An economic feasibility study of a managed supply chain stocker operation in NE Oklahoma

by

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ABSTRACT

Oklahoma is traditionally known for stocker cattle, but in the northeastern corner of the state, the practice of grazing yearlings is relatively rare. “Green Country” is a patchwork of small ranches, mostly in cow-calf production and predominantly with cow herds less than 50. These producers have limited options when it comes to marketing their calves and are tied to the use of local auctions by their size. These cattlemen represent an opportunity to a stocker producer. The region’s improved grass pastures are capable of withstanding heavy grazing pressure if managed properly, there is a ready supply of calves, and potential feeder cattle buyers are nearby in western TX, OK and KS. By purchasing calves from a select group of local producers, a consistent group of high-quality calves could be obtained annually from within just a few miles of the new operation, easing the logistics, health concerns and potential quality issues in buying from several local auctions. The cow-calf producers will get a competitive price for their calves, save on commission fees, and reduce pricing risk by avoiding the sale barn. Calves purchased into the program would be subject to requirements as far as quality, phenotype, and condition. If done properly the group should represent an approximation of a single large ranch’s calf crop. The calves would be purchased in two blocks, one winter and one summer. The calves will rotationally graze sod-seeded small grains or improved grass pastures in the winter and summer respectively. These practices will reduce health risk and increase efficiency. The scale of the business will offer increased marketing channels, with particular focus on forward contracting direct to buyers.

Historical price analysis was completed as part of the research for this project and serves to show the volatility of the stocker segment. Over 10 years, pricing trends are loose at best, allowing only general observations. The best barometer for performance year over year was the Value of Gain. If the Unit Cost of Production (UCOP) is known for a given period, it can be directly compared to the Value of Gain (VOG); if the UCOP is higher than the VOG, the cattle will not make money. Ideally, actual margins would have been analyzed but the differences between stocker operations make this an impossible task. There is too much variation from ranch to ranch to confidently use such findings, even if the source data could be found.

Enterprise budgets were developed to forecast profitability of the businesses and indicated that in 2023-24, the business would have shown a net profit of $74,604 for the two groups of calves. Return on investment in this case was roughly 8.7% with all costs included.

Risks associated with the business are much the same as any other stocker business, though the proposed business is designed to mitigate as many as possible, favoring lower risk over the opportunity for higher returns. Some years, the business is profitable. On years with thin margins, the operational methods or throughput may need to be adjusted to maintain profitability. Overall, the business design should be profitable in a wider range of market conditions than a traditional grazing operation. Observation of the markets, and an understanding of the cattle cycle is critical to the long-term success of the proposed business.

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CHAPTER I: INTRODUCTION

The United States cattle industry is a modern, multi-segment, $88 billion dollar per year industry with the sole purpose of producing high quality beef through a consistent and safe supply chain. The segmentation of cattle raising in the U.S. is generally broken into three stages: there is the cow/calf producer, the stocker operator/backgrounder, and the feedlot stage where cattle are fed to their finish weight. There are approximately 700,000 cattle farms or ranches in the United States producing about 19% of the world's beef. Of these U.S. operations, only 9.9% have herds of more than 100 cows; in fact, the average cow herd size in the U.S. per the 2017 USDA Agricultural Survey was 44 head. This indicates that 90.9% of cattle operations (by number, not volume) are smaller, family-owned farms. The remaining 9.9% of herds over 100 head comprise 56% of the nation's cow herd (USDA- Economic Research Service 2023).

As with any industry, there are efficiencies gained by operating at scale; larger producers often operate at lower unit costs, have more options when marketing and purchasing, benefit from lower pricing on bulk inputs and in general have more opportunities to maximize revenue per dollar invested. By comparison, small producers have limited avenues for marketing their calf crop, are limited in management practices by their smaller balance sheets and face higher unit input costs across the board. These issues compound to create tighter margins for small operators than their large counterparts. These small producers represent an overlooked financial opportunity in the cattle industry pertaining to management, herd composition and marketing. Among northeastern Oklahoma's vast number of small ranches, a "managed supply chain" approach may

benefit both the small-time rancher and the individual willing to rethink the cow/calf to stocker transition.

"Green Country" Oklahoma cow/calf producers raising 50 or less calves per year are the primary source of calves for the proposed stocker operation. From the 2017 U.S. Census of Agriculture, Oklahoma is home to 46,080 cattle farms; of these 74% were reported to be 49 cows or less (USDA- National Agricultural Statistics Service 2019). This number jumps to 88% when encompassing farms of 99 cows or less, with the average herd being smaller on the eastern side of the state where tracts of land are smaller and there are larger population centers. In short, northeastern Oklahoma presents ample opportunity to purchase high quality, single-source calves from small producers. One of the goals of the stocker business is to increase net economic welfare along the supply chain, so how will the stocker operation benefit the cow-calf raisers?

Many ranch owners in the region raise cattle as a part-time job, with their primary income being earned off-farm. The area is typical of many rural-suburban interfaces; there are limitations on running commercial livestock operations at scale. As smaller businesses, these individuals have limited choices in marketing. They can patronize several local sale barns, they can attempt direct sales to an off-taker, or they can retain ownership of the animal through subsequent segments. All these options carry risks.

Sale barns are the most common choice, but can be confusing for new farmers, carry a sales cost in the form of commission, require a time commitment to deliver calves, often on a weekday, and follow daily market movements leading to increased market risk. The second option, selling to a feedlot or stocker operator directly is much preferred but is difficult for many cattle owners due to their herd size. Feedlots and commercial grow

yards/grazing operations want to purchase large groups of incoming cattle with consistent and preferable genetics, and many want to deal with producers who will be able to deliver a similar contract year over year which aids in forecasting future placements. (Lalman, Ratcliff and Ward 2017). Producers must also have the right contacts and be willing to take the time to find and deal with buyers. The final option is to retain ownership through the stocker phase or even through feeding to finish. If practiced on a whole calf crop, this is the hardest option to manage due to increased turnaround of cash flows, increased risk as animals are held considerably longer than normal, and it requires the most knowledge on animal husbandry and feeding practices to maximize returns. This option works best for larger operators who rely on their business for their primary income. The cow-calf producers in the area could benefit from a local off-taker who targets the top performing local cow-calf producers, offers a strong price, and offers an opportunity to avoid commissions, mitigate pricing risk and ease logistics.

The cattle industry is well established, and has operated in much the same way since the 1950s, so how can the system be improved upon? All industries love efficiency, and by aggregating many small producers' calf crops of similar genetics and phenotype, many small ranch's output can approximate one large ranch worth of production. For the stocker operator buying these calves, the benefits of this operational paradigm include having a known source for calves with consistent availability, calf quality, health, and reduced operational risk through relationships between buyer and seller. An important ancillary benefit of sourcing local calves is they are acclimated to the conditions of the region.

The cow-calf operators will benefit from the relationship with a stable off taker, a reduction in market risk, and a fair price for value added calves. This idea is not totally new, it is inspired by early 20th century cattle buyers who made regular rounds through the countryside buying odd lots of cattle, putting together larger, more marketable groups as they progressed before commissioning them to stockyards or direct to a packing plant. With the advent of trucking, this practice lost its competitive edge, but aspects would still be useful in maximizing calf value in today's market. As is the case in many industries, supply chain management is key to success; incorporating this methodology into a cattle operation may prove profitable.

