

Challenges Impacting the Beef Cattle Industry:
An Analysis of the Implications for a Southern Idaho Ranch

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Executive Summary

This analysis focuses on the changing environment around the beef cattle industry and measures how the emerging challenges impact the industry. The main concern of this analysis is to determine what the implications of these challenges are for a local Southern Idaho ranch. In the process, a major problem will be revealed and a recommendation will subsequently be proposed.

Introduction

This project attempts to show how the factors impacting the beef cattle industry relate to a local ranch called Rocky Mountain Cattle LLC. These factors pose an enormous threat to most of the businesses that are part of the industry, but this project focuses on the uniqueness of the organizational strategies and structures at this particular ranch. To be able to understand how the alternatives and recommendation shared at the end of the project are suitable to Rocky Mountain Cattle LLC, the initial sections of this analysis share crucial information on the organization's history, its current strategy and structure, and the internal and external environments that affect the company, which includes a SWOT analysis that spotlights pertinent strengths, weaknesses, opportunities and threats.

Once the company is clearly defined from all angles, the scope of the project turns to a major problem that the owners of the operation will most likely be facing sometime soon. Interestingly, although there have already been some developments that show the appearance of an issue arising, the actual problem is projected to get worse and truly impact the operation a few years from now. The recommendation shared in the final section of this project is a plan aimed at being as well prepared as possible for when the problem impacts the ranch in full force.

The project emphasizes the viability of the options discussed from an economic standpoint. However, since producers generally have very little or no control over agricultural commodity markets, it's extremely hard to predict what the actual benefit of the solutions proposed could be. For the most part, worst-case scenarios are analyzed — very low hay production per acre, 10-year average market prices, etc. —, with the intent of showing that even in years in which prices or production are low, the solutions could still be viable. Similarly, the cost analysis has been carried out through researched examples that could be applicable to this operation. However, it's important to note that the accuracy of the analysis is dependent on how the available information that was used in this project applies to Rocky Mountain Cattle LLC. The analysis was conducted without knowing all of the intricacies of the operation, which could change some of the cost structures and profitability predictions that are explained. Due to this, before moving on with this recommendation, a more thorough analysis with an internal perspective from the company is suggested.

The Organization

Over one hundred and fifty years ago, President Abraham Lincoln signed the Homestead Act on May 20, 1862. This act gave United States citizens 160 acres of public land in exchange for them to live on it, improve it, and pay a small registration fee. The program granted more than 270 million acres of land, 10% of all US land, on over 1.6 million homestead applications while it was in effect until 1976, when the Federal Land Policy and Management Act repealed the Homestead Act (US Government National Archives). Frederick Jackson Turner, an American historian in the 20th century, described the Homestead Act as “the richest free gift that was ever spread before civilized man” (Muhn, 2019).

In this context, a southern Idaho man named Thomas Reed submitted his entry for a homestead at South Springs in 1926, very close to the border of Idaho and Nevada. At the time, TR was probably trying to support his family, find security and a better economic opportunity, or maybe even adventure, as James Muhn would suggest in his motivations for homesteading from a presentation titled *The “Incongruous Land System.”* Little did TR know that what he started then would become a livestock operation that has lasted just under a century and is still running today.

It appears that South Springs wasn’t enough for this ambitious, hard-working man who would continue to homestead in the following years, even using other family members’ names on official documents, if needed, to be able to obtain approval and be granted ownership of the lands. As his economic power grew, not only did he homestead in a couple of other locations, but he was also able to buy out other homesteaders in places as far north as Bruneau, Idaho. In 1933, TR passed away, and he left one dollar to each of his five boys and five daughters, for a total of ten dollars passed down in his will. Apart from that, one of his sons, Jacob Reed took over the main parts of the operation.

If the rocky geology and arid climate type that are evident south of the Treasure Valley are considered, it’s clear that the water supply is limited. With big rocks all across the desert and a scarce water supply, it’s extremely difficult to make improvements on the land. Because of this, homesteaders would try to find areas where water was available and rocky terrain wasn’t an impediment, leaving thousands of desert acres in hands of the government. Before the mid 1930’s, animals were able to roam freely across that southern Idaho desert that was owned by the US, with the only limitation being the need to cooperate with others who were also trying to graze the public lands to keep their animals alive. However, in 1934, the Taylor Grazing Act was passed into law by President Franklin Roosevelt with hopes of providing regulated grazing on federal public lands to “improve range conditions and stabilize the livestock industry in the American West” (Oregon BLM, 2012). From then on, legal regulations were put in motion, and operations like the one that TR had started, began to take shape.

In 1936, due to a severe drought along with the overgrazing of public lands in that part of Idaho, individuals were forced to report the number of livestock that they were running, so that the government could form more accurate regulations. At that time, JR recorded ownership of 2,000 sheep at the Department of Land.

It wasn't until 1961 when the operation got passed down to the next generation. JR sold 1150 ewes¹, 150 lambs², 17 rams³ and 70 Hereford cattle⁴ with a Diamond 2 brand⁵ to his son, Jake. In the late 1960's, Jake decided to get rid of the sheep and convert the operation to one that only ran cattle. In 1974, the ranch was sold to Jake Jr. and Clint, sons of Jake, and they incorporated a new WS brand, as well as new genetics through the Angus breed⁶. Finally, in 2015, the property was sold to their brother-in-law, and the beef cattle herd was purchased by their niece and her husband, and another couple that partnered with the latest descending owners. Today, both couples run the operation on approximately 5,000 acres of deeded land, which is land that has been transferred by a deed, and 66,400 acres of government land, extending from the Bruneau Valley, all the way to the Idaho-Nevada state line. The herd has grown to its maximum capacity of around 300 mother cows and approximately 18 bulls, determined by the grazing limitations of the government allotments used on the ranch.

Internal Environment: Strengths and Weaknesses

The history and development of this beef cattle operation goes far beyond the family having a very rich past to share. In fact, the work that TR started almost one hundred years ago is precisely one of the company's main strengths today, and both the land and the cattle are there to show for it. The ratio of 300 head of cattle on 66,400 acres might seem like there aren't enough cattle for that amount of land, but the ratio is misleading. The cows graze different areas of the ranch during different seasons of the year, getting moved as far down in altitude as possible in the winter, and being pushed as far up on the mountains as possible in the summer. This means that the cattle graze different parts of the acreage for three- to four-month periods at a time, giving the soil a chance to recover and grow new grass for the next time they come around. This system provides the ranch with grassland throughout the year, even during the winter months, meaning that the company doesn't have to incur any type of feed costs apart from mineral supplementation. To put this into perspective, the average 1,200-pound beef cow eats 2% of its body weight, or 24 pounds a day, at least (Radke, 2013). So, 300 cows eat 7,200 pounds per day, or the equivalent of 3.6 one-ton hay bales per day. Under the assumption that most cows in Idaho are fed during 4 months or approximately 120 days to make it through the winter, 300 cows would eat 432 tons of hay during that time period. According to a US Department of Agriculture report on hay prices in Idaho, the average cost of a one-ton utility hay bale⁷ on the week of December 3rd, 2021, was \$210. So, if Rocky Mountain LLC had to feed their cows to get through the winter this year, it would cost them \$90,720 to buy the hay now. In other words, that's the amount of money that the ranch is saving thanks to having a winter range for the cows to be on, and ultimately thanks to what started in 1926.

