THESIS

A NEEDS ASSESSMENT FOR COLORADO BEEF PRODUCERS: UNDERSTANDING RANCHER PRIORITIES, PREFERRED COMMUNICATION STRATEGIES, AND INFLUENTIAL FACTORS ON PRIORITIZATION AND RELATIONSHIPS WITH LAND GRANT UNIVERSITIES

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ABSTRACT

A NEEDS ASSESSMENT FOR COLORADO BEEF PRODUCERS: UNDERSTANDING RANCHER PRIORITIES, PREFERRED COMMUNICATION STRATEGIES, AND INFLUENTIAL FACTORS ON PRIORITIZATION AND RELATIONSHIPS WITH LAND GRANT UNIVERSITIES

Colorado's beef cattle numbers have grown in recent years. Colorado beef producers provide a high-quality protein source to consumers while acting as responsible stewards of the land. However, market volatility, changing demographics within the beef industry, and pressure from consumers, has influenced the dynamic of beef production. The industry's long-term success will rely heavily on the productivity of its underlying resource base and the management abilities of its many ranchers. At the same time, Extension resources and funding are diminishing. Extension personnel are asked to provide the same amount of assistance in addressing community needs with less available resources. It is increasingly difficult for Extension to prioritize issues in the communities they serve. Direct producer feedback is useful when setting industry priorities and developing effective programming. Specifically in Colorado, direct feedback is critical because there has never been a comprehensive needs assessment of beef producers.

To better understand and prioritize current needs and opportunities faced by the Colorado beef industry, a comprehensive needs assessment was conducted by Colorado State University (CSU) in collaboration with the Colorado Cattlemen's Association (CCA) and Colorado Livestock Association (CLA). The objectives of this study are Colorado beef producers'

educational priorities are influenced by demographic characteristics; Colorado beef producers' preferences for formatting and delivery methods for Extension and outreach materials are influenced by demographic characteristics; and external and internal factors influence prioritization and preferences for Colorado beef producers.

A 31-question mailed survey was sent via the Dillman Tailored Design Method to producer members (N=1,840, 39.6% response rate) to collect quantitative data related to the three objectives. The questions asked about priority educational needs and preferred communication strategies, as well as a compilation of demographics for Colorado's beef producers. Additionally, one-on-one key informant interviews (N=21) of these ranchers were conducted to provide qualitative data in support of results from the needs assessment. Key informant interviews of these ranchers also provided insight into understanding how rancher identity and community affect relationships at a land grant university. Quantitative data were analyzed through both a linear probability model and linear regressions, and qualitative data from the key informant interviews were transcribed and analyzed through thematic analysis. Themes were constructed through summarization and review. A final summary was examined for patterns relative to the research objectives.

From the quantitative study, respondents were over 56 years of age (72.1%) with over 21 years of ranching experience (75.8%). Over 70% of participants are the operation owner and manager and nearly 75% of the operations are full-time. Representation from all four-industry segments was reported; operations were mostly commercial cow-calf (73.7%), with 12.3% grazing/growing stocker, 10% seedstock, and 4% feedlots. Operation size varied with 35.6% small (<100 head), 45.8% medium (101-500 head), and 18.6% large (>500 head). Regionally

respondents indicated being from the Front Range (15.4%), Peaks and Plains (46.9%), and Western Slope (37.7%).

Over half of the quantitative study respondents rated business management, resource management, and risk management as high priority themes. Segment ($p = .05$) and region ($p = .01$) influenced prioritization of resource management. An overwhelming majority indicated a need for more outside resources for managing market risk (73%) and developing and implementing production strategies (59%). Producers prioritized marketing strategies (63%) and herd level challenges, such as nutrition and supplementation (47%), grazing and weeds (46%), and herd health (42%) as management areas needing additional education. Outside these tops priorities, segment ($p = .01$) influenced prioritization of genetic technologies and tools and human resource management. Over 70% of all producers identified providing tools to take home and use and hands-on demonstrations as essential components of effective educational programs, with no significant differences in top priorities due to demographic characteristics ($p > .10$). Over 60% of all participants selected field days and ranch demonstrations, and full day seminars and workshops with expert speakers, as preferred formats to obtain new educational information. Segment ($p < .05$) and location ($p < .04$) influenced selection of educational formatting. For interest in future activity areas, producers had moderate interests in all activities, but demographic characteristics, such as segment ($p < .05$), scale ($p < .01$), and location ($p < .02$), influenced interest levels. Nearly one-third of producers selected "productivity of land and animals" as their primary motivation. Region ($p < .04$) influenced selection of "productivity of land and animals" and "profitability and enterprise growth as producer motivations. Scale of operation ($p < .07$) also influenced selection of "transition to next generation" and "family lifestyle or tradition" for producer motivation. About 70% of participants indicated their current

financial situation (cash flow or cost of production) as the biggest obstacle. Additionally, direct producer feedback from key informant interviews explained how particular internal (family dynamics, generational transition, diversification, operational scale) and external (labor, regulations, land use competition, marketing) forces influenced a shift or change in operational needs and priorities.

A compilation of rancher perspectives from key informant interviews led to exploration of three main themes: ranching as an identity, communities and connection, and trust of a land grant university. These individual themes build upon one another for a broader explanation of how rancher identity and community influence trust of a land grant university. Ranching identity includes independence and pride in the lifestyle, while ranching communities provide an outlet for networking, assistance, and advice. From these influences, trust is developed through personalized relationships and finding a connection with individuals and their communities.

A systems map was developed to better understand the current structure and challenges of producer engagement with an association, specifically Colorado Cattlemen's Association. The focusing question of "Why have we (CCA) been struggling to effectively engage our affiliates?" guided stakeholders. The systems thinking process identified three key leverage points for change: build aligned and passionate engagement, evolve organizational structure with members needs, and develop life-long learners.

Insight from this project shows that Colorado beef producers prioritize the development and delivery of educational programs focused on improving production practices and mitigating financial risk. Providing programs that can be tailored to a variety of preferred delivery formats and offer valuable opportunities to interact with other producers will be important. Results indicate Extension should consider developing programs that focus on providing education

related to management decisions and strategies, especially related to risk, marketing, and production practices. Goals for communication strategies should include prioritizing in-person programming that provides particular structural elements, such as specific tools for producers to take home and use and hands-on demonstrations. In addition, recommendations of local-level, in-person involvement of Extension personnel, and formation of strategic stakeholder partnerships can be beneficial for rebuilding relationships between ranchers and a land grant university. For Colorado Cattlemen's Association, specific recommendations for growth and long-term engagement success requires avoiding short-term fixes, prioritizing efforts to operate using ideal, strategic solutions, and concentrating on incorporating key leverage points into the association's system.

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Producer Needs Assessments

The mission of Extension is to deliver agricultural college-generated knowledge beyond the land grant university campus to community members (National Research Council, 1995). A basis for determining applicable knowledge for a community is through needs assessments. A needs assessment generally refers to the methods, efforts, and activities involved in or used for identifying needs (Royse, Staton-Tindall, Badger & Webster, 2009). Goals of needs assessments are to first learn about problems, issues, or concerns in a community, and then to provide strategic programs, services, or products in response to the identified needs (Garst & McCawley, 2015). Within needs assessment methods, Extension personnel identify problems in communities and potential education solutions by using input from community stakeholders. Community involvement in the needs assessment and issue prioritization process is essential. Research has shown that stakeholder support for and acceptance of Extension programs, services, and products is secured through knowing local needs (Garst & McCawley, 2015). After understanding community needs, Extension personnel pursue particular educational programs and content areas based on community responses. Extension personnel are able to use needs assessments as a guide instead of blindly targeting certain community groups or education categories.

In the case of beef producers in the United States, needs assessments have been necessary to understand priorities for both education and outreach. States that use this process ultimately understand their producers better and in turn, producers are encouraged to have better relationships with Extension personnel (Torell, 2001; Vergot III, Israel & Mayo, 2005).

Connecting with Producers

Both indirect and direct methods have a purpose when connecting with producers. Indirect methods, including quantitative exploration through surveys, focus on collecting objective data and determining how variables within these data may or may not influence each other (University of Southern California, 2018). Quantitative studies have highly structured design and methods, aimed to collect data in numerical and statistical form. Results are documented using objective language (Creswell & Creswell, 2013). These studies are particularly beneficial for reducing bias and providing a framework so data are more easily measured against one another (Rabinowitz, 2018). These studies are beneficial for collecting demographic information and structured to provide basis for statistical analysis of data. Ranchers are sometimes concerned about sharing their data so these methods also provide better structure for anonymity.

Direct, qualitative methods are also purposeful for connecting with producers. Research has shown that qualitative methods are necessary to recognize the complexities behind decision-making processes and lifestyle decisions for ranchers (Sayre, 2004). Qualitative studies seek to explore, explain, and understand responses (Creswell & Creswell, 2013). Methods include interviews, observations, focus groups, or community meetings. Each of these methods typically does not provide results that can be translated to numerical scores or values (Rabinowitz, 2018). However, the open-ended structure in qualitative methods encourages flexibility in responses; therefore adding more variety in detail about collected data.

Understanding Producer Priorities

There are several key trends influencing how cattle producers in the United States are operating. Historically, the cattle market has followed a fairly structured marketing cycle that

had price swings and inventory changes from high to low as well. However in recent years, cattle market volatility has increased exponentially (Griffith, 2018). Cattle producers are facing more risk as markets have experienced drastic swings that do provide some opportunities, but mostly leave producers facing challenging times and more risk (Griffith, 2018). Changes in population, cattle numbers, product consumption, live cattle prices, and average retail prices impact the industry (Field, 2018). In addition to market volatility, consumer scrutiny of cattle production practices, and beef consumption has increased. Cattle producers are dedicated to high industry standards to provide a safe, wholesome, high-quality product, but consumers are more critical. Whether it is animal care standards, health concerns, or environmental influences, cattle producers are faced with critical consumers demanding to know more about their beef (USDA, ERS, 2018). Changes in the global trade and markets have also influenced cattle production in the United States. Forecasts for 2018 suggest that global demand for beef will increase along with exports of American beef (USDA, FAS, 2018). However, as carcass weights for cattle have increased and more efficiency has been introduced in beef production, United States cattle producers should be able to satisfy demand even as cattle inventory numbers fluctuate (Field, 2018).

Through a series of seven listening sessions across Iowa, Iowa State University Extension conducted a needs assessment to better understand and articulate specific challenges for beef producers in the state (Gunn & Loy, 2015). Beef cattle numbers had dropped and row-crop production had increased due to a variety of factors, such as price volatility, aging producer base, and drought and lack of feed availability. From these listening sessions, there were eight frequently discussed challenges affecting producers. In order from most to least challenging, these eight challenges were land access, farm transition, production efficiency, marketing,

genetics, data management, feedstuffs, and herd health (Gunn & Loy, 2015). The specific topics within each of these challenges showed Extension that beef producers want to incorporate new information and technology into their enterprises. Development of new priority areas and challenges also solidified the importance of routine assessment and revision of Extension programming and planning.

Another needs assessment of livestock producers was completed in Nevada in 2001 as part of Extension's requirement to periodically assess the educational needs in a geographic area of responsibility (Torell, 2001). The primary objectives of this survey were to determine if current programming was addressing local needs, as well as identifying potential new issues or content areas related to livestock production and marketing. Results from the survey denoted that prioritized subject areas included disease treatment and prevention; reproductive management and second conception; Beef Quality Assurance programs; 4-H programs; and marketing, risk management, and retained ownership (Torell, 2001). By both using these needs assessments and recognizing changing industry dynamics, understanding beef producer priorities becomes clearer.

Preferred Producer Communication Strategies

For beef producers, needs assessments by Extension personnel in several states have begun to identify the most applicable communication strategies. Producers' preferences from these surveys indicate Extension should use more traditional educational formats for programming, such as in-person presentations and written materials.

The Nevada needs assessment of livestock producers that assessed educational needs of livestock producers also presented discussions of programming delivery (Torell, 2001). This survey sought examination of past Extension education efforts to determine the desired

presentation for future programming. The preferred educational formatting for Nevada livestock producers were livestock newsletters, on-ranch demonstrations, and fact sheets and publications (Torell, 2001). Another study of beef cattle producers in Florida highlighted communication preferences. This study was conducted to examine the effectiveness of Extension service in a particular Extension region of Florida. A specific priority of the survey was to address cattle producers' preferences for sources and channels of information to help guide education program efforts of Extension to best serve their clientele in this region (Vergot III, Israel & Mayo, 2005). Findings from the survey emphasized beef producers preferences for more traditional formatting and sources of programming. In the case of Florida beef producers, printed materials, such as newsletters, magazines, and bulletins are preferred over Internet resources (Vergot III, Israel & Mayo, 2005). Additionally, the preferred sources to provide information to producers ranked from other producers as the most preferred, then Extension officials, followed by veterinarians and local supply dealers (Vergot III, Israel & Mayo, 2005).

There are external factors that may influence communication preferences and strategies. With the changes of funding and technology use in Extension, it is essential that Extension remain aware of their clientele's previous experiences, perceptions of current programs, and how program delivery may need to be adapted in the future (Adedokun, Parker, Loizzo, Burgess & Robinson, 2011). Previous research highlights that preferred methods of communication for audiences is influenced by age demographics, level of education of the audience, and access to technology (Dahlen, Hadrich & Lardy, 2014). Through a broad-based survey, North Dakota State University Extension explored both communication and outreach preferences for North Dakota beef producers, as well as these producers age demographics and anticipated technology use. Results reinforced the need to maintain traditional methods of program delivery to satisfy

beef producers currently (Dahlen, Hadrich & Lardy, 2014). The preferred methods of educational delivery included face-to-face meetings, newsletters, and bulletins over more technologically based programming. This North Dakota survey also indicated attendance at programs would be highest when programming content is impactful to the producer, located close to the producer, and ultimately, when producers recognize the opportunity cost of spending their time at the program (Dahlen, Hadrich & Lardy, 2014).

Beef Producer Demographics

The Beef Industry in the United States

The current cattle inventory as of January 2017 is 95,584,600 head (USDA NASS, 2017). The estimated economic impact for 2016 was $67.56 billion in farm cash receipts for cattle and calves (USDA NASS, 2017). Cattle inventory is distributed across the United States, but the top ten cattle-producing states are Texas, Nebraska, Kansas, California, Oklahoma, Missouri, Iowa, South Dakota, Wisconsin, and Colorado (USDA NASS, 2017). These ten states represent 57 percent of all cattle and calves in the United States. There are 913,246 total cattle and calf operations, with the average age of a typical American cattle producer at 58.3 years old (U.S. Census Bureau, 2012). All four segments of beef production are represented in the United States, with commercial cow-calf operations as the most common. Nationwide statistics about beef producers indicate average beef cattle herd size is 40 head. Those with 40 or fewer head are typically part of supplemental income or part of multi-enterprises (USDA ERS, 2018). Herds with 100 or more head represent 51 percent of the beef cattle inventory and 9 percent of all beef operations (USDA ERS, 2018). For feedlots, the majority are less than 1,000 head capacity; but those with more than 1,000 head capacity, represent only 5 percent of all feedlots, and market 80 to 90 percent of all fed cattle (USDA ERS, 2018).

Colorado's Beef Industry

In Colorado, the total farm marketing receipts from 2016 were $6.3 billion, with 66 percent of the total coming from livestock and livestock products (USDA NASS, 2017). According to USDA NASS, as of January 2017, Colorado is one of the top ten states for total number of cattle and calves with 2.8 million head, and a value of production in the state at nearly $2 billion. This value of production includes cattle inventory, marketing, slaughter, and home consumption. Colorado is home to over 13,000 cattle producers with herd sizes ranging from less than 10 head to over 5,000 head at some of the large feedlots across the state (U.S. Census Bureau, 2012). Of these 13,000 beef producers, operation type varies across all four sectors with representation of commercial cow-calf operations, seedstock operations, stocker operations, and feedlots. According to USDA NASS statistics, as of January 2017, the top ten counties with the highest cattle and calves inventory were, in order: Weld, Yuma, Morgan, Logan, Kit Carson, Prowers, Crowley, Washington, Otero, and Montrose. These ten counties represent 65.8% of all cattle and calves in the Colorado (USDA NASS, 2017). These counties, excluding Montrose County, are on the eastern side of the state and are home to the most feedlots, hence the higher inventory. The more mountainous western portion of the state is home to more commercial cow-calf producers. Regardless of the operational representation regionally, beef production is common statewide.

Specific statistics about rancher age, experience, and segment representation are not available on a state level for Colorado. There is a discrepancy of readily available information on these demographics. This gap in knowledge about Colorado beef producer demographics could be purposefully explored through a comprehensive needs assessment. Hence the prioritization of this research project.

For Colorado's beef producers, there are a variety of available opportunities for involvement and education. Colorado has two premier producer associations for beef producers, Colorado Cattlemen's Association and Colorado Livestock Association. Both groups provide producers invaluable resources for education, legislative efforts, and networking. Beyond membership associations, beef producers are also able to remain connected through the land grant university for Colorado, Colorado State University (CSU), and the programming provided through CSU Extension.

Cattle Production Methods

In the United States, there are four primary cattle production segments. Each of these methods have unique production practices and operational differences, however, all four segments are necessary for the beef production cycle. The four segments are seedstock, commercial cow-calf, backgrounder or stocker, and feedlots.

Seedstock producers raise cattle of all ages, but focus specifically on providing genetics that can contribute to the productivity and profitability of the beef industry (Field, 2018). These producers sell breeding animals, semen, embryos, and genetic information to other producers. Each seedstock producer creates a specialized service for their customers that provides specific characteristics for another producer to utilize in their production and marketing program. This service relates directly to the genetic merit claimed to be provided by their breeding herd.

Commercial cow-calf producers maintain cowherds and raise calves from birth to weaning, or sometimes beyond weaning if there is retained ownership (Field, 2018). Cow-calf producers seek to maximize their resources effectively so each cow in their herd produces one calf a year. This calf is the primary source of revenue for most cow-calf producers. Revenue is important for maintaining the cowherd and if need be, purchasing new heifers, females that have

not had a calf yet, to replace unproductive cows. Management and marketing strategies for these producers emphasize typically calving once a year, and weaning their calves to be sold at the same time each year. Cow-calf producers also utilize more pasture-based grazing for their herds and supplement nutrition during certain times of the year if the available forage declines (Field, 2018).

Backgrounder or stocker operations provide forage, in the form of pasture-based grazing or more confinement-type facilities, to help add weight to weaned calves before they are shipped to feedlots for final weight gain. These operations typically purchase weaned calves from commercial cow-calf producers. Two alternatives to this change in ownership are commercial cow-calf producers retain ownership and feed their own weaned calves or cattle feeders from feedlots purchase calves and feed them during the growing and feedlot phases (Field, 2018).

Feedlot operations are confinement operations that provide the facilities and nutrition necessary for cattle gaining weight to be prepared for slaughter (Field, 2018). This final stage emphasizes growth and maturity of cattle, and the confinement style of feedlots requires more intensive day-to-day management and labor. Not all cattle reach market-ready weight at feedlots and can continue to grow while grazing pasture until they reach mature weight.

Understanding Producer Motivation and Engagement

As each of the needs assessments above indicate, beef producers across the United States have similar mentalities when considering prioritization of critical content areas and preferred methods of educational outreach. Beef producers continually select hands on workshops as a valuable feature and primary reason for attendance (Hall, McKinnon, Greiner & Whittier, 2004). With content areas, prioritization relates to maximizing how beef producers use their resources and in turn, increase their productivity or profits. Influences on decision-making are another

layer to explore to better understand ranchers. Research has continually shown that ranchers rely on other producers as a highly respected and used resource for information (Kachergis et al., 2013; Vergot III, Israel & Mayo, 2005). This sense of community is abundantly apparent as ranchers interact within their ranching communities. Cattlemen may differ in management decisions or production practices, but have fierce loyalty and a strong sense of community identity when they believe their ranching communities may be threatened (Kreye, Pienaar & Adams, 2016). This "us versus them" mentality can lead to a problematic divide between consumers and ranchers, but for many ranchers, this divide can be easily overcome when they believe their lifestyle is respected. Ranchers interact with their neighbors and communities during times of crisis and celebration, but regardless, the ranching community is a constant source of support for individual ranchers.

Ranching often gives a sense of achievement and act as a source of identity (Sorice, Kreuter, Conner & Wilkins, 2012). Ranchers have immense pride and respect the time-honored tradition of their livelihoods, many times ranking their ranching lifestyle over economic returns from their ranching business (Roche et al., 2015). Part of this historic ranching lifestyle is reliance on one's independence. Ranchers are able to use their personal knowledge, experiences, perceptions, and values as a guide for decision-making and management strategies (Roche et al., 2015). As mentioned before, ranching communities provide support, but ranchers are fiercely independent and self-sufficient (Wilmer & Fernández-Giménez, 2016).

Producer engagement troubles stakeholders. Organizations, associations, and academics seek to provide educational material at presentations or exclusive beef producer events, and they continually struggle to recruit attendees. Some research suggests that programing format, content, or event location may be to blame for a lack of attendance (Dahlen, Hadrich & Lardy,

2014). However, even when all these factors are accounted for, producer attendance can still be minimal. Different formats or motivating factors to attend need to be explored. If Extension personnel or other stakeholders are not able to find ways to encourage attendance, then they are most likely not reaching as many producers as they could.

Land Grant Universities and Extension

Land grant universities were established through the Morrill Act of 1862 and 1890 in hopes of improving rural life and educating citizens in practical professions, such as agriculture, home economics, and mechanical arts (National Research Council, 1995). These institutions emphasized practical research and the teaching of agriculture to develop agricultural innovations, required through the Hatch Act in 1887 (National Research Council, 1995). As these universities continued to prioritize practical education and research, there was a need to more effectively disseminate this information to communities. That is when the 1914 Smith-Lever Act was created as a cooperative activity between the federal government and the state-level, land grant universities. One purpose of Extension was to deliver the agricultural college-generated knowledge beyond the campus to the community members (National Research Council, 1995).

Since 1914, the purpose of Extension has not strayed from providing college-generated knowledge to the public; however, there have been adaptations and transformations within Extension for land grant universities. Extension personnel have changed program deliveries in the past 25 years and programs have been developed based on specific needs of various people within communities (Chase, Ely, & Hutjens, 2006). Extension has expanded to include programming to educate youth, promote better human health, economic advancement, and agricultural productivity growth (Wang, 2014). These programming content changes are oftentimes connected to the funding sources for Extension. Originally, Extension was meant to

be a joint venture between federal and state funds (National Research Council, 1995). Currently, the balance has shifted toward less federal funding and more state funding, but a significant decrease in funding for Extension as a whole has occurred (Wang, 2014). Budget constraints are a constant concern for Extension personnel and can lead to overworked Extension employees that are unable to address the concerns in their communities. Budget decreases have also lead to Extension programs focusing on applying for specific federal grants that have particular research objectives in mind that may provide funding but not directly benefit communities (Wang, 2014). Extension personnel may also have different prioritization of certain program formatting than the community members they are serving (Boone, Boone, Cullen, Woloshuk, 2011).

The land grant university for Colorado is Colorado State University (CSU) and was established in 1870 (National Research Council, 1995). As mentioned previously, each land grant university is responsible for connecting with the community through Extension. The mission of CSU Extension is “to provide information and education, and encourage the application of research-based knowledge in response to local, state, and national issues affecting individuals, youth, families, agricultural enterprises, and communities of Colorado" (Colorado State University, 2016). CSU’s Extension program struggles with similar issues as other land grant universities, but regardless of external factors, personnel continue to strive to exemplify its mission.

A Systems Thinking Approach

A unique way to identify how people problem solve and make decisions is through the process of systems thinking. The purpose of systems thinking is to provide a nontraditional form of analysis, which encourages a more expansive look at all the influences on a problem, not just seeking a solution; hence the systematic process (Sterman, 2000). This nontraditional format

asks how various elements within a system influence one another and instead of reacting to problems, this methodology guides users to explore relationships within the system while looking for patterns over time and seeking underlying, root causes of these repeated issues (Goodman, 1997). Problems that are typically most effective for the process of systems thinking are complex problems with nonobvious solutions, which have multiple external influences from the environment and system surrounding them (Checkland, 1999). Systems thinking is also helpful for uncovering unintended consequences that often come from the traditional format of making a decision and seeking one solution to a problem (Sterman, 2000). Because systems thinkers are not explicitly focused on finding one solution to a problem, all aspects of the issue including unintended consequences that may stem from potential solutions to the problem, are unearthed and evaluated. Through evaluation of all elements within a system and the relationships and patterns within the system, leverage points for change are identified. Although these leverage points are not solutions, they are critical points where change can be introduced and allow for beneficial transformation within the system.

In evaluating needs and priorities, systems thinking allows researchers to explore influential forces. The complexities of defining prioritization are better articulated through systems thinking due to this process of problem solving incorporating internal and external influences. Additionally, systems thinking encourages a more thorough evaluation of how these influences can be modified for productivity within the system. Leverage points for best addressing needs and priorities may include organizational restructure or development of partnerships with stakeholders.

The Iceberg Metaphor

One of the most explanatory methods for understanding systems thinking is using the Iceberg metaphor (Figure 1.1.). This metaphor indicates that there is one small piece of the system that is recognizable, the tip of the iceberg; however, the majority of the iceberg, and most important pieces, are hidden beneath the surface.

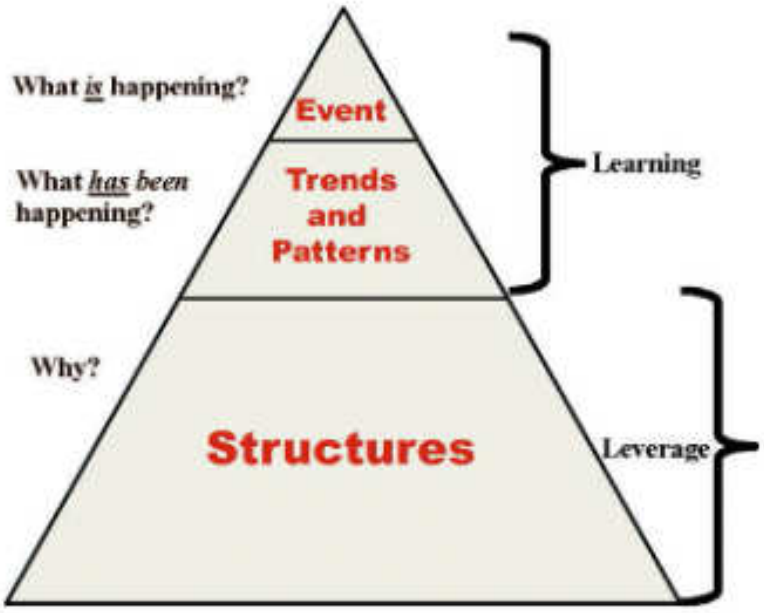

Figure 1.1. The Iceberg Metaphor and the Three Associated Phases that Lead to Identifying the Leverage Points within the System (Rhoades, McCuistion, & Mathis, 2014).

In systems thinking, this iceberg metaphor translates to include three layers that encompass the problem-structuring phase of systems thinking (Rhoades, McCuistion, & Mathis, 2014). The tip of the iceberg is the single event or problem, and then just below the surface is further examination into the patterns of events or trends that relate to the single event (Cunliff, n.d.). As Figure 1.1 shows, the event and associated trends and patterns are part of the learning phase of systems thinking. During the learning phase, the focusing questions first explore "what

happened?" and then "what has been happening" (Goodman, 1997). This learning phase allows deeper understanding of the problem so participants can more effectively understand potential structural influences or critical leverage points for change within the third step of the iceberg. The leverage phase has the greatest impact on change in the system through identification of leverage points for change.

Mental Models and Leverage Points for Change

The leverage phase of systems thinking investigates the underlying structures and forces that explain why the issue is happening on a deeper, less obvious level (Goodman, 1997). To be most effective in exploration during this phase, mental models must be taken into consideration. Mental models are the ways in which people think about the relationships between variables in the world around them (Karash, n.d.). The world is connected through cause-and-effect relationships, but oftentimes people do not recognize why they make certain connections or links. Mental models filter how people interact with the world around them and are typically treated as the truth; even though many times mental models are flawed or incomplete (Isee Systems, 2006). These mental models reinforce behaviors and lead to the patterns or trends that are associated with issues. However, recognition of mental models means that people can move beyond these constraints and begin to explore more subtle features within a system. This subtle exploration leads to identifying leverage points for change in a system. Leverage points are where new or alternative interventions can be introduced to improve the system. The purpose of these leverage points is to yield large improvements to the system (Kim, 2000). Leverage points are often non-intuitive, influence the distribution of power in a system, affect rules of the system, change goals of the system, and recondition the paradigm of which the system arises (Meadows,

2008). Once leverage points are introduced to a system, the outcomes should lead to an overall beneficial change to the original problem or issue.

Systems Mapping

Each of the processes of systems thinking can be visually represented through transformation into conceptual systems maps. Systems maps offer detailed explanation of the problem, trends and patterns that influence the problem or issue, and indicate how leverage can be used within the structures of a system (Kim, 2000). These maps begin from causal loop diagrams, which are a simplified version of a systems map and include minimal variables in the feedback loops. A feedback loop includes at least two variables and directionality of change from one variable to the other. Feedback loops build upon each other to map out the problem and the trends and patterns that influence the issue. With systems thinking, feedback is incorporated into every causal loop and systems map because each link in the systems map is part of a feedback circuit.

Building from causal loop diagrams to systems maps involves an expansion of causal loops to include multiple inputs and outputs that effect or influence the feedback loops. Each causal loop is able to stand alone as explanation of a particular event or issue, but combining the loops provides a comprehensive diagram that explains all possible influences within a system. It also includes leverage points for change from outside the system and demonstrates how these leverage points instigate change in the system. This comprehensive diagram is known as the systems map.

Archetypes of Systems Thinking

Although the basic principles of systems thinking are built upon the feedback loops described previously, systems archetypes are beneficial for continuing the systems thinking

process. These archetypes are helpful for providing a framework for understanding the typical structures and underlying story lines that generally explain an issue (Kim, 2000). There are reoccurring structures that occur in many different situations and systems. It is often difficult to unpack complex systems so understanding the eight archetypes of systems thinking is helpful for developing a systems map for explaining an issue. Each of the archetypes has specific descriptions and guidelines, but the following two archetypes are critical (Kim, 2000):

Fixes that Fail. In this archetype, a quick solution is implemented for fixing a situation; however the unintended consequences of the quick fix amplify the problem. Then, the problem will either return back to its original level or will continue to become worse. In order to break this archetype it is important to recognize the quick fix is not solving the entire issue and solving the real problem will require commitment. Additionally, applying the quick fix while seeking out a more permanent solution will help avoid the trap of continually addressing unintended consequences. An example of this archetype is when businesses attempt to save money by decreasing maintenance. This temporarily decreases costs, but then there are more breakdowns of equipment, which add to higher costs and add pressure to cut costs again.

Shifting the Burden. In this archetype, a symptomatic solution is applied to solve a problem, which is problematic because it distracts from more fundamental solutions. This archetype can also be referred to as an "Addiction" archetype because this diversion pattern can develop in a way where the side effect may overwhelm the original problem symptom. It is important to note that problem symptoms are the easiest element to recognize, but if the side effect becomes the problem, it may be an "Addiction" archetype instead. For this archetype it is helpful to explore the problem from a different

perspective in order to better understand a potential fundamental solution. An example of this archetype would be borrowing money to cover uncontrolled spending instead of making a budget to control spending.

LITERATURE CITED

Adedokun, O. A., Parker, L. C., Loizzo, J., Burgess, W. D., & Robinson, J. P. (2011). Factors influencing participant perception of program impact: Lessons from a virtual fieldtrip for middle-school students. *Journal of Extension*, 49 (6) Retrieved from http://www.joe.org/joe/2011december/a8.php.

Boone, D.A., Boone, H.N., Cullen, T.J. & Woloshuk, J.M. (2011). Evaluation of information transfer between beef producers and extension agents in West Virginia. *Journal of the National Association of County Agricultural Agents (NACCA),* 4 (2): 1-7.

Chase, L. E., Ely, L. O., & Hutjens, M. F. (2006). Major advances in extension education programs in dairy production. *Journal of Dairy Science*, 89 (4), 1147-1154. Retrieved from http://www.journalofdairyscience.org/article/S0022-0302(06)72183-X/fulltext.

Checkland, P. (1999). Systems thinking. In W. Currie & B. Galliers (Eds.), *Rethinking management information systems: An interdisciplinary perspective* (45-56). New York: Oxford University Press Inc.

Colorado State University (2016). *Colorado State University: Extension.* Retrieved from: http://www.ext.colostate.edu/coop/mission.html

Creswell, J.W. & Creswell, J.D. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed). Los Angeles, CA: SAGE Publications, Inc.

Cunliff, E. (n.d.). Connecting systems thinking and action. *The Systems Thinker.* Retrieved from https://thesystemsthinker.com/connecting-systems-thinking-and-action/.