1.1 Stocker Operations/Backgrounding

With the primary target of the proposed business model to aggregate calves from smaller cow/calf producers, it is assumed that all sales participants in the model will have traditionally sold through a sale barn and are not selling directly to an off taker themselves, nor are they multi-segment cattle operations, i.e. retaining ownership of their calves. In addition to this assumption, it is important to define "stocker operation" as it pertains to this model.

A "stocker operation" is generally defined as that portion of the U.S. cattle industry acting as an intermediate step between cow/calf producers and feed lot operations. The main goals of a stocker operator are to 1) put weight on calves, 2) bolster calf health, and 3) assemble readily marketable groups of like kind and quality. Stocker phase cattle may be owned by the stocker operator for anywhere from 60 to 180 days depending on environment, contract specifications, and forage availability. In general, stocker calves are weaned and are between 9 and 15 months old. Forages in use range from native or

improved grass pasture to small grains such as wheat, oats, rye, or triticale depending on region, season, and farming practices.

The proposed stocker business is designed to operate on a mix of improved grass forage, inter-seeded small grain pasture as well as supplemental feeding and hay. The goal is to maximize profitability over two inventory turns per year (summer and winter), with facility size limited to 320 acres initially. Other considerations include reducing unit costs, increasing net economic welfare for participants within the supply chain, and building a sustainable grazing system. Discussions with local cow-calf raisers indicate the number of ranchers required to fulfill the business model could be anywhere between 15 and 25 producers. The business' area of operation is roughly 60% spring calving cows, and 40% fall calving cows. To match the local supply, the initial model will produce 500 stockers annually, with 300 on the winter grazing schedule (spring calves purchased at weaning in the fall) and 200 on the summer grazing schedule (fall calves purchased at weaning in the spring).

Enterprise budgets aid in determining whether a managed supply chain stocker operation can be profitable, what if any benefits may be realized over the current industry norms, and what expected returns could look like in different scenarios. The outcome of this work should produce a model that can serve as a budgeting tool given a set of inputs including purchase price, estimated production costs, contracted sales price, and various performance metrics concerning average daily gain and cost of gain. Historical price analysis will be completed and will help to gain a better understanding of the industry, its cyclic nature and the general volatility involved.

1.2 Key Marketing Considerations

Stocker cattle (yearlings) present several marketing considerations that must be addressed to maximize profitability. The most basic of these are health, quality, herd size, seasonality, and calf background. The importance of herd health is easy to understand, healthier calves are more profitable. A study completed by Oklahoma State University stated that calf health has "the most profound effect on price" with discounts below the market averaging $8.58/cwt over the 3-year test period for cattle with health concerns (Lalman, Ratcliff and Ward 2017). Buyers are acutely aware of the effect health has on profitability when feeding, so extra caution is taken. Poor health at receiving can not only lead to additional costs in veterinary medicine or death loss, but also negatively affect a calf's feed efficiency and weight gain leading to further ancillary losses indirectly related to the primary issue.

Genetics also play a large role in marketability, with specific genetic traits and phenotypes preferred for both performance and marketing reasons over time. These preferences vary slightly by region, but the last several decades have driven the U.S. Beef Industry in the direction of a black-hided, Angus influence animal. Additionally, the same Oklahoma State University study as above determined that buyers of feeder cattle prefer heavy-muscled, moderate framed, polled steers. (Lalman, Ratcliff and Ward 2017).

Importantly, the same study also determined that feeder cattle buyers prefer purchasing larger lots. Commercial feedlots seek large contracts of consistent yearling cattle with the ideal purchase being large lots of preconditioned, single-source, high quality cattle. The single-source and preconditioning aspects represent a decreased health risk, and increased consistency in feed performance, and logistical convenience. If not single source, then

feedlots purchase large lots from stocker operators who have "put together" groups, grazed and preconditioned them for a period of time before shipping.

Seasonality also plays a substantial role in stocker marketing. Historically, certain months are better to sell in than others; for instance, weaned calves hit their seasonal highs in the spring, while heavier feeder calves hit theirs in late summer/early fall (Shulz 2015). Bearing this in mind, operators need to determine when they will be marketing their calves, and how to best navigate adverse seasonal effects. This can be difficult since a buyer's calf supply is based on a consistent calving period year over year, driven by local custom and climate.

Calf background is vitally important for a feedlot to consider prior to purchase. Were they in a grow yard eating a low-energy ration or were they on stronger forage such as wheat or stockpiled fescue? What is their weight and body condition going to be? Commercial feeders are looking for consistency, stability, and the best "bang for their buck". Aligning stockers with these goals can help increase their value over competition. The proposed business will sell preconditioned calves, who have learned to drink from a waterer, eat from a trough, and are in prime condition to enter a feed lot successfully.

More advanced marketing decisions tie back to the business model itself. These can include risk management practices such as hedging, options and Livestock Revenue Protection insurance products. It can also mean attaining credentials such as age-source verifications, compliance with certain programs such as BQA or GAP, or certain traits that earn premiums on the cattle. Value-added factors deserve consideration as they can increase profitability at minimal extra cost and create a stronger value proposition for a company with limited resources. With the proposed business model, the cow-calf producer

will know they are getting paid for the value-added practices such as weaning, vaccinating, implanting (as warranted by the market) and others, while hopefully being able to market these calves forward on the same ideology.

1.3 Value Added

Stocker operations are a margin business, plain and simple. The operator buys calves at a given price, incurs production and fixed costs, and sells the calves at a given price. Because profitability is driven by these simple metrics, it is well understood that profit margins are typically tight. With producers striving to squeeze every possible dollar of revenue out of each dollar invested, the term "value added" has come to play a very important role in the marketing and raising of yearling cattle. Traditionally, value-added practices move downstream through the supply chain, i.e. the stocker producer will be increasing the unit value of his calves through various means, leading to a higher value animal for his buyers. In the case of stockers, there is also an opportunity to create upstream value for the cow-calf rancher. Through proper forecasting, risk management and relationship building, a symbiosis can be achieved between a group of local cow-calf ranches and a stocker operator to offer stability, decrease costs, and increase profitability for both. Many of the value-added propositions of the cow-calf producers represent additional value to the final off taker of the feeder cattle.

With the proposed business, age-source verification would be low-hanging fruit, since the intent is to track all cattle starting at branding or weaning with EID tags. This would allow a 3rd party verification of the source of the cattle, which is becoming an increasingly hot button issue in the industry. Additional value could be any of a number of certifications such as GAP, "Natural", or "Non-Hormone Treated Cattle" (NHTC).

Ultimately, the market will dictate whether these would be worthwhile, and the business model is not currently intending to follow a natural or NHTC route.

1.4 Purpose

All industries rely on supply chain management with whole sub-industries having grown up around logistics. When people think of supply chain management their thoughts typically jump to modern industries such as electronics manufacturing, auto manufacturing, or food processing but supply chain management is important in every industry and can be practiced at every level of the supply chain.