¹ Adult female sheep

² Sheep that are less than one year of age

³ Adult male sheep

⁴ A cattle breed originated in Herefordshire, England in the 1600's, recognizable by their red and white pigmentation, and used for beef production

⁵ A way to show ownership

⁶ A cattle breed originated in northeast Scotland at the beginning of the 19th century, recognizable by their lack of horns and predominantly black pigmentation, and used for beef production

⁷ Hay that isn't of the highest quality

Also, another thing to note about the way that the ranchlands are set up is that the cows travel 40 miles in one direction and 40 miles again to return every year and they do it all by foot. Although it's a long way, they have 365 days to do it, and the main point is that they aren't transported by truck every time they need to be moved. Cattle lose 1% of their body weight per hour for the first three to four hours of transit (Barnes, Lalman & Smith, 2017). This allows the company to trail the cows, prevent stress and weight loss, and maintain the herd as healthy as possible at all times.

As for the herd itself, it goes back to 1961 at least, when JR sold 70 Hereford cattle to Jake. By 1970 the sheep had been sold and all attention and care was devoted to the cattle. Fifty years are plenty when it comes to animals adapting to their surroundings and obtaining survival skills that cows which are accustomed to other climates and terrains lack. Today, the cattle thrive in the ecosystem they live in, thanks to the genetics that have been modified and passed down through their offspring as years have gone by. To give an example, these cows are able to survive in below freezing temperatures and with up to 6 inches of snow on the ground, because they have learned to dig down through the snow to find grass, and use the snow itself as a hydration source. Apart from that, the older cows also know their way around, making the job easier for the cowhands that try to manage and move them from one allotment to another.

Today, there are four people that own, manage and run the operation. Interestingly, although they are all capable of handling any type of problem that comes along in the beef cattle operation, each one of them specializes in a certain area that complements the skills of the rest of the partners, forming a very knowledgeable and strong team. They're all experienced cattle growers, but to put it simply, there's a veterinarian, an accountant, a handyman, and an all-around problem solver. When these skills are put together, Rocky Mountain LLC is able to operate without having to outsource or bring in ranch hands. It isn't often that they need a lot of extra help, but when they do, it's usually on important days, two or three weekends per year during branding or weaning⁸, for example. They are able to get the help they need for these labor-intensive days from family and volunteering neighbors, keeping employee costs extremely low.

Similarly, both couples have different backgrounds that also bring other strengths to the team. The couple that is related to TR and has family ties to the ranch, has grown up in the area and knows every hill, meadow or mountain that the cows live on. That has also allowed them to build very strong relationships with the surrounding ranchers. In addition, they have experience owning alternative businesses — bookkeeping and excavating —, providing them with good business acumen. The other couple has been running a separate beef cattle operation in a different area of Idaho, long before they began this partnership in 2015. Through that, they have obtained a lot of knowledge about the science of beef production and stay well-informed about growth maximization techniques and managing the overall health of beef cattle.

One might think that this operation is well set up and runs very smoothly, which it does, but like in any other business, there are also weaknesses at Rocky Mountain LLC. The first is their dependence on the Bureau of Land Management. The BLM is a government bureau in charge of “sustaining the health, diversity, and productivity of public lands for the use and enjoyment of

⁸ Separating the calves from their mothers

present and future generations” (BLM). The ranch depends on the BLM in terms of knowing how many cattle they can run on the ranch’s different allotments of government land. This is a weakness because each allotment has a different size and a different number of AUMs — animal unit months —. The animal unit stands for a 1,000-pound cow and her un-weaned calf, and an AUM is “the amount of air-dry forage an animal unit will consume in one month” (Scasta, Stam & Thacker, 2018). To obtain a number, the BLM makes the assumption that a cow will consume 2.5% of her body weight per day, which for a cow of this size would be 25 pounds per day. Then they multiply that by 30 days, to come up with 750 pounds per month. So, for example, if the BLM says that an allotment has 100 AUMs, it means that allotment can support 100 animal units for one month. When these AUMs vary from one allotment to the other, it makes it very difficult to operate at maximum capacity at every field that the cows use throughout the year. The point is that if the company’s cattle inventory is at 300 cows because the BLM only allows it to have that many in the fall allotment, but in the winter it’s allowed 800 in the new field that they get moved to, the company is basically losing the opportunity of running 500 extra cows in the winter time. Apart from that, the BLM also sets restrictions for when you can enter and by when you have to leave each allotment.

There are also some concerns involving the management team. Although they possess outstanding skills, this is a part-time job for all four of the owners. As described earlier, one couple has another cattle operation that they are in charge of, and the other couple is busy managing alternative businesses. Unless there is an emergency, they generally have their days at Rocky Mountain LLC well planned out, and might have to put certain tasks or projects of less importance at the ranch off to a side, because they don’t have enough time to get to them. In contrast, all of their neighbors are full-time ranchers, so whatever they can’t get done one day, they can get back to the next. In fact, they seem to like, or even take advantage of that at times. For example, when those full-time ranchers receive a phone call from a neighboring rancher saying that a handful of cows have slipped through the fence, they have the time to go out the next day and pick them back up. Rocky Mountain LLC doesn’t have that time, so they put a big emphasis on making sure that all fences are up, undamaged, steady and robust. The issue is that the neighboring ranchers don’t feel the need to have to go through the time and work that checking and fixing fences takes, so that task is completely up to Rocky Mountain LLC.

They can easily run into communication challenges as well, because telephone service isn’t easily accessible on the ranch. The daily plan of attack needs to be clearly spelled out beforehand, so that they aren’t trying to solve problems on their own without the input or help of the rest of the partners. Furthermore, both families live in town and away from the ranch. It takes at least two hours to drive from their homes to the top of the mountain where the cows are during the Summer. Apart from the time investment involved, this obviously requires quite a bit of fuel money that makes their operating cost more expensive than it could otherwise be.