Dahlen, C.R., Hadrich, J.C., & Lardy, G.P. (2014). The North Dakota beef industry survey: Implications for extension. *Journal of Extension,* 52 (6). Retrieved from https://www.joe.org/joe/2014december/rb7.php.

Field, T.G. (2018). *Beef production and management decisions* (6th ed). New York: Pearson.

Garst, B.A. & McCawley, P.F. (2015). Extension program development model: Needs assessment solving problems, ensuring relevance, and facilitating change: The evolution of needs assessment within cooperative extension. *Journal of Human Sciences and Extension,* 3 (2), 26-47.

Goodman, M. (1997). Systems thinking: What, why, when, where, and how? The Systems Thinker, 8 (2), 6-7.

Griffith, A.P. (2018). Market highlights: Challenges, opportunities in risky cattle market. *Drovers.* Retrieved from https://www.drovers.com/article/market-highlights-challenges-opportunities-risky-cattle-market.

Gunn, P. & Loy, D. (2015). Opportunities and challenges in a changing beef industry: Results of a statewide needs assessment in Iowa. *Journal of Extension,* 53 (5). Retrieved from https://www.joe.org/joe/2015october/rb2.php.

Hall, J.B., McKinnon, B.R., Greiner, S.P., & Whittier, W.D. (2004). Teaching complex, in-depth programs. *Journal of Extension*, 42 (3). Retrieved from https://joe.org/joe/2004june/a2.php.

Isee Systems, Inc. (2006). *Applying systems thinking and common archetypes to organizational issues.* Retrieved from https://www.iseesystems.com/Online_training/course/overview/index.htm.

Kachergis, E., Derner, J., Roche, L., Tate, K., Lubell, M., Mealor, R., Magagna, J., (2013). Characterizing Wyoming ranching operations: natural resource goals, management practices and information sources. *Natural Resources,* 4 (1), 45-54.

Karash, R. (n.d.). Mental models and systems thinking: Going deeper into systemic issues. *The Systems Thinker.* Retrieved from https://thesystemsthinker.com/mental-models-and-systems-thinking-going-deeper-into-systemic-issues/.

Kim, D.H. (2000). Systems thinking tools: A user's reference guide. Waltham, MA: Pegasus Communications, Inc.

Kreye, M.M., Pienaar, E.F., & Adams, A.E. (2016). The role of community identity in cattlemen response to Florida panther recovery efforts. *Society & Natural Resources,* 30 (1): 79-94. doi: 10.1080/08941920.2016.1180730.

Meadows, D.H. (2008). *Thinking in systems: A primer.* White River Junction, VT: Chelsea Green Publishing Company.

National Research Council (1995). *Colleges of agriculture at the land grant universities: A profile.* Washington, D.C.: National Academy Press.

Rabinowitz, P. (2018). Community tool box: Section 15: Qualitative methods to assess community issues. *University of Kansas: Center for Community Health and Development.* Retrieved from https://ctb.ku.edu/en/table-of-contents/assessment/assessing-community-needs-and-resources/qualitative-methods/main.

Rhoades, R.D., McCuistion, K.C., & Mathis, C.P. (2014). A systems thinking approach to ranching: Finding leverage to mitigate drought. Rangelands, 36 (6), 2-6. doi: 10.2111/RANGELANDS-D-14-00017.

Roche, L.M., Schhr, T.K., Derner, J.D., Lubell, M.N., Cutts, B.B., Kachergis, E., Eviner, V.T., & Tate, K.W. (2015). Sustaining working rangelands: Insights from rancher decision making. *Rangeland Ecology and Management,* 68(5): 383-389. Retrieved from http://dx.doi.org/10.1016/j.rama.2015.07.006.

Royse, D., Staton-Tindall, M., Badger, K., & Webster, J. M. (2009). *Needs assessment.* New York, NY: Oxford University Press.

Sayre, N.F. (2004). Viewpoint: The need for qualitative research to understand ranch management. *Journal of Range Management,* 57 (6): 668-674. https://doi.org/10.2111/1551-5028(2004)057[0668:VTNFQR]2.0.CO;2.

Sorice, M.G., Conner, J.R., Kreuter, U.P., & Wilkins, R.N. (2012). Centrality of the ranching lifestyle and attitudes toward a voluntary incentive program to protect endangered species. *Rangeland Ecology & Management,* 65(2): 144-152. Retrieved from https://www.jstor.org/stable/41495355.

Sterman, J.D. (2000). Business dynamics: System thinking and modeling for a complex world. Boston, MA: Irwin McGraw-Hill.

Torell, R. (2001). An assessment of the educational program needs of livestock producers in northeastern Nevada. *University of Nevada, Reno.* Retrieved from https://www.unce.unr.edu/publications/files/ag/2002/fs0201.pdf.

University of Southern California. (2018). Organizing your social sciences research paper: Quantitative methods. *USCLibraries: Research Guides.* Retrieved from https://libguides.usc.edu/writingguide/quantitative

USDA, Economic Research Service. (2018). *Cattle & beef: Sector at a glance.* Retrieved from https://www.ers.usda.gov/topics/animal-products/cattle-beef/sector-at-a-glance/

USDA, Foreign Agricultural Service. (2018). *Livestock and poultry: World markets and trade.* Retrieved from https://apps.fas.usda.gov/psdonline/circulars/livestock_poultry.pdf.

USDA National Agricultural Statistics Service. (2017). *Colorado cattle facts.* Retrieved from https://www.nass.usda.gov/Statistics_by_State/Colorado/Publications/Agriculture_Profile/Colorado_Cattle_Facts_2017.pdf.

U.S. Census Bureau (2012). *Cattle, including calves, operators.* Retrieved from https://quickstats.nass.usda.gov/results/B7C759AD-F8AB-3232-AD08-865649153776.

U.S. Census Bureau (2012). *Census of agriculture: Farmer's by age.* Retrieved from https://www.nass.usda.gov/Publications/Highlights/2014/Farm_Demographics/index.php.

Vergot III, P., Israel, G. & Mayo, D.E. (2005). Sources and channels of information used by beef cattle producers in 12 counties of the northwest Florida extension district. *Journal of Extension,* 43 (2). Retrieved from https://www.joe.org/joe/2005april/rb6.php.

Wang, S.L. (2014). Cooperative extension system: Trends and economic impacts on U.S. agriculture. *Choices,* quarter 1. Retrieved from http://www.choicesmagazine.org/choices-magazine/submitted-articles/cooperative-extension-system-trends-and-economic-impacts-on-us-agriculture.

Wilmer, H. & Fernández-Giménez, M.E. (2016). Some years you live like a coyote: Gendered practices of cultural resilience in working rangeland landscapes. *Ambio,* 45 (3): 363. https://doi.org/10.1007/s13280-016-0835-0.

CHAPTER 2: COLORADO BEEF PRODUCER NEEDS ASSESSMENT PART 1: PRIORITIZING INDUSTRY NEEDS

Introduction

Colorado's beef cattle numbers have grown in recent years; however, the industry's long-term success will rely on the productivity of its underlying resource base and the management ability of its many ranchers in the face of variable economic and market conditions. Producer input is especially useful when setting industry priorities and developing effective programming. With over 13,000 beef producers in the state (U.S. Census Bureau, 2012) it is difficult to design products and programs for such a diverse set of needs. Producer challenges are often variable and particular to an individual operation. Challenges often include disease treatment and prevention, reproductive management, land access, herd health, transition of the farm or ranch, production efficiency, herd nutrition, genetics, and marketing (Gunn & Loy, 2015; Torell, 2001; Field, 2007). As demographics, such as producer age, labor availability, consumer preferences, and environmental concerns, have changed in the beef industry and cattle markets have become more volatile, producer educational needs and priorities are constantly evolving (Drouillard, 2018; Griffith, 2018).

Extension services have traditionally been used to provide scientific, university-based research and education to local communities (National Research Council, 1995). Unfortunately, resources for statewide and local Extension activities are becoming increasingly scarce (Wang, 2014). Extension funding to administer producer programs has shifted to rely more heavily on state level funding and applications for specific federal grants. Budget decreases have led to Extension personnel time and effort constraints (Wang, 2014). Thus, effective programming to meet the needs of Colorado beef producers must be prioritized.

To better understand and prioritize current needs and opportunities faced by the Colorado beef industry, a comprehensive needs assessment was conducted in collaboration with the Colorado Cattlemen's Association (CCA), Colorado Livestock Association (CLA), and Colorado State University (CSU). A primary goal of the needs assessment was to explore if *"Colorado beef producers' educational priorities are influenced by demographic characteristics."* Additionally, one-on-one interviews of Colorado beef producers were conducted to provide a deeper understanding of the prioritized educational and research needs defined in the broader survey. Analysis of specific survey and interview results provides key insight into producer needs. Priority areas identified by producer feedback will serve as a guide for Extension personnel and other stakeholders as educational programs and content are developed for the industry.

Materials and Methods

Population and Sample

The population of this study was beef producers in Colorado. Beef producer members of both the Colorado Cattlemen's Association (CCA) and Colorado Livestock Association (CLA) were surveyed. A beef producer was defined as any adult directly involved in a beef cattle operation in Colorado and a member of either or both CCA and CLA. The needs assessment survey was created, distributed, and collected through a collaborative effort with an experienced third-party survey organization in order to limit researchers' direct access to information about participants to protect participant anonymity. Of the 1,840 beef producers surveyed, 83 were ineligible responses and 10 were refusals. Completed surveys from 728 respondents were received, resulting in a response rate of nearly 40 percent (39.6%). A high response rate could be

indicative of this being the first comprehensive needs assessment sent to Colorado beef producers.

The same beef producer population was sampled for one-on-one interviews. Utilizing guidance from CCA and CLA staff, 21 beef producers were identified and one-on-one interviews were conducted. The interviewees were selected to match both the geographical and association representation generated in the broader survey. Meaning, 19 and 2 producers were selected from CCA and CLA, respectively (94% CCA and 6% CLA) and 11 Peaks and Plains producers, 7 Western Slope producers, and 3 Front Range producers, respectively. Interview participants were not required to complete the broader survey.

Quantitative Procedures and Data Analysis

Although the creation, distribution, and collection of the needs assessment was orchestrated through a third-party organization, the following briefly outlines the process. A 31-question survey was created and beta tested through a collaborative effort with the third party and stakeholders from Colorado's beef industry (Appendix A). The comprehensive survey focused on educational needs and priorities, specific cattle-related evaluations, preferred outreach methods, and collection of some demographics. In this study, the results focus exclusively on the needs and priorities of participants and demographics of respondents. Results from the additional questions, in particular those associated with "Herd Level Performance Evaluation" and "Grazing Animal Nutrition," were analyzed and will be reported in different projects. The needs assessment was mailed and distributed to participants via the Dillman Tailored Design Method, including personalization within the survey materials, incentives, and multiple points of contact (Dillman, 2007). The first survey was mailed February 17, 2017 and two follow-up mailings were sent March 17, 2017 and April 7, 2017, with data collection ending

in May 2017. Each mailing included a personalized letter (Appendix B), survey (Appendix A), and stamped return envelope. For confidentiality purposes, each participant was given a unique producer identification code that was used solely for internal data collection and analysis by the third party.

Data were collected and compiled via the third-party organization into an Excel sheet; columns indicating responses to each question and variables within the questions, and rows indicating each completed, returned producer survey. Data were analyzed using SPSS (Version 25) to perform frequency counts, descriptive statistics, cross tabulations, and linear regressions. The independent variables for analysis were *experience* (Beginner: 0-10 yrs., Intermediate: 11-20 yrs., Experienced: 21 yrs. plus), *scale* (Small: <100 head, Medium: 101-500 head, Large: >500 head), *segment* (Seedstock, Commercial Cow-Calf, Grazing/Growing Stocker, Feedlot), and *region* (Front Range, Peaks and Plains, Western Slope). Participants were asked to enter a zip code as an indicator of location, however in order to make zip codes manageable, they were sorted into three statewide Extension regions, including Front Range, Peaks and Plains, and Western Slope. Dependent variables analyzed were *industry priorities*, *operational needs*, and *additional education areas*. To determine relationships between demographics (independent variables) and priority areas (dependent variables), several tests were used. Cross tabulations and chi-square tests were used to determine if priorities differed based on demographics. For all analysis, the alpha level was set at 0.05 to determine significant differences. A tendency was set when the alpha level was between 0.05 and 0.1.

Results are reported for two types of regression models. First, regression analyses of questions that use a binary response (e.g., yes/no) are interpreted as Linear Probability Models. In this case, coefficients can be interpreted as the change in probably of an affirmative response.

Second, regression analyses of questions that are categorical in nature, but also ordinal (e.g., ranking of low, medium, high), are interpreted as a traditional multivariate linear regression model. However, because the dependent variables in these cases do not have units (they are ordinal yet qualitative at the same time) only the statistical significance and directionality of the coefficients can be interpreted. In particular, they will show on average whether a particular factor significantly increases or decreases a respondent's expected ranking. Variables on scale and experience are included in the regression models as quantitative explanatory variables, whereas variables on segment and region are included using sets of dummy variables. For the later variables, the dummy variable for feedlot is left out and used as the reference case to interpret the remaining segment variables, whereas for region the Western Slope is used as the reference case.

In addition to quantitative data, there were 21 key informant interviews of these ranchers. Each interview participant was asked the same 14 interview questions (Appendix C) and summarized responses from these interviews provided researchers with key observations and themes to be used as supporting evidence for results from the needs assessment survey. Direct feedback from these interviews is signified in the text as "Producer Communication."

Results and Discussion

Demographics

Participants were asked a series of demographic questions about themselves and operation (Table 2.1). In general, respondents were over 56 years of age (72.1%) with over 21 years of ranching experience (75.8%). Over 70% of participants are the operation owner and manager and nearly 75% of the operations are full-time. Representation from all four-industry segments was reported; operations were mostly commercial cow-calf (73.7%), with 12.3%

grazing/growing stocker, 10% seedstock, and 4% feedlots. Operation size varied with 35.6% small (<100 head), 45.8% medium (101-500 head), and 18.6% large (>500 head). Regionally (Figure 2.1), respondents indicated being from the Front Range (15.4%), Peaks and Plains (46.9%), and Western Slope (37.7%).

Table 2.1 Demographic Characteristics of Beef Producer Participants from Colorado Needs Assessment

Category	# Respondents	% Respondents
Age (n=717)		
<34 yrs.	32	4.5%
35-44 yrs.	63	8.8%
45-54 yrs.	105	14.6%
55-64 yrs.	210	29.3%
65 yrs. plus	307	42.8%
Experience (n=728)		
Beginner (0-10yrs)	61	8.4%
Intermediate (11-20yrs)	115	15.8%
Experienced (21yrs plus)	552	75.8%
Operation Role (n=723)		
Owner	143	19.8%
Manager	55	7.6%
Both	525	72.6%
Operation Type (n=718)		
Full-time	536	74.7%
Part-time	182	25.3%
Operation Scale (n=716)		
Small (<100 head)	255	35.6%
Medium (101-500 head)	328	45.8%
Large (>500 head)	133	18.6%
Industry Segment (n=721)		
Seedstock	72	10.0%
Commercial cow-calf	531	73.7%
Grazing/growing stocker	89	12.3%
Feedlot	29	4.0%

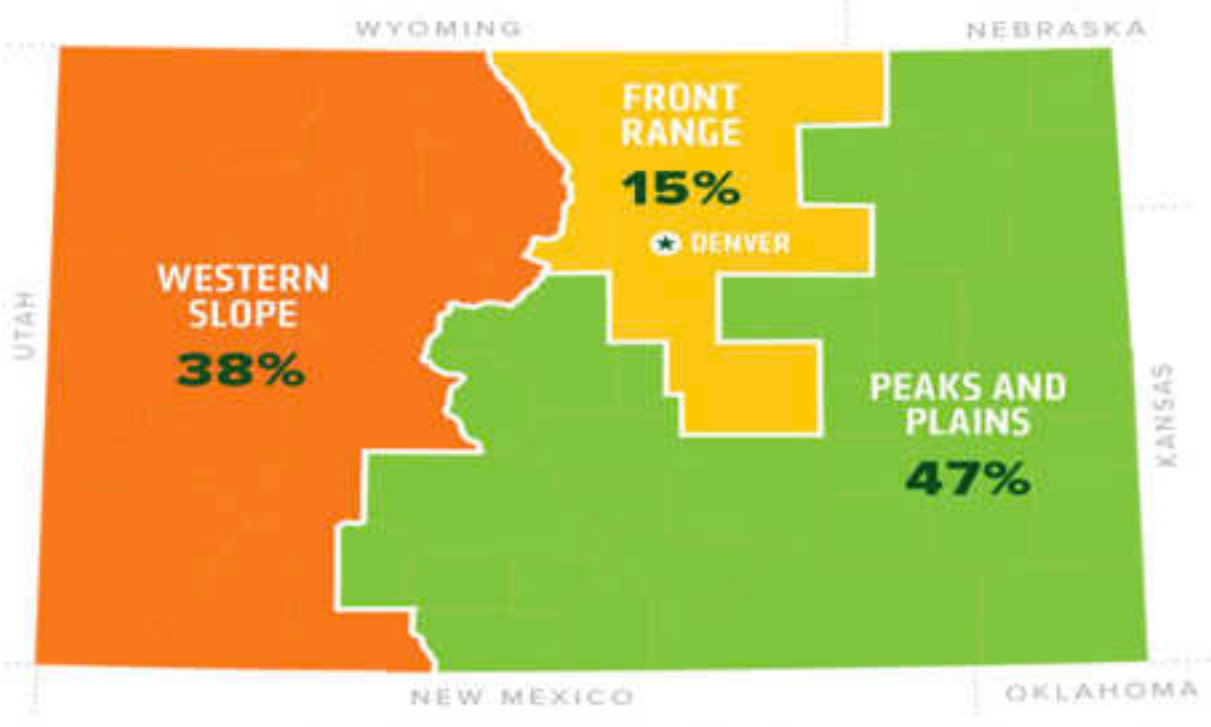

Figure 2.1. Percent of Respondents from Extension Regions (Front Range, Peaks and Plains, and Western Slope) from Colorado Needs Assessment

High-Level Industry Priorities

The beef industry is highly diverse (i.e. segments and systems) with producers, whose knowledge and skill level range from basic to extensive. Long-term industry success depends on the producers ability effectively manage an enterprise across a broad range of knowledge areas. At the same time, Extension personnel are challenged to provide timely information and programs to support these knowledge areas. Prioritizing high-level industry needs can be an effective first step towards determining which knowledge areas to focus time and resources.

Ranchers were asked to rank the top priorities for the Colorado beef industry as a whole. (Figure 2.2). Among six major themes (risk management, business management, technology, herd level performance evaluation, resource management, and leadership), half or more of all

study respondents ranked three as high priority: “business management” (57.1%), “resource management” (54.9%), and “risk management” (52.4%).

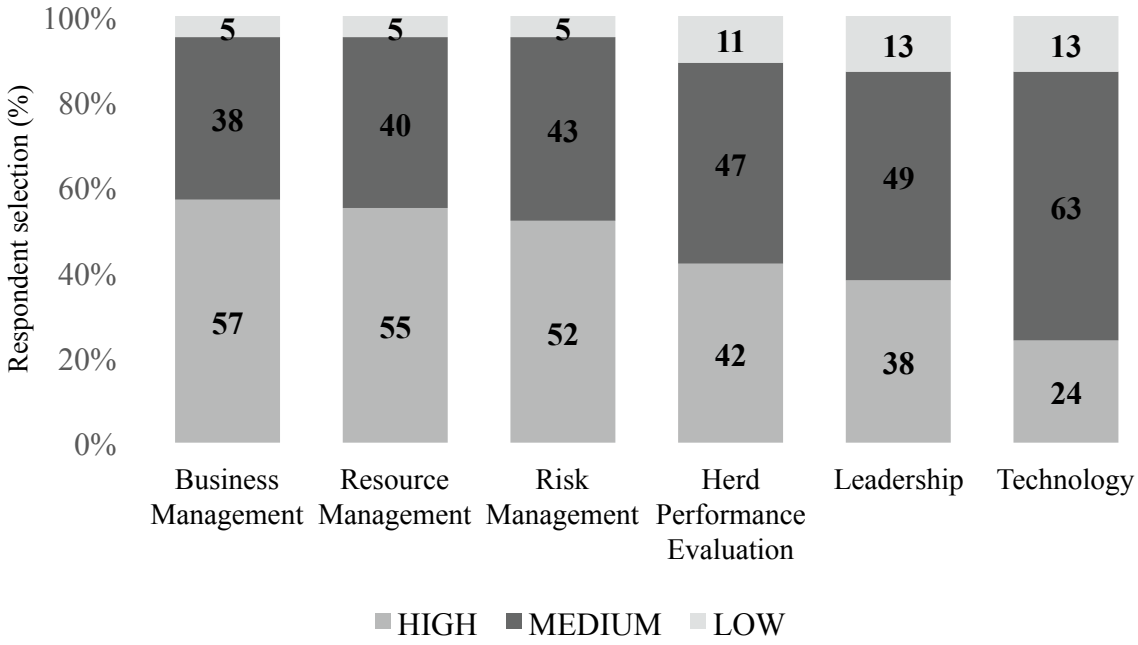

Figure 2.2 Respondent Selection (%) of Prioritization for High-Level Beef Industry Needs, Ranked as High, Medium, or Low Priority

These top three priority need areas highlight the complexities involved with the management of beef production systems. Producers not only tactically manage day-to-day operations, but also must strategically manage the business, which includes financing, marketing, and human resources. External forces, such as the cattle prices, weather, and consumer pressures have exacerbated management risk and created a more uncertain environment. Management risk forces ranchers to think more strategically. Respondents clearly understand the importance of focusing time and resources on business, resource, and risk management decisions, which have a direct influence on the ranches long-term financial viability. “Herd performance evaluation” and “leadership” were ranked as high priority areas by nearly 40% of respondents, suggesting these

areas are important to producers but not of immediate concern. “Technology” was ranked by less than 25% of respondents as a high priority. Rapid advancement in beef industry technology could explain why producers do not consider this a high priority area. Additionally, beef producers are historically slow to adopt new technology, typically waiting until other producers implement or the technology has been proven. Generally, the priority ranking of “low” within all need areas was minimal (<13.0% of respondents). Suggesting, ranchers believe all categories included in this survey are relatively important needs and influential to industry success.

Interesting to note, priority ranking of the industry need area “business management” did not differ as the demographics (experience, size, segment, and region) of participants changed (Table 2.2). Whereas with “risk management,” there is a tendency ($p = .09$) for larger operations to rank this as a higher priority area than smaller operations. This minimal variation may be due to the fact that producers were asked to rank these needs on an industry level, not a personal level. Producers can objectively rank issues that are affecting the beef industry statewide, rather than subjectively determine what is directly affecting their operations. However, producer response to “resource management” as a high priority need area was influenced by demographics.

Table 2.2. Regression Analysis for Top Three Beef Industry Need Areas from Colorado Needs Assessment

	Resource Management			Business Management			Risk Management		
Model	β	SE	P-value	β	SE	P-value	β	SE	P-value
Constant	2.33	.16	< .01	2.21	.16	< .01	2.28	.16	< .01
Experience	.041	.04	.28	.019	.04	.62	-.041	.04	.27
Scale	.085	.06	.13	.047	.06	.41	.094	.06	.09
Seedstock	.237	.14	.08	.162	.14	.23	-.203	.13	.13
Cow-calf	.231	.12	**.05**	.065	.12	.58	.012	.11	.92
Stocker	.126	.13	.35	-.007	.13	.96	.099	.13	.45
Front Range	-.131	.07	.08	.050	.07	.50	.094	.07	.19
Peaks & Plains	-.129	.05	**.01**	-.004	.05	.95	.059	.05	.25

Respondents from cow-calf operations were more likely (p = .05) to rank "resource management" as a high priority, and there was a tendency (p = .08) for seedstock operators to rank this as a higher priority. It is important to note regression coefficients for segment are compared relative to feedlots as the reference case. All interpretation is in reference to the feedlot category. Therefore, both cow-calf and seedstock operators are more likely to rank "resource management" higher than feedlot operations. Difference could be due to the inherent nature of production segments. Cow-calf operations are characterized as land based grazing systems and seedstock operations can be characterized as specialized cow-calf operations (Field, 2006). Compared to other segments, effective resource management on cow-calf and seedstock operations is more likely to define future success and sustainability. Additionally, Peaks and Plains producers were less likely (p = .01) to rank "resource management" as a high priority than respondents from the Western Slope, and there was a tendency (p = .08) for Front Range producers to be less likely to prioritize this area. For region, the Western Slope is the reference case for comparison of the regression coefficients. All interpretation is in reference to the Western Slope category. Commercial cow-calf operations more intently manage their natural resources like pasture and range, whereas feedlots have minimal use of these same natural

resources. However, these confinement operations have to intently manage different resources, like employees and equipment. Depending on producer participant definition of resource management, a greater number of feedlot operations located in the Peaks and Plains region might explain a lower ranking. Survey results indicate 57.1% of feedlot participants were from the Peaks and Plains region. In addition, Western Slope producers have more Forest Service and Bureau of Land Management permits that are used for grazing cattle than Front Range and Peaks and Plains producers. Requirements of these permits include careful resource management; therefore it is in the best interest of Western Slope producers to prioritize this area.

Overall, the need to focus on management (business, resource, and risk) was determined to be the number one priority among respondents. Beef industry participants will be required to continuously adjust business, risk, and resource management strategies (Rutherford, 2016). Defining high-level industry priorities provides a ranking of fundamental areas in which education and engagement can have the broadest impact among stakeholders.

Operational Needs Requiring Additional Support

Beef enterprises function in a complex, risky environment where uncontrollable factors (i.e. markets, weather, etc.) cause decision making to be difficult and often uncertain. Some facets of decision-making are more critical if profitability and sustainability are the desired outcomes. Prioritizing operational resource needs can help to identify which decision-making support areas are most important.

Specific to the ranch, respondents were asked to select three areas of need for additional outside resources from a list of six decision support categories. As shown in Figure 2.3, an overwhelming majority indicated a need for additional outside resources on “managing market risk” (73.1%) and “developing and implementing production strategies” (58.8%). “Record

keeping" (40.7%) and "setting ranch goals and direction" (40.2%) also appear as mid-level areas of need.

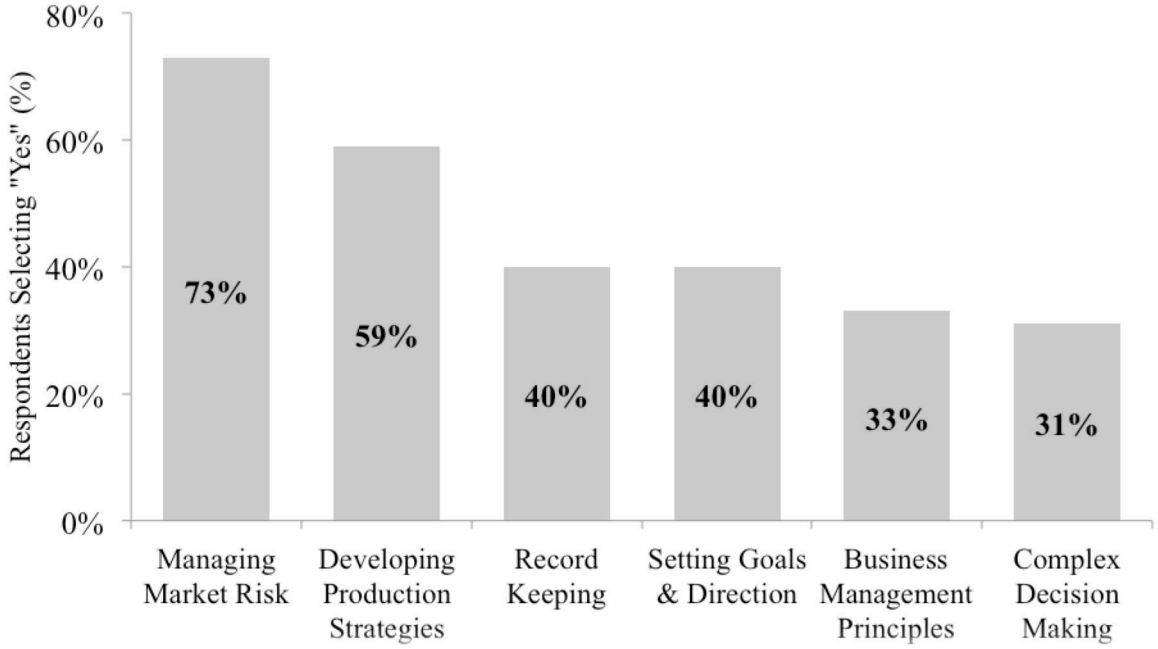

Figure 2.3. Respondents Selecting "Yes" (%) to Requiring Additional Support from Outside Resources for Each Priority Area.

It is not surprising that respondents rank "managing market risk" as the top priority area requiring additional support. Cattle prices have declined in recent years meaning protecting profits has become more challenging. Recent exposure to volatile markets and perpetual variance in climatic conditions (i.e. drought) has made it more difficult to manage risk in commercial cow-calf production (Producer Communication). Profitability on beef operations in today's environment is more dependent upon the producer's ability to market cattle and decisions to manage market risk.

Although "business management" ranked as a high-level industry priority in the previous section, interestingly only one-third (33.4%) of respondents selected "understanding business management principles" as a top priority area requiring additional support. This category was

included on the survey to gauge the operational need for resources pertaining to basic business management skills (i.e. organizational structure, human resource management, strategic planning). A majority of producers in this study identified themselves as "experienced" (75.8% selected 21-plus years' experience). Meaning for most respondents, a basic understanding of business principals has likely been achieved or deemed less important for decision-making. Excluding a tendency ($p = .07$) for Peaks and Plains producers to be more likely to prioritize record keeping and tracking performance, producer response within the six operational need categories did not have a statistically significant effect due to demographic changes ($p = .23$).

Overall, resources for improved decision making related to "methods of managing market risk" and "developing and implementing production strategies" are needed. Results are consistent with priority areas determined in previous section. Conventional experimentation to evaluate alternative marketing and production strategies is time consuming and expensive. Extension services could offer beef operations exceptional value by providing robust user-friendly support tools that assist producers with making informed marketing and production decisions.

Management Areas Requiring Additional Education

Beef producers must perform a wide range of daily management tasks, some requiring an extensive amount of knowledge and skill. Effective management and consequently improved enterprise profitability can be achieved by continually incorporating new information and technology. Most state extension services offer a variety of timely beef educational programs addressing important issues and topics. However, information that is more impactful could be delivered with a better understanding of which management areas need most attention.

Table 2.3 shows the ranking of specific to day-to-day ranching activities in which respondents prioritized needing additional education pertinent to their operation. Among nine educational topic areas, the top three selected by all respondents were “marketing strategies” (63.1%); “nutrition & supplementation” (46.5%); and “grazing & weeds” (46.2%) (Table 2.3).

Table 2.3. Respondent Selection of Management Areas Needing Additional Education

Educational Area	Respondents Selecting “Yes” (%)
Marketing Strategies	63.1
Nutrition & Supplementation	46.5
Grazing & Weeds	46.3
Herd Health	41.6
Genetic Technologies & Tools	30.0
Reproductive Management	29.4
End Product	24.3
Human Resource Management	20.7
Endangered Species & Wildlife Management	15.6

A majority of producers selected “marketing strategies” as the primary area where additional education is required. Historically, net returns in the beef industry have been relatively low and highly variable among operations (Peck, 2002). Reports indicate that a majority of cow-calf producers traditionally market cattle through a local auction market, suggesting the implementation of alternative marketing strategies has been limited (Lacy & Hicks Knight, 2017). However, given a recent decline in cattle prices, producers have expressed interest in exploring new marketing methods (production strategies) and niche markets (channels) to add value and mitigate risk (Producer Communication). Additional education is likely a priority since knowledge and skill (i.e. production and marketing) gaps may exist.

More than 40% of producers also consider “nutrition & supplementation”, “grazing & weeds”, and “herd health” educational priority areas. Similarly, herd nutrition, pasture and range management, and herd health were previously reported as the top management priorities among

cow-calf producers (Field, 2007). As annual production costs continue to rise, these management areas typically represent influential cost factors within a beef system (Berger, 2017). Herd nutrition is expensive; especially with winter-feed costs in Colorado and challenges related to implementing rotational systems and developing weed management plans make grazing management difficult (Producer Communication). Low cost producers achieve greater profitability through reduced supplemental feed costs, better pasture management, and a strong her health program (Taylor and Field, 1995). Less than 30% of producers selected the remaining management topics (genetic technologies, reproductive management, end product, human resource management, and wildlife management) as priority need areas. Suggesting, adequate information and programs exist or these challenges are unique to a smaller subset of producers.

Selection of management need areas "marketing strategies" and "nutrition & supplementation" does not differ as the demographics (experience, size, segment, and region) of producers change (Table 2.4).