The application of supply chain management techniques by a stocker operation will provide structure and discipline in a market segment that is not traditionally associated with this level of strategy; the intent is to source a stable, consistent, high-quality supply of calves from local producers who fit the model's requirements. If successful, the calves from the numerous ranches involved will aggregate to represent the approximation of a single, large ranch worth of output. In theory, the "put together" herd should display about the same genetic and phenotypic variance as a large ranch with several locations, if appropriate cattle are sourced. Program requirements will define the quality and condition of the purchased calves so that they are as homogenous as possible at the time of aggregation. Primary weaning will be completed prior to purchase for 25-30 days, but the cattle will finish weaning after purchase in their new lots at the Company location. The type of producer considered for the program is already completing many of the requirements the business would want; they have quality herds of moderate to large frame angus-influence cows, are progressive in their management, and adhere to established veterinary and feed protocols. In short, they take pride in their operation. With minimal

modifications to their operating structures, adherence to the program will result in competitive pricing for the calves (based on top-end of local market with possible premiums), reduced production costs and mitigation of the risks of an open market, as well as a known and consistent off-taker. They will no longer need to take time off of work to haul to the sale barn, only to worry about whether the buyers that day will pay up for the value-added practices employed on their ranch, nor will they need to pay a sale commission. The buyer of these calves will benefit from the consistency, mitigated health risks, sourcing stability, and scalability of the business model. The stocker operator will be able to spend more time marketing the yearlings effectively, and less time buying cattle at various sale barns. There will be considerably less time required at the beginning of the grazing period to "straighten out" these cattle since they will arrive healthy and weaned; this equates to faster positive gains. Downstream, the feedlot buyer of the stockers will benefit from the quality, health and condition of the cattle, the addition of another commercial scale supplier for sourcing, and an opportunity for the feed lot to define what they want in their yearlings.

CHAPTER II: LITERATURE REVIEW

The constituent parts of this thesis have been researched and are well documented. The intent of the work is not to reassess cattle valuation methods, enterprise budgeting methodology or supply chain management techniques but instead to consider what the application of these elements into a stocker business may offer in terms of profitability. It is proposed that the implementation of sound agricultural practices, modern business tactics and supply chain management will yield a superior value proposition within the current disjointed cow-calf, stocker, feedlot model. The marriage of these ideas in an environment of small-scale ranching represents a break in the traditional thinking of how cattle move through the system. Below is a summary of several of the basic principles to be employed in the business opportunity.

2.1 Operational Management

Gone are the days when running a successful farm relied solely on one's ability to grow a good crop. Rising input costs, land use pressure, increased technology adoption and foreign competition have all created an environment in which a ranch manager must wear several hats. He or she must be a first-class stockman, but also a competent businessman. A study completed by Oklahoma State University set out to survey a portion of the cow-calf and stocker operators in Oklahoma to evaluate the production and management practices used in Oklahoma. To assess all aspects of the businesses surveyed, questions ranged from nutritional and husbandry-based questions to financial and risk management questions. By organizing the respondents into sub-groups based on herd type, herd size, and reliance on operational income (as opposed to off-farm income) the questionnaire was able to shed an interesting light on how operations of varying scope have been run in Oklahoma. What the

study ultimately found was that "operation size and income dependency strongly influenced the adoption of a variety of marketing, risk management and business planning management practices" (Lalman, et al. 2017). More granular findings with regards to animal health and nutrition were that practices such as dehorning, hormone implanting, vaccinations, mineral supplementation, and other such practices were routine across all respondents though larger, more income dependent operations were notably more active in using these practices. For instance, almost all producers used some sort of feed supplement, yet only 31% conducted forage testing, and only 7% used software designed to develop and manage a supplementation plan.

For business planning management, marketing, and risk management the outcome was much the same. The larger the operation and the more dependent the producer was on that income, the more advanced were their business management techniques. The study found that "marketing cattle and managing risk is an area of beef production of particular importance to stocker producers who often face increased risk due to factors such as price volatility and narrow margins of cattle weight gain" (Johnson, et al. 2017). In short, day to day management of health and nutrition is important, but managing marketing and risk is of equal importance in a sector so entirely dependent on margin.

The articles and reports used in developing this project have lent credence to the fact that the more unsystematic risk a producer can remove and the more aspects of the business that can be managed, the more stable revenue and costs will prove. "You can't manage what you don't measure" has long been a favorite saying in the cattle industry. A simple modification to "you can't manage what you don't control" better expresses the necessary mindset of a stocker producer in the modern cattle industry looking to be

successful. Wringing every cent of revenue out of every dollar invested is critical to success.

2.2 Supply Chain Management

Supply chain management (SCM) is not a novel idea in agriculture, however its conscious implementation by a stocker producer sourcing calves from a grower "pool" of small cow herds, expressly designed to streamline calf inventory, source, health and management practices is a departure from the norm. Leveraging "big business" methods as a smaller producer helps to plan long-term, treat the business as a business and eek out as many efficiencies as possible within the supply chain at the proposed scale of operation. The application of supply chain management philosophies at the microeconomic level is key to recognizing increased profitability. The effective implementation of SCM both upstream and downstream within the stocker business allows a larger, commercial scale to be attained than operating solely from the traditional stocker model.

The proposed stocker operation relies on an understanding of Supply Chain Management (SCM) principles, and how to apply them to the livestock industry. So, what is the supply chain? On its simplest level a supply chain "…consists of all parties involved, directly or indirectly, in fulfilling a customer request" (Chopra 2017). Supply Chain Management doesn't care what the product in question is, the application of the techniques is universal. Large-scale, modern companies have whole teams and subsidiaries built around SCM, and the small-scale ranching industry of northeast Oklahoma will benefit from utilizing it as well.

As stated above, the supply chain involves every single piece/person involved in getting a product to the consumer. The overall goal of SCM is to maximize the net value

generated within the supply chain; regardless of industry, this starts with 3 decision phases: the development of a supply chain strategy, the planning of the supply chain and the supply chain operation. According to "Supply Chain Management" the design, planning and operation of a supply chain are critical factors in a company's overall profitability and success. "It is fair to state that a large part of the success of firms such as Seven-Eleven Japan and Walmart can be attributed to their effective supply chain design, planning and operation". The textbook uses case studies from a plethora of different industries, indicating that the benefits to be reaped by focusing on SCM are critical and also universal, but the book largely neglects the fact that comparatively small businesses benefit from SCM.

Leveraging supply chain management techniques in agriculture is a step towards economic sustainability. A forward-thinking producer focuses on creating a stable, efficient supply chain of calf producers, suppliers, vendors and off-takers leading to a business that can perform year in and year out, with limited supply disruptions. Of particular importance to animal agriculture within the SCM domain will be Strategic Fit, Demand Forecasting within the supply chain (both upstream and downstream), Managing Economies of Scale in a supply chain, and mitigating uncertainty within the supply chain (Chopra 2017). Placing a value on the supply chain management component will be difficult, since a direct comparison is required, but intrinsically there will be eased logistical concerns, saved time for all parties, and the comfort knowing that the quality of cattle received this year will be very similar to that received next year, or last year. Consistency is key in marketing cattle, and relationships rely on the ability to deliver.

2.3 Pricing and Valuation/Marketing

Myriad sources are available when it comes to valuing market cattle. Cattle valuation in a business sense comes down to several factors. What will the calf be worth at sale time, how much did it cost to get it there, and how much did it cost to obtain? In terms of estimating profitability, the calf cost less the future value at sale determines gross cattle margin; many cattle buyers consider average expenses to quickly make a "buy/no buy" decision depending on market conditions. With stocker cattle profitability is heavily dependent on the accuracy of estimating unit costs, a process best accomplished via an enterprise budget.