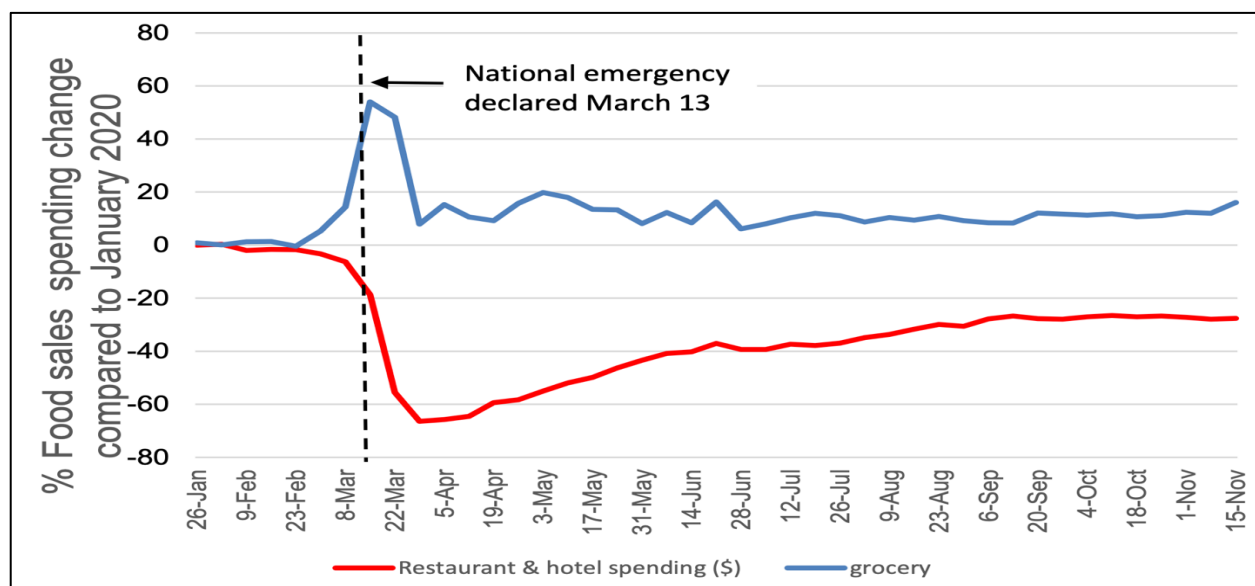
Finally, although all four owners of the ranch are extremely hard-working and committed to the success of the company, they hardly ever seem to split the work and are constantly trying to help one another. No matter what the task at hand is, both couples are always driving long hours in two separate family pick-ups, to be able to help out on the range. This might help in making the work days shorter, because there are eight hands on the job instead of four. But although it can

very well sound like a strength, and in many ways it is, the reality is that they don't usually split the input, but they always split the profit.

External Environment: Opportunities and Threats

The United States beef cattle industry is usually divided into two sectors: cow-calf producers and cattle feeding (Economic Research Service, 2021). Considering that Rocky Mountain Cattle LLC is a cow-calf operation, the focus of this analysis will be on this sector, although a lot of the challenges that the industry is facing affect both. The first of these challenges is the COVID-19 pandemic. Practically every industry in the world has been affected by it, and the beef cattle industry is no exception. Due to the pandemic, global trade fell 14% in the second quarter of 2020, which amounted to a reduction in demand for US meat exports and downward pressure on prices of meat and livestock (Balagtas & Cooper, 2021). Furthermore, people and firms began to take private precautions to protect themselves from the virus, which along with mandates, resulted in an exceptional reduction in food service meals and an increase in demand for meats in grocery stores.

Figure 1. Spending change because of the first COVID-19 case in January 2020 and the National Emergency that was declared in March 2020



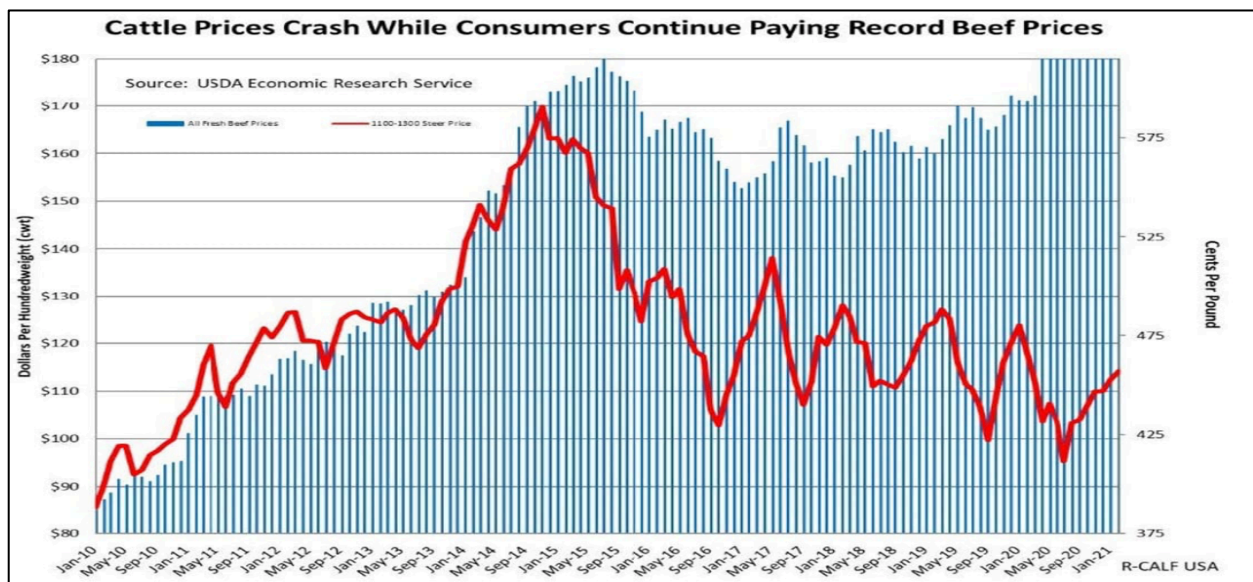
Source: Opportunity Insights (2020)

What the graph shows at any of the dates after March 22nd is that the percentage of spending in restaurants has decreased more than the percentage of spending at grocery stores has increased. This reflects an overall decrease in demand. As if this wasn't enough, US meat supply chains were also affected when meatpacking plants and processors were forced to diminish production or even shut down temporarily, as COVID-19 spread through the workforce (Bunge, 2020). In fact, according to Cortney Cowley, a senior economist in the Regional Affairs Department of the Federal Reserve Bank of Kansas City, daily capacity at US cattle processing facilities declined as

much as 45% in May 2020, resulting in beef shortages like never before. The cattle were there, but they weren't making it to the shelves (Stoller, 2021).

Today, meatpacking plants and processors are struggling to get back to their previous operating efficiency, but since there is “a lack of competition at a key bottleneck point in the meat supply chain — meat-processing —,” they have increased the price of beef to the extent that in September of this year, the Biden administration attacked the industry over the high prices, calling for an end to pandemic profiteering (Deese, Fazili & Ramamurti, 2021). The lack of competition comes from the fact that there are only four large conglomerates — Cargill, Tyson Foods Inc, JBS SA and National Beef Packing Co — that overwhelmingly control meat supply chains (Smith, 2021). In 1997, the four largest beef packing firms controlled 25% of the market, compared to 82% today (Deese, Fazili & Ramamurti, 2021). The issue this creates is that there is too little competition among beef processors to buy cattle, which means that while these four conglomerates see increases in the prices they're getting for beef, ranchers can only sit back and watch the prices they get for their cattle remain low.

Figure 2. The red line shows the prices ranchers have been getting for cattle, while the blue bars represent the prices meat-packers have been getting for beef.