Table 2.4. Regression Analysis for Top Three Management Areas for Beef Producers from Colorado Needs Assessment

	Marketing Strategies			Nutrition & Supplementation			Grazing & Weeds		
Model	β	SE	P-value	β	SE	P-value	β	SE	P-value
Constant	.346	.13	.01	.596	.13	< .01	.504	.12	< .01
Experience	.041	.03	.19	-.062	.03	.05	.019	.03	.53
Scale	.080	.04	.07	.010	.05	.84	-.085	.05	.06
Seedstock	.073	.11	.50	.059	.11	.60	.312	.11	**.01**
Cow-calf	.060	.09	.51	.030	.10	.75	.154	.09	.09
Stocker	.103	.11	.33	-.107	.11	.33	.268	.11	**.01**
Front Range	.018	.06	.76	.002	.06	.97	.068	.06	.25
Peaks & Plains	.060	.04	.15	-.004	.04	.92	-.015	.04	.71

However, there is a tendency ($p = .05$) for more experienced operators to prioritize "nutrition and supplementation" less than beginners, potentially because their experience has allowed them to

experiment with different management strategies in this area to find better strategies. There is also a tendency (p = .07) for larger operations to more highly prioritize assistance with "marketing strategies." Participant response to "grazing & weeds" as an educational need area was significantly influenced by industry segment and scale. Producers from seedstock and grazing/growing stocker operations were 26.8 to 31.2% more likely (p = .01) to select "grazing & weeds" as an area where additional education is needed. Improving range or pasture production and utilization has the potential to reduce costs in both industry segments. Stocking rate and timing and duration of grazing are important aspects of grazing management that should be emphasized in educational programs (Field, 2006). There was a tendency (p = .06) for larger operations to be less likely to select "grazing and weeds" as a management area for additional education. This could either be due to the fact larger operations in the survey may be representative of feedlot operations, which typically do not incorporate any grazing into management strategies. Additionally, larger pasture-based operations may have more resources currently available for assistance in this management area, such as fences in place for rotational grazing plans or resources to support spraying for weeds.

Industry segment influenced the selection of additional management topics. Figure 2.4 shows the percentage that selected "genetic technologies and tools" as a priority for additional education from each industry segment.

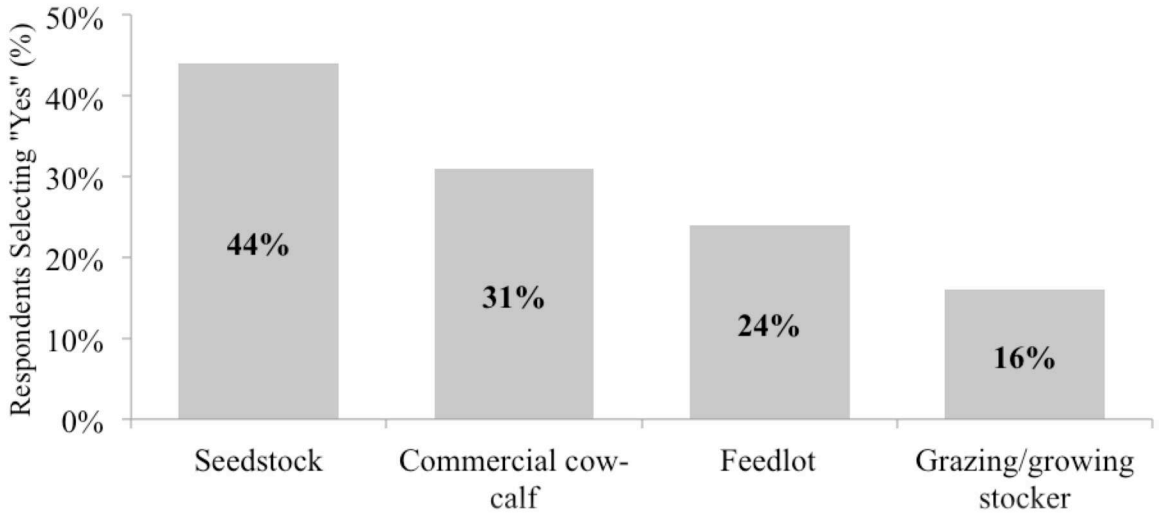

Figure 2.4. Percentage of Respondents that Selected "Genetic Technologies and Tools" as a Priority Area within each Beef Industry Segment.

Predictions indicated seedstock producers were 24.9% more likely ($p < .01$) to select "genetic technologies and tools" as a priority area. Rapid development of genetic selection tools has allowed educated seedstock producers to improve herd genetics and create competitive advantages. Thus, it is not surprising that seedstock respondents emphasized the area of genetics as an educational priority. Further, Figure 2.5 highlights the importance of "human resource management" on feedlot operations, compared to lower selection from the three other segments.

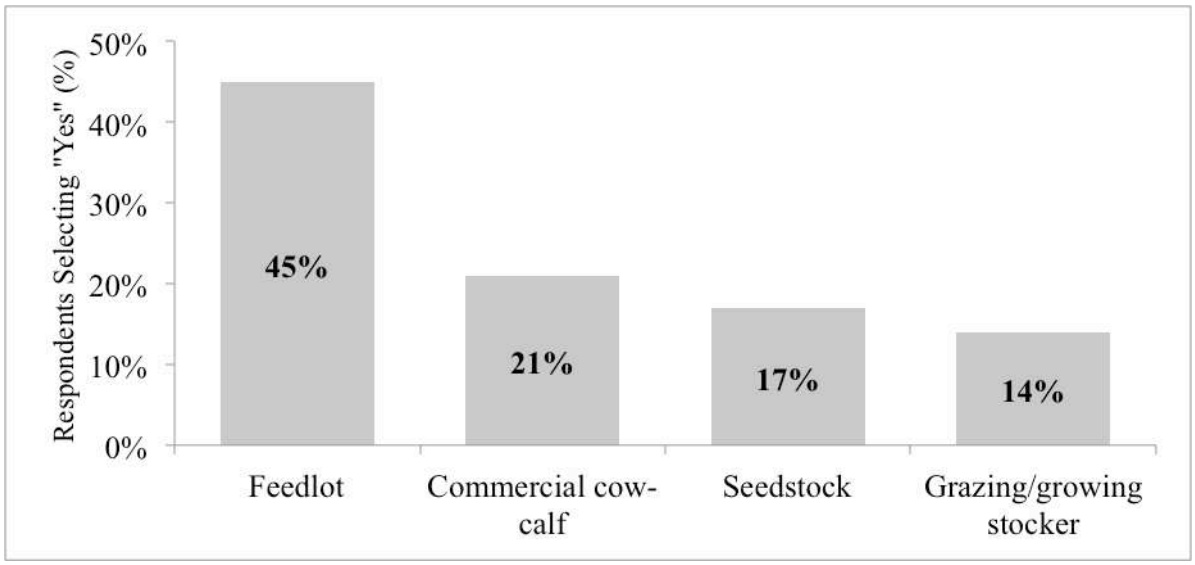

Figure 2.5. Percentage of Respondents that Selected "Human Resource Management" as a Priority Area within each Beef Industry Segment.

Predictions show commercial cow-calf, seedstock, and grazing/growing stocker operations were 20.4 to 27.3 % less likely ($p < .01$) to select "human resource management" as a management area requiring additional education. Feedlots are typically larger (i.e. number of head) in scale and more intensively managed, requiring a greater number of employees. Knowledge of employee management (i.e. hiring, evaluating, incentivizing) is a vital component of managing a large ranch (Rhoades, Livsey, McCuistion, & Mathis, 2013).

Prioritizing the development and delivery of educational programs focused on "marketing strategies" is clearly needed. Operation size, producer experience, industry segment, and regional location had minimal influence on the selection of key management areas. Progress and innovation around key management areas will be vital elements of success, moving forward. Developing programs and information that directly address the top management priorities would benefit beef operations and potentially lead to management that is more effective.

Conclusions

Most Extension programs are being forced to operate on tighter budgets with fewer personnel (Wang, 2014). Providing effective education for beef producers will require identifying priorities. Direct producer feedback and an awareness of industry trends could help guide Extension personnel toward the fulfillment of its mission to provide information and education in response the issues in the communities (Colorado State University, 2016). Results indicate Extension should consider developing programs that focus on providing education related to management decisions and strategies, especially risk, marketing, and production practices. Prioritization in these key areas suggests producers recognize challenges with marketing cattle in a volatile environment, but do not have resources to mitigate risk. Results show how variation in educational preferences relates to differences in demographic characteristics. Each of the demographics (scale of operation, segment, region, and experience) affects prioritization on a high-level industry level and a more personalized, operational level. Further research should explore how producers prefer to receive educational information. It is important to understand desired content, but content must pair with effective delivery to be of best use to beef producers. Outcomes from this chapter not only provide opportunities for the advancement of Extension programming, but also chances for improvement in future productivity of Colorado beef producers.

LITERATURE CITED

Berger, A. (2017). Profit tip: Unit cost of production for a cow-calf enterprise. *University of Nebraska, Beef: Institute of Agriculture and Natural Resources.* Retrieved from https://beef.unl.edu/unit-cost-production-cow-calf-enterprise.

Colorado State University (2016). *Colorado State University: Extension.* Retrieved from: http://www.ext.colostate.edu/coop/mission.html

Dillman, D. A. (2007). *Mail and Internet Surveys: The Tailored Design Method (2nd ed.).* Hoboken, NJ: John Wiley and Sons, Inc.

Drouillard, J.S. (2018). Current situation and future trends for beef production in the United States of America—A review. *Asian-Australas Journal of Animal Science*, 31(7): 1007-1016. doi: 10.5713/ajas.18.0428.

Field, T.G. (2006). Priorities first: Identifying management priorities in the commercial cow-calf business. *American Angus Association.* Retrieved from https://www.angus.org/Pub/PrioritiesFirstFinal.pdf.

Griffith, A.P. (2018). Market highlights: Challenges, opportunities in risky cattle market. *Drovers.* Retrieved from https://www.drovers.com/article/market-highlights-challenges-opportunities-risky-cattle-market.

Gunn, P. & Loy, D. (2015). Opportunities and challenges in a changing beef industry: Results of a statewide needs assessment in Iowa. *Journal of Extension,* 53 (5). Retrieved from https://www.joe.org/joe/2015october/rb2.php.

Lacy. R.C. & Hicks Knight, C. (2017). Profitable cattle marketing for the cow-calf producer. *University of Georgia, Extension.* Retrieved from http://extension.uga.edu/publications/detail.html?number=B1078&title=Profitable%20Cattle%20Marketing%20for%20the%20Cow-Calf%20Producer.

National Research Council (1995). *Colleges of agriculture at the land grant universities: A profile.* Washington, D.C.: National Academy Press.

Peck, C. (2002). Return on investment. *BEEF Magazine.* Retrieved from https://www.beefmagazine.com/mag/beef_return_investment.

Rhoades, R.D., Livsey, J.J., McCuistion, K.C., & Mathis, C.P. (2013). Employee management on large ranches. *Rangelands* 35(2): 2-11. doi: 10.2111/RANGELANDS-D-12-00076.1.

Rutherford, B. (2016). Top 10 issues facing beef producers. *Drovers.* Retrieved from https://www.beefmagazine.com/blog/top-10-issues-facing-beef-producers.

Taylor, R.E. & Field, T.G. (1995). Achieving cow/calf profitability through low-cost production. *Range Beef Cow Symposium.* Retrieved from http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1198&context=rangebeefcowsymp.

Torell, R. (2001). An assessment of the educational program needs of livestock producers in northeastern Nevada. *University of Nevada, Reno.* Retrieved from https://www.unce.unr.edu/publications/files/ag/2002/fs0201.pdf.

U.S. Census Bureau (2012). *Cattle, including calves, operators.* Retrieved from https://quickstats.nass.usda.gov/results/B7C759AD-F8AB-3232-AD08-865649153776.

Wang, S.L. (2014). Cooperative extension system: Trends and economic impacts on U.S. agriculture. *Choices,* quarter 1. Retrieved from http://www.choicesmagazine.org/choices-magazine/submitted-articles/cooperative-extension-system-trends-and-economic-impacts-on-us-agriculture.

CHAPTER 3: COLORADO BEEF PRODUCER NEEDS ASSESSMENT PART 2: COMMUNICATION STRATEGY PREFERENCES

Introduction

As the beef industry in Colorado continues to expand and contract, producers across the state are continually adapting to the changing industry (Griffith, 2018). Part of successful adaptability to industry changes relates to producers' ability to evaluate their operations and seek resources to alleviate operational challenges. Outside resources may include online content, commodity association groups, other producers, or university Extension personnel. Excluding other producers, these resource providers are often uncertain of the best ways to communicate with producers. Producer preferences for communication strategies have historically prioritized traditional, in-person programming over technologically based programming (Dahlen, Hadrich, & Lardy, 2014). However, further exploration of programming delivery preferences indicates particular barriers, demographic influences, and challenges may influence how these preferences change. As producers' needs for assistance become critical in the changing industry, effective support from stakeholders becomes more important.

University Extension systems have been useful in the past as a means of providing pertinent, research-based information to communities (National Research Council, 1995). However as resources for statewide and local Extension activities are becoming scare, developing effective programming that meets producer preferences requires more coordination with producers (Wang, 2014). Instead of relying on Extension personnel to conduct personal research about community needs, direct feedback from communities can be beneficial. Additional challenges with a decreasing resource base for Extension personnel include a lack of human capital and decreasing funds for marketing programs. These compounding challenges

directly affect Extension personnel's abilities to adequately engage in the communities they serve to provide effective programming that suites producers' program delivery preferences.

To better understand and prioritize current needs and opportunities faced by the Colorado beef industry, a comprehensive needs assessment was conducted in collaboration with the Colorado Cattlemen's Association (CCA), Colorado Livestock Association (CLA), and Colorado State University (CSU). A primary goal of the needs assessment was to explore if *"Colorado beef producers' preferences for formatting and delivery methods for Extension and outreach materials are influenced by demographic characteristics."* Additionally, one-on-one interviews of Colorado beef producers were conducted to provide a deeper understanding of the prioritized communications strategies defined in the broader survey. Analysis of specific survey and interview results provided important insight into producer communication preferences. Communication strategies identified by producer feedback will serve as a guide for Extension personnel and other stakeholders as educational programs and content are developed for the industry.

Materials and Methods

Population and Sample

The population of this study was beef producers in Colorado. Beef producer members of both the Colorado Cattlemen's Association (CCA) and Colorado Livestock Association (CLA) were used. A beef producer was defined as any adult directly involved in a beef cattle operation in Colorado and a member of either or both CCA and CLA. The needs assessment survey was created, distributed, and collected through a collaborative effort with an experienced third-party survey organization in order to limit researchers' direct access to information about participants. Of the 1,840 beef producers surveyed, 83 were ineligible responses and 10 were refusals.

Completed surveys from 728 respondents were received, resulting in a response rate of nearly 40 percent (39.6%). A high response rate could be indicative of this being the first comprehensive needs assessment sent to Colorado beef producers.

The same beef producer population was sampled for one-on-one interviews. Utilizing guidance from CCA and CLA staff, 21 beef producers were identified and one-on-one interviews were conducted. The interviewees were selected to match both the geographical and association representation generated in the broader survey. Meaning, 19 and 2 producers were selected from CCA and CLA, respectively (94% CCA and 6% CLA) and 11 Peaks and Plains producers, 7 Western Slope producers, and 3 Front Range producers, respectively. Interview participants were not required to complete the broader survey.

Quantitative Procedures and Data Analysis

Although the creation, distribution, and collection of the needs assessment was orchestrated through a third-party organization, the following briefly outlines the process. A 31-question survey was created and beta tested through a collaborative effort with the third party and stakeholders from Colorado's beef industry (Appendix A). The comprehensive survey focused on educational needs and priorities, specific cattle-related evaluations, preferred outreach methods, and collection of some demographics. In this study, the results focus exclusively on the preferred outreach methods of participants and demographics of respondents. Results from the additional questions, in particular those associated with "Herd Level Performance Evaluation" and "Grazing Animal Nutrition," were analyzed and reported in different projects. The needs assessment was mailed and distributed to participants according to Dideriksen (2018) methodology.

Data were collected and compiled via the third-party organization into an Excel sheet; columns indicating responses to each question and variables within the questions, and rows indicating each completed, returned producer survey. Data were analyzed using SPSS (Version 25) to perform frequency counts, descriptive statistics, cross tabulations, and linear regressions. The independent variables for analysis were *experience* (Beginner: 0-10 yrs., Intermediate: 11-20 yrs., Experienced: 21 yrs. plus), *scale* (Small: <100 head, Medium: 101-500 head, Large: >500 head), *segment* (Seedstock, Commercial Cow-Calf, Grazing/Growing Stocker, Feedlot), and *region* (Front Range, Peaks and Plains, Western Slope). Participants were asked to enter a zip code as an indicator of location, however in order to make zip codes manageable, they were sorted into three statewide Extension regions, including Front Range, Peaks and Plains, and Western Slope. Dependent variables analyzed were *barriers to attending programming, essential educational categories, preferred educational formatting, reliable sources of information*, and *future activity areas*. To determine relationships between demographics (independent variables) and communication preferences (dependent variables), several tests were used. For all analysis, the alpha level was set at 0.05 to determine significant differences. A tendency was set when the alpha level was between 0.05 and 0.1. Specific methods associated with analyzing dependent variables were completed according to Dideriksen (2018).

In addition to quantitative data, there were 21 key informant interviews of these ranchers. Each interview participant was asked the same 14 interview questions (Appendix C) and summarized responses from these interviews provided researchers with key observations and themes to be used as supporting evidence for results from the needs assessment survey. Direct feedback from these interviews is signified in the text as “Producer Communication.”

Results and Discussion

Demographics

Participants were asked a series of demographic questions about themselves and their operation. In general, respondents were over 56 years of age (72.1%) with over 21 years of ranching experience (75.8%). Over 70% of participants are the operation owner and manager and nearly 75% of the operations are full-time. Representation from all four-industry segments was reported; operations were mostly commercial cow-calf (73.7%), with 12.3% grazing/growing stocker, 10% seedstock, and 4% feedlots. Operation size varied with 35.6% small (<100 head), 45.8% medium (101-500 head), and 18.6% large (>500 head). Regionally, respondents indicated being from the Front Range (15.4%), Peaks and Plains (46.9%), and Western Slope (37.7%).

Barriers to Producer Attendance at Educational Programs

Producer engagement challenges stakeholders, including Extension. Many times Extension personnel have relevant content and expert speakers at educational programs, but attendance remains low. Extension's resources are decreasing rapidly so it is essential for personnel to format programming in a way to encourage participation so these decreasing resources are not wasted (Wang, 2014). Recognizing barriers that may affect attendance is an effective first step for Extension personnel seeking higher attendance at programs and events.

From the needs assessment, producers were asked to determine the influence of five different barriers to attending educational programming (Figure 3.1.). Ranchers indicated the *major* barriers for attending an educational program are "time" (46.7%) and "scheduled dates" (22.8%). "Travel" is also a *moderate* barrier with 21.4% selection by producers.

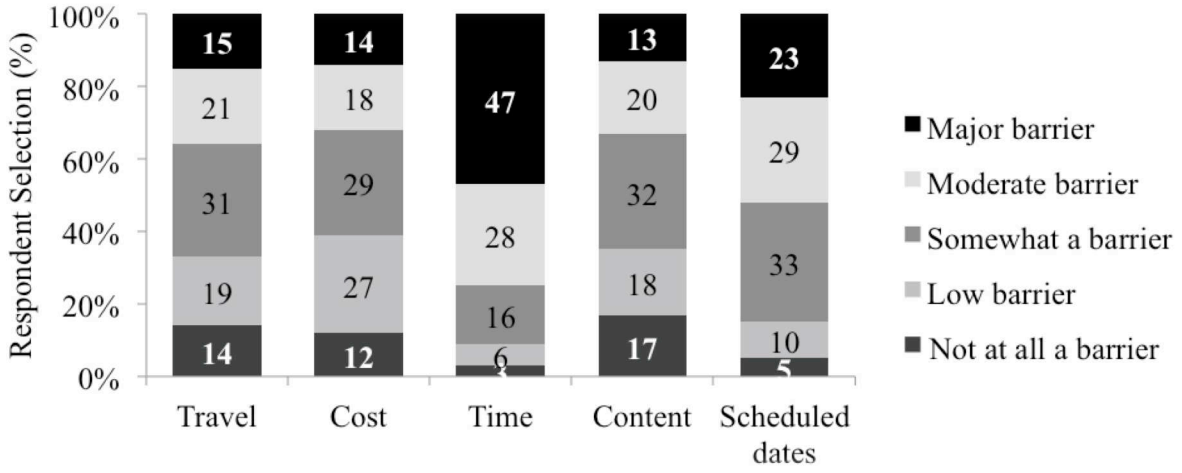

Figure 3.1. Respondent Selection (%) of Ranking of Barriers for Beef Producer Attendance at Educational Programs, Ranking either as Major, Moderate, Somewhat, Low, or Not at All.

These top barriers to attendance suggest that producers want to attend events, but the responsibilities of running their operations come first. External factors such as weather, breeding and calving seasons, and typical day-to-day management requirements affect producer engagement. Unfortunately for the 75% of participants who selected "time" as a major or moderate barrier, there is no way to provide more time in a day for producers to dedicate to attend events. Producers in all states struggle with the lack of time for attending events (Dahlen, Hadrich, & Lardy, 2014), especially in the case of the 70% of survey participants who are operation owner and manager, plus the nearly 75% of operations running as full-time businesses. For the 23% who selected "scheduled dates" as a major barrier, troubleshooting the best times to step away from their operation is difficult. More than two-thirds of participants indicated that "travel" was at least somewhat of a barrier to their attendance. Research has consistently shown that educational opportunities not being hosted in a producers' area may affect their attendance (Dahlen, Hadrich, & Lardy, 2014). Regional programming could mitigate time constraints by decreasing the necessary time for attendance.

These data reflect that besides those from the Front Range region being less likely to select travel as a barrier to attendance (p = .02), the top three barriers are consistent between all demographic categories of producers (Table 3.1.). This is not surprising because regardless of scale, segment, or experience of producers, all producers are influenced by not having enough time to designate to traveling to events and conflicts with scheduled dates.

Table 3.1. Regression Analysis for Top Three Attendance Barriers for Beef Producer Attendance at Educational Programs from Colorado Needs Assessment

	Travel			Time			Scheduled Dates		
Model	β	SE	P-value	β	SE	P-value	β	SE	P-value
Constant	3.88	.33	< .01	3.81	.28	< .01	3.15	.29	< .01
Experience	.031	.08	.70	-.056	.70	.42	.111	.07	.13
Scale	-.051	.12	.66	< .01	.10	.99	-< .01	.10	.99
Seedstock	-.240	.28	.39	.090	.24	.71	.177	.25	.48
Cow-calf	-.331	.24	.16	.268	.21	.19	.079	.21	.71
Stocker	-.323	.27	.24	.035	.24	.88	-.176	.25	.48
Front Range	-.366	.15	**.02**	.093	.13	.48	-.164	.14	.24
Peaks & Plains	-.028	.11	.79	.106	.09	.25	.018	.10	.85

Front Range Extension region producers may have fewer challenges with “travel” as a barrier due to typical locations for educational programming in Colorado. The Front Range region includes CSU’s main campus and the Denver metropolitan area, two locations that host many events for beef producers. Therefore, these producers have a shorter traveling distance to access typical programming. However, if more events were hosted across the state, these same producers may feel differently about the influence of travel as a barrier.

Gaining producer engagement at educational programming can be complicated. Producers recognize the value of education, but are unwilling to forgo their operational responsibilities to participate in programming. For those in Extension or other stakeholders, evaluating the busier times in their communities and scheduling accordingly is essential for beginning the process of using the best communication strategies for beef producers.

Essential Educational Categories Provided during Programming for Beef Producers

Regardless of the industry, participants are more satisfied when attending educational programs determined to provide value for their business. Just as producers seek ways to add value to their cattle through breeding and marketing decisions, adding value to an operation through producer education is important (Field, 2018). For Colorado beef producers, value is derived through providing specific structural elements during a program.

When asked about preferred structural elements provided during educational programming, an overwhelming majority of all producers identifying "providing tools to take home and use" (72.4%) and "hands-on demonstrations" (69.1%) as essential components of effective educational programs. Providing ranchers with structural elements of "critical research" (45.9%) and "current reading materials" (45.4%) during programming were also highly prioritized (Figure 3.2.).

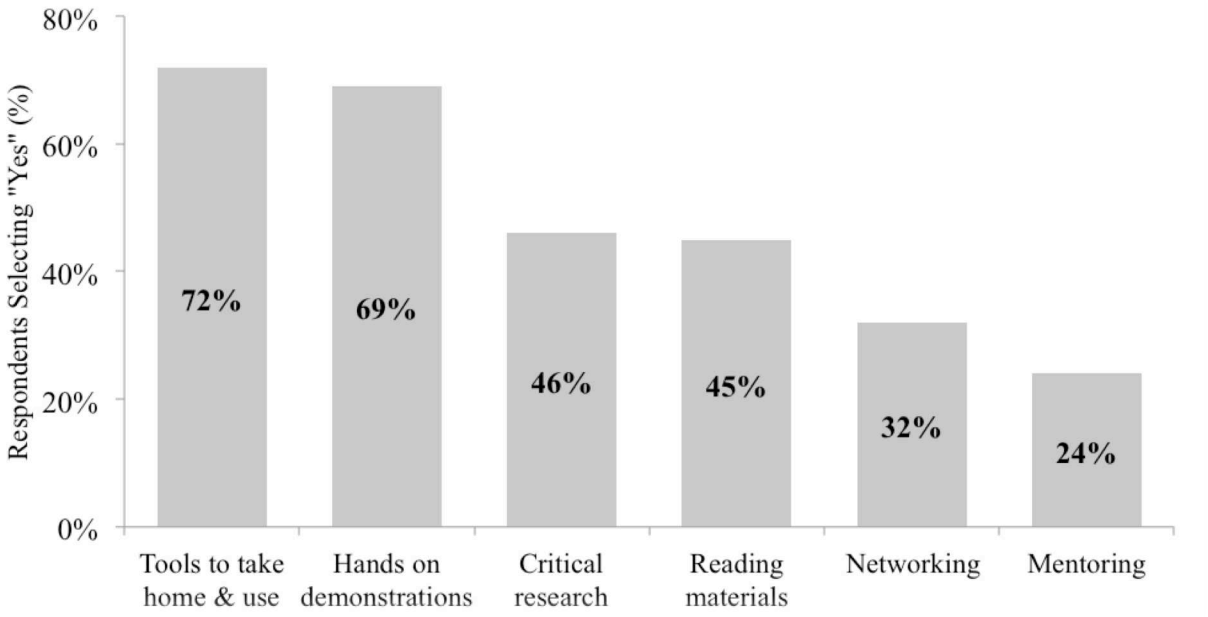

Figure 3.2. Respondents Selecting "Yes" (%) to Each Essential Educational Category Provided During Programming for Beef Producers.

The high prioritization of "tools to take home and use" shows how educational value relates to practicality within programming. Recent volatile markets, declining of cattle prices, and adverse climatic conditions have required producers to productively maximize their time and resources (Producer Communication). By educational programs providing tools to be applied for management decisions or operational issues on ranches, producers are able to rationalize spending time off the ranch. The resulting value of practical education is improvement of ranch profitability and productivity. Beyond these applicable tools, producers also prioritize "hands on demonstrations" in education programming. Beef producers continually select hands on workshops as a valuable feature and primary reason for attendance (Hall, McKinnon, Greiner & Whittier, 2004). Each day on a ranch provides experiential learning so relating the same concepts of experiential, hands-on learning within a formal educational program meshes well with rancher learning styles. Producer response within the educational categories was not significantly influenced by demographic changes ($p = .10$), excluding a tendency ($p = .09$) for more experienced participants to be less interested in programming including networking opportunities. Practicality of educational structural elements transcends operational differences between producers because all producers strive to be more profitable and productive than their current operation.

Program design should incorporate essential structural elements, such as tools to take home and use and hands-on demonstrations, for educational programs to have more effective organization. Extension personnel may have different prioritization of certain program formatting than beef producers (Boone, Boone, Cullen, & Woloshuk, 2011), but it is necessary to use the preferred methods of producers to improve value of programming and ultimately create more successful communication strategies with beef producers.

Beef Producers' Preferred Formats for Education

Technology is rapidly advancing and producer technology utilization is evolving. Producers have varying skill levels with technological literacy, which may relate to the ranking of their preferred methods of communication. Extension must distinguish the most applicable formats for engaging with producers. Identification of preferred formatting allows Extension and stakeholders opportunities to engage with producers more effectively.

Survey participants were prompted to select preferences for formats to obtain new educational information from seven different educational structures. More than half of all participants selected "field days and ranch demonstrations" (67.0%) and "full day seminars and workshops with expert speakers" (59.1%) as preferred formats. Additionally, nearly half of participants selected "websites (Ext. publications & electronic materials)" (46.5%) and "presentations at regular meetings" (45.7%) as prioritized options for formatting (Table 3.2.).

Table 3.2. Respondents Selecting "Yes" (%) to Each Preferred Format for Educational Programming for Beef Producers

Educational Programming Format	Respondents Selecting "Yes" (%)
Field days, on ranch demonstrations	67.0
Full day seminars/workshops with expert speakers	59.1
Websites (Ext. publications & electronic materials)	46.5
Presentations at regular meetings	45.7
On-line resources (webinars, courses, videos)	41.5
Fee for service consulting (1-on-1 training)	13.8
Virtual conference	7.3

Ranchers tend to be traditionalists when it comes to most aspects of their operational and personal lives. Therefore, it is of no surprise that more traditional, in-person formats were the preferred effective formats for Colorado beef producers. In other states as well, these face-to-face meetings and traditional methods are commonly prioritized over other methods (Dahlen, Hadrich, & Lardy, 2014). With over 60% of participants selecting either "field days and ranch

demonstrations" or "full day seminars and workshops with expert speakers" as priorities, the necessity for planning these formats for programming is reinforced. Although these in-person meetings and seminars are highly prioritized, beef producers understand the importance of online resources as a method for receiving information and education (Karisch & Parish, 2013). As indicated previously, Colorado beef producers are often limited in their attendance at in-person, scheduled events. However, online resources allow producers the opportunity to stay updated and gain industry knowledge without having to commit to particular scheduled dates or factor in travel to or time at these events. Capacity is also stretched in Extension (Wang, 2014), so this online platform could be an area for future efforts for Extension personnel that benefit producers while minimizing resource use by Extension. It is idealistic to focus efforts solely on field days and seminars, but realistic to incorporate a combination of in-person education with the availability of online resources.

Within selection of the top educational formats, both region and segment were influential demographics (Table 3.3.). For differences by segment, stocker producers were 26.9% more likely to prefer "field days, on ranch demonstrations" ($p = .03$), as well as cow-calf producers were 25.2% more likely to prefer this formatting method ($p = .05$).

Table 3.3. Regression Analysis for Top Preferred Educational Formats for Beef Producers from Colorado Needs Assessment

	Field days, on ranch demonstrations			Full day seminars/workshops with expert speakers			Presentations at regular meetings		
Model	β	SE	P-value	β	SE	P-value	β	SE	P-value
Constant	.443	.16	.01	.616	.17	< .01	.607	.17	< .01
Experience	.022	.04	.57	.014	.04	.73	-.008	.04	.85
Scale	-.026	.06	.65	-.040	.06	.50	-.040	.06	.51
Seedstock	.166	.14	.23	-.070	.14	.62	-.168	.15	.25
Cow-calf	.252	.12	**.03**	-.025	.12	.84	-.117	.12	.35
Stocker	.269	.13	**.05**	-.040	.14	.78	-.174	.14	.22
Front Range	.066	.07	.38	.182	.08	**.02**	.017	.08	.83
Peaks & Plains	.107	.05	**.04**	.084	.06	.13	.113	.06	**.05**

The traditional, hands-on management skills required of cow-calf and stocker operations can be best learned through field days and demonstrations. Topics such as rotational grazing management, plant and weed identification, and cattle handling directly affect these operations (Producer Communication). These operators would therefore benefit from exploring other ranching operations to discuss principles of managing these challenges. Many ranchers appreciate hands-on learning and field days incorporate this teaching style effectively.

Educational formatting preferences were also regionally influenced (Table 3.3.). Those from the Peaks and Plains region had a 10.7% higher chance of selecting "field days, on ranch demonstrations" than other regions ($p = .04$) and were 11.3% more likely to select "presentations at regular meetings" ($p = .05$). For Front Range producers, "full day seminars/workshops with expert speakers" were 18.2% more likely to be selected ($p = .02$). These regional influences present interesting guidelines for Extension. It is difficult to pinpoint exact variables from each region that influence the prioritization of formatting. Nonetheless, increased interest in certain formatting for particular regional areas is important to consider when planning programming and Extension personnel in these regions should format their programming accordingly.

The advancement of technology surpasses adoption rates of beef producers. Keeping in mind the prioritization of certain formats encourage the most productive learning environments for producer education. Traditional in-person meetings are highly prioritized by producers. However these in-person formats, in combination with some online resources and print materials, provides room for online educational growth without ignoring producers' educational formatting preferences.