An enterprise budget approximates a business venture over the course of a set period, and aids in determining the profitability potential of the venture. There are several factors in estimating profitability in the cattle industry. "Beef producers cannot control average market price, though they do control which side of the seasonal or annual average price their calves land. They do, however, control their expenses and, along with Mother Nature, control their productivity. Combine the latter two pieces, and you have a ranch's Unit Cost of Production." Dr. Machen states that if the Unit Cost of Production (UCOP) is not known, market prices have little meaning (Machen, PhD and Bevers 2021). This guidance is from a series of 2021 Texas A&M Agrilife Extension articles intended to help increase producer awareness of the true measures of ranch profitability in the cow-calf and stocker sectors. Obviously, sales price alone is not an indicator of profitability since costs must be considered. Two of the three articles focused on cow-calf production, but the concepts are analogous to stocker producers as well. The key to understanding profitability is two-fold: understanding breakeven prices and understanding the unit cost of production.

For stockers, the unit being measured can be the unit cost of production per CWT or the unit cost of production per head. In the case of stockers which rarely have secondary revenue such as cull cow sales, UCOP per CWT and breakeven price are synonymous (Machen, PhD and Bevers, Unit Cost of Production Expressions 2021). In describing the importance of Unit Cost of Production as a performance indicator, Dr. Machen states that "systems thinking" is critical when making decisions for the operation. By thinking about the effect of each cost incurred, unintended consequences or "trickle down effects" can be minimized. This statement supports the fact that the application of supply chain management will be beneficial to any ranching operation. It is also imperative to note that UCOP is not simply operational costs. It involves every cost associated with production being converted to a marginal cost. While it would seem to be common sense, it cannot be stated strongly enough that profitability in ranching is driven by cost management. Understanding the foundation of these costs by utilizing a measure such as UCOP is of utmost importance to understanding an operation's true financial health. "Accurately predicting and managing unit costs of production is key to sustainably providing the inventory "shock absorption" ranchers and cattle feeders depend on" (Machen, PhD and Bevers 2021). All of this is to say that enterprise budgets are a great resource but are of little use without a knowledge of real costs, expected cattle performance and futures pricing. Further, sensitivity analysis should be conducted to understand how fluctuations in variables affect profitability under adverse market conditions.

2.4 Risk Management

In the case of livestock, risk management falls into two buckets: operational risk management and financial risk management. Both are vitally important to success but are different and require unique management.

Where operational risk is aimed at mitigating "on the farm" risks such as fraud, security, business interruptions, or reputation risks, financial risk management's goal is to lay off as much of the market or systematic risk as possible. Financial risk is important for stocker producers since both outputs and inputs can be protected, and failure to do so can have drastic effects in times of volatility. The proper application of risk management techniques helps insulate the business from market shocks, helps to forecast income and helps mitigate operational losses. The most common strategies in use by stocker producers are forward contracting, options contracts, hedging, and insurance-based programs such as LRP (Livestock Revenue Protection).

Forward contracting is the preferred option of marketing the yearling calves in the proposed business. Ideally agreements could be reached very close to the purchase date, avoiding the cost of covering cattle with LRP insurance. This may not be the case initially while the business "builds its brand", but eventually the goal would be to have the cattle contracted the day they are purchased. The appeal of private treaty sales is that they are typically the cheapest marketing option but require the most action on the part of the seller. If handled incorrectly, money could be left on the table. Private treaty sales allow the seller to negotiate, promote their cattle quality directly, and set a price in advance of an auction setting. Risk is greatly mitigated with this option and gets continuously better as relationships are built on the reputation of the cattle with the buyers (Parish, Rhinehart and

Anderson 2021). This method of marketing can provide robust protection, but care needs to be taken that the buyer is a reputable business who can deliver on the transaction.

LRP has become very popular over the last few years and will be the main consideration in the analysis of the new business considering the expected scope of business. The product is offered through approved insurance companies, with premiums subsidized by the USDA. The programs have availability for feeder cattle, fed cattle and swine. LRP is an insurance product that acts like a put option, giving the producer the right, but not the obligation, to sell their commodity at a given price, basically creating a price floor (Fischer, Benavidez and Hagerman 2022). LRP is an attractive option for many smaller ranchers as the costs are minimized through government subsidized premiums, and policies are not based on set "contract sizes" as futures and options contracts are. The program was not designed to be a profit generator, but as a safety net against catastrophic market fluctuations, and it is particularly useful for smaller producers who may not be able to fill whole commodity exchange contracts. The program is governed by a weight-class, and cattle-type system, rather than being regulated by "contract weights" of 50,000# (40,000# for fat cattle) like futures contracts or options are. The policies can be written for anywhere from 1 to 25,000 head in a particular crop year, allowing small producers to effectively protect their revenue, while retaining unlimited upside opportunities.

Put options are similar in the fact that they create the right to sell a commodity, but not the obligation, at a given price and that downside risk is limited to the cost of the option (just as the loss is limited to the premium in LRP) but that is the end of the comparison. Contracts for puts are marketed through a futures exchange market, the Chicago Mercantile Exchange and are transacted in 50,000# contract units (Fischer, Benavidez and Hagerman

2022). The main downside is that the 50,000# contract size is equivalent to sixty-six 750# feeders, which presents a barrier of entry into the market and favors larger producers. For instance, a stocker operator running a thousand head per cycle can utilize options contracts efficiently, but a producer with 100 or 200 yearlings would be severely limited. Due to the size of the contracts, put options will not be incorporated into the budgets, though if the business were to expand, they would come into play, with costs being compared to LRP premiums at that point.

Like puts, short contracts will not be considered in the enterprise budgeting because of the cost and scale required. Hedging requires margin accounts, which in many cases require the use of a line of credit. Like options, contracts are traded on futures exchanges in 50,000# units (40,000# for fed cattle) but require more capital, while freeing up more liquidity. These are particularly useful for large ranches or farms but are outside of the scope and intent of the managed supply chain stocker operation.

Risk management can also be practiced on the operational input side of the enterprise. In cattle feeding this would generally take the form of hedging feed items such as corn, or prepaying items during opportune market conditions. For a stocker operator or cow/calf operator, who is relying on grazing forage for most of the weight gain, there are a few options as well. To mitigate risk on the supplemental feed, forward contracts are usually drawn up between the operator and local feed supplier. The model in use assumes that this practice is being used. Of particular use for a stocker operation would be the consideration of Pasture, Rangeland, and Forage Insurance (PRF). Like LRP, this product is managed by the USDA Risk Management Agency, in conjunction with the Federal Crop Insurance Corporation. This insurance is intended to protect pasture, forage and rangeland

utilizing a rainfall index. The policies are sold through certified Crop Insurance agents and provide coverage against a single issue, the lack of precipitation. Coverage is determined by a grid system developed by the National Oceanographic and Atmospheric Administration Climate Prediction Center (USDA-RMA 2017). Policyholders decide on a coverage level from 70%-90%. The index does not measure direct loss or decreased production, but instead is solely a function of the rainfall for a given grid. In the case of the stocker operation, the insured rainfall amount would be driven by the amount of rainfall required to reach target production. PRF can be of great benefit if used properly, and like LRP it is designed to prevent catastrophic loss, it can be used to generate additional revenues. PRF is not considered within the Enterprise Budgets as they currently exist but is of sufficient importance to warrant inclusion in subsequent iterations.