Source: R-CALF USA (2021)

However, ranchers would probably be happy if COVID-19 was their only threat. Another big external factor that the industry needs to look out for is the ease with which false information is spread nowadays, and how that has begun to affect the industry. There are a lot of people in the world that are trying to link negative consequences to the consumption of beef. This is happening especially on two levels. First, the growing environmental concern has pushed people towards believing that all cattle production is harmful to the environment. What's more, at the COP26 climate summit held just weeks ago, governments started looking into enforcing quotas on meat consumption and some think that taxation could be a more realistic solution (Morris, 2021).

It has been scientifically proven that ruminants⁹ release methane gas — CH₄ — every time they defecate, which is “the second most abundant anthropogenic greenhouse gas after carbon dioxide — CO₂ —” and “affects the earth’s temperature and climate system” (US Environmental Protection Agency, 2021). However, when we look at the history of our planet and think of what it was like in prehistoric times, ruminants were already here in abundance. A good example is the American Bison, which is now the national mammal of the United States. This majestic animal is a ruminant just like cattle, sheep, goats, deer or others, and the American prairies used to support greater numbers of them than they now do cattle (Broughton, 2016). Keeping this in mind, it’s important to know that bison generate “as much or more methane as do beef cattle on a per-head-basis” (Lusk, 2014). Not only is this so, but the positive impact that ruminants have on our planet is left unattended when talking about climate change and the environment. Grasslands are the greatest sequesters of carbon and they need animals to stay healthy. When managed well by ranchers, with adequate recovery time for example, ruminants take carbon out of the atmosphere and place it in the soil. Ruminant manure and the carbon that goes with it, plays a key role in increasing a microbe called mycorrhizal fungi. These fungi have the “unique ability to tap natural nutrient deposits and supply them in a usable form for plants” and for a plant’s roots, “a cubic meter of searchable soil is exponentially increased to a cubic kilometer where a strong mycorrhizal fungi population exists” (Howard, 2020). In fact, there are studies and examples that show how crucial livestock are for the development of mycorrhizal fungi. Ray Archuleta, a conservation agronomist at the NRCS East National Technology Center, says that “cows are needed. Dung, urine and manure are needed in the ecosystem. They stimulate nutrient cycling.” Below is an example of a case study that proves that well managed cattle are needed. The Las Damas ranch in the Chihuahuan Desert in Mexico is operated as a dryland ranch with no irrigated meadows, and through the good management of cattle they have been able to restore native grasslands.

Figure 3. The picture on the left shows the Chihuahuan Desert under bad management, and the picture on the right shows the transition after adaptive grazing practices thanks to cattle.



Source: Understanding Ag

Just like in every industry, there are agricultural practices that aren’t managed well and that harm the environment. However, that isn’t the case for all livestock production. Regardless, the

⁹ Herbivorous, even-toed, hoofed mammals that have a complex 3 to 4 chambered stomachs

reality is that society has a growing misbelief due to not being fully educated on the matter. This idea is steering potential consumers away from beef consumption, as well as misleading governmental agencies in the direction of beginning to think about taxing all beef producers, when many of them have placed the ecosystem that surrounds them as their top priority.

The other mindset that seems to be growing in society is connecting adverse health outcomes to beef consumption. Although there are numerous articles and studies that suggest that beef consumption increases the risk of cancer, there are probably just as many that show the opposite. For example, Tamara Willner, a registered nutritionist with an MSc in Clinical Nutrition from Roehampton University, says that “animal and in vitro studies have suggested that high doses of certain chemicals found in red meat may have cancer causing effects,” but “the doses used in these studies are far higher than the amounts we’re typically exposed to.” Again, this growing belief drives consumers away from beef.

Although the beef industry is facing numerous challenges that might compromise the future of the business and how it will function in upcoming years, there are also opportunities to continue to be successful. Consumers are more interested than they ever have been in food production and knowing where it comes from. The International Food Information Council says that according to a survey, “nearly two-thirds — 63% — of adults say the ingredients in a food or beverage have at least a moderate influence on what they buy.” This creates an opportunity for ranchers to market their own beef and try to change their production system of either cow-calf or cattle feeding, to one where they take charge of the calf from the moment it’s born until it’s ready for market. There are obviously costs involved with a change like this. For a cow-calf operation like the one being analyzed in this paper, the calves are generally sold when they are around 8 months old and weigh somewhere between 500 and 600 pounds. Generally speaking, cattle are usually ready for market when they are at least 14 months old and weigh around 1,200 to 1,300 pounds. That means that a cow-calf operation wanting to market their own beef would have to feed and take care of those animals for an extra 6 months, at least. Regardless of if they chose to do it themselves, or outsource to an independent feeder, there would be a considerable added cost. However, according to data from the Beef & Dairy Market Reports shared by the Idaho Farm Bureau Federation on October 8th 2021, steers between 500 and 700 pounds sold for \$151 per hundredweight — cwt¹⁰ —, at the highest. If we take a 600-pound steer¹¹, a cow-calf operation could expect to get \$906 at most for that animal, at that price. Now think of that animal at least 6 months later when it weighs 1,200 pounds. According to a South Dakota State University extension article, you can expect a “740-770-pound carcass from a 1,200-pound steer.” Supposing that the steer is average in terms of fat and muscling, the producer will get “490 pounds of boneless, trimmed beef from a 750-pound carcass.” That translates to 185 pounds of ground beef, 85 pounds of round roasts and steaks, 90 pounds of chuck roasts and steaks, 80 pounds of rib and loin steaks, and 50 pounds of other cuts. If we give that breakout an economic value using an average retail price obtained from the US Labor of Statistics of \$6.03 per pound, the meat could add up to be worth around \$2,954.70. That means a \$2,048.70 increase from selling the steer at 8 months of age, which makes one believe that it could be worth it, depending on the increase of the costs involved. Also, ranchers that market their own beef can take advantage of the opportunity to educate their customers in regard to the

¹⁰ Hundredweight will appear as ‘cwt’ on market reports

¹¹ A good sized steer at the age of 8 months old

production practices they are using, as well as teaching that beef cattle are used for many other purposes. For example, hides, hooves and hair from beef cattle are used to make things like sports equipment, leather goods, and paint brushes. Fats are used to make soap, shampoo and cosmetics. And the pancreas and liver are used to make medications for diseases such as anemia and hypoglycemia (AgMag, 2021).

Another opportunity that is showing up in the industry is the need to fill niche markets. These could include a rising interest in grass-fed beef, dry aged beef, or even simply Wagyu beef¹². According to an IRI report released in November of 2019, there had been a 16.1% growth in annual dollar sales of organic grass-fed beef (Loria, 2020). In regard to dry aged beef, the price of it is two to four times more expensive than retail meat, and there are a lot of exporting opportunities (Ashman, Hastie, Hunyh, Jacob & Warner). As for the Wagyu beef, its extremely high quality in terms of tenderness, flavor and juiciness, and its unique high concentration of beneficial omega 3 and omega 6 fatty acids make it extremely valued by consumers and allow producers to charge premiums for it (Beyond Beef Wagyu, 2021). Because of these reasons, beef cattle producers could look into producing these types of meats.

