology at facilities.</p>	<p>Roughly 3 – 7 years is the payback period for anaerobic digestors according to the Environmental and Energy Study Institute.</p>	<p>Increased energy savings, lower energy bills, and increased usage of renewable energy sources.</p>

<p>Waste Reduction throughout facilities and operations as well as increased recycling incentives and operations across facilities.</p>	<p>Procedural and Material</p>	<p>Overall waste was reduced by over 16% from 2019 to 2020. We hope through sustainability and resiliency strategizing and planning the company is able to find more innovative ways to reduce waste. National Beef also saw a 220% increase in reported recycled materials between 2019 and 2020 due to increased reporting capabilities regarding production processes.</p>	<p>Some money may need to be put into research and development regarding packaging and sanitation practices to see if there are considerable ways for National Beef Packing to reduce their waste and increase use of recyclable packaging. Solid costs on these types of projects have not yet been determined.</p>	<p>N/A</p>	<p>N/A</p>	<p>Reducing waste and overall usage of plastics will help with reducing scope 3 emissions for National Beef Packing. Reducing waste will also help to incentivize employees and increase sense of pride amongst workers at NBP facilities.</p>
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# Truth in Testimony Disclosure Form

In accordance with Rule XI, clause 2(g)(5)\* of the *Rules of the House of Representatives*, witnesses are asked to disclose the following information. Please complete this form electronically by filling in the provided blanks.

**Committee:** \_\_\_\_\_

**Subcommittee:** \_\_\_\_\_

**Hearing Date:** \_\_\_\_\_

**Hearing** :

**Witness Name:** \_\_\_\_\_

**Position/Title:** \_\_\_\_\_

**Witness Type:**  Governmental  Non-governmental

**Are you representing yourself or an organization?**  Self  Organization

**If you are representing an organization, please list what entity or entities you are representing:**

## **FOR WITNESSES APPEARING IN A NON-GOVERNMENTAL CAPACITY**

**Please complete the following fields. If necessary, attach additional sheet(s) to provide more information.**

**Are you a fiduciary—including, but not limited to, a director, officer, advisor, or resident agent—of any organization or entity that has an interest in the subject matter of the hearing? If so, please list the name of the organization(s) or entities.**

**Please list any federal grants or contracts (including subgrants or subcontracts) related to the hearing's subject matter that you, the organization(s) you represent, or entities for which you serve as a fiduciary have received in the past thirty-six months from the date of the hearing. Include the source and amount of each grant or contract.**

**Please list any contracts, grants, or payments originating with a foreign government and related to the hearing's subject that you, the organization(s) you represent, or entities for which you serve as a fiduciary have received in the past thirty-six months from the date of the hearing. Include the amount and country of origin of each contract or payment.**

**Please complete the following fields. If necessary, attach additional sheet(s) to provide more information.**

- I have attached a written statement of proposed testimony.
- I have attached my curriculum vitae or biography.

\* Rule XI, clause 2(g)(5), of the U.S. House of Representatives provides:

(5)(A) Each committee shall, to the greatest extent practicable, require witnesses who appear before it to submit in advance written statements of proposed testimony and to limit their initial presentations to the committee to brief summaries thereof.

(B) In the case of a witness appearing in a non-governmental capacity, a written statement of proposed testimony shall include— (i) a curriculum vitae; (ii) a disclosure of any Federal grants or contracts, or contracts, grants, or payments originating with a foreign government, received during the past 36 months by the witness or by an entity represented by the witness and related to the subject matter of the hearing; and (iii) a disclosure of whether the witness is a fiduciary (including, but not limited to, a director, officer, advisor, or resident agent) of any organization or entity that has an interest in the subject matter of the hearing.

(C) The disclosure referred to in subdivision (B)(iii) shall include— (i) the amount and source of each Federal grant (or subgrant thereof) or contract (or subcontract thereof) related to the subject matter of the hearing; and (ii) the amount and country of origin of any payment or contract related to the subject matter of the hearing originating with a foreign government.

(D) Such statements, with appropriate redactions to protect the privacy or security of the witness, shall be made publicly available in electronic form 24 hours before the witness appears to the extent practicable, but not later than one day after the witness appears.