Risk management will be of particular importance in the budgeting of this new business and will incorporate the factors above as well as further considerations into seasonality and its effect on price, methods of protecting input costs and what ultimately is the correct decision to protect calves outside of forward contracting.

CHAPTER III: DATA DESCRIPTION

3.1 Introduction

The analytical basis of this thesis was the development of Microsoft Excel-based Enterprise Budgets for the proposed stocker operation. The budgets were created using price information from CattleFax, USDA market reports, the Chicago Mercantile Exchange (CME), and real-world cost structures to identify as accurately as possible, the profitability potential of the managed supply chain stocker business. Further background analysis was completed using historical pricing from CattleFax and CME to determine average gross cattle margins, the effect of seasonality on cattle prices and the macroeconomic indicators of high and low margin years. Finally, breakeven analysis and alternative pricing matrices were incorporated into the completed enterprise budgets to provide a rapid outlook on various scenarios.

The purpose of the tools and models developed within this thesis are aimed at determining whether the stocker business has the potential to be profitable, as well as to gain a better understanding of how macroeconomic variables affect the stocker segment.

Understanding prices, costs, and performance metrics are key components of a successful stocker operation, and can be explored and analyzed within the enterprise budget. Quality data is required to create the models and historical analysis which are detailed in the following chapter. This chapter will give insight into the data needed to confidently understand the stocker market and build a realistic enterprise budget.

3.2 Historical Pricing Data

Although the Enterprise Budget is designed as a tool to be used in a forward-looking manner, historical pricing was required to build an understanding of the stocker

market, as well as to provide real-world pricing for the initial analysis of the enterprise budget. To function as intended, the budget requires the current market price of calves to be purchased, as well as values from the CME futures market for the expected shipping date of the cattle. Since the budget was created during an off-cycle period (the business plan is to buy calves in late spring and mid-fall to align with customary local weaning periods), May and November data for 2023 were used in determining feasibility of both Winter and Summer stocker groups for the project. To reduce estimated purchase or sales variables, all values were based off steer pricing. In practice, the model would need to include blended prices for heifers and steers, but for the initial analysis of the budget the variability of heifer discounts as compared to the CME Feeder Index could materially skew the model if incorrect.

3.2.1 Calf Prices (CattleFax, Local Stockyards)

Stocker operations represent a complicated segment to analyze due to the variability of cattle price. For analysis of historical prices and trends, the CattleFax pricing was obtained for the last 10 years on steers ranging from 450 pounds to 850 pounds (100-pound increments) in Oklahoma reported sales. The most relevant data for determining historical pricing spreads and margins as they relate to the proposed business are the 450# Oklahoma Steer values, and the CME feeder index. CattleFax provides real-world average pricing for Oklahoma over time and allows analysis of pricing trends and spreads. As with the budgets, the historical price analysis is based off steer pricing and omits heifers as their prices are not directly correlated with the CME Feeder Index at a set discount. For use within the Enterprise Budget, Tulsa Stockyards sale results are the basis for valuation on the purchase calves. This method was settled upon after discussions with several local

producers who helped define an equitable valuation strategy. Different pricing models were discussed, but the consensus was to tie the purchase price to the most recent week's sale, with premiums to be determined on a negotiated basis. The purchase data within the model is based on the Tulsa Stockyards #1 weaned calf price for the most relevant weight range for steers (real life use would require a blended price of steers and heifers as appropriate). In use, other local markets could also serve as a valuation basis such as Joplin Stockyards or Coffeyville Stockyards.

At the time of writing, 450# weaned calves were roughly $320/CWT based on the CattleFax pricing. Over the 10 years of compiled information, the low value was $137/cwt, and the max imvm was $346/cwt (CattleFax 2023). Table 3.1 below shows statistical analysis of both the 450# Oklahoma Steer historical prices, and the CME Feeder Index for the same period.

3.2.2 Feeder Cattle Prices (CME)

Historical Feeder Cattle prices were obtained from CattleFax, with the data showing the daily CME Feeder Index values over the last 10 years. CME Feeder Index values are determined by figuring the 7-day average price and weight of feeder steers sold in a twelve-state reporting area (CO, IA, KS, MO, MT, NE NM, ND, OK, SD, TX, WY). As of this writing, the index reported a feeder value of $217.71/cwt. Over the ten-year period, the minimum reported price was $114.41/cwt, and the maximum was $254.06/cwt (CattleFax 2023). As seen in Table 3.1 below, historical pricing in and of itself does not provide much value statistically. The figure shows roughly 10 years' worth of data including the mean, minimum and maximum values for the period, but the standard deviation reveals that the difference between prices and the mean is incredibly large. In

addition to providing a basis for valuation of the stocker cattle at shipping, the margin between the CME Feeder Index (expected sales price) and the purchase price of the lightweight calves is a key component in determining profitability. Historical price analysis and it's uses are discussed further in Chapter 4.

While the CME Feeder Index is not a perfect analog for setting the sales price within the enterprise budget, it is a supportable value that serves as an acceptable valuation basis and a barometer for the industry. Further support for use of the CME Feeder Index Value sans a basis was a comparative analysis of the Feeder Index versus the 750 # Oklahoma Steer average prices for the same period. As seen in Table 3.2, the Oklahoma 750 # Steer cash price is on average $3/cwt above the CME Feeder Index and is 82.7% likely to be above the CME Feeder Index on a weekly basis according to the historical trends.

Table 3.1: Statistical Analysis of Historical Pricing, 2014-2023

10 Yr. Statistical Analysis	450 # OK Steer $/cwt	CME Feeder Index $/cwt	Price Spread $/CWT
Mean	$213.37	$165.33	$44.85
Median	$190.00	$153.69	$41.00
Minimum	$137.00	$114.41	$13.00
Maximum	$346.00	$254.06	$107.50
Standard Deviation	50.90	33.91	20.00

Table 3.2: CME Feeder Index vs. concurrent 750 # Oklahoma Steer, 2014-2023

Year	750# OK Annual Avg. $/CWT	CME Feeder Index Annual Avg. $/CWT	Avg. Basis $/CWT
2014	$208.46	$205.44	$3.02
2015	$210.58	$206.30	$4.27
2016	$144.57	$144.41	$0.15
2017	$147.06	$144.69	$2.37
2018	$150.12	$146.19	$3.92
2019	$144.02	$140.63	$3.39
2020	$137.62	$134.84	$2.78
2021	$150.02	$146.85	$3.17
2022	$169.94	$167.53	$2.41
2023	$224.71	$218.13	$6.57
10 Yr. Aggregate	**$168.52**	**$165.33**	**$3.19**

3.2.3 Input Costs (Feed, Pasture Rent/Ownership, Interest rates, etc.)

Input costs for the model were obtained from many sources. Direct inputs such as feed, veterinary costs, mineral, seed and fertilizer were gathered from local businesses who provided information for unit costs. Risk management costs were obtained directly from USDA rate lists for the appropriate cattle classes and coverage percentages of Livestock Revenue Protection.