Finally, in today's world, with all of the technological advancements and scientific know-how, genetics play a key role in beef cattle production. To put it simply, important beef production profit drivers related to animal performance are influenced by the genetic make-up of the herd. Some of these profit drivers are weaning rates, cow survival rates, cow weights, calving ease, sale weights, retail beef yield, or marbling score, for example (Meat & Livestock Australia, 2019). To be as profitable as possible, producers should focus on constantly improving genetics in their herd.

Organizational Strategy: Business-level and Corporate-level Strategies

Rocky Mountain LLC earns its revenues mainly from selling steers¹³ and heifers¹⁴ when they are 8 or 9 months old. Those steers and heifers are a commodity, which are raw materials or agricultural products that can be sold. In pure commodity markets, competitive advantage goes to the company that has the lowest cost (Hill, Jones & Schilling, 2017). Since commodity prices are always fluctuating, low costs enable a company to make a profit at price points where its rivals are losing money. Similarly, most businesses involved in the exchange of a commodity tend to ignore different market segments and produce a standardized product for the average consumer, using a standardization strategy. Since Rocky Mountain LLC produces a product for the average consumer and their product is directed to various market segments, the business-level strategy that they are currently following is a broad low-cost strategy.

For a small company like this one that doesn't have any employees other than the four owners, the goal of a corporate-level strategy is basically to identify the courses of action yielding better profit to the company. Looking at the history of the company and how it has focused solely on beef cattle production since the late 1960's, the company hasn't decided to grow, diversify or enter new markets. Because of this, a stability strategy is the corporate-level strategy that Rocky

¹² Any of the four Japanese beef cattle breeds, known for their intramuscular fat, or marbling

¹³ Male bovine animals castrated before sexual maturity

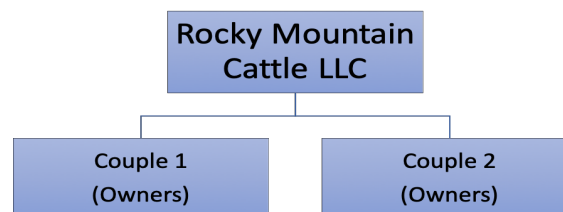
¹⁴ Young cows that have not had a calf

Mountain LLC is using. This strategy takes the existing success under the platforms already in place to maintain market share. The methods used include making the process of beef production more cost efficient (Leonard, 2019). Since the company is already profitable and there are extreme difficulties involved with changing the way a beef cattle production operates, the owners don't feel the need for growth strategies like vertical or horizontal integration, diversification or market penetration.

Organizational Structure

The organizational structure at any company is considered to be “the system that outlines how certain activities are directed in order to achieve the organization’s goals” (Kenton, 2021). The structure also defines what the flow of information is like within the organization. In general, companies can either have a centralized or decentralized structure. In a centralized structure information flows from the top down, while in a decentralized structure most employees have decision-making power. At Rocky Mountain LLC the structure in place is a decentralized one. The owners are the only employees and they all have the same level of authority within the organization. Information flows equally through the four owners on the same level, without being sent up or down to an employee of higher or lower position.

Figure 4. Organizational Chart of Rocky Mountain Cattle LLC.



However, successful organizational structures also define each employee’s job. In this case, although all four owners take on most of the tasks together, there are some areas of the operation that each couple is accountable for. In this cow-calf operation, the only animals that are together year-round on some field of the ranchland are the cows. Other important assets like the bulls that are needed to breed the cows, or the calves that the cows produce are taken out of the herd yearly. For example, the bulls are taken into the winter range in March and are taken out in July, right before the cows make their way up to the mountains for the summer. The rest of the year, the bulls are away from the cows, recovering and putting weight back on after having lost between 100 to 200 pounds during the breeding season (Daly, Olson, Perry & Walker, 2009). They spend 7 months out of the year on one of the couple’s private land.

Similarly, all calves are weaned at about 7 or 8 months of age every year. From there they go to the other couple’s private land for 45 days before they’re sold. This process is called preconditioning and it’s usually done by cow-calf operations to “offset shrink associated with stress of the weaning process,” as well as allowing the calves “some additional time to gain weight before marketing” (Mauldin, 2021).

Then, when the calves are ready to be sold, a small percentage of heifers are kept by the ranch to be put back into the herd as replacement heifers. These are heifers that are selected to be bred and placed in the herd, often replacing cows that have been culled — reducing or controlling the size of the herd by removal — due to old age, infertility, or sickness, for example. These animals are taken care of on private land until they are mature enough to be back in with the herd. So, in terms of employee responsibilities, one couple provides land and care for the bulls, while the other provides the same for the calves and replacement heifers.

The company's structure and the way that the employee responsibilities are shared fit hand in hand with the strategy of Rocky Mountain Cattle LLC. The low-cost strategy that the ranch follows is actually reflected in the structure, and vice versa. Since the owners of the organization are utilizing private lands that are independent from the ones available to the ranch for the cow-calf operation, the ranch is able to cut its costs by not having to find pastures for its bulls or not having to custom feed and pay feedlots to take care of the preconditioning process.

Another main component of organizational structures are their control systems. The ones used by this ranch all tend to be output controls. This type of control system in particular, “focuses on measurable results within an organization” (Edwards, 2014). In other words, this control system involves closely monitoring Key Performance Indicators — KPIs —. For cow-calf operations, the most important KPI of ranch productivity is “pounds weaned per exposed female” (Anderson & Bevers). This indicator is a function of other important metrics like weaning percentage¹⁵ and weaning weights. Other economic KPIs include revenue per breeding female, operating expense as a percentage of total revenue, or cost per cwt. of weaned calf, for example. Meanwhile, there are other metrics that don't show the economic impact within themselves, but that are still important. These include pregnancy percentage¹⁶, calving percentage¹⁷, or calf death loss percentage¹⁸, for example. These Key Performance Indicators and metrics are at the core of the control system at Rocky Mountain Cattle LLC, and they provide the management team with the necessary information to be able to make decisions to lower costs and be as profitable as possible.

The Problem

In the quest of trying to identify the most crucial management challenge for Rocky Mountain Cattle LLC, it's paramount to fully understand that the company has two main tangible resources that are equally important. These tangible resources are the livestock and the land. While reflecting on businesses that make a living by producing and selling animals, many may think that their main asset or resource is the animal. Although this assumption is partially correct, this asset can't exist if it doesn't have food and water. In the case of this operation, which runs on 66,400 acres, food and water for the livestock are provided by the land, making it a tangible resource just as important as the animal itself.

As was explained in a previous section of this paper, the management practices used by cattle producers can play a key role in taking care of the land. However, there is also a major factor

¹⁵ Number of calves weaned divided by the number of live calves that were born

¹⁶ Number of pregnant cows divided by number of total cows exposed to bulls

¹⁷ Number of cows that calved divided by the number of pregnant cows

¹⁸ Number of calves that died prior to weaning divided by number of calves born

that's out of the control of ranchers and is a critical component of every decision-making process that they're involved in. The factor under consideration is the weather and mother nature. Where the ranch is located, in Southwest Idaho, the climate type that the ranchers have to deal with is arid. An arid climate is defined by the lack of moisture. "The soil is dry, the air is dry, and yearly precipitation is very low" (Patrick, 2018). In fact, precipitation is so scarce that Rocky Mountain Cattle LLC relies primarily on the snow that falls high in the mountains during the Winter. The following Spring, that snow melts and fills creeks, waterholes and reservoirs throughout the ranch, providing water supply for the cattle, as well as moisture to help the grass grow.