Most Reliable Sources of Information for Colorado Producers

With constantly swinging markets, increased regulations, and new marketing strategies, many beef producers are overwhelmed with operational decision-making. Information is readily available, but it is often difficult to differentiate good assistance from bad advice. For this reason, beef producers are particular about selecting reliable sources of information. Also to note, matching the information source with the preferences of the audience increases programming effectiveness (Vergot, Israel, & Mayo, 2005). Understanding trusted information sources provides the opportunity to reflect on who producers seek out for assistance.

Results indicate the top choices for most reliable source of information for producers are "other producers" (38.9%), "commodity associations (CCA, CLA, NCBA)" (22.3%), and "University Extension personnel" (17.1%) (Figure 3.3.). Producer response within the top sources of information was not influenced by demographic changes, except for a tendency (p = .09) for more experienced participants to be less likely to select "other producers" as a reliable source than beginning operators. More experienced operators may be looking to learn different information than beginners and the information they are seeking requires more expertise or credibility.

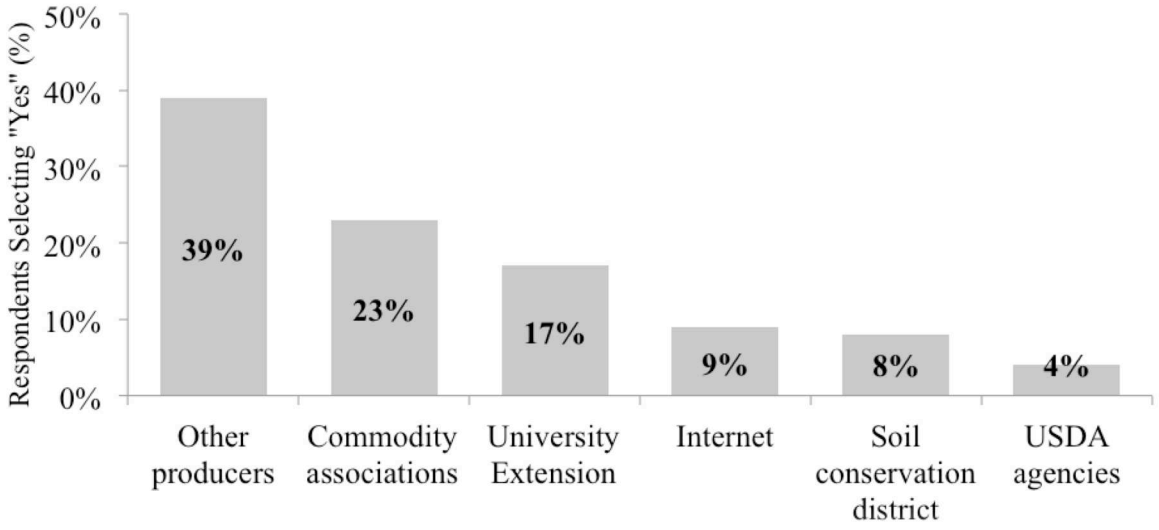

Figure 3.3. Respondents Selecting "Yes" (%) for Each Reliable Source of Information for Colorado Beef Producers.

In the case of producers in Colorado, the top reliable source of information is "other producers." Producers find that connecting with other producers in their communities provides invaluable insight about managing operational challenges or external forces (Producer Communication). The industry knowledge of producers is developed from experiences and often translates to applicable operational advice. Although other producers are valued for their knowledge, formal programming is typically not provided through this avenue. For this reason, it is important to evaluate additional reliable resources for producers. Commodity associations have gained reliability for producers, with 22.3% selection by participants. These associations help lobby for beef production and provide member services that benefit their producer members. Tradition of involvement and overall history in the state also lend some credibility to these entities. Some associations are beginning to adapt programming to include more education due to changes in member priorities. Extension ranks as the third most reliable source of information with selection by less than 20% of participants. This lower ranking may be discouraging for Extension personnel as they try to gain credibility in communities.

Program planners for beef producers should recognize how educational credibility can influence their programs. A strategic format should incorporate a more collaborative approach that utilizes the strengths from each of these top sources for information (Vergot, Israel, & Mayo, 2005). An example of this collaborative format would be a seminar or workshop presented by a commodity association that invites Extension personnel and association leadership to provide some technical knowledge in a certain content area of which beef producers are interested. Once the formal presentation is finished, the program could transition to a producer panel, where the audience is able to hear from their peers on the subject. This type of formatting comprehensively includes the top credible sources for informational outreach. If Extension and other stakeholders continue to collaborate in program content and structure, then beef producers should find more value in educational programming.

Interest Levels in Future Activity Areas for Ranchers

Extension continues to adapt program content based on specific needs (Chase, Ely, & Hutjens, 2006). There are no creative limitations to program development, only budgeting and resource constraints. For this reason, Extension and other stakeholders should consider feedback from producers when setting goals for future Extension projects.

Producers were asked to rank future activity areas as high interest, medium interest, or low interest. The ranking of "high interest" was as follows: "Become BQA certified" (26.8%), "Join a regional rancher group" (22.5%), "Participate in research projects" (17.1%), and "Host a regional ranch gathering" (8.5%) (Figure 3.4.).

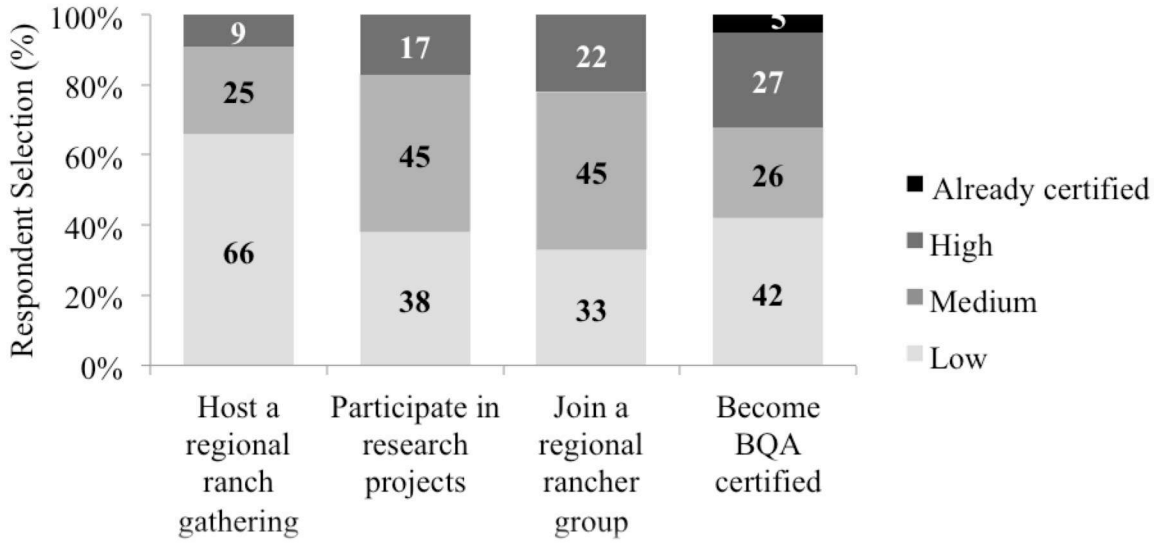

Figure 3.4. Respondent Selection (%) of Ranking Interest Levels in Future Activity Areas for Beef Producers. Ranking either as High, Medium, or Low; Option of "Already Certified" Added for BQA Certification.

Producers expressed a moderate interest to participate in each of these future activity areas. The interest levels in these four areas relate to the innovation adoption curve (LaMorte, 2018). From early adopters to the laggards in the system, people have different trigger points that influence the adoption of an innovation, or in this case, a future activity area. Extension personnel should not pressure producers to participate sooner than they are prepared. Not surprisingly, the moderate spread of interest within these results shows that there are early adopters and laggards within beef producers. Identifying the participants who are early adopters could be a beneficial first step to beginning to develop new project ideas. Early adopters can be change leaders in a community and guide those slower to adopt to participate.

Both segment and regional location were influential on interest levels in three future activity areas (Table 3.4.). Beyond seedstock operators having a tendency (p = .09) to be more interested, producer response to "participate in research projects" was not influenced by demographic characteristics.

Table 3.4. Regression Analysis of Potential Future Activity Areas for Colorado Beef Producers

	Host a regional ranch gathering			Join a regional rancher group			Become BQA certified		
Model	β	SE	P-value	β	SE	P-value	β	SE	P-value
Constant	.755	.17	< .01	1.56	.20	< .01	1.36	.26	< .01
Experience	.032	.04	.45	.017	.05	.73	.073	.06	.25
Scale	.074	.06	.24	.112	.07	.11	.338	.09	**< .01**
Seedstock	.581	.15	**< .01**	.366	.17	**.03**	-.014	.22	.95
Cow-calf	.251	.13	**.05**	.264	.15	.07	-.030	.19	.87
Stocker	.436	.15	**< .01**	.370	.17	**.03**	-.072	.22	.74
Front Range	.193	.08	**.02**	.157	.09	.09	.353	.12	**< .01**
Peaks & Plains	.014	.06	.81	-.149	.07	**.02**	-.009	.09	.92

Seedstock operators were likely to be interested in hosting a regional ranch gathering than other segments ($p < .01$). Seedstock operators are accustomed to hosting customers at their ranches for bull or female sales, so hosting in a different capacity would not exasperate their management or operational structure. Additionally, cow-calf operators ($p = .05$) and stocker operators ($p < .01$) are both likely to be interested in hosting these types of regional gatherings. Interest for these two segments is more peculiar because these types of operations do not typically have many visitors on their operations. However these producers may desire more contact with other producers. A ranch gathering would encourage camaraderie, while also establishing potential business partnerships not explored before. Producers from the Front Range region were likely to want to host a ranch gathering ($p = .02$). Eagerness from Front Range producers could stem from these producers' increased contact with urban and suburban populations distributed throughout the Front Range. These producers might be interested in educating their non-agricultural neighbors. Also they may feel isolated from other producers and seek connection within a ranching oriented community.

Seedstock operators ($p = .03$) and stocker operators ($p = .03$) were likely to be interested to "join a regional rancher group," and there was a tendency ($p = .07$) for cow-calf operators to

be interested. All these segments rely on relationships with other producers to make their businesses more successful. For example, seedstock producers need relationships to sell their bulls, semen, or females, while stocker operators need relationship to buy cattle to be backgrounded or sell their backgrounded cattle. Likelihood of interacting with potential customers increases with formalized rancher groups. Related to region, producers in the Peaks and Plains region are less likely to want to "join a regional rancher group" ($p = .02$) and there was a tendency ($p = .09$) for Front Range producers to be more interested. This disinterest could be related to the high concentration of feedlots in this area (57.1%). Due to their typical operational scale, feedlots often establish their own culture and workforce, therefore not prioritizing connections with neighbors for assistance or networking. Similarly to reasoning for hosting a ranch gathering, Front Range producers may feel isolated among their more urban neighbors and seeking connection in a ranching community.

Front Range producers are likely to want to "become BQA certified" ($p < .01$). The closeness of Front Range producers to more urban and suburban populations affects transparency in ranching. Ranchers are under more scrutiny from these populations. For these producers, BQA certification might be an effective step toward gaining more trust with consumers. The processes and guidelines of BQA certification encourage better stockmanship practices, which appeal to consumer concerns about animal welfare (Drouillard, 2018). Additionally, as scale increases, interest in becoming BQA certified increases ($p < .01$). Large-scale operations are constantly adjusting to maximize economies of scale. BQA principles and practices help producers capture more value from their cattle, thereby increasing levels of production in an operation.

Beef producers initial hesitation for participating in new activities may be off-putting for stakeholders. But as Extension adapts programming to fit community needs (Chase, Ely, &

Hutjens, 2006), exploration of new activities becomes unavoidable. As these results suggest, Extension personnel and other stakeholders should continue to develop activities that allow producer interaction on a regionalized basis.

Conclusions

Extension personnel have continually adapted program deliveries in the past 25 years to specifically address the needs and preferences of local communities (Chase, Ely, & Hutjens, 2006). For Colorado's beef producers, the adaptation of program deliveries should incorporate some newer technology, but rely most heavily on traditional methodology for outreach and delivery. Goals for communication strategies should include prioritizing in-person programming that provides structural elements, such as specific tools for producers to take home and use and hands-on demonstrations. Producer responses indicate demographic characteristics (scale of operation, region, segment, and experience) are influential on communication preferences. Overall, there are consistencies within components of programming and some formatting, but unique attributes of producers particularly influence interest in future activity areas. Future programming efforts will require some collaboration with other stakeholders, like other producers or commodity association, but this has been proven to be more appealing to beef producers (Vergot, Israel, & Mayo, 2005). Barriers to producer engagement suggest certain influential factors may affect how producers make decisions. Operational responsibilities are the highest priority to beef producers, however, these other factors need to be explored to understand opportunities for amplifying the efficacy of communication strategies with Colorado beef producers.

LITERATURE CITED

Boone, D.A., Boone, H.N., Cullen, T.J. & Woloshuk, J.M. (2011). Evaluation of information transfer between beef producers and extension agents in West Virginia. *Journal of the National Association of County Agricultural Agents (NACCA),* 4 (2): 1-7.

Chase, L. E., Ely, L. O., & Hutjens, M. F. (2006). Major advances in extension education programs in dairy production. *Journal of Dairy Science*, 89 (4), 1147-1154. Retrieved from http://www.journalofdairyscience.org/article/S0022-0302(06)72183-X/fulltext.

Dahlen, C.R., Hadrich, J.C., & Lardy, G.P. (2014). The North Dakota beef industry survey: Implications for extension. *Journal of Extension,* 52 (6). Retrieved from https://www.joe.org/joe/2014december/rb7.php.

Dideriksen, S.M. (2018). *A need assessment for Colorado beef producers: Understanding rancher priorities, preferred communication strategies, and influential factors on prioritization and relationships with land grant universities.* (Master's thesis).

Dillman, D. A. (2007). *Mail and Internet Surveys: The Tailored Design Method (2nd ed.).* Hoboken, NJ: John Wiley and Sons, Inc.

Drouillard, J.S. (2018). Current situation and future trends for beef production in the United States of America—A review. *Asian-Australas Journal of Animal Science*, 31(7): 1007-1016. doi: 10.5713/ajas.18.0428.

Field, T.G. (2018). *Beef production and management decisions* (6th ed). New York: Pearson.

Griffith, A.P. (2018). Market highlights: Challenges, opportunities in risky cattle market. *Drovers.* Retrieved from https://www.drovers.com/article/market-highlights-challenges-opportunities-risky-cattle-market.

Hall, J.B., McKinnon, B.R., Greiner, S.P., & Whittier, W.D. (2004). Teaching complex, in-depth programs. *Journal of Extension,* 42(3). Retrieved from https://www.joe.org/joe/2004june/a2.php.

Karisch, B.B. & Parish, J.A. (2013). Assessment of beef cattle extension publication use via internet download monitoring. *Journal of Extension,* 51(1). Retrieved from https://www.joe.org/joe/2013february/pdf/JOE_v51_1tt2.pdf.

LaMorte, W.W. (2018). Diffusion of innovation theory. *Behavioral Change Models,* Boston University School of Public Health. Retrieved from http://sphweb.bumc.bu.edu/otlt/MPH-Modules/SB/BehavioralChangeTheories/BehavioralChangeTheories4.html.

National Research Council (1995). *Colleges of agriculture at the land grant universities: A profile.* Washington, D.C.: National Academy Press.

Vergot III, P., Israel, G. & Mayo, D.E. (2005). Sources and channels of information used by beef cattle producers in 12 counties of the northwest Florida extension district. *Journal of Extension,* 43 (2). Retrieved from https://www.joe.org/joe/2005april/rb6.php.

Wang, S.L. (2014). Cooperative extension system: Trends and economic impacts on U.S. agriculture. *Choices,* quarter 1. Retrieved from http://www.choicesmagazine.org/choices-magazine/submitted-articles/cooperative-extension-system-trends-and-economic-impacts-on-us-agriculture.

CHAPTER 4: COLORADO BEEF PRODUCER NEEDS ASSESSMENT PART 3: RECOGNIZING INFLUENTIAL FACTORS

Introduction

Beef producers often operate in an unwelcoming environment. Whether due to pressure from consumers or environmental hardships, beef producers are challenged by a variety of external forces. As producers strategically adapt to outside challenges, specific educational needs and priority areas evolve. Changing demographics within the beef industry, such as increasing producer age and lower labor availability, affect internal factors of operational management structure and family dynamics (Drouillard, 2018). Although many producers have reservations about sharing personal details, these specific internal pressures also influence prioritization of needs (Wilmer & Fernández-Giménez, 2016). External and internal influential factors are often variable and particular to an individual operation. However, direct producer feedback is useful for recognizing significant influences on operational needs.

Extension personnel have historically provided assistance for beef producers (National Research Council, 1995). Now, Extension is operating on a tighter budget and with fewer resources than desired (Wang, 2014). Regardless of Extension's diminishing funding availability, personnel are expected to understand the needs of their communities in order to best serve these populations. Therefore, strategic Extension programming will require concerted efforts to distinguish how particular influences on beef producers affect prioritization of educational and research needs.

To better understand and prioritize current needs and opportunities faced by the Colorado beef industry, a comprehensive needs assessment was conducted in collaboration with the Colorado Cattlemen's Association (CCA), Colorado Livestock Association (CLA), and Colorado

State University (CSU). A primary goal of the needs assessment was to explore if *"External and internal factors influence prioritization and preferences for Colorado beef producers."* Additionally, one-on-one interviews of Colorado beef producers were conducted to provide a deeper understanding of the influences on prioritized educational and research needs defined in the broader survey. Analysis of specific survey and interview results provided essential insight into these influences for producers. Producer feedback about influential factors will serve as a guide for Extension personnel and other stakeholders as educational programs and content are developed for the industry.

Materials and Methods

Population and Sample

The population of this study was beef producers in Colorado. Beef producer members of both the Colorado Cattlemen's Association (CCA) and Colorado Livestock Association (CLA) were used. A beef producer was defined as any adult directly involved in a beef cattle operation in Colorado and a member of either or both CCA and CLA. The needs assessment survey was created, distributed, and collected through a collaborative effort with an experienced third-party survey organization in order to limit researchers' direct access to information about participants. Of the 1,840 beef producers surveyed, 83 were ineligible responses and 10 were refusals. Completed surveys from 728 respondents were received, resulting in a response rate of nearly 40 percent (39.6%). A high response rate could be indicative of this being the first comprehensive needs assessment sent to Colorado beef producers.

The same beef producer population was sampled for one-on-one interviews. Utilizing guidance from CCA and CLA staff, 21 beef producers were identified and one-on-one interviews were conducted. The interviewees were selected to match both the geographical and association

representation generated in the broader survey. Meaning, 19 and 2 producers were selected from CCA and CLA, respectively (94% CCA and 6% CLA) and 11 Peaks and Plains producers, 7 Western Slope producers, and 3 Front Range producers, respectively. Interview participants were not required to complete the broader survey.

Quantitative Procedures and Data Analysis

Although the creation, distribution, and collection of the needs assessment was orchestrated through a third-party organization, the following briefly outlines the process. A 31-question survey was created and beta tested through a collaborative effort with the third party and stakeholders from Colorado's beef industry (Appendix A). The comprehensive survey focused on educational needs and priorities, specific cattle-related evaluations, preferred outreach methods, and collection of some demographics. In this study, the results focus exclusively on the needs and priorities of participants, preferred outreach methods, and demographics of respondents. Results from the additional questions, in particular those associated with "Herd Level Performance Evaluation" and "Grazing Animal Nutrition," were analyzed and reported in different projects. The needs assessment was mailed and distributed to participants according to Dideriksen (2018) methodology.

Data were collected and compiled via the third-party organization into an Excel sheet; columns indicating responses to each question and variables within the questions, and rows indicating each completed, returned producer survey. Data were analyzed using SPSS (Version 25) to perform frequency counts, descriptive statistics, cross tabulations, and linear regressions. The independent variables for analysis were *experience* (Beginner: 0-10 yrs., Intermediate: 11-20 yrs., Experienced: 21 yrs. plus), *scale* (Small: <100 head, Medium: 101-500 head, Large: >500 head), *segment* (Seedstock, Commercial Cow-Calf, Grazing/Growing Stocker, Feedlot), and

region (Front Range, Peaks and Plains, Western Slope). Participants were asked to enter a zip code as an indicator of location, however in order to make zip codes manageable, they were sorted into three statewide Extension regions, including Front Range, Peaks and Plains, and Western Slope. Dependent variables analyzed were *primary motivations of producers* and *barriers to operational success*. To determine relationships between demographics (independent variables) and influential factors (dependent variables), several tests were used. For all analysis, the alpha level was set at 0.05 to determine significant differences. A tendency was set when the alpha level was between 0.05 and 0.1. Specific methods associated with analyzing dependent variables were completed according to Dideriksen (2018).

In addition to quantitative data, there were 21 key informant interviews of these ranchers. Each interview participant was asked the same 14 interview questions (Appendix C) and summarized responses from these interviews provided researchers with key observations and themes to be used as supporting evidence for results from the needs assessment survey. Direct feedback from these interviews is signified in the text as "Producer Communication."

Results and Discussion

Demographics

Participants were asked a series of demographic questions about themselves and operation. In general, respondents were over 56 years of age (72.1%) with over 21 years of ranching experience (75.8%). Over 70% of participants are the operation owner and manager and nearly 75% of the operations are full-time. Representation from all four-industry segments was reported; operations were mostly commercial cow-calf (73.7%), with 12.3% grazing/growing stocker, 10% seedstock, and 4% feedlots. Operation size varied with 35.6% small (<100 head), 45.8% medium (101-500 head), and 18.6% large (>500 head). Regionally, respondents indicated being from the Front Range (15.4%), Peaks and Plains (46.9%), and Western Slope (37.7%).

Primary Motivations of Colorado Ranchers

Beef producers quantify their successes based on different deliverables. For some, success is defined as increasing operational profitability and for others, their ranching lifestyle is more important than economic returns (Roche et al, 2015). Different rancher motivations explain diversity in defining success in the beef industry. Understanding how motivation influences operational decisions and educational needs is a constructive step for stakeholders wanting to provide applicable assistance to beef producers.

Participants were asked to select their primary motivation for ranching. Overall, 32.8% of ranchers selected "productivity of land and animals," 22.7% selected "profitability and enterprise growth," and 19.9% selected "family lifestyle and tradition," as their primary motivations (Figure 4.1.).

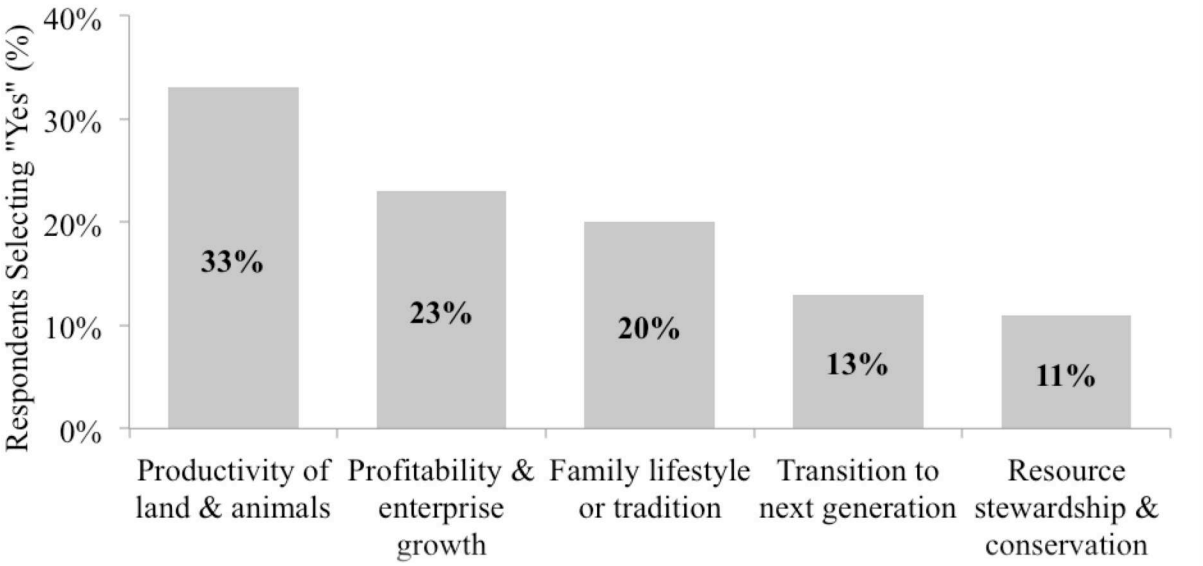

Figure 4.1. Respondents Selecting "Yes" (%) to Each Primary Motivation within Colorado Beef Producer Operations

Variation in motivations for ranchers highlights how producers prioritize their efforts. Nearly one-third of producers selected "productivity of land and animals" as their primary

motivation. Defining productivity for individual operations is subjective, but ranchers can reflect on improvements in production on their operation as a means of measurement. Ranchers recognize productive land and animals provide more returns for their operation. Therefore, as producers drive for productivity, they emphasize raising higher-quality animals and practice management strategies that do not damage their land (Producer Communication). "Profitability and enterprise growth" was another top motivation for ranchers. Growth in profitability is motivating because profit solidifies a future for an operation. As beef production is threatened by urban development and consumer criticism, profitability ensures some operational longevity (USDA, ERS, 2018). Enterprise growth strategies, for example with diversification, offer stability during times of market volatility and higher risk (Griffith, 2018). Profitability might be less concerning for the 20% that selected "family lifestyle or tradition" as their primary motivation. Studies have shown that profit is not the primary motive for involvement in ranching (Sayre, 2004). Ranchers stress the importance of a better quality of life provided to them and their families because of their involvement in ranching (Raish & McSweeney, 2003).

Selection of "family lifestyle or tradition" as a primary motivation did not differ as the demographics of producers change, beyond a tendency ($p = .07$) for larger operations to be less motivated by this factor. Participant response to top responses of "productivity of land and animals" and "profitability and enterprise growth" was influenced by regional location (Table 4.1.).

Table 4.1. Regression Analysis for Beef Producer Primary Motivations within Operations from Colorado Needs Assessment

	Transition to next generation			Productivity of land and animals			Profitability and enterprise growth		
Model	β	SE	P-value	β	SE	P-value	β	SE	P-value
Constant	-.004	.09	.96	.303	.12	.01	.026	.10	.80
Experience	.013	.02	.54	.021	.03	.47	-.004	.03	.87
Scale	.065	.03	**.03**	.001	.04	.97	.034	.04	.35
Seedstock	.039	.07	.59	.077	.10	.45	-.048	.09	.58
Cow-calf	.065	.06	.30	.040	.09	.65	-.119	.08	.12
Stocker	.076	.07	.29	-.133	.10	.18	-.055	.09	.52
Front Range	-.038	.04	.33	-.060	.06	.27	.098	.05	**.04**
Peaks & Plains	-.014	.03	.62	-.139	.04	**< .01**	.146	.03	**< .01**

Peaks and Plains producers were 13.9% less likely to select "productivity of land and animals" ($p < .01$) as a primary motivation and 14.6% more likely to select "profitability and enterprise growth" ($p < .01$) as their primary motivation than other regions. These relationships indicate high priority for profitability as motivation for Peaks and Plains ranchers. This region is home to a majority of the high inventory counties for cattle and calves in Colorado (USDA NASS, 2017). These Peaks and Plains counties are also home to a majority of Colorado's feedlots, with 57.1% of feedlot operations from the needs assessment in this region. Feedlots are a purposeful end point for cattle where animals gain weight to prepare for harvest (Field, 2018). Because of the direct relationship between end products and profit, these feedlot owners and managers have more profitability-centered management styles.

Interesting to note, selection of "transition to the next generation," was influenced by operational scale. As scale of the operation increases, producers are 6.5% more likely to select "transition to next generation" as a primary motivation ($p = .03$). Larger ranches function as businesses, balancing production, finance, marketing, employees, and revenue. This business mindset drives producers to think toward the future to maintain ranch viability. Succession planning helps businesses maintain economic value (Fetsch, 1999). This means that by

incorporating plans for generational transfer, operators of larger ranches can secure quality of life, even through retirement (Fetsch, 1999).

Primary motivations for producers are driven by both profit and production. Additionally, some ranchers are motivated because of the traditional lifestyle ranching provides. Regardless, Extension needs to consider educational needs that fit within each motivational factor. Producers interested in productivity and profitability may be more interested in learning about strategic cowherd management or creating a business plan than those who are primarily interested in ranching for lifestyle and tradition. Developing programming that addresses features within top motivations would be beneficial for assisting beef producers.

Barriers to Operational Success as a Beef Producer

Profitability on beef operations in today's system is dependent upon the producer's ability to manage livestock and resources, while operating in risky markets, harsh environmental conditions, and with scrutiny from consumers. Quantifying influences from external challenges is specific to each operation. Also on an individualized basis, certain operational barriers challenge producers. Prioritizing these barriers to success can help identify areas for Extension to provide educational resources and support.

To assess the current situation at the ranch, the needs assessment aimed to better understand the top barriers to success within participants' operations. Nearly 70% of participants indicated their "financial situation (cash flow or cost of production)" as the biggest obstacle (69.1%). Participants also struggle with a "lack of qualified employees" (43.8%) and "quality of information" (41.8%) (Figure 4.2.).

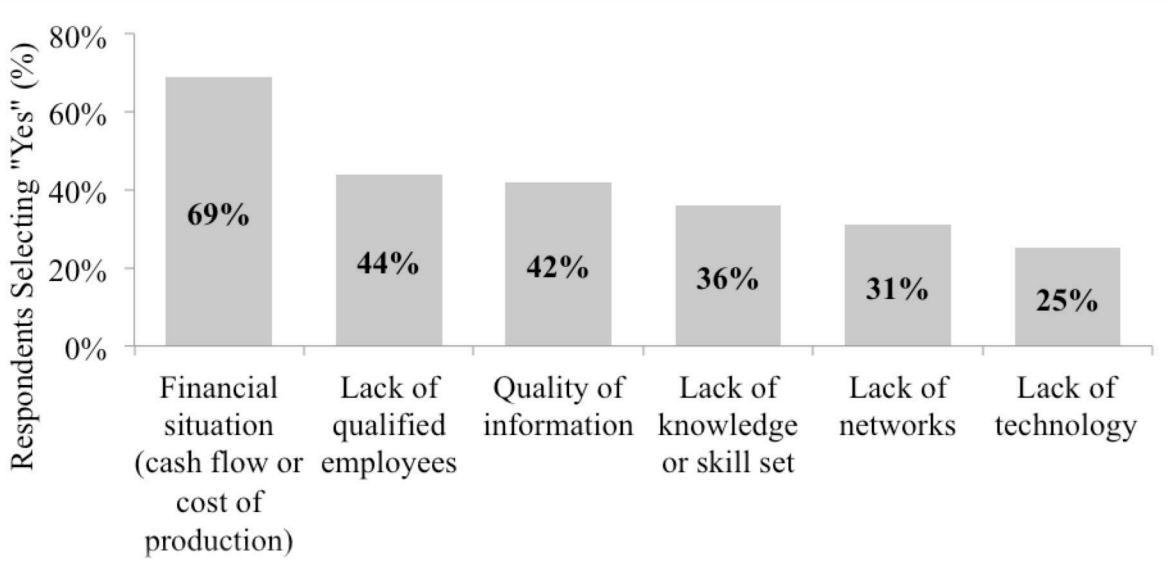

Figure 4.2. Respondents Selecting "Yes" (%) to Each Barrier to Operational Success as a Colorado Beef Producer.

Overwhelming selection of "financial situation" reflects the influence of declined cattle prices and increased market volatility. Higher input costs influence how ranchers balance costs of production versus profits (Rutherford, 2016). Producers are attempting to find ways to become more efficient by utilizing resources effectively and "doing more with less" (Producer Communication). In this scramble for financial security, producers are challenged to maintain productivity. Not all producers are able to manage their financial situations when confronted with compounding barriers, like a lack of qualified employees and quality of information for more than 40% of participants. Qualified employees may cost more for producers to recruit and maintain their employment, triggering financial hardship. However, qualified employees are necessary for maintaining operational productivity. Producers are left in a bind where they cannot afford to pay for qualified employees, but they cannot afford to damage operational productivity (Producer Communication). Labor issues also transcend wages. Many producers are simply struggling to find qualified employees, as labor availability is decreasing. Quality of information can be interpreted as a lack of applicable support from outside resources. Producers

have particular operational-level issues and often times cannot find information to help alleviate these challenges. Producer responses within the top barriers to success were not influenced by demographic characteristics. One exception is a tendency (p = .09) for Front Range producers to have fewer issues with a lack of qualified employees because these producers are located in more populous areas with more opportunities to connect with potential employees. There are some expectations that barriers to operational success would be less influential on producers with more experience. However, the current market volatility and changing beef industry demographics has completely changed how beef producers operate. Those with experience are unable to rely on what has been done in the past because these market conditions have never been seen before.