Indirect inputs such as labor, marketing, operating cost of capital, utilities, fuel/lube/repairs were all estimated using industry knowledge gathered over 15+ years in the livestock industry, as well as utilizing information contained in existing enterprise budget examples from Kansas State University and Oklahoma State University. Variable units such as labor hours were based directly on experience in this region; both for the hourly amount of pay and the time it would take to perform certain labor tasks. For example, the labor hours estimated for planting is based on an eight-foot no-till drill planting 4.85 acres per hour. Considerable research was conducted in determining per acre input costs as it related to stocking capacity on the lease property, as well as ensuring that

the parameters used in the budget model were realistic for the "area of operation". This was a key consideration both in terms of forage production possibilities and cattle performance metrics. Lease expense was estimated based on local knowledge and discussions with several area ranchers; USDA and OSU both have data on lease rates for 2022 and 2023 however Mayes County is not reported. Regardless, the rates indicated by the OSU research are considerably lower than the actual lease market, so the local rate was used.

3.2.3 Value Added Variables

Value-added variables were without a doubt the toughest subject to implement within the model. Solid research has documented possible price premiums, and several good sources of information were found from Oklahoma State University, University of Nebraska (UNL), and Kansas State University. Although the research suggested that "value-added" characteristics generally increase profitability and value, it was difficult to justify manipulating the expected sales price within the model, since claiming a value above market would be speculation. To combat the inability to confidently set a premium that would be earned, a table was developed in conjunction with the enterprise budgets indicating how varying sale prices would affect the business' profitability in $1/cwt increments within a +/- $5/cwt range. Likewise, the table shows the effect of premiums paid above the base purchase price into the model (Tulsa Stockyards #1 average) up to $10/cwt.

Data were obtained outlining the effect of value-added practices, but standard deviations proved very high, and properly correlating any expected premiums directly into the budgets was deemed inappropriate. The value-added data sources were typically on auction setting cattle, at widely varying weight classes. The auction aspect of the sale

introduces market risk into the valuation and could skew the results some. Although unable to appoint a valid premium, the author feels confident that at minimum, the cattle would be sold at, or above CME Feeder Index prices based on the sales data in Table 3.2.

3.3 Estimated Variables

Creating the Enterprise Budgets for both winter and summer stocker cattle required several variables to be estimated. The stocker business is diverse, with lots of variables tied to market conditions, region, weather, and operational differences; no two stocker operations are the same. Many of the key performance indicators that serve as benchmarks in downstream market segments, such as average daily gain, cost of gain or feed conversion in fat cattle, are more difficult to determine accurately for stocker cattle. In a feedlot setting, things like feed intake or conversion can be tracked accurately since 100% of the animal's diet is delivered. In a stocker setting, this same variable is almost impossible to determine since forage production is based on small samples applied to the overall acreage. Using industry experience and research from OSU, KSU, TAMU along with other regional agricultural universities, a realistic scenario was constructed within the enterprise budgets for both the winter and summer grazing seasons. Further discussion of the processes used to estimate forage production, yield, and cattle performance is found in Chapter 4.

As many known-cost variables as possible were included in the budgets. The model represents a business that has not been attempted in this area and will invariably harbor several unknown factors. That said, as the business operates and begins posting results, the model will gain accuracy and expenses/performance will be better understood over time.

CHAPTER IV: METHODS

4.1 Introduction

This chapter will cover the development of the spreadsheet models for the enterprise budget, as well as the historical price analysis. The goal of the enterprise budget is to determine whether the business could be profitable in a given market, and to be able to estimate profitability for one or both grazing periods during the year. The model is designed to accept substantial user modification but is ultimately tailored specifically for an annual, two-turn grazing system with the winter herd on inter-seeded small grain (sod-seeded)/ dormant grass pasture and the summer herd on improved grasses during the growing season. The Enterprise Budget Summaries provide an estimation of profitability factoring in user input variables. The Profitability Matrix worksheet is designed to quickly convey the effect of gross calf margin changes such as paying calf producers a premium or receiving a premium/discount at sale.

4.2 Historical Performance and Costs

Historical performance and costs are incorporated into various aspects of the Enterprise Budget. Historical costs are useful to understand since their accuracy is critical to the realism of the model output. Ideally, an enterprise budget is completed with current market information on the sales and purchases since these two variables directly impact cattle margin and determine gross sales. Stocker performance and revenue is particularly hard to estimate too far into the future since a main variable, the calf purchase price, is not sold on a futures exchange. There are some tools available that can estimate future calf prices such as beefbasis.com or CattleFax but there is no sure way to forecast weaned calf prices with accuracy very far in advance. CME feeder futures do typically represent a

decent approximation of the actual cash feeder price in the future (less basis), however these figures do not correlate wholly to calf prices, especially more than a few months out. As the thesis project was coming together, lots of time was devoted to looking at previous pricing data and thinking of how best to utilize and interpret it.

During the preparation for the project, it was quickly determined that historical pricing alone is of little use for understanding industry dynamics, or for looking at past profitability. More useful is analyzing comparable figures. Figure 4.1 below shows the average price spread for CattleFax 450# steers in Oklahoma versus a lagged Feeder Index over a ten-year period. The Feeder Index variable was lagged 150 days to approximate the actual cash price spread from purchase on day 0, to the sale on day 150; this would be indicative of not using risk management and "running open" on the yearlings. The chart outlines very basic information; if you buy a calf at price "x/cwt", it would sell at price "y/cwt". By itself, this information creates a graph that does not seem to be useful. In fact, the info is most useful in completing other analyses. It also visually confirms that prices are extremely volatile season to season in the cattle industry. Despite the apparent lack of a trend in Figure 4.1, the base data was rearranged to better visualize the data in a useful format. Figure 4.2 included the same 10 years of price information, but instead organized the data points into their respective months, year over year. Of the 10 years included, seven show what appears to be a strong trend, although this "trend" contains variances of over $20/cwt year to year and standard deviations are very high. What are the 3 obvious outlier years on the chart? They represent the transitional periods between "cattle cycles".

The cattle cycle is a roughly 10-year industry phenomenon that drives many aspects of the cattle market, is usually triggered by weather, and is bracketed by build-up and

liquidation periods of the United States cow herd. Figure 4.2 shows that throughout the duration of the most recent cattle cycle price spreads remained relatively stable monthly, year over year. As would be expected, the cattle cycle tails of 2014 and 2023 show an inverse trend with the other years where spreads increase while cattle supply drops. The year 2015 on the other hand shows a correction period back to the status quo with spreads steeply declining back to their typical levels.

Building on the basic trend that appears annually in Figure 4.2, the data was rearranged to look at the trend on a monthly basis, year over year. The prices for each of the 10 years were averaged, and each month was compared to the annual mean. This method turns the average mean into an index and allows observation of the average deviation above or below that index. The "January" portion of the chart for instance shows that on average, cattle prices are below the annual average. The highest average stocker prices annually are seen in September, October, and November, while the lowest prices are typically in February, March, and April.

Other than targeting historically strong sale periods, the most useful aspect of the historical pricing data appears to lie in the ability to estimate gross cattle margins in past years. Figure 4.4 shows the difference between the gross cost of purchasing a 450# Oklahoma Steer and selling the same steer at 750# roughly 150 days later. The difference represents the Gross margin per calf, though in the figure it is further consolidated into Gross Margin/cwt. Another term for this in the stocker industry is the Value of Gain, and it represents the dollar value associated with gaining an additional unit of weight on the calf. This information is important, since it also represents the breakeven production cost; if the

Unit Cost of Production rises above this number, no matter the cattle's performance they will not make money.