The issue is that the amount of precipitation the ranch is going to get in a year is always an uncertainty. This can create two big problems for the ranch. The first is the risk of not having enough water or feed because of the lack of precipitation, and the other is that in years with big storms, especially in the winter, water sources easily freeze and the snow can impede cattle from finding feed. Looking at recent years, the first issue is the one that has posed the biggest threat, but the owners are always alert during the winter months, in case major storms are on the way.

This is an issue that has affected anyone involved in the practice of taking care of livestock in the wild, throughout history. However, what truly makes this a problem that the management team is going to have to get ready for are the technological advancements and scientific know-how that have allowed humans to make predictions into the future that most ranchers are hoping will be wrong. According to States at Risk, a project aimed at showing how Americans in all 50 states are experiencing the impacts of climate change, "Idaho is projected to see a 110% increase in drought threat," by 2050. This year alone, "61% of Idaho land was in drought status compared to 20% one year ago" and as of June 1, "only the highest elevation sites had snow remaining" (Natural Resources Conservation Service, 2021). This could be a periodic event, at least that's what most people are hoping, but the science is suggesting the opposite. And for any type of operation that depends on mother nature so much, to ignore this problem and look another way would be extremely irresponsible and could hurt the business in ways beyond repair.

Alternatives and Issues

The problem of future drought threat prolonged over time would bring about extreme complications, jeopardizing the profitability of Rocky Mountain Cattle LLC. This is because the company's low-cost strategy would be impaired by the urgent need of solutions to be able to keep the livestock alive. Almost every alternative involves a cost increase, so the challenge is to find an opportunity that could also result in increased revenue.

The first possibility for Rocky Mountain Cattle LLC is to predict what the year ahead will be like and manage stocking rates accordingly. The stocking rate is "the number of animals on a given amount of land over a certain period of time" (Bidwell & Redfearn, 2017). Assuming the threat of drought, water supply and feed will both decrease, meaning that the decision regarding the ranch's stocking rate would involve reducing the number of cattle. This decision doesn't affect the costs of production too much, but it does decrease the revenue as stocking rates are reduced, supposing that the price that ranchers get for their calves remain somewhat constant or close to the average.

If the ranch decided that the stocking rate shouldn't be adjusted, another way to support the current number of cattle without reducing it would be to find new land or pasture. The land could either be bought, or rented, but it would be very costly either way. Apart from the cost factor, the ranchers wouldn't be able to know exactly what time of the year that land would be needed. For example, one year the ranchland could be short on feed in the summer pasture and the next year it could be lacking water in the winter allotment. This would make it extremely difficult to manage, especially if the decision was to rent land.

To simplify and address each situation more specifically, the drought affects the ranch on two levels. It can either limit the water supply, it can have an impact on the amount of feed available for the cattle, or it can reduce both. A solution to the water shortage could be to haul water to the cattle. This would practically be the only way to tackle the situation without moving the cattle off of the ranch to a new location that did have water. In the case of Rocky Mountain Cattle LLC, one of the couples already owns a water truck, so the ranch could lease and use it for this purpose. In terms of trying to make up for feed shortages without reducing numbers or moving the cattle off of the ranch, the alternative would be to buy hay and feed it to the cattle. In a scenario in which the cows would need to be fed for a specific period of time of 4 months at most, this option would have the potential to be effective. It would increase the cost by at least \$40,000, if the price of hay was quite low, but the operation could still remain profitable — understanding profitable as a positive result from subtracting revenues with costs —. The issue is that there is no assurance that the cows would only need to be fed for 4 months. If the drought conditions were really severe, they might need to be fed for a time period longer than 4 months, making the costs unbearable, especially if the price of hay isn't low.

Recommendations and Implementation

The alternatives provided above could work under certain circumstances. They could even complement each other if a decision was made to adopt more than one of those solutions at once. However, the recommendation described in this paper will be much more complex. It will address the problem from two different directions. First, an alternative will be recommended to combat water supply deficiency and after that a recommendation will be made to confront the threat of feed shortage.

Water Supply

As argued in the previous section of this paper, water supply deficiency can only be dealt with by hauling water. To do this, the ranch would have two options depending on what future profits allow the company to do. With profits permitting, the owners could look into investing in a water truck as a tangible resource for the operation. Otherwise, the ranch could take advantage of the fact that one of the couples already owns one, and it could lease it directly from them.

Feed Shortage

In regard to the recommended solution to the threat of feed shortage, it involves the use of some of the owners' private lands that were described above in the *Organizational Structure* section. As a reminder, one of the couples takes care of the bulls that are used for breeding on their private land, while the other couple takes care of calves and replacement heifers on theirs. This recommendation will focus on the private land of the couple that takes care of the bulls.

Breeding system modification to lower bull stocking rate and increase profitability.

The breeding system used in this operation is known as natural service breeding, where bulls breed cows as they naturally show heat. According to a study from The Ohio State University conducted by Dr. Mike Day, the recommended bull to cow ratio is 1 bull for every 20 to 30 females. At Rocky Mountain Cattle LLC, considering the information provided in *The Organization* section, there are approximately 300 cows and 18 bulls. This means that the ratio is 1 bull for every 17 cows, which is lower than the recommended ratio. It's lower to try to maintain a high pregnancy percentage, by ensuring that the bulls have a better chance of getting to the females and breeding them.

Although most cow-calf operations use natural service breeding, there are some cattle breeders that use reproductive technologies like artificial insemination — AI —, or estrous synchronization — ES —. More specifically, commercial producers have taken advantage of these technologies simultaneously to come up with timed artificial insemination — TAI —. TAI involves using estrous synchronization to inseminate all cows at the same time. Estrous synchronization allows the breeder to alter the normal 21-day estrous cycle in cattle to be able to breed a group of females at the same time (Dyer & Graves, 2017). The process involves an injection of prostaglandin — PG —, two injections of gonadotropin-releasing hormone — GnRH —, one controlled internal drug release — CIDR —, and a straw of semen. Prostaglandin affects the estrous cycle, making estrous occur 2 to 6 days after cows are given the injection, the GnRH is a hormone that causes the release of other hormones that affect follicle development and ovulation, and the CIDR is a hormone that works to maintain the pregnancy (Carpenter & Sprott).