Beyond the top three barriers to success, "lack of knowledge or skill set" was influenced by operational scale. As size increased, producers were 13.6% less likely to select "lack of knowledge or skill set" as a barrier to success (p = .04) (Table 4.2.). Because running a larger beef operation some operational expertise, producers involved in these outfits typically have more experience. With experience, producers develop an abundance of knowledge and cattle management skills, thereby decreasing issues with deficiency in these areas.

Table 4.2. Regression Analysis for Barriers to Operational Success for Colorado Beef Producers

	Lack of knowledge or skill set		
Model	β	SE	P-value
Constant	.720	.18	< .01
Experience	-.035	.05	.43
Scale	-.136	.07	**.04**
Seedstock	-.149	.16	.34
Cow-calf	-.059	.13	.66
Stocker	-.003	.15	.99
Front Range	-.058	.09	.50
Peaks & Plains	.108	.06	.08

Across the beef industry, there is a consistency of issues with financing, labor, and information quality affecting operational success. Beef producers combat barriers to success through making strategic management decisions. To be best informed about making productive operational management decisions, producers may rely on outside assistance. Extension needs to realize value in providing resources that assist producers with making operational adjustments to decrease negative influences from these top barriers to success.

Internal and External Forces Influencing Operational Changes

Beef production follows specific processes, but intricacies within operational-level systems are dynamic. Extension personnel are typically unable to be intimately involved in beef production. Direct producer feedback allows stakeholders to explore management decisions on operations and influences on operational changes. Understanding why producers adapt their operations in the face of adversity is important as stakeholders develop assistance for prioritized producer needs.

During key informant interviews with producers, participants were asked about what internal and external forces have led to a shift or change in their operational priorities and needs. From an internal standpoint, ranchers discussed the impacts of family dynamics and generational transfer. Many key informant interviews were with producers at the cusp of beginning discussions about transition and re-structure on their operations. In ranching, family members transition in and out of the operation due to age or change in priorities, described by one rancher as, “I mean I'm getting older now so that changes your outlook on things.” These changes in structure affect the operation. Producers have to renegotiate responsibilities or may have to hire new employees, adding to human resource management duties. Additional structure changes that were discussed as internal influences were adjusting operational structure through size

adjustments, segment changes, and diversification. Internal forces are more variable with each operation as every ranch dynamic is different. However, all beef producers are influenced by volatility in the cattle markets so diversification was a popular adjustment being considered. Diversification adds some depth to income and resource distribution that allows producers to supplement their income. Changing scale of an operation may be dependent on availability of labor, which is plaguing many ranchers. Although impacts of internal forces are more variable and particular to individual operations, these trends indicate that ranchers are dealing with similar issues. Recognizing the potential internal operational influences may explain rancher behavior and priorities.

Producers also elaborated on a variety of external forces that influenced operational changes. With the internal influences of changing dynamics in management structure, issues of labor availability are exasperated. These structure changes create needs for additional laborers. Ranchers are unable to compete with wages offered in other labor-intense industries. Many laborers are also less attracted to working in a ranching environment or if they are interested, they have less ranch-level skills. Market changes also influence ranchers. The current cattle market is more risky in past years with dramatic swings that offer opportunities, but even more challenges, for beef producers than ever before (Griffith, 2018). This requires producers to be more aware of marketing strategies and different demands. Producers are also concerned about pressure from outside the ranching community with both regulations and land availability. When regulations are finalized, producers may have to operate differently. This is of particular concern to producers because many legislators are disconnected from agriculture and do not realize how regulations impact beef production. In Colorado, competition over land has become more of a problem. Urban development causes issues with land transitioning from pasture leasing to new

housing developments. Public lands issues with recreation and drought also decrease viability of grazing permits. Now more than ever, producers are scrambling to piece together the necessary amount of land for cattle grazing. Ranchers cannot control causation for external forces, but recognition of these forces is important to understand producer priorities.

Conclusions

Beef production is a challenging industry. Balancing influences from internal and external forces while maintaining productivity and profitability requires more than the extensive industry knowledge and experiences of most ranchers. Widespread concerns of cattle market volatility, increased risk in ranching, and impending generational transition force ranchers to evaluate their priorities. Producer feedback articulates how influential elements affect their educational priorities and needs. Internal influences include family dynamics, generational transition, diversification, operational scale, while external factors include labor availability, regulations, land use competition, and marketing. Beyond these specific elements, influences of scale of the operation and regional location affect preferences and priorities. Extension should use this insight to develop resources that assist with alleviating challenging influences stemming from these described forces. If Extension personnel and other stakeholders consider producer motivations of productivity and profitability, as well as operational barriers to success including financing, labor availability, and quality of information, then producers should receive pertinent information that will benefit their individual operations and therefore strengthen the Colorado beef industry. Uncertainty in beef production may be intimidating for producers, but having applicable education that targets their priorities will ultimately positively affect these producers.

LITERATURE CITED

Dideriksen, S.M. (2018). *A need assessment for Colorado beef producers: Understanding rancher priorities, preferred communication strategies, and influential factors on prioritization and relationships with land grant universities.* (Master's thesis).

Dillman, D. A. (2007). *Mail and Internet Surveys: The Tailored Design Method (2nd ed.)*. Hoboken, NJ: John Wiley and Sons, Inc.

Drouillard, J.S. (2018). Current situation and future trends for beef production in the United States of America—A review. *Asian-Australas Journal of Animal Science*, 31(7): 1007-1016. doi: 10.5713/ajas.18.0428.

Fetsch, R.J. (1999). Some do's and don'ts for successful farm and ranch family estate transfers. *Journal of Extension,* 37(3). Retrieved from https://www.joe.org/joe/1999june/iw2.php.

Field, T.G. (2018). *Beef production and management decisions* (6th ed). New York: Pearson.

Griffith, A.P. (2018). Market highlights: Challenges, opportunities in risky cattle market. *Drovers.* Retrieved from https://www.drovers.com/article/market-highlights-challenges-opportunities-risky-cattle-market.

National Research Council (1995). *Colleges of agriculture at the land grant universities: A profile.* Washington, D.C.: National Academy Press.

Raish, C. & McSweeny, A.M. (2003). Economic, social, and cultural aspects of livestock ranching on the Española and Canjilon ranger districts of the Santa Fe and Carson national forests: A pilot study. *United States Department of Agriculture: Forest Service, Rocky Mountain Research Station.* Retrieved from https://www.fs.fed.us/rm/pubs/rmrs_gtr113.pdf.

Roche, L.M., Schhr, T.K., Derner, J.D., Lubell, M.N., Cutts, B.B., Kachergis, E., Eviner, V.T., & Tate, K.W. (2015). Sustaining working rangelands: Insights from rancher decision making. *Rangeland Ecology and Management,* 68(5): 383-389. Retrieved from http://dx.doi.org/10.1016/j.rama.2015.07.006.

Rutherford, B. (2016). Top 10 issues facing beef producers. *Drovers.* Retrieved from https://www.beefmagazine.com/blog/top-10-issues-facing-beef-producers.

Sayre, N.F. (2004). Viewpoint: The need for qualitative research to understand ranch management. *Journal of Range Management,* 57 (6): 668-674. https://doi.org/10.2111/1551-5028(2004)057[0668:VTNFQR]2.0.CO;2.

USDA, Economic Research Service. (2018). *Cattle & beef: Sector at a glance.* Retrieved from https://www.ers.usda.gov/topics/animal-products/cattle-beef/sector-at-a-glance/

USDA National Agricultural Statistics Service. (2017). *Colorado cattle facts.* Retrieved from https://www.nass.usda.gov/Statistics_by_State/Colorado/Publications/Agriculture_Profile/Colorado_Cattle_Facts_2017.pdf.

Wang, S.L. (2014). Cooperative extension system: Trends and economic impacts on U.S. agriculture. *Choices,* quarter 1. Retrieved from http://www.choicesmagazine.org/choices-magazine/submitted-articles/cooperative-extension-system-trends-and-economic-impacts-on-us-agriculture.

Wilmer, H. & Fernández-Giménez, M.E. (2016). Some years you live like a coyote: Gendered practices of cultural resilience in working rangeland landscapes. *Ambio,* 45 (3): 363. https://doi.org/10.1007/s13280-016-0835-0.

CHAPTER 5: UNDERSTANDING HOW RANCHER IDENTITIES AND COMMUNITITES AFFECT RELATIONSHIPS AT A LAND GRANT UNIVERSITY

Introduction

Ranching in Colorado has been part of the history since before the state's inception. Cowboys have been romanticized as iconic and heroic characters in books and movies, but the life of a rancher requires hard work and long hours (Knowlton, 2017). This disconnection between reality and fantasy leaves some curiosity about what it truly means to be a rancher and how these traditional, agricultural characters interact in contemporary society. Colorado continues to grow in population while the ranching community is decreasing in number of producers and land dedicated to ranching (USDA NASS, 2017). In 1980, Colorado's population of 2.9 million was split between 80% urban and 20% rural. As of 2010, the population was 5.03 million and the rural distribution dropped to 14% (U.S. Census Bureau, 2010). As population grows and the agricultural sector becomes more removed from most citizens' everyday lives, it becomes critical to understand what it means to be a rancher. Disconnection between consumers and ranchers exasperates concerns about transparency. When consumers do not understand ranchers or their production practices, their concerns about beef production, animal welfare, and environmental issues are elevated (Henderson, 2017).

In addition to the changing landscape of urbanization in Colorado, program funding for the university Extension system is diminishing (Wang, 2014). Land grant universities were established in 1862 with the purpose of providing scientific, research-based education to address issues in communities (National Research Center, 1995). Extension personnel are stretched thin and often unable to dedicate time to understanding their community needs. This leads to program content differing between what communities desire to learn about and what Extension provides

(Boone, Boone, Cullen, & Woloshuk, 2011). Without understanding stakeholder issues, it is impossible to provide necessary assistance. Input from stakeholders provides purposeful direction for Extension programming. Decreasing resource allocation to Extension exaggerates Extension inabilities to connect to communities to understand their needs and priorities. Applicable research may also be faltering, as land grant universities have issues with integration between Extension priorities and research priorities to produce research-based information that is informative and helpful for the general public (Radhakrishna, Tobin, & Foley, 2014).

To better understand rancher identities and communities in Colorado, key informant interviews were conducted by Colorado State University (CSU) in collaboration with Colorado Cattlemen's Association (CCA) and Colorado Livestock Association (CLA). A primary objective for these interviews was to explore how rancher identities and communities affect their relationships with land grant universities. Specific exploration included development of identity through ranching, the influence of communities and connection on ranchers, and then how both communities and rancher identities influence trust of land grant universities. Key insights from these interviews emphasize the importance of local-level engagement and strategic partnerships as a means of developing relationships with ranchers.

Methods

The population of this study is beef producers in Colorado. In order to learn more about this population, beef producers from both the Colorado Cattlemen's Association (CCA) and Colorado Livestock Association (CLA) were interviewed. A beef producer was defined as any adult directly involved in a beef cattle operation in Colorado and a member of either or both CCA and CLA. Using guidance from CCA and CLA staff, 21 beef producers were identified for one-on-one key informant interviews. Key informant interviews are beneficial because this type

of interviewee is able to provide more information and a deeper insight about what is affecting their communities (Marshall, 1996). These key informant interviews aimed to understand the perspectives of Colorado ranchers using qualitative methods that recognize the complexities behind decision-making processes and lifestyle decisions for ranchers (Sayre, 2004). Contact with these producers was facilitated through a gatekeeper at CCA and the gatekeeper was included during all initial communication with participants (Tracy, 2013). This gatekeeper allowed researchers access to knowledgeable ranchers willing to share about their experiences as a rancher in Colorado (Parsons, 2008). Each participant identified through the gatekeeper was emailed and asked for participation in a phone call or in-person interview. The email is attached in the appendix (Appendix E). None of the identified ranchers declined an interview. Interviewees were all asked the same series of 14 interview questions (Appendix C). All interview questions and methodology were approved for exemption by the Colorado State University Institutional Review Board (Submission: 17-7438H).

The 21 interviewees were geographically spread around Colorado in the three CSU Extension regions: the Front Range, Western Slope, and Peaks and Plains. There were 19 interviewees from CCA and 2 interviewees from CLA, representative of the response rates from the two different associations (94% from CCA and 6% from CLA) identified during a needs assessment of Colorado beef producers. Participants in the interviews were not required to have completed the aforementioned survey; the interviewees were selected from the same group of 1,840 beef producers surveyed in the Colorado beef producer needs assessment. Of the 21 interviews, 4 were women and 17 were men, ranging in ranching experience from 2 years to over 50 years. Participants were all primary operators on their individual operations and representatively involved in all four operation segments, including seedstock operations (28.6%),

commercial cow-calf operations (76.1%), grazing/growing stocker operations (4.8%), and feedlots (4.8%), with some producers claiming more than one sector.

Data Analysis

Interviews took place in-person and over the phone, and all but four interviews were recorded, per participant consent. Each audio-recorded interview was transcribed and for the four interviews that were not recorded, extensive notes were used for summarization and therefore these interviews were included for final data collection. After transcription, interview transcripts were read and re-read and interviewer notes from the non-transcribed interviews were reviewed to identify key observations and themes from each rancher. These summarizations of each rancher's responses were recorded in Excel as a matrix with individual rancher as the row and summarized response to each question in columns. Each rancher's response was recorded in another matrix as a compilation of summarized and divergent responses (Nadin & Cassell, 2004). This final summary was examined for patterns relative to the research objective of exploring how rancher identities and communities influence their relationships with land grant universities (Schutt, 2011) (Figure 5.1.).

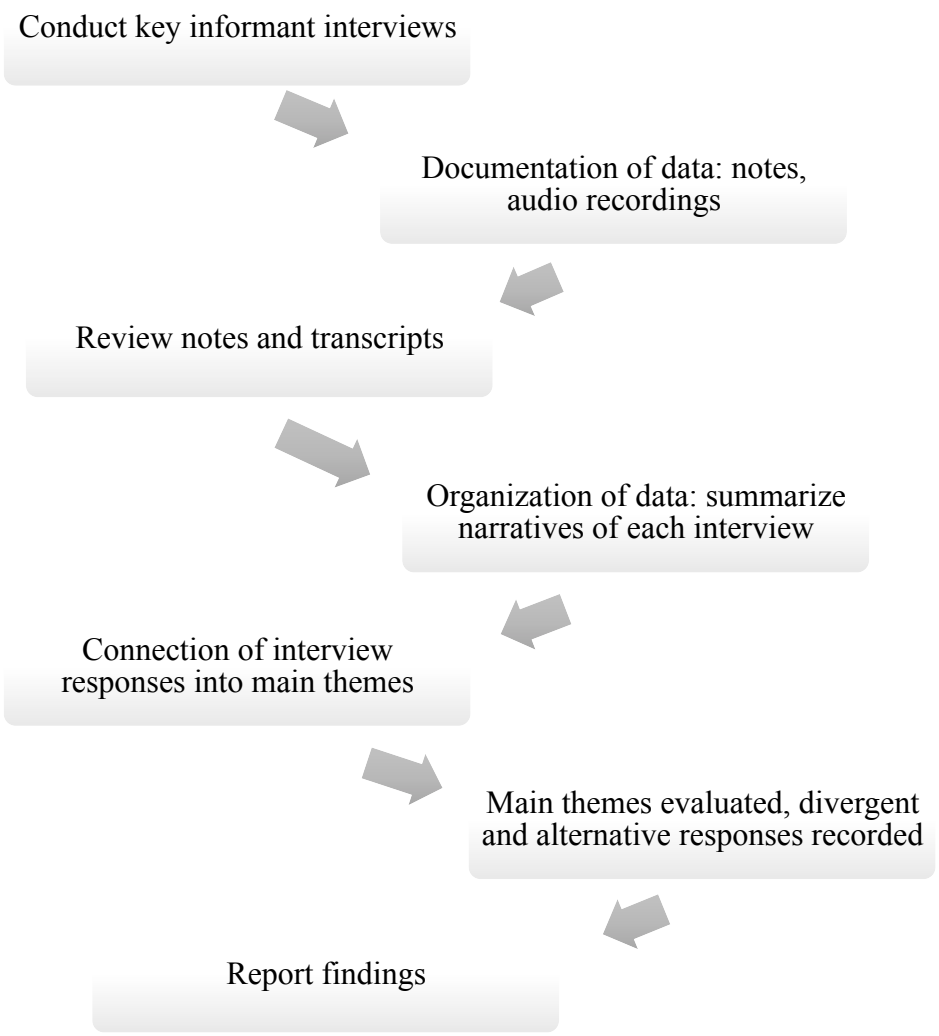

Figure 5.1. Analyzing Interviews to Explore How Rancher Identities and Communities Affect Relationships at a Land Grant University (Leech & Onwuegbuzie, 2007).

For this project, the epistemology perspective was constructivism. Constructivism maintains that researchers construct knowledge through experiences and each person has a different interpretation of knowledge (David, 2015). Through constructivism processes, the researcher uses open-ended questions to collect data and then in turn interprets these data. With qualitative data, there are several processes in place that confirm authenticity and trustworthiness

with collecting and interpreting results (Lincoln & Guba, 1986). Trustworthiness and authenticity can be likened to validity and reliability in quantitative data (Lincoln & Guba, 1986). In the case of this study, researchers addressed these standards by engaging in prolonged immersion in these data, participating in peer debriefing to discuss results, and lastly through data triangulation with interview notes and transcriptions. Further data triangulation included that data were collected from 21 different ranchers with different demographic characteristics and from different regions across Colorado (Carter, Bryant-Lukosius, DiCenso, Blythe, & Neville, 2014). Additionally, these data were compared back to results from the broader needs assessment survey of Colorado beef producers.

Themes

After completion of the 21 rancher interviews, a compilation of ranchers' perspectives led to exploration of three main themes. Summaries and direct quotes from the rancher interviews provide candid descriptions and support for each of the themes. These themes also build upon one another for a broader explanation of how ranchers' identities and communities influence their trust of a land grant university.

Ranching as an Identity

Ranching often gives a sense of achievement and can act as a source of identity (Sorice, Kreuter, Conner & Wilkins, 2012). A rancher identity includes pride in their lifestyle and upholding the tradition associated with their profession that is often times more a lifestyle than a job. Unique personal experiences and internal and external forces affect how ranchers manage their individual operations, but the identity of ranchers remains true to their pride, tradition, and independence. Ranchers understand that their lifestyle is challenging and requires dedication and

hard work, but they wouldn't trade their experiences for any other life. A rancher from the Peaks and Plains region sums up his experience as a rancher as:

> *"It's a lifestyle that I'm successful because I can do what I love and I'm not doing something I'm just showing up every day because I have to. You understand? Not that I, you know, yes I need to make money and I have to do those things, but I'm living a lifestyle that I'm happy getting up every morning and I'm not making a million dollars but it doesn't take a million dollars to make me happy. If I could be on a ranch, and I've told this to several people, if you can give me 10 million dollars and never step on a ranch or give me a ranch and you know, I would just take the ranch."*

Ranchers have immense pride and respect the time-honored tradition of their livelihoods, many times ranking their ranching lifestyle over economic returns from their ranching business (Roche et al, 2015). There are positive economic returns with ranching, but studies have continually shown that profit is not the primary motive for involvement in ranching (Sayre, 2004). As the Peaks and Plains rancher above noted, a full-fulfilling lifestyle is more important than money and his quote exemplifies how highly ranchers value their livelihood. Many look at the hard work and long hours that ranchers put in and do not understand why ranchers are so passionate about their lifestyle. Ranchers stress the importance of a better quality of life provided to them and their families because of their involvement in ranching (Raish & McSweeney, 2003). Any rancher immediately understands the commitment it takes for their lifestyle and they are proud and devoted to ranching. This unique devotion is part of the rancher identity.

Not surprisingly, when two other Peaks and Plains ranchers were asked about their experiences as ranchers and what motivates them, they kept their responses concise but explanatory:

"I like being independent, being my own boss, setting my own goals, own expectations."

"Well probably the way of life you know being your own boss and being able to do kind of whatever you want to do."

Although brief, both quotes tie directly to the fact that ranchers are fiercely independent and self-sufficient (Wilmer & Fernández-Giménez, 2016). Both these ranchers appreciate the independence available to them as ranchers. The idea of "being their own boss" can be both a motivator for choosing the life of rancher as well as a benefit of the ranching lifestyle. As a motivator, people choose to be ranchers because they know more often than not they will be able to manage themselves and their time according to their own management plans. Ranchers often live more remotely and requirements of the ranching profession include long hours. For these reasons, independence is built into ranching, but as mentioned before, that is an appealing requirement. Ranchers accept the challenges of the entrepreneurial nature of ranching and necessary self-discipline because of the independence associated with their chosen lifestyle.

Community and Connection

As much as independence is a key characteristic in the identities of ranchers, community support and connection run deep through the ranching community. Whether at a branding or in a

local feed store, ranchers rely on each other and their community as trusted references for advice or support. Research has continually shown that ranchers rely on other producers as a highly respected and used resource for information (Kachergis et al, 2013; Vergot , Israel & Mayo, 2005). One Peaks and Plains rancher states:

> "*You're living it. It's a big difference you know a lot of guys, that's why your fellow rancher who's older who's been through it, he's living it with you and that's just gonna help, versus a guy that's never set foot on your ranch and talking to you from (the University) you know take his advice, but with a grain of salt and apply it, not all of it is going to fit your situation, not all of it is going to fit your ranch."*

Ranchers prioritize the expertise of the "old timers" in their areas that have been resilient. Age and experience give these older ranchers credibility. Respect for these older ranchers and connections between generations in the ranching community allow dissemination of shared knowledge. This continued transfer of knowledge supports longevity of ranching in these communities. Instead of looking outside the community for advice, other ranchers seek out the ranching veterans in their communities for their valued input. These veterans understand the challenges of ranching in a particular area and their expertise is based off experiences, not classroom knowledge. Although research-based information is important, ranchers continually select producers from their own community as the most reliable and respected source of information. For ranchers, assistance is more than just knowing helpful information; it is about

learning from the shared experiences that all ranchers go through, as mentioned by one West Slope rancher:

> *"People that don't understand that ranching isn't pretty, that they think it should all be green and they think it should all be green and flowers, that sort of thing. People that don't understand that animals aren't people…and just in our case, the fact that we are surrounded by people that mean well but aren't ranchers and they don't understand the impact of them coming."*

Ranchers may differ in management decisions or production practices, but have fierce loyalty and a strong sense of community identity when they believe their ranching communities may be threatened (Kreye, Pienaar & Adams, 2016). The importance of a strong ranching community has become more relevant as the ranching sector is threatened by expansion of urban populations. These urban populations may be intrigued by raising livestock or aesthetically enjoy watching cattle graze, but they "do not understand what being a rancher means." Ranchers feel as though they have to band together and strengthen their united front to protect their lifestyle. Community and connection is essential for keeping the ranching mentality thriving to withstand pressure from urban development, but also for ranchers to have opportunities for fellowship and networking to learn strategies to be more successful.

Trust of the Land Grant University

As these interviews were conducted in Colorado, there were specific questions regarding the land grant university, Colorado State University (CSU). Urbanization in Colorado communities has influenced Extension. Minimal content overlap between agricultural and urban

issues forces Extension personnel to create more programming. Extension's stretched capacity leaves personnel no longer able to focus specifically on agricultural issues. This transition has left many ranchers in Colorado feeling disconnected from Extension and encouraged many ranchers to focus more internally on protecting themselves and their communities from the perceived threat of Extension working against ranching. Eight of the key informant interviewees mentioned concerns about Extension's priorities. One rancher states:

> *"You know the direction of CSU is starting to concern me a little bit and when I was there it had a top notch beef sciences program and I think maybe they still do, but they seem to be buried under the green university and that really concerns me as to how long they're going to be able to survive and frankly what would be done with my information if I cooperated with them."*

This rancher recognizes a disparity between what beef producers need and what CSU is focusing efforts on. Ranchers are fiercely loyal to their communities and fellow ranchers so when they perceive CSU to be heading in a direction that could negatively influence agriculture, they are concerned. "Green universities" generally disapprove of conventional agriculture, focusing on priorities of using hormone and antibiotic-free products and organic production (Huffington Post, 2013). Ranchers believe that negative perceptions about conventional agriculture impact are perpetuated at green universities. Many producers think these beliefs harm the viability of their industry. Concerns also arise when ranchers sense a change in CSU's agenda like the producer above. He recognized that CSU used to have a good reputation in the ranching community, but something has changed. Although the cause for the change is

sometimes unknown, this rancher is more wary of working with the university now. He felt a sense of uneasiness as he noticed CSU's priorities moving away from traditional agriculture and more toward the "green university" mentality. Just as consumers are hesitant when there is minimal transparency with beef production, ranchers are concerned about CSU's lack of transparency in priorities. They do not understand how CSU determines resource allocation or prioritization of research efforts. Discrepancies in information dissemination harm producers' trust of the university. Many ranchers have noticed a change of priorities away from helping the commercial cattlemen and instead focusing more on production practices that support the sustainability and "green" agenda. Ranchers note that CSU has begun to focus on pursuing projects outside of agriculture and partnering with stakeholders that ranchers perceive to be harmful to their industry. When asked about trust of CSU from the ranching community, a Peaks and Plains rancher said:

"I think they've lost sight somewhat or lost maybe it might be through personnel or attitudes but even amongst the general cattle population, they no longer consider CSU as a go to source. Trust has been burned….At times I just don't feel that CSU is a team player."

If CSU drifts too far away from ranching and their reputation is further damaged, ranchers will rally together against CSU as a community as a means of protecting their own (Kreye, Pienaar & Adams, 2016). The above rancher does not believe that CSU should be a reliable source for assistance because they damaged their trust with the industry, particularly by CSU engaging in partnerships with stakeholders that actively campaign against beef

consumption and the beef industry. Historically, trust developed from the university understanding issues affecting ranchers and having foresight and knowledge to help these producers, either as these issues arose or before they became challenges. Help came in many forms, such as educational seminars, on-ranch assistance, or updating producers about forecasted changes for the industry. Now, trust has been damaged because CSU's efforts have been perceived to no longer prioritize helping producers. Ranchers have noticed a lack of commitment and effort by the university to help producers. As with other ranchers, this rancher is most bothered by the change he has seen from CSU because the university used to be reliable and connected to the community and industry.

As jaded as some producers may be toward CSU, there are still ranchers that trust the university. Ten interviewees mentioned some degree of trust for CSU. Two different West Slope ranchers have positive relationships and experiences with CSU:

> "*My experience in the past you know I'll have to be honest and tell you I'm not as up to date as I probably should be, my experience in the past is CSU has been an ideal partner you know they have been able to do research, to collect data, to come up with suggestions recommendations that I think have proved very very valuable to the beef industry and I'll add not just the beef industry as a whole but in individual ranching families as well so I've been, I'm a strong supporter of CSU."*

> *"I think they are a very trusted and important entity in terms of all this stuff, in terms of gathering it and in terms of sharing it. We have a lot of respect for CSU*

and the Extension service and the university…I think, I know in terms of the Extension program, there's different degrees of success just based on who the agent is and we had kind of a really top notch one."

Trust in these cases stems from a connection to the university. The university has shown these ranchers a commitment to helping their communities and the beef industry. As mentioned previously, ranchers have respect and connection within their communities (Young, 2016). When a rancher believes CSU is connected to their community and has the best interests of their fellow ranchers in mind, they are more likely to trust CSU. Producer loyalty toward CSU is maintained through CSU's community involvement, such as participating in local cattlemen's association meetings or in 4-H Youth programs. Respect is earned through actions in the ranching community. Ranging from helping individual families with challenges on their operations to providing specific recommendations to gain profitability or productivity, these efforts show ranchers CSU's investment. Just as ranchers protect each other when they believe their ranching community is threatened, they will stand up for the land grant university and Extension once they believe these entities are committed to their communities.

Limitations

This research presents novel concepts about developing connection and trust within a ranching community to build better relationships between ranchers and the land grant university, but the methods do create limitations to the study. Because these interviews were structured as key informant interviews, themes were developed from specific key leaders and stakeholders in the Colorado beef industry. This could present some bias in responses and not fit as a characterization for the Colorado beef industry as a whole. It is important to note that this study

does not present a generalizable sample of the population. For this reason, the theory of rancher identities and communities influencing relationships with land grant universities should be explored in a broader study. There needs to be more research to fully test the relationships between the three themes presented. Processes described in the methods section also address how trustworthiness and authenticity can be confirmed for this study.

Additionally, there may be some interviewer bias, however to limit this bias, a semi-structured interview process was used with pre-determined questions and question order, as well as transcription and recording of the interviews to avoid misunderstandings between notes taken and actual responses (Ziniel, n.d.).

Discussion and Implications

These interviews indicate that ranchers are independent and proud of their lifestyle, but still rely heavily on each other and their communities. These ranching communities provide camaraderie, helpful advice, and necessary assistance in times of need. Respect is earned through understanding the ranching way of life and interacting with ranchers on their own turf, so to speak. Ranchers have reservations about outsider interactions, but once someone has joined their community, they are supportive and loyal. Trust is developed through personalized relationships and finding a connection with individuals and their communities.

Insight from the key informant interviews suggests the relationship between the land grant university for Colorado, CSU, and ranchers is not completely defunct; there is room for expansion and growth. Most specifically in how the university and CSU Extension gain trust back in the communities. One Front Range rancher bluntly summarizes rancher concerns about land grant universities and Extension as, “if it smells like an Extension program, run the other way.” Ranchers continue to be disappointed by the rut that Extension has been perceived to have

fallen into with unappealing programming content and advice that does not match the needs of the local communities. To be most effective and improve relationships, CSU and Extension need to get involved on a local level to understand the needs of ranchers and best serve their communities.

As CSU and Extension works towards mending relationships and learning to better serve agricultural communities, it is critical that these community members embrace these attempts. Although CSU damaged trust, if ranchers are too focused on issues in the past, they may isolate themselves from future assistance. Ranchers should consider being more open to working with collaborators that may come from different backgrounds and outside the industry. This more open mentality from ranching communities could be beneficial as CSU tries to get more involved on a local level.

It is essential that CSU Extension personnel and campus faculty start by spending less time on main campus and more time out in local communities. These local visits need to be spread across the state because ranchers needs and interests vary from the eastern plains to the western slope to the Front Range, and ranchers are not always able to travel to programming near main campus. Ranchers want to see that CSU is invested on a local level and is available for fielding questions, concerns, or comments. At the same time, when CSU is engaged in local communities, their presence should be known. Commitment to the community means more than a booth at a county fair or flyer in a local sale barn. Engaging in conversation and demonstrating following through after these conversations show commitment to the community. For Extension personnel, remembering to engage more personally and less from an academic, high-level perspective would be beneficial. Ranchers are proud of their identities and speaking down on their lifestyle does not encourage productive conversations. By CSU and Extension being

involved in more local meetings, ranchers feel prioritized by the university and it begins to show university allegiance to the ranching community. This allegiance by CSU builds support for why ranchers should trust the university.

In addition to increasing CSU's presence on a local level, engagement in strategic partnerships could be beneficial for the university. CSU needs to recognize that "trust has been burned" and they may not be immediately welcomed into the ranching community. However, by partnering with organizations or stakeholders that are respected in the local communities, CSU can begin to rebuild relationships. Ranchers trust other ranchers as reliable sources of information so if another rancher vouches for CSU it holds more weight. There are ranchers in the community that have good relationships so CSU should continue to facilitate positive interactions with these ranchers. Strategic partnerships may also take the form of basing more research at the ranch level. Many ranchers in Colorado are interested in being involved in projects that benefit the beef industry. Herd health, nutrition, and reproduction affect the productivity and profitability of ranchers (Field, 2006). Support and research about these types of topics are essential for helping ranchers. As CSU focuses more efforts in these types of areas that directly affect producers, producers recognize that CSU can be trusted as a go-to source for assistance and support. Focusing in these areas may be particularly beneficial for Extension personnel either new to Extension as an institution or new to assisting beef producers. Trust is easily lost and not quickly gained back in the ranching community. CSU needs to recognize the loss of trust, but act strategically to gain it back. The strategic steps of understanding rancher identities and their ranching communities begin this relationship building process.

LITERATURE CITED

Boone, D.A., Boone, H.N., Cullen, T.J. & Woloshuk, J.M. (2011). Evaluation of information transfer between beef producers and extension agents in West Virginia. *Journal of the National Association of County Agricultural Agents (NACCA),* 4 (2): 1-7.

Carter, N., Bryant-Lukosius, D., DiCenso, A., Blythe, J. & Neville, A.J. (2014). The use of triangulation in qualitative research. *Oncology Nursing Forum,* 41 (5): 545-7. doi: 10.1188/14.ONF.545-547.

David, L. (2015). Constructivism. *Learning Theories*. Retrieved from https://www.learning-theories.com/constructivism.html

Henderson, G. (2017). Consumers want transparency in beef production. *Drovers.* Retrieved from https://www.drovers.com/article/consumers-want-transparency-beef-production.

Huffington Post. (2013). Green universities: 25 of the world's greenest campuses. *Huffington Post, Canada.* Retrieved from https://www.huffingtonpost.ca/2013/01/14/green-universities_n_2474391.html.