Also, of interest within the cattle industry is the effect of seasonality on pricing. Cattle prices are seasonal; the driving factor being consumer demand for beef and how that works backwards into the system. Research indicates that the seasonal price effects are more pronounced the further down the supply chain the calf is from the consumer and become increasingly less material as cattle move through stocker phase into the feed lots and eventually are processed into beef. To get an idea of the effect of seasonality on yearling stockers, daily pricing (business days) for the CME Feeder Index was obtained and manipulated to find the average annual prices to serve as an index. The data was then aggregated monthly, year over year and compared to the annual index price as a percentage above or below the average.

With low standard deviations monthly, the data suggests it is best to try and time sales for periods of higher historical pricing, i.e. September or October vs. January or February. Determining future calf prices is difficult, however margins do follow a general trend year over year. Industry knowledge is key since the trend really only breaks at the edges of the cattle cycle; knowing where you are within the ~10-year period can help improve the odds of profitability. Indicators such as "heifers on feed" and "USDA cow herd reports" can signal shifts in the cycle that may affect stocker pricing. The data also proves strategy is important when it comes to buying and selling calves. While stocker buyers don't have total freedom in this respect since calving periods are relatively static, the business should be tailored as much as possible to sell during traditional periods of

higher prices. The business should also maintain a vigilant watch on margins and adjust the model as necessary to maximize returns for changing market conditions.

Figure 4.1: Price Spreads (150 Day Lag)

Figure 4.2: Average Monthly Price Spread: 10-year period by month

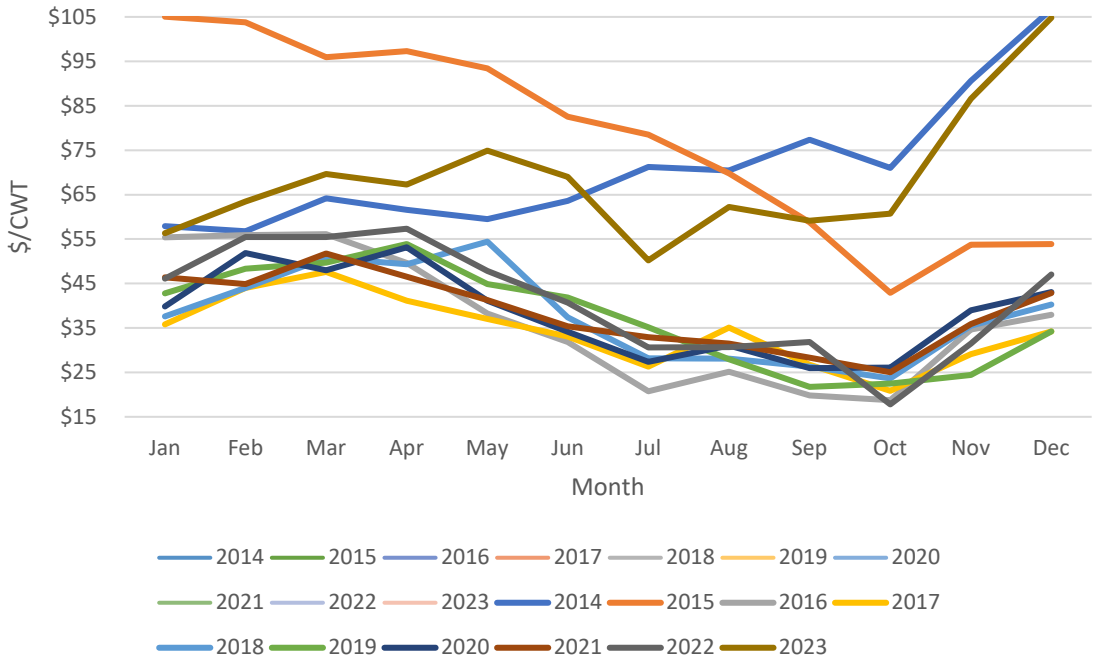


Figure 4.3: Seasonality of CME Feeder Index, Monthly Pricing vs. Annual Mean

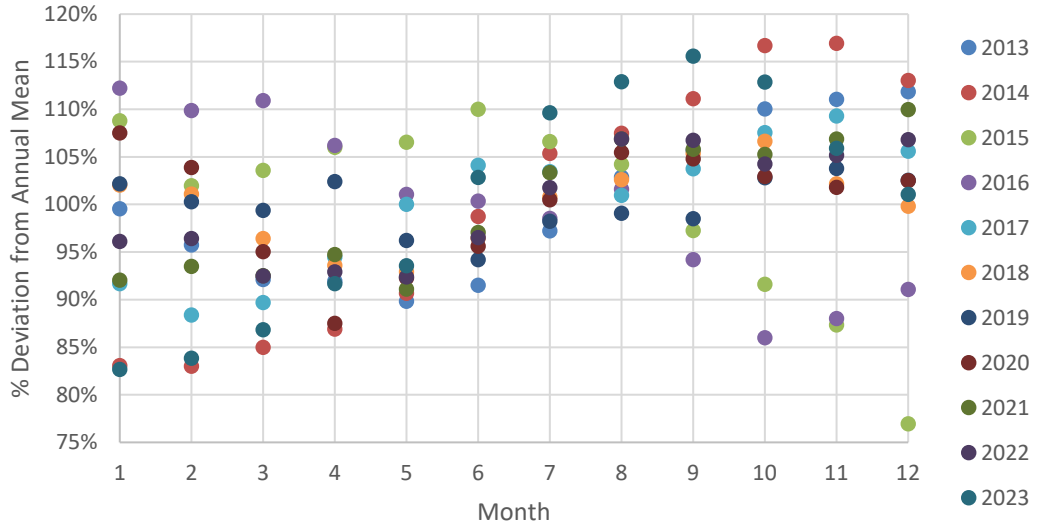
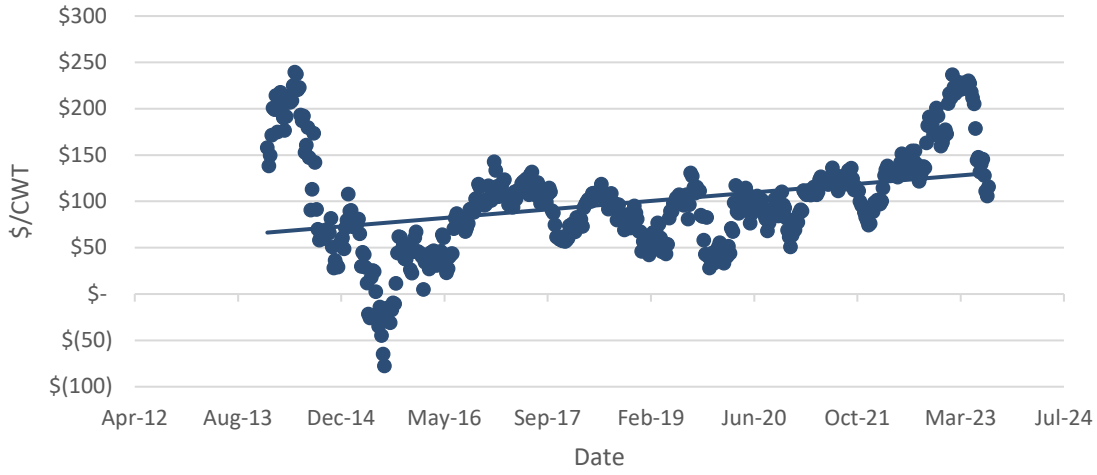