Some of the reasons producers have adopted TAI include the access to genetics from sires that would be too costly to purchase for natural service breeding, choosing genetics from multiple bulls to breed selectively, or the ability to narrow the calving time frame (Boyer, Carter, Griffith & Rhinehart). The last reason just mentioned can be a huge potential advantage, because when calves are born within the first 21 days of the calving season, producers are able to “market larger, more uniform groups of calves,” and “TAI is estimated to have a net benefit of \$11,110 for a 40 cow-herd compared to natural service because of improved conception and wean rates, as well as heavier weaning weights” (Beef Research, 2018). To be clear, with the current breeding program being implemented at the ranch, the calving season can be up to 3 months long. This results in calves being born up to 3 months apart, meaning that the ranch isn't capitalizing on the calves that are born later, since they're all weaned at the same time. By weaning time, some calves have been gaining weight for three months longer than others have, indicating that the ranch isn't maximizing its overall weaning weight opportunities. In contrast, under the assumption that TAI provides a conception rate of at least 50%, this breeding method can assure that the ranch is calving at least half of its calves within the first 21 days of the calving season. This gives those calves a chance to be gaining weight at the ranch for as long as possible, increasing overall weaning weights and sales revenues after weaning. Not only is this so, but since at least half of the herd conceives through artificial insemination, the inventory of bulls can also be reduced by half. These bulls that would be kept are called clean-up bulls, because their job is to breed the cows that failed to conceive through artificial insemination.

The fact that with TAI the amount of live bulls needed could be reduced at least from 18 to 9, means that the stocking rate at the private land would also be reduced considerably. The

reduction of live bulls would mean that the cost of buying new bulls would also decrease. Since the two couples that currently operate the ranch took charge in 2015, they have had to buy at least two bulls per year to replace bulls that were old, sick, or sore footed. Each bull costs at least \$5,000 dollars, so reducing the need to have as many as the ranch currently requires would also reduce the need to buy replacements. However, although artificial insemination could provide the operation with a competitive edge, it also comes with costs.

Figure 5. Cost per Cow Pregnancy.

Herd size (# of breeding females)	150		
	NS	TAI+NS 45%	TAI+NS 60%
Timed AI conception rate (%)			
Total cost of AI (\$)	--	7762.50	7762.50
Total cost per AI pregnancy (\$)	--	115.00	86.25
Number of natural service bulls ^b	5	3	2
Bull purchase price (\$/hd)	4,000		
Annual bull cost per female exposed (\$) ^c	54.28	32.57	21.71
Total breeding cost per cow pregnancy (\$)^d	57.14	88.76	77.33
Bull purchase price (\$/hd)	6,000		
Annual bull cost per female exposed (\$) ^c	73.52	44.11	29.41
Total breeding cost per cow pregnancy (\$)^d	77.39	100.91	85.43

Source: Boyer, Carter, Griffith & Rhinehart.

The data on the table above shows that there's at least a \$23.52 increase in the total breeding cost per cow pregnancy if the AI conception rate is 45%, elevating the total breeding cost by \$7,056. Nevertheless, the potential gains associated with boosted weaning weights described above could easily offset the cost increase.

Transformation of unirrigated pasture to farmable land and possible benefits.

The private land that the bulls are currently kept on has close to 240 acres of farmable land, but it's currently used as unirrigated pasture although the owners do have water rights. The reduction of live bulls could allow the couple to turn the pasture into irrigated farmland and grow hay. Instead of having the bulls graze the pasture, they could be fed part of the hay that the couple would produce. The rest of the hay could be used to feed cows in the case of feed shortage due to drought, or it could be sold to other ranchers and provide another income stream if the cows didn't need it.

To understand the potential profitability of this alternative, there are a few factors to take into consideration. According to statistics from the US Department of Agriculture, the average yield for alfalfa hay in Idaho during 2020 was 4.5 tons per acre (Idaho Crops, 2021). Assuming that the couple could achieve at least average production, they could produce 1,080 tons of alfalfa hay per year. The 9 bulls, weighing an average of 1,800 pounds and eating at least 2% of their bodyweight per day, would consume 19.44 tons of that hay over a 4-month period, leaving 1060.56

tons of hay left over. As was explained above, that hay could be used to feed the cows if needed, or it could be sold. In the extreme scenario that the cows needed to be fed 10 months out of the year for example — not very probable even under extreme drought conditions —, they would require 1,080 tons of hay. The couple could provide almost all of that with the 1060.56 tons left over. This way, the only costs involved would be the costs of custom haying, along with the purchase of 19.44 tons of extra hay. The haying process is made up of three parts: swathing, raking and baling. According to an article on the Herald Journal, custom rate guidelines suggest that the cost of swathing is \$22 per acre, raking costs are \$10 per acre, and baling large one-ton bales costs up to \$25 per bale (Israelsen, 2018). After adding these numbers, and supposing that it would take three cuttings to produce 1,080 tons of alfalfa each year, the cost would be approximately \$50,040. This calculation suggests that in one of the worst-case scenarios where the 300 cows needed to be fed for 10 months out of the year, the total cost would be close to \$50,040, allowing for the operation to still be profitable.

However, it's important to remember that this hay is coming from the private land of one of the couples, so it wouldn't be fair for all of the costs to be covered by one couple if the hay is being used at Rocky Mountain Cattle LLC for free. Because of this, the other couple would pay a percentage of the custom haying costs depending on what percentage of the hay is used on the ranch.

Figure 6. The custom haying cost breakup for both couples. Couple 1 are the owners of the land used to produce the hay. Couple 2 is the other couple.

Feeding time period (months)	12	11	10	9	8	7	6	5	4	3	2	1	0
Tons of feed produced per year	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080
Tons of hay consumed by 300 cattle + 9 bulls	1354.32	1241.46	1128.6	1015.74	902.88	790.02	677.16	564.3	451.44	338.58	225.72	112.86	0
Percentage of produced hay used at RMC	125%	115%	105%	94%	84%	73%	63%	52%	42%	31%	21%	10%	0%
Total custom haying cost	\$50,040	\$50,040	\$50,040	\$50,040	\$50,040	\$50,040	\$50,040	\$50,040	\$50,040	\$50,040	\$50,040	\$50,040	\$50,040
% of total cost for couple 1	50%	50%	50%	53%	58%	63%	69%	74%	79%	84%	90%	95%	100%
Cost for couple 1	\$25,020.00	\$25,020.00	\$25,020.00	\$26,508.69	\$29,123.28	\$31,737.87	\$34,352.46	\$36,967.05	\$39,581.64	\$42,196.23	\$44,810.82	\$47,425.41	\$50,040.00
% of total cost for couple 2	50%	50%	50%	47%	42%	37%	31%	26%	21%	16%	10%	5%	0%
Cost for couple 2	\$25,020.00	\$25,020.00	\$25,020.00	\$23,531.31	\$20,916.72	\$18,302.13	\$15,687.54	\$13,072.95	\$10,458.36	\$7,843.77	\$5,229.18	\$2,614.59	\$0.00

If 100% of the hay is used at Rocky Mountain Cattle LLC, both couples would split the haying costs as is shown when the ranch has to feed during 10, 11, or 12 months. If none of the hay is used at Rocky Mountain Cattle LLC, “Couple 1” would take care of all custom haying costs, because that hay would be sold and only that couple would earn revenue from it. In essence, both couples would split the costs of custom haying the hay that is used by Rocky Mountain LLC, and what's left over is covered by “Couple 1.” For example, if the column where the ranch has to feed during 6 months is taken into account, the table shows that the percentage of hay being used by the ranch from all that is produced is 63%. In that scenario, both couples would split the cost of that 63%, and the remaining 37% would be added to the cost incurred by “Couple 1.”