Field, T.G. (2006). Priorities first: Identifying management priorities in the commercial cow-calf business. *American Angus Association.* Retrieved from https://www.angus.org/Pub/PrioritiesFirstFinal.pdf.

Kachergis, E., Derner, J., Roche, L., Tate, K., Lubell, M., Mealor, R., Magagna, J., (2013). Characterizing Wyoming ranching operations: natural resource goals, management practices and information sources. *Natural Resources,* 4 (1), 45-54.

Knowlton, C. (2017). *Cattle kingdom: The hidden history of the cowboy west.* Boston, MA: Houghton Mifflin Harcourt Publishing Company.

Kreye, M.M., Pienaar, E.F., & Adams, A.E. (2016). The role of community identity in cattlemen response to Florida panther recovery efforts. *Society & Natural Resources,* 30 (1): 79-94. doi: 10.1080/08941920.2016.1180730.

Leech, N. L., & Onwuegbuzie, A. J. (2007). An array of qualitative data analysis tools: A call for data analysis triangulation. *School Psychology Quarterly*, 22(4), 557.

Lincoln, Y.S. & Guba, E.G. (1986). But is it rigorous? Trustworthiness and authenticity in naturalistic evaluation. *New Directions for Program Evaluation,* (30): 73-84. https://doi.org/10.1002/ev.1427

Marshall, M.N. (1996). The key informant technique. *Family Practice,* 13: 92-97. Retrieved from https://pdfs.semanticscholar.org/df18/f52ec42d1fef4a149f474aeaad3cc51a4244.pdf.

Nadin, S. & Cassell, C. (2004). Using data matrices'. In Cassell, C. and Symon, G. (Eds.) *Essential Guide to Qualitative Research Methods in Organizational Research*. London: Sage Publications.

National Research Council (1995). *Colleges of agriculture at the land grant universities: A profile.* Washington, D.C.: National Academy Press.

Parsons, J.A. (2008). Key informant. In P.J. Lavrakas (Ed.), *Encyclopedia of Survey Research Methods*. doi: http://dx.doi.org/10.4135/9781412963947.n260

Radhakrishna, R., Tobin, D., & Foley, C. (2014). Integrating extension and research activities: An exploratory study. *Journal of Extension,* 52 (1). Retrieved from https://www.joe.org/joe/2014february/a1.php.

Raish, C. & McSweeny, A.M. (2003). Economic, social, and cultural aspects of livestock ranching on the Española and Canjilon ranger districts of the Santa Fe and Carson national forests: A pilot study. *United States Department of Agriculture: Forest Service, Rocky Mountain Research Station.* Retrieved from https://www.fs.fed.us/rm/pubs/rmrs_gtr113.pdf.

Roche, L.M., Schhr, T.K., Derner, J.D., Lubell, M.N., Cutts, B.B., Kachergis, E., Eviner, V.T., & Tate, K.W. (2015). Sustaining working rangelands: Insights from rancher decision making. *Rangeland Ecology and Management,* 68(5): 383-389. Retrieved from http://dx.doi.org/10.1016/j.rama.2015.07.006.

Sayre, N.F. (2004). Viewpoint: The need for qualitative research to understand ranch management. *Journal of Range Management,* 57 (6): 668-674. https://doi.org/10.2111/1551-5028(2004)057[0668:VTNFQR]2.0.CO;2.

Schutt, R.K. (2011). *Investigating the social world: The process and practice of research* (7th ed.). Thousand Oaks, CA: SAGE Publications, Inc.

Sorice, M.G., Conner, J.R., Kreuter, U.P., & Wilkins, R.N. (2012). Centrality of the ranching lifestyle and attitudes toward a voluntary incentive program to protect endangered species. *Rangeland Ecology & Management,* 65(2): 144-152. Retrieved from https://www.jstor.org/stable/41495355.

Tracy, S.J. (2013). *Qualitative research methods: Collecting evidence, crafting analysis, communicating impact.* Oxford, UK: John Wiley & Sons, Ltd.

USDA National Agricultural Statistics Service. (2017). *Colorado cattle facts.* Retrieved from https://www.nass.usda.gov/Statistics_by_State/Colorado/Publications/Agriculture_Profile/Colorado_Cattle_Facts_2017.pdf.

U.S. Census Bureau. (2010). *Rural Urban by State 1990 to 2010.* Retrieved from https://demography.dola.colorado.gov/census-acs/2010-census-data/.

Vergot III, P., Israel, G. & Mayo, D.E. (2005). Sources and channels of information used by beef cattle producers in 12 counties of the northwest Florida extension district. *Journal of Extension,* 43 (2). Retrieved from https://www.joe.org/joe/2005april/rb6.php.

Wang, S.L. (2014). Cooperative extension system: Trends and economic impacts on U.S. agriculture. *Choices,* quarter 1. Retrieved from http://www.choicesmagazine.org/choices-magazine/submitted-articles/cooperative-extension-system-trends-and-economic-impacts-on-us-agriculture.

Wilmer, H. & Fernández-Giménez, M.E. (2016). Some years you live like a coyote: Gendered practices of cultural resilience in working rangeland landscapes. *Ambio,* 45 (3): 363. https://doi.org/10.1007/s13280-016-0835-0.

Young, J. (2016). Young ranchers, listen up: 8 tips from an old-timer on how to succeed in ranching. *BEEF Magazine.* Retrieved from https://www.beefmagazine.com/ranch-management/young-ranchers-listen-8-tips-old-timer-how-succeed-ranching.

Ziniel, S. I. (n.d.). Avoiding bias in the research interview. *Harvard Medical School.* Retrieved from http://www.childrenshospital.org/~/media/Research%20and%20Innovation/Clinical%20Research%20Center/Clinical%20Research%20Center%20Education%20Core/Avoiding%20Bias%20in%20the%20Research%20Interview.ashx.

CHAPTER 6: HOW A SYSTEMS THINKING APPROACH IS BENEFICIAL FOR ASSOCIATION PLANNING

Introduction

Problem solving has traditionally followed a cause-and-effect methodology that seeks finding immediate answers and then moving on to the next problem. This fire-fighting method does not allow for better understanding of the underlying influences on an issue nor does it help illuminate creative or new solutions to a problem. For some problems, this deeper understanding or creative solutions are not important. However, when problems become the limiting factor on the success of a group or individual, a new approach is needed. One unique way of addressing problem solving is through the process of systems thinking. The nontraditional format of systems thinking encourages a thorough evaluation and exploration of possible solutions surrounding an issue (Goodman, 1997). Instead of finding an immediate solution to a problem, systems thinkers spend time understanding the systems within a problem and surrounding a problem. Through this problem exploration, participants are able to more completely and accurately examine a problem and ask better questions before leaning into a conclusion (Goodman, 1997). Systems thinking is also helpful for uncovering unintended consequences that often come from the traditional format of making a decision and seeking one solution to a problem (Sterman, 2000). Understanding the features of systems thinking highlights why this form of analysis may be beneficial for certain problems, such as the challenges facing Colorado Cattlemen's Association.

Within the beef industry in Colorado there are several associations that garner interest from Colorado producers and are useful for providing resources for producers. One such association, known for serving as a principal voice and advocate for beef production, is Colorado Cattlemen's Association (CCA). With 46 local affiliate groups around the state and a

longstanding tradition of membership in Colorado, CCA has typically flourished in the state. However with changing demographics and new external pressures, commodity associations as a whole are struggling to maintain membership as well as recruit new members. The American Society of Association Executives stated that association membership is declining in all sectors (Yohn, 2016). Declining membership comes from a variety of factors including the recession, an increase in social networking sites, and different generational preferences. It has been found that millennial workers prefer less formal and traditional means of networking typically provided by associations (Yohn, 2016). This changing environment has led some associations toward redefining their purpose and approach within their individual sectors, such as CCA's platform within the beef industry.

One of the defining issues plaguing CCA is the lack of member engagement. The current structure of the association involves local affiliate groups based within certain regions and counties, and then one state office that serves as the headquarters for staff and leadership and heads up the association's policy and membership efforts. With the changing dynamic of the purpose for associations as stated above and the recorded decreases in member engagement, CCA explored ways to reinvent the association in order to best serve the participating beef producers in Colorado and recruit ranchers who are not already involved. For this reinvention, CCA underwent an association-wide strategic planning and long-range goal session. After membership polling and planning sessions, membership approved the long range plan and set forth several goals to push CCA to exceed expectations while balancing the challenge of the changing beef industry and member landscape. The following outlines the Colorado Cattlemen's Association's process of using systems thinking for association planning, specifically for

addressing the issue of decreasing member engagement and finding key leverage points for change.

Methods of a Systems Thinking Approach

Although systems thinking is not a traditional, linear form of thinking or problem solving, there is a methodology for the process. The complexities of this process can be explained through the Iceberg metaphor. Using the Iceberg metaphor as a template, this process is best understood in two phases: the learning phase and the leverage phase (Rhoades, McCuistion, & Mathis, 2014). Beginning with the learning phase, or the tip of the iceberg, CCA leadership, staff, and stakeholders discussed the current events and issues affecting the association. These currents issues are the premise for the guiding question for the process; with the focusing question based on exploring "what happened?" (Goodman, 1997). This learning phase also involves discussion of the trends and patterns of events and behavior, in a manner that explains what has been habitually happening. The second step begs the question, "what has been happening?" or "what are the trends we have seen? (Goodman, 1997). During this phase it is important to emphasize avoidance of finding solutions for the issues and instead exploring all angles and influences surrounding an issues. Overall discussion throughout the learning phases includes a series of questions that encourage exploration of current structures, characteristics of the association, past events, or trends and patterns in an in-depth and investigative manner.

Once the learning phase is complete, stakeholders step into the leverage phase. Reflecting back on the iceberg metaphor, this phase delves into the underlying structures and forces that explain why the issue is happening on a deeper, less obvious level (Goodman, 1997). CCA stakeholders incorporated conceptual maps that use Casual loop diagrams to explain the forces surrounding the key variables in the problem of member engagement. These casual loops

develop further into a systems map that represents the relationships between the key variables affecting the problem of affiliate engagement. Many times, these systems maps fall into similar patterns that fit into the systems archetypes (Kim, 2000). In the case of CCA's membership engagement problem, the "shifting the burden" systems archetype best explained the relationship between the problem and the key variables. Beyond exploration of these variables, this leverage phase is essential in the development of mental models, otherwise known as the ways in which people think about the issue. If systems thinking does not include understanding of these mental models, then the last step of determining key leverage points for change is nonexistent. The purpose of these leverage points is to yield large improvements to the system (Kim, 2000). Systems thinking encourages finding points in the system where these new or alternative interventions can play a role in ultimately improving the system.

Applying Systems Thinking to Association Planning

The process of using systems thinking for association planning helped to develop more critical evaluation of affiliate engagement. The following systems map allowed CCA stakeholders to not only better understand the current structure of the association, but also help find the key leverage points for change within the system surrounding the issues. With the issue of decreasing membership and engagement across all associations, it is essential that CCA seek new or alternative approaches for combating their decrease in affiliate engagement. Keeping this issue in mind, a systems thinking approach focused on the question, "Why have we (CCA) been struggling to effectively engage our affiliates?", also understood as why has CCA struggled to increase the level of engagement with affiliates.

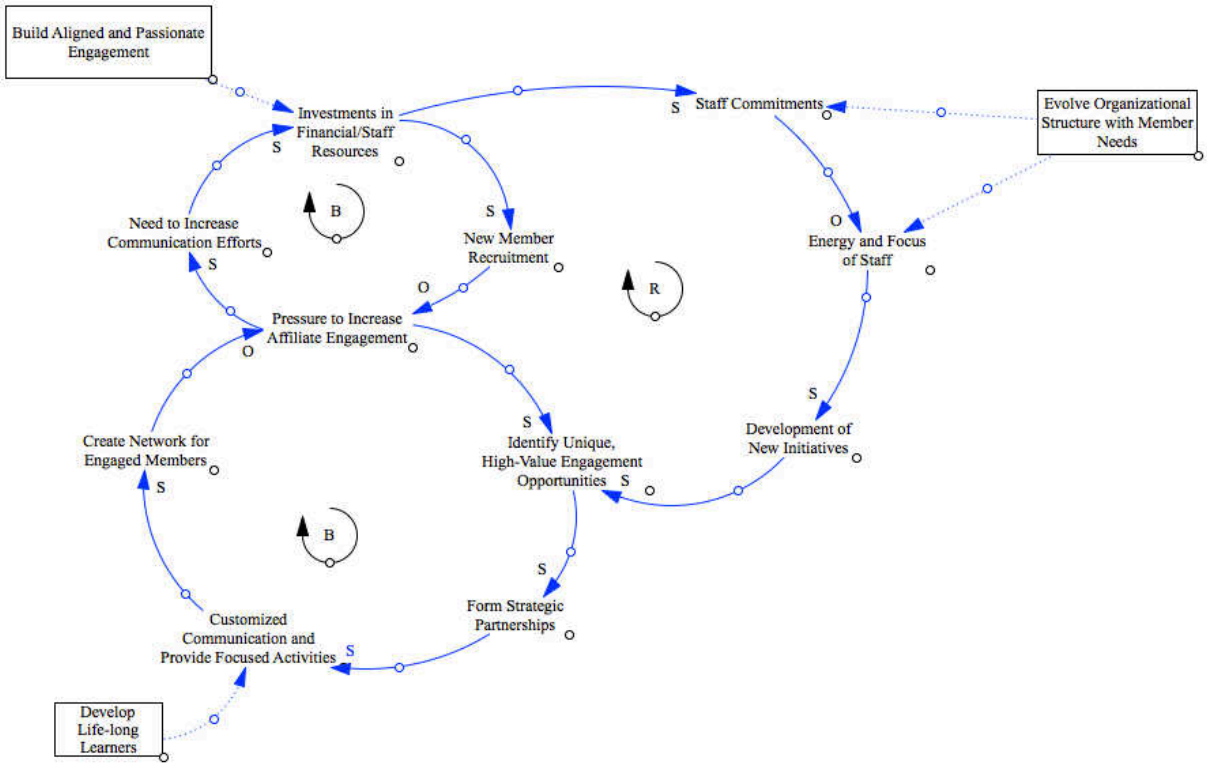

Figure 6.1. Systems Map of Challenges Associated with Increasing Affiliate Engagement within CCA, Including Balancing (B) and Reinforcing (R) Loops and High-Leverage Engagement Alternatives.

Following the "shifting the burden" archetype, a systems map was built to articulate the structure surrounding the issue of affiliate engagement. With CCA's efforts, there is first a short-term fix for the issue of affiliate engagement. Although not ideal, many times this temporary system is the typical route for addressing an issue. In this case, when the *pressure to increase affiliate engagement* increases then CCA staff feels a pressure to *increase communication efforts*. These communication efforts vary from more social media content to more in-person meetings with members to even spending extra time on the phone calling individual members. It is necessary for CCA to increase *investments in financial/staff resources*, in order to keep up with the travel, time, and funds that are required to maintain the increased communication. These efforts lead to *new member recruitment* and therefore a decrease in *pressure to increase affiliate*

engagement, but as with all "shifting the burden" archetypes, there are unintended consequences that stem from this short-term fix. These unintended consequences have a negative impact on the ideal solution for helping with affiliate engagement.

Ideally, when the *pressure to increase affiliate engagement* increases, so does CCA's emphasis on *identifying unique, high-value engagement opportunities.* These engagement opportunities include connecting to communities CCA has not traditionally reached or with allied industry stakeholders who mesh with CCA's values and desires for advancing the legacy of the beef industry. Each of these opportunities should compile into *forming strategic partnerships* that benefit CCA membership and the allied partners. As these new partnerships form, CCA has to *customize communication and provide focused activities* so that affiliates, general membership, and these new partners can connect. An example of a beneficial focused activity would be a regional ranch gathering. These ranch gatherings would occur in regionalized areas across the state and allow a more specific group of the ranching communities to meet and interact. If CCA can provide these types of activities, then they would succeed in *creating networks for engaged members* and therefore decrease the *pressure to increase affiliate engagement.*

As mentioned previously, there are unintended consequences that are created from the short-term fix that negatively affect the ideal solution for an issue. In CCA, when there are increased *investments in financial/staff resources*, there is an immediate increase in *staff commitments.* When staff becomes overcommitted, their *energy and focus* falter, as do their efforts with the *development of new initiatives.* Although this over commitment may seem solely like staff burnout that could be addressed with staff learning to adjust their schedules or obligations, it directly affects staff ability to *identify unique, high-value engagement*

opportunities, which is the first step in beginning the ideal system for decreasing the *pressure to increase affiliate engagement.*

Because this system has unintended consequences that influence the success of the ideal system for addressing the issue of affiliate engagement, it is essential for CCA to find leverage points for change. Within this system, there are three leverage points identified. First as CCA struggles in the short-term fix with balancing the *need to increase communication efforts* with the increase in *investments in financial/staff resources*, including efforts to *build aligned and passionate engagement* would be useful. Efforts in this area include encouraging affiliate leadership or local members to step into more leadership roles or take on more responsibility. This type of engagement would allow these individuals to be more closely connected and therefore encourage their increased involvement and passion. If engagement from members is more aligned and passionate, then staff would not need to expend extra resources to connect with affiliates, and the affiliates could also pursue new member recruitment. Another leverage point of *evolving organizational structure with member needs* connects with both *staff commitments* and *energy and focus of staff* to help mitigate the challenges from the unintended consequence. In this case, organizational structure could expand to filter some responsibility from staff to other capable parties. An example of this would be to use some type of internship or fellowship program to allow younger folks interested in the industry and the association a chance to engage. These individuals could take ownership over some of the additional commitments that staff handles when there is *pressure to increase affiliate engagement.* Commitments could vary from handling social media content and posting to heading up efforts when there are membership acquisition mailings. *Evolving organizational structure with member needs* allows for the necessary contraction or expansion when needs change in the association, which is a fairly

frequent occurrence. The last leverage point for change in this system is within the ideal situation and emphasizes the need to *develop life-long learners*. As CCA begins to host more *focused activities,* it is essential that membership and affiliates continue to have desire to attend these activities. By *developing life-long learners*, CCA can solidify attendance at activities and buy-in from membership. Those who are committed to learning about the industry will be most likely to engage with the association and their peers. Engagement is the end-goal for all of the key variables within the system and this leverage point would emphasize continued engagement.

Conclusions and Implications

Like with any systems thinking approach, using systems thinking for association planning allows for better understanding of challenges and issues while allowing unique exploration of key leverage points for change. In the circumstance of Colorado Cattlemen's Association, systems thinking helped stakeholders with the issue of affiliate engagement. Instead of falling into the cycle of shifting the burden and staying in short-term fixes, systems thinking encourages more idealistic and strategic choices that provide the framework for increasing member engagement. Although systems thinking does not provide one solution to this issue, participation in systems thinking offers better understanding of the events, patterns, and structures of this issue so the leverage points for change will be most effective. The systems map effectively demonstrates big picture thinking about an issue and help explain the complexities of relationships between variables in a system. Regardless of the level of complexity of an issue, systems thinking processes provide opportunities for growth and success of an association.

LITERATURE CITED

Goodman, M. (1997). Systems thinking: What, why, when, where, and how? *The Systems Thinker 8* (2), 6-7.

Kim, D.H. (2000). Systems thinking tools: A user's reference guide. Waltham, MA: Pegasus Communications, Inc.

Rhoades, R.D., McCuistion, K.C., & Mathis, C.P. (2014). A systems thinking approach to ranching: Finding leverage to mitigate drought. *Rangelands 36* (6), 2-6. doi: 10.2111/RANGELANDS-D-14-00017

Sterman, J.D. (2000). Business dynamics: System thinking and modeling for a complex world. Boston, MA: Irwin McGraw-Hill.

Yohn, D.L. (2016). To stay relevant, professional associations must rebrand. *Harvard Business Review.* Retrieved from https://hbr.org/2016/01/to-stay-relevant- professional-associations-must-rebrand.

APPENDIX A.

Survey Instrument for the CO Beef Producer Needs Assessment

CO Beef Producers Needs Assessment

Section 1: Identifying Priority Needs

Q1: For each area, indicate the level of Priority (high, medium, low) and circle the most important need facing CO's beef industry.

Category	*Priority level*
a. Risk management:	High Medium Low
b. Business management:	High Medium Low
c. Technology:	High Medium Low
d. Herd level performance evaluation:	High Medium Low
e. Resource management:	High Medium Low
f. Leadership:	High Medium Low

Q2: Thinking of your operation as a whole system, **circle the letter of the top 3 areas** in which you need additional support from outside resources.

a. Methods of managing market risk
b. Understanding business management principles
c. Complex decision-making
d. Record keeping and tracking performance
e. Developing and implementing production strategies
f. Setting goals and direction for your business

Q3: Mark a √ beside each item you prioritize as needing additional education pertinent to your operation.

a. Herd health
b. Reproductive technology/management
c. Nutrition and supplementation
d. End product
e. Marketing strategies
f. Grazing & weeds
g. Endangered species and wildlife management
h. Genetic technologies and tools
i. Human resource management

The next series of questions is about *Herd Level Performance Evaluation*

Q4: Circle the letter for each herd level performance measure for which you routinely collect data.

a. Percent calf crop
b. Weaning (sale) weight
c. Breeding inventory
d. Dystocia rate
e. Grazing days
f. Pregnancy rate
g. Calving season distribution
h. Body condition score (cows)
i. Range conditions
k. Feed use and cost

Q5: Do you know your breakeven cost within $0.10/lb.?

a. Yes
b. No

Q6: What method(s) do you use to collect herd level data? (circle all that apply)

a. Smart Phone app
b. Pocket sized book (Red book)
c. Desktop or laptop computer
d. Worksheets
e. Other _____ (please specify)

Q7: What "value" would you place on *herd level performance evaluation* for operation?

High or **Medium** or **Low**

The next series of questions is about *Grazing Animal Nutrition Evaluation.*

Q8: Mark a √ beside each of the following types of samples you have collected and analyzed.

a. Feed
b. Forage
c. Fecal
d. Soil
e. Water
f. Other

Q9: On the scale below, indicate how often you use results from these samples (from #8 above). (circle the number of one category)

None (0) Limited (1) Some (2) A lot (3)

Q10: Mark a √ for each specific management change listed here that you made based on results in #8 above.

a. Protein supplementation
b. Energy supplementation
c. Mineral supplementation
d. Pasture rotation

Q11: Are you willing to share analysis results by submitting them to an online system? (*circle the letter for one category below*)

a. Yes
b. No

Q12: What "value" would you place on *grazing animal nutrition evaluation* for your operation?

High or **Medium** or **Low**

Section 2: Motivation and Communication Preferences

Q13: Which of the following best characterizes your primary motivation within your operation? (*circle the letter of one category*)

a. Resource stewardship and conservation
b. Transition to next generation
c. Productivity of land and animals
d. Profitability and enterprise
e. Family lifestyle or tradition

Q14: For each factor, circle a number on the 1-5 scale to indicate to what degree it is a barrier for attending an educational program.

	Not at all a barrier				
a. Travel	1	2	3	4	5
b. Cost	1	2	3	4	5
c. Time	1	2	3	4	5
d. Content	1	2	3	4	5
e. Scheduled dates	1	2	3	4	5

Q15: Mark a √ next to the **top 3 categories** you consider barriers to success within your operation.

a. Quality of information
b. Lack of technology
c. Lack of knowledge or skill set
d. Lack of qualified employees
e. Financial situation (cash flow or cost of production)
f. Lack of networks

Q16: Mark a √ next to the **top 3 categories** you feel are essential to provide in an effective educational program.

a. Critical research
b. Hands on demonstrations
c. Tools to take home and use
d. Networking opportunities
e. Mentoring
f. Reading materials

Q17: Circle the letter for the **top 3 formats** you find most effective to obtain new research and education information.

a. Field days, on ranch demonstrations
b. Websites (Ext. publications and electronic materials)
c. Full day seminars/workshops with expert speakers
d. Presentations at regular meetings
e. On-line resources (webinars, courses, videos)
f. Virtual conference
g. Fee for service consulting (1-on-1 training)

Q18: Circle a number on each scale to indicate how frequently you use each of the following social media.

	Not at all	*Occasionally*	*All the time*
a. Facebook	1	2	3
b. Twitter	1	2	3
c. Instagram	1	2	3
d. LinkedIn	1	2	3
e. Pinterest	1	2	3
f. YouTube	1	2	3

Q19: Of the following sources you may get information from, which do you tent to consider most reliable? (*circle the letter of one category*)

a. Other producers
b. University Extension personnel
c. Soil conservation district
d. Internet (websites and popular press articles)
e. USDA agencies
f. Commodity associations (CCA, CLA, NCBA)

Q20: Do you use any "apps" (for smartphone or tablet) to support your operation? (*circle the letter of one category*)

a. Yes, I use (please specify: _____, _____, _____)

b. Yes, I have a mobile device, but I do not use apps for my operation.

c. No

Q21: Which of the following best describes how you typically adopt new technologies for your operation? (*circle the letter of one category*)

a. I'm often the first one in my area

b. I usually wait until someone else has adopted first

c. I like to wait for these new technologies to prove themselves before I adopt

d. I avoid adopting new technologies altogether

Q22: Indicate the level of interest (high, medium, low) you have for each of the following activities (*circle one number on each scale*).

	Low	Medium	High
Host a regional ranch gathering	1	2	3
Participate in research projects	1	2	3
Join a regional rancher group	1	2	3
Become BQA certified	1	2	3

Section 3: Demographics

Q23: # of total years involved in, or managing a ranch? _____(# of years)

Q24: Are you the owner, manager, or both of your ranch? (*circle one response*)

Q25: Is your operation full-time or part-time? (*circle one response*)

Q26: In what year were you born? 19_____

Q27: Indicate the relative scale of your operation by circling one of the following:

Small (< 100 head) **Medium** (101-500 head) **Large** (> 500 head)

Q28: Which segment of the industry do you consider your *primary operation*?

a. Seedstock
b. Commercial cow-calf
c. Grazing/growing stocker
d. Feedlot

Q29: Which of the following categories best reflects your average gross annual sales from your entire operation? (*circle one response*)

a. Less than $24,999
b. $25,000-$49,999
c. $50,000-$99,999
d. $100,000-$249,999
e. $250,000-$499,999
f. $500,000-$999,999
g. $1,000,000 or more

Q30: # of total employees you hire: _____ part-time (#) _____ full-time (#)

Q31: Enter your zip code: 8 ____ _____ _____ _____ _____

APPENDIX B.

Cover letter sent in conjunction with needs assessment survey instrument

Western Science Institute
P.O. Box 196
Potlatch, ID 83855
westernscience.org

Date

Dear:

As part of a scientific random sample, you have been selected as one of **Colorado's Beef Producers** to participate in a Needs Assessment survey. The purpose of the project is to understand beef industry priorities for Colorado producers as well as preferences about communicating and educational outreach. **Colorado State University (CSU) Department of Animal Science, in cooperation with the Colorado Cattleman's Association (CCA) and the Colorado Livestock Association (CLA),** commissioned the study and contracted the Western Science Institute as a third-party and experienced survey organization to administer the survey.

Results of this study will be used by researchers at CSU to improve outreach, education, scientific research, and programs for producers. For the results to accurately represent the range of perspectives of producers in your area, it is very important that each questionnaire in the sample be completed and returned. The more responses received allows CSU researchers to target program planning efforts more effectively. **To incentivize you, all respondents will be entered into a lottery drawing for a $500 Cabela's gift card**!

To complete the enclosed questionnaire, you should have knowledge of the day-to-day practices and decision-making for your operation. A spouse, partner, or management team member may fit this requirement in many situations. *The questionnaire has an identification number for mailing purposes only. Neither your name nor any identification will be used with the data*. Western Science Institute provides assurance that all information provided will remain confidential.

Please return the survey in the enclosed postage paid, self-addressed envelope. If you have any questions, you may contact WSI at 208-230-7333. CSU's Department of Animal Science will provide analysis and results of the study later in 2017.

Thank you for your participation in this important research.

Sincerely,

J.D. Wulfhorst
Professor of Rural Sociology
Director, Western Science Institute

Improving Science for Producers in the West!

APPENDIX C.

Colorado Beef Producer Needs Assessment: Interview Protocol

Demographics

- Total # of years involved in or managing a ranch:
- What segment of the industry is your primary segment? (Seedstock, Commercial cow-calf, Grazing/growing stocker, Feedlot)
- Location (county):

Motivations & Defining 'Success'

- What are the things you enjoy about ranching that make you successful?
- What are the things that make ranching challenging?
- How do you see your ranch changing in the next 10 years to meet your future goals?

Prioritizing Needs

- In our recent needs assessment survey, Colorado ranchers selected three high priority areas of educational need (marketing strategies, nutrition & supplementation, grazing & weeds). What are the specific challenges you face in each area? What type of educational resources would help?
- What internal and external forces have led to a shift or change in your operational priorities and needs?

Production Measures (Data/Records = Production, Grazing, Financial)

- In a perfect world, what are the tools or information you need to be a better rancher?
- Ranchers often record data in red books, scratch paper, etc., but now there are new options. An example would be a smartphone app. Does this seem effective or usable for your operation? Ideally, what would you need to improve how you record or collect information?
- How do you currently use the data you collect? What prevents you from using the data you collect and transforming it into more value for decision-making? Ideally, what would you need to improve how you utilize collected data?
- Even though information about your ranch is already shared and used for things like taxes, insurance, and decision-making, there are many reasons why producers have concerns about sharing records. What makes you uncomfortable about sharing records?
- To what degree is CSU a trusted partner in the collection and analysis of ranch level data that would benefit you and the beef industry?
- It is part of CSU's mission to determine what issues, concerns, and needs are unique to each community, and offer sound solutions. How can we better engage with you and your neighbors to understand the issues and help you become more profitable and productive?

APPENDIX D.

Regression analysis for all questions evaluated from needs assessment survey instrument

Question 1 Regression Tables

Table D.1. Regression Analysis for Dependent Variable: Risk Management

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	2.279	.16	<.01
Experience	-.041	.04	.27
Scale	.094	.06	.09
Seedstock	-.203	.13	.13
Cow-calf	.012	.11	.92
Stocker	.099	.13	.45
Front Range	.094	.07	.19
Peaks & Plains	.059	.05	.25

Table D.2. Regression Analysis for Dependent Variable: Business Management

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	2.207	.16	<.01
Experience	.019	.04	.62
Scale	.047	.06	.41
Seedstock	.162	.14	.23
Cow-calf	.065	.12	.58
Stocker	-.007	.13	.96
Front Range	.050	.07	.50
Peaks & Plains	-.004	.05	.95

Table D.3. Regression analysis for Dependent Variable: Technology

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	2.102	.16	<.01
Experience	.059	.04	.12
Scale	-.043	.06	.44
Seedstock	.241	.14	.08
Cow-calf	-.009	.12	.94
Stocker	-.114	.13	.39
Front Range	-.004	.07	.96
Peaks & Plains	-.137	.05	.01

Table D.4. Regression analysis for Dependent Variable: Herd level performance evaluation

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	2.092	.17	<.01
Experience	-.014	.04	.73
Scale	.036	.06	.56
Seedstock	.420	.15	.004
Cow-calf	.423	.13	.001
Stocker	.006	.14	.97
Front Range	-.048	.08	.55
Peaks & Plains	-.078	.06	.16

Table D.5. Regression analysis for Dependent Variable: Resource management

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	2.334	.16	<.01
Experience	.041	.04	.28
Scale	.085	.06	.13
Seedstock	.237	.14	.08
Cow-calf	.231	.12	.05
Stocker	.126	.13	.35
Front Range	-.131	.07	.08
Peaks & Plains	-.129	.05	.01

Table D.6. Regression analysis for Dependent Variable: Leadership

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	2.465	.18	<.01
Experience	.056	.04	.19
Scale	.060	.06	.34
Seedstock	-.158	.15	.30
Cow-calf	-.294	.13	.03
Stocker	-.331	.15	.03
Front Range	-.029	.08	.73
Peaks & Plains	-.147	.06	.01

Question 2 Regression Tables

Table D.7. Regression analysis for Dependent Variable: Methods of managing market risk

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.465	.17	.01
Experience	.037	.04	.38
Scale	.036	.06	.56
Seedstock	-.055	.15	.71
Cow-calf	.118	.13	.35
Stocker	.046	.14	.75
Front Range	-.024	.08	.76
Peaks & Plains	.014	.06	.80

Table D.8. Regression analysis for Dependent Variable: Understanding business management principles

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.441	.19	.02
Experience	.033	.05	.46
Scale	-.021	.07	.75
Seedstock	-.127	.16	.42
Cow-calf	-.003	.14	.98
Stocker	-.068	.15	.66
Front Range	-.060	.09	.49
Peaks & Plains	.024	.06	.70

Table D.9. Regression analysis for Dependent Variable: Complex decision-making

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.213	.18	.25
Experience	.001	.05	.98
Scale	.047	.07	.47
Seedstock	-.088	.16	.57
Cow-calf	-.032	.13	.81
Stocker	-.019	.15	.90
Front Range	.102	.09	.23
Peaks & Plains	.026	.06	.66

Table D.10. Regression analysis for Dependent Variable: Record keeping and tracking performance

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.555	.19	.003
Experience	.007	.05	.87
Scale	-.045	.07	.49
Seedstock	.004	.16	.98
Cow-calf	.027	.14	.84
Stocker	-.036	.16	.82
Front Range	-.073	.09	.40
Peaks & Plains	.112	.06	.07

Table D.11. Regression analysis for Dependent Variable: Developing and implementing production strategies

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.619	.19	.001
Experience	-.012	.05	.79
Scale	.020	.07	.77
Seedstock	.171	.16	.28
Cow-calf	.143	.14	.29
Stocker	.036	.15	.81
Front Range	-.068	.09	.43
Peaks & Plains	-.068	.06	.27

Table D.12. Regression analysis for Dependent Variable: Setting goals and direction for your business

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.463	.19	.01
Experience	.043	.05	.35
Scale	-.052	.07	.44
Seedstock	-.088	.16	.58
Cow-calf	-.066	.14	.63
Stocker	-.061	.16	.69
Front Range	-.038	.09	.66
Peaks & Plains	.019	.06	.76

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Table D.13. Regression analysis for Dependent Variable: Herd health

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.490	.13	<.01
Experience	-.031	.03	.33
Scale	.046	.05	.31
Seedstock	.040	.11	.72
Cow-calf	.057	.09	.55
Stocker	.004	.11	.97
Front Range	-.098	.06	.10
Peaks & Plains	-.024	.04	.57

Table D.14. Regression analysis for Dependent Variable: Reproductive technology/management

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.264	.12	.03
Experience	-.016	.03	.58
Scale	.026	.04	.54
Seedstock	.142	.10	.16
Cow-calf	.169	.09	.05
Stocker	.003	.10	.97
Front Range	.000	.06	.99
Peaks & Plains	-.041	.04	.30

Table D.15. Regression analysis for Dependent Variable: Nutrition and supplementation

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.596	.13	<.01
Experience	-.062	.03	.05
Scale	.010	.05	.84
Seedstock	.059	.11	.60
Cow-calf	.030	.10	.75
Stocker	-.107	.11	.33
Front Range	.002	.06	.97
Peaks & Plains	-.004	.04	.92

Table D.16. Regression analysis for Dependent Variable: End product

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.101	.11	.37
Experience	.046	.03	.10
Scale	.079	.04	.05
Seedstock	-.074	.10	.44
Cow-calf	-.006	.08	.94
Stocker	.044	.09	.64
Front Range	.033	.05	.53
Peaks & Plains	.007	.04	.85

Table D.17. Regression analysis for Dependent Variable: Marketing strategies

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.346	.13	.01
Experience	.041	.03	.19
Scale	.080	.04	.07
Seedstock	.073	.11	.50
Cow-calf	.060	.09	.51
Stocker	.103	.11	.33
Front Range	.018	.06	.76
Peaks & Plains	.060	.04	.15

Table D.18. Regression analysis for Dependent Variable: Grazing and weeds

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.504	.13	<.01
Experience	.019	.03	.53
Scale	-.085	.05	.06
Seedstock	.312	.11	.004
Cow-calf	.154	.09	.10
Stocker	.268	.11	.01
Front Range	.068	.06	.25
Peaks & Plains	-.015	.04	.71

Table D.19. Regression analysis for Dependent Variable: Endangered species & wildlife management

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.169	.09	.07
Experience	.002	.02	.95
Scale	.013	.03	.70
Seedstock	.012	.08	.88
Cow-calf	.032	.07	.64
Stocker	.062	.08	.42
Front Range	-.122	.04	.01
Peaks & Plains	-.085	.03	.01

Table D.20. Regression analysis for Dependent Variable: Genetic technologies and tools

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.209	.12	.08
Experience	-.021	.03	.48
Scale	.018	.04	.67
Seedstock	.249	.10	.01
Cow-calf	.120	.09	.17
Stocker	-.021	.10	.83
Front Range	.100	.06	.07
Peaks & Plains	-.021	.04	.58

Table D.21. Regression analysis for Dependent Variable: Human resource management

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.241	.10	.02
Experience	-.014	.03	.57
Scale	.086	.04	.02
Seedstock	-.259	.09	.003
Cow-calf	-.204	.08	.01
Stocker	-.273	.09	.002
Front Range	.014	.05	.77
Peaks & Plains	-.026	.03	.45

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Table D.22. Regression analysis for Dependent Variable: Resource stewardship and conservation

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.238	.08	.004
Experience	-.027	.02	.18
Scale	-.042	.03	.15
Seedstock	-.082	.07	.24
Cow-calf	.007	.06	.90
Stocker	-.011	.07	.87
Front Range	-.017	.04	.66
Peaks & Plains	-.031	.03	.25

Table D.23. Regression analysis for Dependent Variable: Transition to next generation

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	-.004	.09	.96
Experience	.013	.02	.54
Scale	.065	.03	.03
Seedstock	.039	.07	.59
Cow-calf	.065	.06	.30
Stocker	.076	.07	.29
Front Range	-.038	.04	.33
Peaks & Plains	-.014	.03	.62

Table D.24. Regression analysis for Dependent Variable: Productivity of land and animals

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.303	.12	.01
Experience	.021	.03	.47
Scale	.001	.04	.99
Seedstock	.077	.10	.45
Cow-calf	.040	.09	.65
Stocker	-.133	.10	.18
Front Range	-.060	.06	.27
Peaks & Plains	-.139	.04	.00

Table D.25. Regression analysis for Dependent Variable: Profitability and enterprise growth

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.026	.10	.80
Experience	-.004	.03	.87
Scale	.034	.04	.35
Seedstock	-.048	.09	.58
Cow-calf	-.119	.08	.12
Stocker	-.055	.09	.52
Front Range	.098	.05	.04
Peaks & Plains	.146	.03	.00

Table D.26. Regression analysis for Dependent Variable: Family lifestyle or tradition

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.448	.10	<.01
Experience	-.010	.02	.68
Scale	-.063	.04	.07
Seedstock	.017	.09	.84
Cow-calf	-.019	.07	.80
Stocker	.073	.08	.38
Front Range	-.014	.05	.75
Peaks & Plains	.045	.03	.16

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Table D.27. Regression analysis for Dependent Variable: Travel

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	3.882	.33	<.01
Experience	.031	.08	.70
Scale	-.051	.12	.66
Seedstock	-.240	.28	.39
Cow-calf	-.331	.24	.16
Stocker	-.323	.27	.24
Front Range	-.366	.15	.02
Peaks & Plains	-.028	.11	.79

Table D.28. Regression analysis for Dependent Variable: Cost

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	3.531	.31	<.01
Experience	.007	.08	.93
Scale	.061	.11	.58
Seedstock	.110	.26	.68
Cow-calf	.056	.23	.81
Stocker	-.014	.26	.96
Front Range	-.042	.15	.78
Peaks & Plains	.141	.10	.18

Table D.29. Regression analysis for Dependent Variable: Time

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	3.812	.28	<.01
Experience	-.056	.70	.42
Scale	.000	.10	.99
Seedstock	.090	.24	.71
Cow-calf	.268	.21	.19
Stocker	.035	.24	.88
Front Range	.093	.13	.48
Peaks & Plains	.106	.09	.25

Table D.30. Regression analysis for Dependent Variable: Content

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	2.929	.33	<.01
Experience	.003	.08	.97
Scale	.176	.12	.14
Seedstock	-.261	.28	.35
Cow-calf	-.368	.24	.13
Stocker	-.398	.28	.15
Front Range	-.099	.16	.53
Peaks & Plains	.073	.11	.51

Table D.31. Regression analysis for Dependent Variable: Scheduled dates

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	3.145	.29	<.01
Experience	.111	.07	.13
Scale	-.001	.10	.99
Seedstock	.177	.25	.48
Cow-calf	.079	.21	.71
Stocker	-.176	.25	.48
Front Range	-.164	.14	.24
Peaks & Plains	.018	.10	.85

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Table D.32. Regression analysis for Dependent Variable: Quality of information

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.407	.19	.03
Experience	.003	.05	.95
Scale	-.042	.07	.53
Seedstock	-.090	.16	.57
Cow-calf	.011	.14	.94
Stocker	.090	.16	.57
Front Range	.067	.09	.45
Peaks & Plains	.010	.06	.88

Table D.33. Regression analysis for Dependent Variable: Lack of technology

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.140	.18	.43
Experience	.006	.04	.90
Scale	-.053	.06	.40
Seedstock	.127	.15	.41
Cow-calf	.250	.13	.06
Stocker	.096	.15	.52
Front Range	.065	.08	.43
Peaks & Plains	.104	.06	.08

Table D.34. Regression analysis for Dependent Variable: Lack of knowledge or skill set

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.720	.18	<.01
Experience	-.035	.05	.43
Scale	-.136	.07	.04
Seedstock	-.149	.16	.34
Cow-calf	-.059	.13	.66
Stocker	-.003	.15	.99
Front Range	-.058	.09	.50
Peaks & Plains	.108	.06	.08

Table D.35. Regression analysis for Dependent Variable: Lack of qualified employees

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.429	.19	.02
Experience	.020	.05	.66
Scale	-.018	.07	.78
Seedstock	-.097	.16	.54
Cow-calf	-.115	.14	.40
Stocker	-.228	.16	.14
Front Range	-.146	.09	.09
Peaks & Plains	-.095	.06	.13

Table D.36. Regression analysis for Dependent Variable: Financial situation (cash flow or cost of production)

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.986	.18	<.01
Experience	-.010	.04	.82
Scale	-.027	.06	.67
Seedstock	-.070	.15	.65
Cow-calf	-.025	.13	.84
Stocker	-.086	.15	.56
Front Range	-.050	.08	.55
Peaks & Plains	.016	.06	.79

Table D.37. Regression analysis for Dependent Variable: Lack of networks

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.473	.18	.01
Experience	-.052	.05	.25
Scale	-.050	.07	.44
Seedstock	.055	.16	.73
Cow-calf	.026	.13	.85
Stocker	-.131	.15	.39
Front Range	.057	.09	.51
Peaks & Plains	.011	.06	.85

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Table D.38. Regression analysis for Dependent Variable: Critical research

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.486	.15	.001
Experience	.031	.04	.40
Scale	-.059	.05	.27
Seedstock	.058	.13	.65
Cow-calf	-.043	.11	.70
Stocker	-.054	.13	.67
Front Range	-.104	.07	.14
Peaks & Plains	-.028	.05	.57

Table D.39. Regression analysis for Dependent Variable: Hands on demonstrations

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.788	.14	<.01
Experience	.037	.03	.28
Scale	-.066	.05	.19
Seedstock	-.140	.12	.24
Cow-calf	-.030	.10	.77
Stocker	-.055	.12	.64
Front Range	-.034	.07	.60
Peaks & Plains	.044	.05	.34

Table D.40. Regression analysis for Dependent Variable: Tools to take home and use

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.625	.14	<.01
Experience	.004	.03	.90
Scale	-.038	.05	.43
Seedstock	.061	.12	.60
Cow-calf	.066	.10	.51
Stocker	.025	.12	.83
Front Range	.043	.06	.50
Peaks & Plains	.074	.05	.10

Table D.41. Regression analysis for Dependent Variable: Networking opportunities

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.330	.14	.02
Experience	-.059	.04	.09
Scale	-.031	.05	.54
Seedstock	.114	.12	.36
Cow-calf	-.019	.11	.86
Stocker	.001	.12	.99
Front Range	.068	.07	.31
Peaks & Plains	.021	.05	.65

Table D.42. Regression analysis for Dependent Variable: Mentoring

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.204	.14	.14
Experience	.013	.03	.70
Scale	.030	.05	.54
Seedstock	-.003	.12	.98
Cow-calf	-.004	.10	.97
Stocker	.099	.11	.38
Front Range	-.005	.06	.94
Peaks & Plains	.053	.05	.24

Table D.43. Regression analysis for Dependent Variable: Reading materials

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.681	.15	<.01
Experience	-.040	.04	.27
Scale	-.047	.05	.38
Seedstock	-.152	.13	.23
Cow-calf	.060	.11	.59
Stocker	-.087	.12	.48
Front Range	.044	.07	.52
Peaks & Plains	-.015	.05	.76

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Table D.44. Regression analysis for Dependent Variable: Field days, on ranch demonstrations

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.443	.16	.01
Experience	.022	.04	.57
Scale	-.026	.06	.65
Seedstock	.166	.14	.23
Cow-calf	.252	.12	.03
Stocker	.269	.13	.05
Front Range	.066	.07	.38
Peaks & Plains	.107	.05	.04

Table D.45. Regression analysis for Dependent Variable: Websites (Ext. publications and electronic materials)

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.564	.17	.001
Experience	.008	.04	.85
Scale	-.083	.06	.17
Seedstock	.074	.15	.61
Cow-calf	.065	.12	.60
Stocker	.039	.14	.78
Front Range	-.052	.08	.51
Peaks & Plains	-.073	.06	.19

Table D.46. Regression analysis for Dependent Variable: Full day seminars/workshops with expert speakers

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.616	.17	<.01
Experience	.014	.04	.73
Scale	-.040	.06	.50
Seedstock	-.070	.14	.62
Cow-calf	-.025	.12	.84
Stocker	-.040	.14	.78
Front Range	.182	.08	.02
Peaks & Plains	.084	.06	.13

Table D.47. Regression analysis for Dependent Variable: Presentations at regular meetings

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.607	.17	<.01
Experience	-.008	.04	.85
Scale	-.040	.06	.51
Seedstock	-.168	.15	.25
Cow-calf	-.117	.12	.35
Stocker	-.174	.14	.22
Front Range	.017	.08	.83
Peaks & Plains	.113	.06	.05

Table D.48. Regression analysis for Dependent Variable: On-line resources (webinars, courses, videos)

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.503	.17	.003
Experience	-.020	.04	.63
Scale	-.031	.06	.61
Seedstock	.089	.15	.54
Cow-calf	.074	.12	.55
Stocker	.042	.14	.77
Front Range	-.034	.08	.66
Peaks & Plains	.018	.06	.75

Table D.49. Regression analysis for Dependent Variable: Virtual conference

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.119	.13	.38
Experience	.024	.03	.47
Scale	-.045	.05	.35
Seedstock	-.018	.11	.87
Cow-calf	-.006	.10	.95
Stocker	-.038	.11	.74
Front Range	-.007	.06	.91
Peaks & Plains	.036	.04	.41

Table D.50. Regression analysis for Dependent Variable: Fee for service consulting (1-on-1 training)

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.205	.14	.16
Experience	.054	.04	.13
Scale	-.031	.05	.55
Seedstock	-.151	.12	.22
Cow-calf	-.209	.11	.05
Stocker	-.184	.12	.13
Front Range	-.023	.07	.73
Peaks & Plains	.120	.05	.01

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Table D.51. Regression analysis for Dependent Variable: Other producers

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.400	.13	.002
Experience	-.052	.03	.09
Scale	-.041	.04	.36
Seedstock	.086	.11	.43
Cow-calf	.045	.09	.63
Stocker	.081	.11	.44
Front Range	.059	.06	.31
Peaks & Plains	.047	.04	.26

Table D.52. Regression analysis for Dependent Variable: University Extension personnel

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.236	.10	.02
Experience	.000	.02	.99
Scale	-.002	.03	.95
Seedstock	-.038	.08	.65
Cow-calf	.028	.07	.70
Stocker	-.040	.08	.62
Front Range	-.044	.04	.32
Peaks & Plains	-.046	.03	.14

Table D.53. Regression analysis for Dependent Variable: Soil conservation district

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.158	.07	.03
Experience	-.015	.02	.40
Scale	-.026	.03	.30
Seedstock	-.043	.06	.48
Cow-calf	.007	.05	.90
Stocker	.015	.06	.80
Front Range	.025	.03	.45
Peaks & Plains	.008	.02	.72

Table D.54. Regression analysis for Dependent Variable: Internet (websites and popular press articles)

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	-.083	.08	.27
Experience	.022	.02	.24
Scale	.005	.03	.85
Seedstock	.090	.06	.16
Cow-calf	.079	.05	.15
Stocker	.088	.06	.16
Front Range	.025	.03	.47
Peaks & Plains	.024	.02	.33

Table D.55. Regression analysis for Dependent Variable: USDA agencies

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.142	.05	.004
Experience	.006	.01	.59
Scale	.005	.02	.78
Seedstock	-.090	.04	.03
Cow-calf	-.109	.04	.003
Stocker	-.116	.04	.005
Front Range	-.026	.02	.24
Peaks & Plains	.003	.02	.84

Table D.56. Regression analysis for Dependent Variable: Commodity associations (CCA, CLA, NCBA)

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.167	.11	.12
Experience	.017	.03	.50
Scale	.059	.04	.12
Seedstock	-.037	.09	.69
Cow-calf	-.080	.08	.31
Stocker	-.042	.09	.64
Front Range	.005	.05	.93
Peaks & Plains	.008	.04	.82

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Table D.57. Regression analysis for Dependent Variable: Host a regional ranch gathering

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	.755	.17	<.01
Experience	.032	.04	.45
Scale	.074	.06	.24
Seedstock	.581	.15	.00
Cow-calf	.251	.13	.05
Stocker	.436	.15	.003
Front Range	.193	.08	.02
Peaks & Plains	.014	.06	.81

Table D.58. Regression analysis for Dependent Variable: Participate in research projects

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	1.366	.19	<.01
Experience	.037	.05	.43
Scale	.014	.07	.84
Seedstock	.282	.17	.09
Cow-calf	.108	.14	.45
Stocker	.185	.16	.26
Front Range	.092	.09	.31
Peaks & Plains	-.109	.06	.09

Table D.59. Regression analysis for Dependent Variable: Join a regional rancher group

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	1.562	.20	<.01
Experience	.017	.05	.73
Scale	.112	.07	.11
Seedstock	.366	.17	.03
Cow-calf	.264	.15	.07
Stocker	.370	.17	.03
Front Range	.157	.09	.09
Peaks & Plains	-.149	.07	.02

Table D.60. Regression analysis for Dependent Variable: Become BQA certified

Model	Unstandardized Coefficients		P-value
	B	Std. Error	
(Constant)	1.362	.26	<.01
Experience	.073	.06	.25
Scale	.338	.09	.00
Seedstock	-.014	.22	.95
Cow-calf	-.030	.19	.87
Stocker	-.072	.22	.74
Front Range	.353	.12	.004
Peaks & Plains	-.009	.09	.92

APPENDIX E.

Email template sent for acquisition of interview participants

Hello,

My name is Sarah Dideriksen and I am a current graduate student from Colorado State University in the Animal Sciences department. I am working on a project in collaboration with Colorado Cattlemen's Association, Colorado Livestock Association, and Colorado State University to learn more about the educational needs and research priorities of Colorado beef producers.

I am reaching out because we would like you to participate in one-on-one interviews and answer a few questions about your needs and priorities as a beef producer. Participation will take approximately one-and-a-half to two hours. Your participation in this research is voluntary. If you decide to participate in the study, you may withdraw your consent and stop participation at any time without penalty.

We will not collect your name or personal identifiers. When we report and share the data with others, we will combine the data from all participants. There are no known risks or direct benefits to you, but we hope to gain more knowledge on the educational needs and research priorities of Colorado beef producers.

There is no known risk of participating in this study; however, it is not possible to identify all potential risks in research procedures, but the researchers have taken reasonable safeguards to minimize any known and potential (but unknown) risks.

To indicate your willingness to participate in this research, please respond directly to this email and we will find a time to meet.

If you have any questions about the research, please contact me at either (970) 219-3825 or sdiderik@rams.colostate.edu. If you have any questions about your rights as a volunteer in this research, contact the CSU IRB at: RICRO_IRB@mail.colostate.edu; 970-491-1553.

Best,

Sarah Dideriksen
Graduate Student, Beef Management Systems
Department of Animal Sciences
Colorado State University
(970) 219-3825

APPENDIX F.

Cross tabulations for all questions evaluated from needs assessment survey instrument

Question 1. Cross tabulations

Risk Management

Q23: Years of Experience	Low	Medium	High	Total	P-value
Beginner (0-10yrs)	0.0%	37.3%	62.7%	662	0.22
Intermediate (11-20yrs)	6.6%	45.3%	48.1%		
Experienced (21yrs+)	5.2%	42.7%	52.1%		
Q27: Relative scale of operation	**Low**	**Medium**	**High**	**Total**	**P-value**
Small (<100 head)	8.8%	47.8%	43.4%	654	< .01
Medium (101-500 head)	2.3%	43.1%	54.6%		
Large (>500 head)	4.9%	31.2%	63.9%		
Q28: Segment of the industry	**Low**	**Medium**	**High**	**Total**	**P-value**
Seedstock	4.5%	60.6%	34.9%	658	0.02
Commercial cow-calf	4.9%	42.4%	52.7%		
Grazing/growing stocker	6.6%	30.3%	63.2%		
Feedlot	3.5%	32.1%	64.3%		
Q31: Regional areas	**Low**	**Medium**	**High**	**Total**	**P-value**
Front Range	3.1%	43.3%	53.6%	645	0.57
Peaks and Plains	5.2%	39.4%	55.4%		
West Slope	5.8%	44.8%	49.4%		

Business Management

Q23: Years of Experience	Low	Medium	High	Total	P-value
Beginner (0-10yrs)	3.3%	36.7%	60.0%	664	0.4
Intermediate (11-20yrs)	6.8%	44.7%	48.5%		
Experienced (21yrs+)	5.2%	36.3%	58.5%		
Q27: Relative scale of operation	**Low**	**Medium**	**High**	**Total**	**P-value**
Small (<100 head)	6.1%	45.0%	48.9%	655	0.02
Medium (101-500 head)	5.3%	36.2%	58.5%		
Large (>500 head)	4.1%	28.7%	67.2%		
Q28: Segment of the industry	**Low**	**Medium**	**High**	**Total**	**P-value**
Seedstock	3.0%	31.8%	65.2%	660	0.7
Commercial cow-calf	5.5%	37.3%	57.2%		
Grazing/growing stocker	6.4%	43.6%	50.0%		
Feedlot	3.6%	39.3%	57.1%		
Q31: Regional areas	**Low**	**Medium**	**High**	**Total**	**P-value**
Front Range	7.2%	28.9%	63.9%	649	0.08
Peaks and Plains	6.1%	36.5%	57.4%		
West Slope	3.4%	43.3%	53.3%		

Technology

Q23: Years of Experience	Low	Medium	High	Total	P-value
Beginner (0-10yrs)	20.4%	55.9%	23.7%	656	0.47
Intermediate (11-20yrs)	12.6%	66.0%	21.4%		
Experienced (21yrs+)	12.3%	63.2%	24.5%		
Q27: Relative scale of operation	**Low**	**Medium**	**High**	**Total**	**P-value**
Small (<100 head)	13.6%	58.8%	27.6%	648	0.52
Medium (101-500 head)	12.7%	64.3%	23.0%		
Large (>500 head)	13.3%	66.7%	20.0%		
Q28: Segment of the industry	**Low**	**Medium**	**High**	**Total**	**P-value**
Seedstock	3.0%	59.1%	37.9%	652	0.02
Commercial cow-calf	13.7%	63.6%	22.7%		
Grazing/growing stocker	20.3%	59.4%	20.3%		
Feedlot	10.7%	64.3%	25.0%		
Q31: Regional areas	**Low**	**Medium**	**High**	**Total**	**P-value**
Front Range	10.3%	60.8%	28.9%	641	0.03
Peaks and Plains	17.5%	61.7%	20.8%		
West Slope	9.3%	64.9%	25.8%		

Herd Level Performance Evaluation

Q23: Years of Experience	Low	Medium	High	Total	P-value
Beginner (0-10yrs)	6.8%	50.8%	42.4%	656	0.71
Intermediate (11-20yrs)	10.7%	51.4%	37.9%		
Experienced (21yrs+)	10.5%	46.0%	43.5%		
Q27: Relative scale of operation	**Low**	**Medium**	**High**	**Total**	**P-value**
Small (<100 head)	7.9%	49.3%	42.8%	649	0.43
Medium (101-500 head)	10.7%	45.8%	43.5%		
Large (>500 head)	14.1%	47.1%	38.8%		
Q28: Segment of the industry	**Low**	**Medium**	**High**	**Total**	**P-value**
Seedstock	10.6%	43.9%	45.5%	652	< .01
Commercial cow-calf	8.5%	43.5%	48.0%		
Grazing/growing stocker	20.3%	60.8%	18.9%		
Feedlot	14.8%	77.8%	7.4%		
Q31: Regional areas	**Low**	**Medium**	**High**	**Total**	**P-value**
Front Range	9.3%	52.6%	38.1%	640	0.23
Peaks and Plains	10.8%	49.5%	39.7%		
West Slope	10.1%	41.6%	48.3%		

Resource Management

Q23: Years of Experience	Low	Medium	High	Total	P-value
Beginner (0-10yrs)	10.0%	36.7%	53.3%	663	0.48
Intermediate (11-20yrs)	6.7%	38.5%	54.8%		
Experienced (21yrs+)	4.6%	40.3%	55.1%		
Q27: Relative scale of operation	**Low**	**Medium**	**High**	**Total**	**P-value**
Small (<100 head)	5.2%	37.2%	57.6%	654	0.69
Medium (101-500 head)	6.3%	39.6%	54.1%		
Large (>500 head)	4.2%	44.2%	51.6%		
Q28: Segment of the industry	**Low**	**Medium**	**High**	**Total**	**P-value**
Seedstock	6.1%	37.9%	56.0%	659	0.17
Commercial cow-calf	5.1%	38.1%	56.8%		
Grazing/growing stocker	7.8%	41.6%	50.6%		
Feedlot	3.6%	64.3%	32.1%		
Q31: Regional areas	**Low**	**Medium**	**High**	**Total**	**P-value**
Front Range	8.2%	36.7%	55.1%	647	0.05
Peaks and Plains	6.9%	42.5%	50.6%		
West Slope	2.9%	35.8%	61.3%		

Leadership

Q23: Years of Experience	Low	Medium	High	Total	P-value
Beginner (0-10yrs)	23.7%	45.8%	30.5%	657	0.14
Intermediate (11-20yrs)	10.7%	49.5%	39.8%		
Experienced (21yrs+)	12.3%	49.7%	38.0%		
Q27: Relative scale of operation	**Low**	**Medium**	**High**	**Total**	**P-value**
Small (<100 head)	14.6%	46.9%	38.5%	649	0.70
Medium (101-500 head)	13.5%	50.7%	35.8%		
Large (>500 head)	9.9%	51.2%	38.9%		
Q28: Segment of the industry	**Low**	**Medium**	**High**	**Total**	**P-value**
Seedstock	12.1%	42.4%	45.5%	653	0.06
Commercial cow-calf	13.4%	51.0%	35.6%		
Grazing/growing stocker	13.7%	53.4%	32.9%		
Feedlot	10.7%	25.0%	64.3%		
Q31: Regional areas	**Low**	**Medium**	**High**	**Total**	**P-value**
Front Range	18.8%	33.3%	47.9%	641	< .01
Peaks and Plains	15.3%	52.8%	31.9%		
West Slope	8.0%	51.7%	40.3%		

Question 2. Cross tabulations

Methods of managing market risk

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	23.7%	76.3%	685	0.55
Intermediate (11-20yrs)	32.1%	67.9%		
Experienced (21yrs+)	26.1%	73.9%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	36.3%	63.7%	676	< .01
Medium (101-500 head)	22.7%	77.3%		
Large (>500 head)	18.3%	81.7%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	37.1%	62.9%	680	0.42
Commercial cow-calf	25.4%	74.6%		
Grazing/growing stocker	28.4%	71.6%		
Feedlot	20.7%	79.3%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	29.4%	70.6%	669	0.60
Peaks and Plains	25.7%	74.3%		
West Slope	26.6%	73.4%		

Understanding business management principles

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	64.4%	35.6%	685	0.74
Intermediate (11-20yrs)	70.5%	29.5%		
Experienced (21yrs+)	66.0%	34.0%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	63.7%	36.3%	676	0.65
Medium (101-500 head)	67.7%	32.3%		
Large (>500 head)	69.8%	30.2%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	74.3%	25.7%	680	0.79
Commercial cow-calf	65.8%	34.2%		
Grazing/growing stocker	67.9%	32.1%		
Feedlot	65.5%	34.5%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	67.6%	32.4%	669	0.67
Peaks and Plains	66.3%	33.7%		
West Slope	67.5%	32.5%		

Complex decision making

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	61.0%	39.0%	684	0.45
Intermediate (11-20yrs)	73.2%	26.8%		
Experienced (21yrs+)	69.4%	30.6%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	75.5%	24.5%	676	0.03
Medium (101-500 head)	68.0%	32.0%		
Large (>500 head)	59.5%	40.5%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	71.0%	29.0%	679	0.73
Commercial cow-calf	70.4%	29.6%		
Grazing/growing stocker	65.4%	34.6%		
Feedlot	58.6%	41.4%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	61.8%	38.2%	668	0.29
Peaks and Plains	70.2%	29.8%		
West Slope	69.7%	30.3%		

Record keeping and tracking performance

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	54.2%	45.8%	683	0.78
Intermediate (11-20yrs)	60.7%	39.3%		
Experienced (21yrs+)	59.6%	40.4%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	49.8%	50.2%	674	0.01
Medium (101-500 head)	63.8%	36.2%		
Large (>500 head)	65.6%	34.4%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	60.9%	39.1%	678	0.89
Commercial cow-calf	58.4%	41.6%		
Grazing/growing stocker	61.7%	38.3%		
Feedlot	67.9%	32.1%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	66.3%	33.7%	667	0.10
Peaks and Plains	54.8%	45.2%		
West Slope	62.3%	37.7%		

Developing and implementing production strategies

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	40.7%	59.3%	685	0.31
Intermediate (11-20yrs)	33.0%	67.0%		
Experienced (21yrs+)	43.0%	57.0%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	40.5%	59.5%	676	0.75
Medium (101-500 head)	39.9%	60.1%		
Large (>500 head)	45.2%	54.8%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	34.3%	65.7%	680	0.47
Commercial cow-calf	40.6%	59.4%		
Grazing/growing stocker	45.7%	54.3%		
Feedlot	55.2%	44.8%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	39.2%	60.8%	669	0.09
Peaks and Plains	45.7%	54.3%		
West Slope	35.7%	64.3%		

Setting goals and direction for your business

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	67.8%	32.2%	685	0.42
Intermediate (11-20yrs)	54.5%	45.5%		
Experienced (21yrs+)	60.1%	39.9%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	62.4%	37.6%	676	0.41
Medium (101-500 head)	56.5%	43.5%		
Large (>500 head)	64.3%	35.7%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	60.0%	40.0%	680	0.64
Commercial cow-calf	60.8%	39.2%		
Grazing/growing stocker	56.8%	43.2%		
Feedlot	44.8%	55.2%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	61.8%	38.2%	669	0.64
Peaks and Plains	59.0%	41.0%		
West Slope	60.7%	39.3%		

Question 3. Cross tabulations

Herd health

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	56.9%	43.1%	706	0.16
Intermediate (11-20yrs)	50.4%	49.6%		
Experienced (21yrs+)	60.2%	39.8%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	57.7%	42.3%	698	0.68
Medium (101-500 head)	57.9%	42.1%		
Large (>500 head)	62.0%	38.0%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	61.4%	38.6%	702	0.66
Commercial cow-calf	56.9%	43.1%		
Grazing/growing stocker	61.2%	38.8%		
Feedlot	65.5%	34.5%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	65.4%	34.6%	689	0.23
Peaks and Plains	58.0%	42.0%		
West Slope	55.6%	44.4%		

Reproductive technology/management

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	70.7%	29.3%	707	0.92
Intermediate (11-20yrs)	69.0%	31.0%		
Experienced (21yrs+)	70.9%	29.1%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	69.1%	30.9%	699	0.31
Medium (101-500 head)	69.2%	30.8%		
Large (>500 head)	76.0%	24.0%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	70.0%	30.0%	703	< .01
Commercial cow-calf	67.4%	32.6%		
Grazing/growing stocker	83.7%	16.3%		
Feedlot	86.2%	13.8%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	69.2%	30.8%	690	0.36
Peaks and Plains	73.6%	26.4%		
West Slope	68.5%	31.5%		

Nutrition and supplementation

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	51.7%	48.3%	707	0.20
Intermediate (11-20yrs)	46.0%	54.0%		
Experienced (21yrs+)	55.2%	44.8%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	53.4%	46.6%	699	0.75
Medium (101-500 head)	52.6%	47.4%		
Large (>500 head)	56.6%	43.4%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	51.4%	48.6%	703	0.14
Commercial cow-calf	51.7%	48.3%		
Grazing/growing stocker	65.1%	34.9%		
Feedlot	55.2%	44.8%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	52.9%	47.1%	690	0.99
Peaks and Plains	53.1%	46.9%		
West Slope	53.1%	46.9%		