Figure 7. Profitability for Couple 1 from selling hay not used at Rocky Mountain Cattle LLC, under the assumption of an average hay price of \$155 per ton in Idaho, according to Hay & Forage.

Feeding time period (months)	12	11	10	9	8	7	6	5	4	3	2	1	0
Tons of feed produced per year	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080
Tons of hay consumed by 300 cattle + 9 bulls	1354.32	1241.46	1128.6	1015.74	902.88	790.02	677.16	564.3	451.44	338.58	225.72	112.86	0
Tons of hay left over	0	0	0	64.26	177.12	289.98	402.84	515.7	628.56	741.42	854.28	967.14	1080
Revenue from selling left over hay	\$0	\$0	\$0	\$9,960	\$27,454	\$44,947	\$62,440	\$79,934	\$97,427	\$114,920	\$132,413	\$149,907	\$167,400
Cost of custom haying for couple 1	\$25,020.00	\$25,020.00	\$25,020.00	\$26,508.69	\$29,123.28	\$31,737.87	\$34,352.46	\$36,967.05	\$39,581.64	\$42,196.23	\$44,810.82	\$47,425.41	\$50,040.00
Profit	-\$25,020.00	-\$25,020.00	-\$25,020.00	-\$16,548.39	-\$1,669.68	\$13,209.03	\$28,087.74	\$42,966.45	\$57,845.16	\$72,723.87	\$87,602.58	\$102,481.29	\$117,360.00

For the couple that owns the private property where hay would be grown, the change of how much more profitable they could make that land would be significant. *Figure 7* reveals the potential that haying the 240 acres of farmland could have. If the cattle needed to be fed anywhere from 0 to 7 months out of the year, “Couple 1” could still remain profitable by selling left over hay, even when not charging the ranch for the hay that’s used there. As for the values shown in red that reflect costs and would suggest a non-profitable situation, although the values are negative, they aren’t as bad as they could be when compared to what those numbers would be if Rocky Mountain Cattle LLC had to purchase hay. For example, when feeding all year long, 1354.32 tons of hay would be needed. At \$155 per ton, the cost for the ranch would be \$209,919.60. Both couples would split that cost, leaving each one with a cost of \$104,959.80. If this number is compared to the cost of having to custom hay — \$25,020.00 — plus purchasing additional hay to meet the needs of the cows and bulls — \$21,259.80 —, the financials show that “Couple 1” would be saving \$58,680.00.

Figure 8. Benefits for couple 2 with hay prices at \$155 per ton.

Feeding time period (months)	12	11	10	9	8	7	6	5	4	3	2	1	0
Tons of feed produced per year	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080
Tons of hay consumed by 300 cattle + 9 bulls	1354.32	1241.46	1128.6	1015.74	902.88	790.02	677.16	564.3	451.44	338.58	225.72	112.86	0
Tons of hay that needs to be bought	274.32	161.46	0	0	0	0	0	0	0	0	0	0	0
Couple 2 cost of extra hay	\$21,259.80	\$12,513.15	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Couple 2 cost with custom haying + extra hay if needed	\$46,279.80	\$37,533.15	\$25,020.00	\$23,531.31	\$20,916.72	\$18,302.13	\$15,687.54	\$13,072.95	\$10,458.36	\$7,843.77	\$5,229.18	\$2,614.59	\$0.00
Couple 2 hay purchasing cost without custom haying	\$104,959.80	\$96,213.15	\$87,466.50	\$78,719.85	\$69,973.20	\$61,226.55	\$52,479.90	\$43,733.25	\$34,986.60	\$26,239.95	\$17,493.30	\$8,746.65	\$0.00
Couple 2 Savings	\$58,680.00	\$58,680.00	\$62,446.50	\$55,188.54	\$49,056.48	\$42,924.42	\$36,792.36	\$30,660.30	\$24,528.24	\$18,396.18	\$12,264.12	\$6,132.06	\$0.00

What’s really interesting about this option is that although it may seem like “Couple 1” would be the only couple obtaining a financial gain from the situation, “Couple 2” would benefit a lot from it as well. *Figure 8* shows the differences in costs for “Couple 2” between having to purchase hay from a third party or paying for their part of the custom haying cost plus any additional hay that may be needed. The reality is that no matter how many months the ranch would have to feed, “Couple 2” would save money by adopting this recommendation.

Center Pivot Irrigation System purchase and installation costs.

In any case, there's an additional cost for "Couple 1" if they decided to farm the land. Changing the unirrigated pasture into irrigated farmland would require quite an investment on a center pivot system. These irrigation systems are mechanized setups that irrigate crops in a circular pattern around a center pivot (Folnovic). According to a study from the University of Arkansas, the initial investment requires the purchase of a pump and gearhead, a power unit, and a center pivot. In this case, a well wouldn't be needed because the owners already have water rights to pump water out of the ditch that runs through the land. The ditch gets its water from a river that runs year-round. The study suggested that those three components would cost \$35.99 per acre per year for at least 15 years, since the items are depreciated over that many years. The yearly cost would add up to \$8,637.60 assuming an interest rate of 8.5%, a property tax rate of 1% and insurance of 0.50%. Meanwhile, repair and maintenance costs are estimated to be \$2,727.44 per year, raising the total cost per year to \$11,365.04 (Bryant, Hogan, Stiles, Tacker & Vories).

This is a significant cost increase bearing in mind that it would be prolonged over 15 years. However, even if this yearly cost was added to *Figure 7*, the profit amounts would change, but the colors indicating profitability or loss wouldn't. Apart from that, it's crucial to clarify that the likeliness of having to feed for more than 6 months out of the year isn't very high, at least in the near future. In fact, since 2015 the ranchers haven't fed the cows at all.

Timeline

Precisely because of this current lack of urgency, the recommendation doesn't need to be immediately implemented. This factor can be helpful in deciding to move ahead with the recommendation, because the overall cost of the project could be spread out over many years. For example, the owners could think of purchasing the center pivot irrigation system and installing it over the next couple of years. This investment would greatly increase the value of the land and could be seen as a smart investment, even if for whatever reason they decided not to turn the pasture to farmable land. Having an irrigated pasture would be an improvement on its own.

Once this was in place, the other components of the recommendation like turning the unirrigated pasture into farmable land, or adapting the breeding system would take much less time and could be done later on. Overall, the suggestion would be to have all aspects of the recommendation implemented within six to ten years.

The main objective of this recommendation is to prove that this option could have the potential to create a win-win script, regardless of whether feed shortage would require the ranchers to feed the cows or not. If this recommendation was adopted, the ranchers could improve their private land and generate a new source of income, and adjust their structure to be prepared for the projected aggravation of drought threat in the meantime.

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