End product

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	82.8%	17.2%	707	0.31
Intermediate (11-20yrs)	77.9%	22.1%		
Experienced (21yrs+)	74.4%	25.6%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	79.5%	20.5%	699	0.21
Medium (101-500 head)	73.8%	26.2%		
Large (>500 head)	72.9%	27.1%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	82.9%	17.1%	703	0.24
Commercial cow-calf	75.7%	24.3%		
Grazing/growing stocker	72.1%	27.9%		
Feedlot	65.5%	34.5%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	73.1%	26.9%	690	0.83
Peaks and Plains	75.5%	24.5%		
West Slope	76.2%	23.8%		

Marketing strategies

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	34.5%	65.5%	707	0.21
Intermediate (11-20yrs)	44.2%	55.8%		
Experienced (21yrs+)	35.6%	64.4%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	42.2%	57.8%	699	0.05
Medium (101-500 head)	35.8%	64.2%		
Large (>500 head)	29.5%	70.5%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	35.7%	64.3%	703	0.92
Commercial cow-calf	37.5%	62.5%		
Grazing/growing stocker	34.9%	65.1%		
Feedlot	41.4%	58.6%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	38.5%	61.5%	690	0.45
Peaks and Plains	34.4%	65.6%		
West Slope	39.2%	60.8%		

Grazing and weeds

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	58.6%	41.4%	707	0.72
Intermediate (11-20yrs)	52.2%	47.8%		
Experienced (21yrs+)	53.5%	46.5%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	41.0%	59.0%	699	< .01
Medium (101-500 head)	57.9%	42.1%		
Large (>500 head)	67.4%	32.6%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	38.6%	61.4%	703	< .01
Commercial cow-calf	56.0%	44.0%		
Grazing/growing stocker	43.0%	57.0%		
Feedlot	82.8%	17.2%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	46.1%	53.9%	690	0.11
Peaks and Plains	57.4%	42.6%		
West Slope	52.3%	47.7%		

Endangered species & wildlife management

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	86.2%	13.8%	707	0.93
Intermediate (11-20yrs)	84.1%	15.9%		
Experienced (21yrs+)	84.3%	15.7%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	84.3%	15.7%	699	0.65
Medium (101-500 head)	85.7%	14.3%		
Large (>500 head)	82.2%	17.8%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	87.1%	12.9%	703	0.55
Commercial cow-calf	84.4%	15.6%		
Grazing/growing stocker	80.2%	19.8%		
Feedlot	89.7%	10.3%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	91.3%	8.7%	690	< .01
Peaks and Plains	87.7%	12.3%		
West Slope	77.3%	22.7%		

Genetic technologies & tools

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	69.0%	31.0%	706	0.76
Intermediate (11-20yrs)	67.3%	32.7%		
Experienced (21yrs+)	70.7%	29.3%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	69.1%	30.9%	698	0.92
Medium (101-500 head)	70.6%	29.4%		
Large (>500 head)	70.5%	29.5%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	55.7%	44.3%	702	< .01
Commercial cow-calf	69.3%	30.7%		
Grazing/growing stocker	83.5%	16.5%		
Feedlot	75.9%	24.1%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	60.6%	39.4%	689	0.06
Peaks and Plains	72.7%	27.3%		
West Slope	71.0%	29.0%		

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	82.8%	17.2%	706	0.22
Intermediate (11-20yrs)	73.5%	26.5%		
Experienced (21yrs+)	80.2%	19.8%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	88.8%	11.2%	698	< .01
Medium (101-500 head)	77.5%	22.5%		
Large (>500 head)	64.3%	35.7%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	82.9%	17.1%	702	< .01
Commercial cow-calf	79.3%	20.7%		
Grazing/growing stocker	86.0%	14.0%		
Feedlot	55.2%	44.8%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	76.7%	23.3%	689	0.79
Peaks and Plains	79.8%	20.2%		
West Slope	79.6%	20.4%		

Question 13. Cross tabulations

	Resource stewardship & conservation	Transition to next generation	Productivity of land & animals	Profitability & enterprise growth	Family lifestyle or tradition	Total	P-value
Q23: Years of Experience							
Beginner (0-10yrs)	18.3%	11.7%	28.3%	25.0%	16.7%	710	0.40
Intermediate (11-20yrs)	8.8%	13.2%	29.8%	21.0%	27.2%		
Experienced (21yrs+)	11.2%	13.4%	34.0%	22.8%	18.6%		
Q27: Relative scale of operation							
Small (<100 head)	14.9%	10.8%	33.3%	11.7%	29.3%		
Medium (101-500 head)	9.4%	13.1%	33.0%	25.5%	19.0%		
Large (>500 head)	9.9%	17.6%	32.8%	35.9%	3.8%		
Q28: Segment of the industry							
Seedstock	4.2%	8.3%	40.3%	26.4%	20.8%		
Commercial cow-calf	12.3%	13.5%	34.6%	20.6%	19.0%		
Grazing/growing stocker	13.1%	17.9%	16.6%	25.0%	27.4%		
Feedlot	6.9%	6.9%	24.1%	48.3%	13.8%		
Q31: Regional areas							
Front Range	11.5%	8.7%	37.5%	24.0%	18.3%		
Peaks and Plains	9.8%	13.4%	26.2%	30.2%	20.4%		
West Slope	12.3%	15.1%	39.4%	13.5%	19.7%		

Question 14. Cross tabulations

Travel

Q23: Years of Experience	Not at all	Low	Somewhat	Moderate	Major barrier	Total	P-value
Beginner (0-10yrs)	8.9%	19.7%	35.7%	26.8%	8.9%	687	0.44
Intermediate (11-20yrs)	16.4%	14.5%	38.2%	20.0%	10.9%		
Experienced (21yrs+)	14.2%	20.0%	28.8%	21.1%	15.9%		
Q27: Relative scale of operation	**Not at all**	**Low**	**Somewhat**	**Moderate**	**Major barrier**	**Total**	**P-value**
Small (<100 head)	13.0%	17.2%	26.1%	23.1%	20.6%	678	< .01
Medium (101-500 head)	13.5%	16.5%	35.0%	22.8%	12.2%		
Large (>500 head)	16.3%	29.5%	30.2%	14.7%	9.3%		
Q28: Segment of the industry	**Not at all**	**Low**	**Somewhat**	**Moderate**	**Major barrier**	**Total**	**P-value**
Seedstock	13.9%	22.2%	29.2%	13.9%	20.8%	682	0.75
Commercial cow-calf	14.7%	17.9%	31.6%	21.7%	14.1%		
Grazing/growing stocker	12.8%	21.8%	24.4%	28.2%	12.8%		
Feedlot	6.9%	20.7%	41.4%	17.2%	13.8%		
Q31: Regional areas	**Not at all**	**Low**	**Somewhat**	**Moderate**	**Major barrier**	**Total**	**P-value**
Front Range	18.8%	27.7%	24.7%	14.9%	13.9%	672	0.05
Peaks and Plains	13.6%	16.8%	35.6%	20.1%	13.9%		
West Slope	11.7%	19.0%	27.4%	25.4%	16.5%		

Cost

Q23: Years of Experience	Not at all	Low	Somewhat	Moderate	Major barrier	Total	P-value
a. Beginner (0-10yrs)	7.1%	19.6%	55.4%	14.3%	3.6%	679	0.01
b. Intermediate (11-20yrs)	8.3%	28.7%	31.5%	18.5%	13.0%		
c. Experienced (21yrs+)	13.0%	27.0%	26.2%	18.6%	15.2%		
Q27: Relative scale of operation	**Not at all**	**Low**	**Somewhat**	**Moderate**	**Major barrier**	**Total**	**P-value**
a. Small (<100 head)	6.9%	22.3%	28.8%	22.7%	19.3%	670	< .01
b. Medium (101-500 head)	12.6%	26.5%	31.1%	17.2%	12.6%		
c. Large (>500 head)	17.2%	35.2%	27.3%	13.3%	7.0%		
Q28: Segment of the industry	**Not at all**	**Low**	**Somewhat**	**Moderate**	**Major barrier**	**Total**	**P-value**
a. Seedstock	6.9%	31.9%	30.6%	15.3%	15.3%	674	0.30
b. Commercial cow-calf	10.7%	26.4%	31.3%	17.7%	13.9%		
c. Grazing/growing stocker	16.9%	24.7%	18.1%	27.3%	13.0%		
d. Feedlot	24.1%	24.1%	27.6%	13.8%	10.4%		
Q31: Regional areas	**Not at all**	**Low**	**Somewhat**	**Moderate**	**Major barrier**	**Total**	**P-value**
a. Front Range	10.9%	29.7%	26.7%	21.8%	10.9%	664	0.82
b. Peaks and Plains	11.0%	26.3%	29.8%	16.9%	16.0%		
c. West Slope	12.3%	27.1%	30.3%	18.4%	11.9%		

Time

Q23: Years of Experience	Not at all	Low	Somewhat	Moderate	Major barrier	Total	P-value
a. Beginner (0-10yrs)	1.7%	5.2%	15.5%	31.0%	46.6%	694	0.98
b. Intermediate (11-20yrs)	2.7%	4.5%	15.3%	25.2%	52.3%		
c. Experienced (21yrs+)	3.1%	6.3%	17.5%	27.8%	45.3%		
Q27: Relative scale of operation	**Not at all**	**Low**	**Somewhat**	**Moderate**	**Major barrier**	**Total**	**P-value**
a. Small (<100 head)	4.2%	5.4%	17.2%	28.9%	44.3%	685	0.28
b. Medium (101-500 head)	0.9%	6.0%	18.7%	26.6%	47.8%		
c. Large (>500 head)	4.6%	6.1%	12.3%	28.5%	48.5%		
Q28: Segment of the industry	**Not at all**	**Low**	**Somewhat**	**Moderate**	**Major barrier**	**Total**	**P-value**
a. Seedstock	1.4%	8.3%	20.8%	26.4%	43.1%	689	0.66
b. Commercial cow-calf	2.8%	5.1%	15.0%	28.7%	48.4%		
c. Grazing/growing stocker	3.7%	8.8%	20.0%	27.5%	40.0%		
d. Feedlot	3.5%	3.5%	31.0%	17.2%	44.8%		
Q31: Regional areas	**Not at all**	**Low**	**Somewhat**	**Moderate**	**Major barrier**	**Total**	**P-value**
a. Front Range	1.0%	6.8%	20.4%	26.2%	45.6%	678	0.81
b. Peaks and Plains	2.8%	5.2%	16.0%	26.8%	49.2%		
c. West Slope	3.2%	6.8%	16.4%	29.6%	44.0%		

Content

Q23: Years of Experience	Not at all	Low	Somewhat	Moderate	Major barrier	Total	P-value
a. Beginner (0-10yrs)	7.3%	18.2%	40.0%	27.2%	7.3%	673	0.40
b. Intermediate (11-20yrs)	22.2%	16.7%	29.6%	16.7%	14.8%		
c. Experienced (21yrs+)	16.7%	18.2%	31.8%	19.6%	13.7%		
Q27: Relative scale of operation	**Not at all**	**Low**	**Somewhat**	**Moderate**	**Major barrier**	**Total**	**P-value**
a. Small (<100 head)	18.9%	19.3%	33.0%	17.6%	11.2%	664	0.06
b. Medium (101-500 head)	18.1%	18.8%	29.4%	19.5%	14.2%		
c. Large (>500 head)	7.8%	12.5%	39.1%	24.2%	16.4%		
Q28: Segment of the industry	**Not at all**	**Low**	**Somewhat**	**Moderate**	**Major barrier**	**Total**	**P-value**
a. Seedstock	12.8%	25.7%	25.7%	24.3%	11.5%	667	0.42
b. Commercial cow-calf	17.5%	16.1%	34.3%	18.7%	13.4%		
c. Grazing/growing stocker	17.1%	25.0%	23.6%	21.1%	13.2%		
d. Feedlot	13.8%	6.9%	34.5%	27.6%	17.2%		
Q31: Regional areas	**Not at all**	**Low**	**Somewhat**	**Moderate**	**Major barrier**	**Total**	**P-value**
a. Front Range	18.2%	18.2%	36.3%	18.2%	9.1%	661	0.61
b. Peaks and Plains	15.8%	16.7%	32.5%	18.9%	16.1%		
c. West Slope	17.6%	20.0%	29.8%	21.2%	11.4%		

Scheduled dates

Q23: Years of Experience	Not at all	Low	Somewhat	Moderate	Major barrier	Total	P-value
a. Beginner (0-10yrs)	5.2%	3.4%	43.1%	29.3%	19.0%	681	0.40
b. Intermediate (11-20yrs)	5.5%	12.8%	36.7%	29.4%	15.6%		
c. Experienced (21yrs+)	5.3%	10.1%	30.5%	29.6%	24.5%		
Q27: Relative scale of operation	**Not at all**	**Low**	**Somewhat**	**Moderate**	**Major barrier**	**Total**	**P-value**
a. Small (<100 head)	6.9%	11.2%	32.3%	28.0%	21.6%	672	0.36
b. Medium (101-500 head)	5.4%	8.3%	33.3%	30.2%	22.8%		
c. Large (>500 head)	0.8%	12.5%	31.2%	30.5%	25.0%		
Q28: Segment of the industry	**Not at all**	**Low**	**Somewhat**	**Moderate**	**Major barrier**	**Total**	**P-value**
a. Seedstock	1.5%	15.5%	22.5%	38.0%	22.5%	676	0.31
b. Commercial cow-calf	5.2%	8.2%	33.7%	29.2%	23.7%		
c. Grazing/growing stocker	7.7%	16.7%	33.3%	25.6%	16.7%		
d. Feedlot	6.9%	10.3%	37.9%	24.2%	20.7%		
Q31: Regional areas	**Not at all**	**Low**	**Somewhat**	**Moderate**	**Major barrier**	**Total**	**P-value**
a. Front Range	6.1%	11.2%	36.7%	28.6%	17.4%	667	0.66
b. Peaks and Plains	4.4%	10.6%	33.0%	27.1%	24.9%		
c. West Slope	5.6%	8.1%	30.6%	32.7%	23.0%		

Question 15. Cross tabulations

Quality of information

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	55.9%	44.1%	682	0.90
Intermediate (11-20yrs)	59.6%	40.4%		
Experienced (21yrs+)	58.2%	41.8%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	62.0%	38.0%	673	0.26
Medium (101-500 head)	57.9%	42.1%		
Large (>500 head)	51.6%	48.4%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	62.3%	37.7%	677	0.49
Commercial cow-calf	59.6%	40.4%		
Grazing/growing stocker	48.1%	51.9%		
Feedlot	55.2%	44.8%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	50.0%	50.0%	667	0.38
Peaks and Plains	59.7%	40.3%		
West Slope	59.9%	40.1%		

Lack of technology

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	71.2%	28.8%	681	0.63
Intermediate (11-20yrs)	79.6%	20.4%		
Experienced (21yrs+)	74.7%	25.3%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	73.9%	26.1%	672	0.25
Medium (101-500 head)	73.5%	26.5%		
Large (>500 head)	82.0%	18.0%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	78.3%	21.7%	676	0.09
Commercial cow-calf	72.4%	27.6%		
Grazing/growing stocker	82.7%	17.3%		
Feedlot	93.1%	6.9%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	72.5%	27.5%	666	0.24
Peaks and Plains	72.1%	27.9%		
West Slope	79.8%	20.2%		

Lack of knowledge or skill set

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	62.7%	37.3%	682	0.60
Intermediate (11-20yrs)	58.7%	41.3%		
Experienced (21yrs+)	65.6%	34.4%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	55.1%	44.9%	673	0.01
Medium (101-500 head)	69.1%	30.9%		
Large (>500 head)	69.5%	30.5%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	71.0%	29.0%	677	0.46
Commercial cow-calf	65.1%	34.9%		
Grazing/growing stocker	55.6%	44.4%		
Feedlot	58.6%	41.4%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	67.6%	32.4%	667	0.43
Peaks and Plains	60.4%	39.6%		
West Slope	66.7%	33.3%		

Lack of qualified employees

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	61.0%	39.0%	682	0.79
Intermediate (11-20yrs)	57.8%	42.2%		
Experienced (21yrs+)	55.3%	44.7%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	67.9%	32.1%	673	< .01
Medium (101-500 head)	54.0%	46.0%		
Large (>500 head)	38.3%	61.7%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	52.2%	47.8%	677	0.16
Commercial cow-calf	56.6%	43.4%		
Grazing/growing stocker	64.2%	35.8%		
Feedlot	34.5%	65.5%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	61.8%	38.2%	667	0.11
Peaks and Plains	59.7%	40.3%		
West Slope	50.0%	50.0%		

Financial situation (cash flow or cost of production)

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	28.8%	71.2%	682	0.83
Intermediate (11-20yrs)	33.9%	66.1%		
Experienced (21yrs+)	30.5%	69.5%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	25.6%	74.4%	673	0.02
Medium (101-500 head)	29.9%	70.1%		
Large (>500 head)	42.2%	57.8%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	29.0%	71.0%	677	0.97
Commercial cow-calf	30.7%	69.3%		
Grazing/growing stocker	32.1%	67.9%		
Feedlot	31.0%	69.0%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	32.4%	67.6%	667	0.89
Peaks and Plains	31.3%	68.7%		
West Slope	29.4%	70.6%		

Lack of networks

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	64.4%	35.6%	683	0.64
Intermediate (11-20yrs)	65.5%	34.5%		
Experienced (21yrs+)	70.4%	29.6%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	69.8%	30.2%	674	0.77
Medium (101-500 head)	68.2%	31.8%		
Large (>500 head)	70.3%	29.7%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	58.0%	42.0%	678	0.13
Commercial cow-calf	68.9%	31.1%		
Grazing/growing stocker	80.2%	19.8%		
Feedlot	65.5%	34.5%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	61.8%	38.2%	667	0.44
Peaks and Plains	70.6%	29.4%		
West Slope	70.2%	29.8%		

Question 16. Cross tabulations

Critical research

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	50.8%	49.2%	703	0.48
Intermediate (11-20yrs)	61.6%	38.4%		
Experienced (21yrs+)	52.8%	47.2%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	56.5%	43.5%	695	0.35
Medium (101-500 head)	50.8%	49.2%		
Large (>500 head)	57.7%	42.3%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	43.7%	56.3%	698	0.69
Commercial cow-calf	55.4%	44.6%		
Grazing/growing stocker	54.8%	45.2%		
Feedlot	51.7%	48.3%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	57.9%	42.1%	687	0.36
Peaks and Plains	56.1%	43.9%		
West Slope	49.6%	50.4%		

Hands on demonstrations

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	33.9%	66.1%	703	0.86
Intermediate (11-20yrs)	33.9%	66.1%		
Experienced (21yrs+)	29.9%	70.1%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	26.0%	74.0%	695	0.17
Medium (101-500 head)	34.5%	65.5%		
Large (>500 head)	30.8%	69.2%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	39.4%	60.6%	698	0.65
Commercial cow-calf	29.4%	70.6%		
Grazing/growing stocker	33.3%	66.7%		
Feedlot	24.1%	75.9%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	35.5%	64.5%	687	0.58
Peaks and Plains	28.8%	71.2%		
West Slope	31.5%	68.5%		

Tools to take home and use

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	23.7%	76.3%	703	0.92
Intermediate (11-20yrs)	29.5%	70.5%		
Experienced (21yrs+)	27.6%	72.4%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	29.3%	70.7%	695	0.65
Medium (101-500 head)	26.3%	73.7%		
Large (>500 head)	26.9%	73.1%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	25.4%	74.6%	698	0.90
Commercial cow-calf	26.8%	73.2%		
Grazing/growing stocker	32.1%	67.9%		
Feedlot	34.5%	65.5%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	24.3%	75.7%	687	0.58
Peaks and Plains	25.8%	74.2%		
West Slope	29.9%	70.1%		

Networking opportunities

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	57.6%	42.4%	703	0.26
Intermediate (11-20yrs)	64.3%	35.7%		
Experienced (21yrs+)	70.3%	29.7%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	72.8%	27.2%	695	0.04
Medium (101-500 head)	69.0%	31.0%		
Large (>500 head)	58.5%	41.5%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	52.1%	47.9%	698	0.04
Commercial cow-calf	71.0%	29.0%		
Grazing/growing stocker	67.9%	32.1%		
Feedlot	55.2%	44.8%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	61.7%	38.3%	687	0.51
Peaks and Plains	68.7%	31.3%		
West Slope	69.3%	30.7%		

Mentoring

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	78.0%	22.0%	703	0.73
Intermediate (11-20yrs)	71.4%	28.6%		
Experienced (21yrs+)	77.1%	22.9%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	78.5%	21.5%	695	0.55
Medium (101-500 head)	75.2%	24.8%		
Large (>500 head)	73.8%	26.2%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	77.5%	22.5%	698	0.40
Commercial cow-calf	77.8%	22.2%		
Grazing/growing stocker	66.7%	33.3%		
Feedlot	69.0%	31.0%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	77.6%	22.4%	687	0.63
Peaks and Plains	74.5%	25.5%		
West Slope	78.7%	21.3%		

Reading materials

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	50.8%	49.2%	703	0.73
Intermediate (11-20yrs)	50.0%	50.0%		
Experienced (21yrs+)	56.0%	44.0%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	51.2%	48.8%	695	0.08
Medium (101-500 head)	53.3%	46.7%		
Large (>500 head)	64.6%	35.4%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	70.4%	29.6%	698	0.02
Commercial cow-calf	50.6%	49.4%		
Grazing/growing stocker	63.1%	36.9%		
Feedlot	69.0%	31.0%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	52.3%	47.7%	687	0.65
Peaks and Plains	57.1%	42.9%		
West Slope	52.8%	47.2%		

Question 17. Cross tabulations

Field days, on ranch demonstrations

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	37.9%	62.1%	691	0.62
Intermediate (11-20yrs)	27.9%	72.1%		
Experienced (21yrs+)	33.5%	66.5%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	32.1%	67.9%	683	0.28
Medium (101-500 head)	35.3%	64.7%		
Large (>500 head)	29.7%	70.3%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	38.6%	61.4%	686	0.46
Commercial cow-calf	31.7%	68.3%		
Grazing/growing stocker	29.3%	70.7%		
Feedlot	48.3%	51.7%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	33.0%	67.0%	676	0.35
Peaks and Plains	30.2%	69.8%		
West Slope	36.1%	63.9%		

Websites (Ext. publications & electronic materials

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	50.0%	50.0%	690	0.92
Intermediate (11-20yrs)	54.1%	45.9%		
Experienced (21yrs+)	53.7%	46.3%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	51.7%	48.3%	682	0.29
Medium (101-500 head)	52.9%	47.1%		
Large (>500 head)	57.8%	42.2%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	50.0%	50.0%	685	0.84
Commercial cow-calf	53.4%	46.6%		
Grazing/growing stocker	53.7%	46.3%		
Feedlot	65.5%	34.5%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	50.9%	49.1%	675	0.03
Peaks and Plains	59.2%	40.8%		
West Slope	46.8%	53.2%		

Full day seminars/workshops w/ expert speakers

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	39.7%	60.3%	690	0.91
Intermediate (11-20yrs)	43.2%	56.8%		
Experienced (21yrs+)	40.5%	59.5%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	38.8%	61.2%	682	0.05
Medium (101-500 head)	45.5%	54.5%		
Large (>500 head)	33.6%	66.4%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	38.6%	61.4%	685	0.95
Commercial cow-calf	41.7%	58.3%		
Grazing/growing stocker	39.0%	61.0%		
Feedlot	34.5%	65.5%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	28.3%	71.7%	675	0.02
Peaks and Plains	41.2%	58.8%		
West Slope	46.2%	53.8%		

Presentations at regular meetings

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	48.3%	51.7%	690	0.80
Intermediate (11-20yrs)	54.1%	45.9%		
Experienced (21yrs+)	55.1%	44.9%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	55.0%	45.0%	682	0.42
Medium (101-500 head)	54.8%	45.2%		
Large (>500 head)	52.3%	47.7%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	56.5%	43.5%	685	0.90
Commercial cow-calf	54.5%	45.5%		
Grazing/growing stocker	57.3%	42.7%		
Feedlot	44.8%	55.2%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	53.8%	46.2%	675	0.20
Peaks and Plains	51.1%	48.9%		
West Slope	59.3%	40.7%		

On-line resources (webinars, courses, videos)

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	50.0%	50.0%	691	0.62
Intermediate (11-20yrs)	57.7%	42.3%		
Experienced (21yrs+)	59.6%	40.4%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	59.7%	40.3%	683	0.15
Medium (101-500 head)	55.1%	44.9%		
Large (>500 head)	64.1%	35.9%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	55.7%	44.3%	686	0.94
Commercial cow-calf	58.2%	41.8%		
Grazing/growing stocker	61.0%	39.0%		
Feedlot	65.5%	34.5%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	59.4%	40.6%	676	0.48
Peaks and Plains	60.4%	39.6%		
West Slope	55.8%	44.2%		

Virtual conference

Q23: Years of Experience	No	Yes	Total	P-value
Beginner (0-10yrs)	93.0%	7.0%	690	0.85
Intermediate (11-20yrs)	94.6%	5.4%		
Experienced (21yrs+)	92.3%	7.7%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	93.4%	6.6%	682	0.39
Medium (101-500 head)	92.6%	7.4%		
Large (>500 head)	91.4%	8.6%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	91.4%	8.6%	685	0.81
Commercial cow-calf	93.1%	6.9%		
Grazing/growing stocker	93.9%	6.1%		
Feedlot	86.2%	13.8%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	91.5%	8.5%	675	0.49
Peaks and Plains	93.8%	6.2%		
West Slope	91.6%	8.4%		

Fee for service consulting (1-on-1 training)

Q23: Years of Experience	**No**	**Yes**	**Total**	**P-value**
Beginner (0-10yrs)	91.4%	8.6%	691	0.67
Intermediate (11-20yrs)	87.4%	12.6%		
Experienced (21yrs+)	85.4%	14.6%		
Q27: Relative scale of operation	**No**	**Yes**	**Total**	**P-value**
Small (<100 head)	90.1%	9.9%	683	0.01
Medium (101-500 head)	86.5%	13.5%		
Large (>500 head)	78.9%	21.1%		
Q28: Segment of the industry	**No**	**Yes**	**Total**	**P-value**
Seedstock	80.0%	20.0%	686	< .01
Commercial cow-calf	88.7%	11.3%		
Grazing/growing stocker	85.4%	14.6%		
Feedlot	58.6%	41.4%		
Q31: Regional areas	**No**	**Yes**	**Total**	**P-value**
Front Range	89.6%	10.4%	676	0.13
Peaks and Plains	82.9%	17.1%		
West Slope	88.4%	11.6%		

Question 19. Cross tabulations

	Other producers	University Extension personnel	Soil conservation district	Internet (websites & popular press articles)	USDA agencies	Commodity associations (CCA, CLA, NCBA)	Tot.	P-value
Q23: Years of Experience							700	0.11
Beginner (0-10yrs)	38.3%	13.3%	10.0%	6.7%	5.0%	26.7%		
Intermediate (11-20yrs)	50.9%	21.1%	7.9%	6.1%	0.9%	13.1%		
Experienced (21yrs+)	36.3%	16.7%	8.2%	10.2%	4.8%	23.8%		
Q27: Relative scale of operation								
Small (<100 head)	41.1%	20.6%	10.1%	5.6%	3.6%	19.0%		
Medium (101-500 head)	37.1%	13.8%	9.7%	12.3%	4.7%	22.4%		
Large (>500 head)	38.6%	17.3%	1.6%	8.7%	3.9%	29.9%		
Q28: Segment of the industry								
Seedstock	41.4%	11.4%	4.3%	11.4%	4.3%	27.2%		
Commercial cow-calf	38.1%	18.9%	8.8%	9.4%	3.9%	20.9%		
Grazing/growing stocker	42.4%	12.9%	9.4%	9.4%	2.4%	23.5%		
Feedlot	37.9%	10.4%	6.9%	3.4%	13.8%	27.6%		
Q31: Regional areas								
Front Range	39.8%	14.8%	10.2%	9.2%	1.9%	24.1%		
Peaks and Plains	40.2%	14.6%	8.2%	9.8%	5.2%	22.0%		
West Slope	35.9%	21.8%	8.1%	9.3%	3.2%	21.7%		

Question 22. Cross tabulations

Host a regional ranch gathering

Q23: Years of Experience	Low	Medium	High	Total	P-value
Beginner (0-10yrs)	66.7%	25.0%	8.3%	691	0.99
Intermediate (11-20yrs)	67.9%	24.1%	8.0%		
Experienced (21yrs+)	65.9%	25.4%	8.7%		
Q27: Relative scale of operation	**Low**	**Medium**	**High**	**Total**	**P-value**
Small (<100 head)	74.3%	20.7%	5.0%	685	< .01
Medium (101-500 head)	64.4%	25.2%	10.4%		
Large (>500 head)	55.9%	33.9%	10.2%		
Q28: Segment of the industry	**Low**	**Medium**	**High**	**Total**	**P-value**
Seedstock	42.0%	39.2%	18.8%	687	< .01
Commercial cow-calf	69.0%	24.1%	6.9%		
Grazing/growing stocker	66.7%	19.7%	13.6%		
Feedlot	78.6%	21.4%	0.0%		
Q31: Regional areas	**Low**	**Medium**	**High**	**Total**	**P-value**
Front Range	57.3%	31.0%	11.7%	674	0.09
Peaks and Plains	68.8%	22.4%	8.8%		
West Slope	66.1%	26.3%	7.6%		

Participate in research projects

Q23: Years of Experience	Low	Medium	High	Total	P-value
Beginner (0-10yrs)	31.7%	55.0%	13.3%	696	0.45
Intermediate (11-20yrs)	45.5%	38.4%	16.1%		
Experienced (21yrs+)	37.6%	44.7%	17.7%		
Q27: Relative scale of operation	**Low**	**Medium**	**High**	**Total**	**P-value**
Small (<100 head)	42.3%	46.1%	11.6%	690	0.01
Medium (101-500 head)	39.7%	40.6%	19.7%		
Large (>500 head)	28.7%	49.6%	21.7%		
Q28: Segment of the industry	**Low**	**Medium**	**High**	**Total**	**P-value**
Seedstock	30.0%	42.9%	27.1%	692	0.06
Commercial cow-calf	39.1%	45.1%	15.8%		
Grazing/growing stocker	43.8%	37.4%	18.8%		
Feedlot	32.1%	53.6%	14.3%		
Q31: Regional areas	**Low**	**Medium**	**High**	**Total**	**P-value**
Front Range	34.6%	41.4%	24.0%	678	0.04
Peaks and Plains	41.7%	43.9%	14.4%		
West Slope	34.0%	48.2%	17.8%		

Join a regional rancher group

Q23: Years of Experience	Low	Medium	High	Total	P-value
Beginner (0-10yrs)	30.0%	46.7%	23.3%	693	0.99
Intermediate (11-20yrs)	34.8%	44.6%	20.6%		
Experienced (21yrs+)	32.5%	44.7%	22.8%		
Q27: Relative scale of operation	**Low**	**Medium**	**High**	**Total**	**P-value**
Small (<100 head)	34.3%	44.6%	21.1%	687	0.41
Medium (101-500 head)	31.6%	43.8%	24.6%		
Large (>500 head)	32.0%	47.7%	20.3%		
Q28: Segment of the industry	**Low**	**Medium**	**High**	**Total**	**P-value**
Seedstock	27.1%	42.9%	30.0%	689	0.15
Commercial cow-calf	33.4%	44.4%	22.2%		
Grazing/growing stocker	28.0%	48.8%	23.2%		
Feedlot	42.9%	46.4%	10.7%		
Q31: Regional areas	**Low**	**Medium**	**High**	**Total**	**P-value**
Front Range	23.3%	47.6%	29.1%	676	< .01
Peaks and Plains	39.3%	41.7%	19.0%		
West Slope	27.8%	48.4%	23.8%		

Become BQA certified

Q23: Years of Experience	Low	Medium	High	Already certified	Total	P-value
Beginner (0-10yrs)	41.1%	28.6%	26.8%	3.5%	667	0.68
Intermediate (11-20yrs)	49.6%	24.3%	19.6%	6.5%		
Experienced (21yrs+)	41.1%	25.8%	28.3%	4.8%		
Q27: Relative scale of operation	**Low**	**Medium**	**High**	**Already certified**	**Total**	**P-value**
Small (<100 head)	53.0%	20.9%	20.9%	5.2%	662	< .01
Medium (101-500 head)	40.7%	29.0%	25.7%	4.6%		
Large (>500 head)	28.0%	27.2%	40.0%	4.8%		
Q28: Segment of the industry	**Low**	**Medium**	**High**	**Already certified**	**Total**	**P-value**
Seedstock	38.8%	29.8%	23.9%	7.5%	663	0.5
Commercial cow-calf	42.0%	26.5%	27.0%	4.5%		
Grazing/growing stocker	52.1%	17.3%	25.3%	5.3%		
Feedlot	39.3%	17.8%	39.3%	3.6%		
Q31: Regional areas	**Low**	**Medium**	**High**	**Already certified**	**Total**	**P-value**
Front Range	32.3%	26.3%	33.3%	8.1%	651	0.32
Peaks and Plains	44.1%	25.9%	25.9%	4.1%		
West Slope	43.1%	25.9%	26.4%	4.6%		