Figure 4.4: Value of Gain $/CWT, 450 Pounds to CME Feeder Index



4.3 Enterprise Budgets

Enterprise Budgets are powerful financial management tools used to estimate costs and income for a specific business activity. The enterprise budget developed to analyze the proposed stocker operation is based on current market values and expenses and is intended to be used as a living document. The model is organized into several sections including Production, Operating Inputs and Fixed Costs. Production measures the gross return/calf

accounting for death loss. Operating inputs cover all expected variable costs associated with grazing the calf from purchase to the expected sale weight. These are variable since they can fluctuate depending on head count, season, and current input prices. Lastly, fixed costs are incurred regardless of head count. These costs include things like lease, equipment depreciation, professional fees and memberships and insurance; these costs are allocated by herd to provide more clarity in assessing actual profitability by herd. The goal of this budget is to be updated and used in decisioning for the business. The Enterprise Budget Summaries are found in Figures 4.5, 4.6, and 4.7.

Figure 4.5 below is an annualized summary. It takes information from both the winter and summer enterprise budgets and aggregates them into a single amount that shows the expected annual profit, costs, and performance metrics for the given crop year. The performance metrics are weighted averages to give the most accurate outlook possible on how the cattle are expected to perform over the year and are shown in the top portion of the summary. Within the enterprise workbook there are several provisions for input of variables that are annual such as lease expense, depreciation and whether the cattle are forward contracted. Some assumptions are required in this respect so that expenses can be allocated more accurately between the two herds based on cattle inventory.

Figures 4.6 and 4.7 are the individual herd summaries. Figure 4.6 is a summary of the winter herd's expected performance. The top portion of the summary shows the expected death loss, head count, daily gain, and grazing period. These numbers are obtained from the accompanying workbook user input.

For margin businesses such as stocker cattle, or feed yard cattle, enterprise budgets are typically laid out on a unit (per head) basis. The vertical column second from the right

shows the corresponding row variable on a per head basis. Next to this, furthest to the right is a column showing the corresponding variable for the entire herd. The "Production" portion of the summary shows the cost of the purchase to buy the calf, the effect of the estimated death loss on sales, and the sales price of each calf. As discussed in Chapter 3, the values used for the cattle prices were obtained from USDA reporting of Tulsa Stockyards sale results for the calf purchase (USDA- My Market News 2023). The CME Feeder Index price obtained from CattleFax was used for the feeder cattle sales figure (CattleFax 2023). The death loss is figured in dollars rather than head as it is more accurate. The number is calculated by multiplying the purchase price by the death loss percentage and subtracting that amount from the cattle sales.

Operating inputs are listed below the production figures and show the associated variable expenses for the herd. Harvested forage, protein supplement, mineral, veterinary medicine, and management software expenses were all estimated using information obtained from local vendors or from speaking with other producers of their costs. Forage production expense was determined through research concerning daily dry matter intake of the various forage types, and the necessary inputs to produce the required yields to attain the cattle performance indicated. The information was obtained primarily from Oklahoma State University and Kansas State University. This information also dictates stocking density, average daily gain, and is a major component of the calves' cost of gain within the model. Labor was estimated using industry knowledge, and contemplating the amount of time the various tasks would take on average. Labor unit costs are set at $20 per hour, which is high for the area but offers a conservative outlook on labor costs should any overruns occur. Utilities and marketing costs were estimated on a per head basis. Utilities

are minimal and include only rural water service for part of the year, and electricity to run minimal equipment and lighting. The marketing cost was estimated with direct sales in mind, to include any freight costs or travel expenses. Risk management costs were obtained from the USDA rate sheet for the proposed start date and reference the cost of insuring value on a weight 2, #1 steer at the ".9965" coverage level (USDA-RMA 2023). These costs are listed by the per cwt unit cost and must be multiplied by the expected sales weight to obtain the per head cost. The operating cost of capital was determined by multiplying the sum of the total expenses, including the purchase price and death loss, by 8% (estimated available rate), dividing by the 360 days (typical interest format), and again multiplying the daily expense by the length of the grazing period plus 30 days to account for payment time. This is not the most exact way of calculating interest, since the formula assumes all expenses occur day one and remain until 30 days post-sale, but it does provide a reasonable approximation.

Below the operating inputs is the "fixed cost" section that includes the expenses that do not change with head count. These expenses are depreciation, pasture lease, professional fees/memberships, and insurance. These expenses are all allocated based on an estimated winter/summer mix of cattle. The model was designed to fit the region it would be operating in, so the winter herd was determined to be 60% of the overall calves for the year, and the summer herd was allocated 40% of the expenses. Depreciation was calculated as straight-line depreciation over 10 years on the equipment complement. The equipment required can be modified and pricing updated to reflect changes. The lease expense per acre was determined by actual lease expenses paid by local producers. Professional fees/memberships were estimated considering membership in National Cattlemen's Beef

Association, Texas Southwestern Cattle Raisers Association, Oklahoma Cattlemen's Association as well as covering attorney fees for document review on purchase and lease contracts. The number was inflated above the expected to provide a more conservative approach. The insurance expense was likewise based on a basic farm policy to cover liability, vehicles, equipment, and a portion of the cattle.

At the bottom of the herd summary is a breakdown of total costs, income above operating costs, and income over total costs. The income over total costs is the true expected profit figure and is used throughout the project to gauge profitability, and to construct the profitability matrices. Also included on the Excel version of the model is a breakeven analysis for several variables including purchase price, sales price, and death loss. These tables can be seen in Chapter 5.

Figure 4.5: 2023-2024 Annual Enterprise Budget Summary

Annual Stocker Summary	2023 Production Year	Spring and Summer Herds

Production Efficiency Information

		Winter Hd. Ct.	**300**	Total Beef Produced (CWT)/Hd
Death Loss	**2.0%**	Summer Hd. C	**200**	3.07
		Total Head C	**500**	
Total Grazing Days per year	**352.0**	Avg. Daily Gain	**1.72**	

Production	**$/Head**	**Total**
Total Sales	$ 1,869.02	$ 934,512.00
Total Purchase Price	$ (1,319.36)	$ (659,678.60)
Total Death Loss	$ (26.39)	$ (13,193.57)
Total Gross Return/Calf	**$ 523.28**	**$ 261,639.83**

Operating Inputs		**$/Head**	**Total**
Forage Production	=	$ 99.23	$ 49,613.86
Harvested Forage	=	$ 24.48	$ 12,240.00
Grain/Protein Supplements	=	$ 32.08	$ 16,040.00
Mineral/Salt	=	$ 13.44	$ 6,720.00
Labor	=	$ 28.27	$ 14,133.85
Vet Medicine/Drugs	=	$ 9.62	$ 4,808.64
Risk Management- LRP Weight 2	=	$ 53.94	$ 26,972.25
Utilities	=	$ 2.00	$ 1,000.00
Machinery/Equip, Fuel, Lube, Repairs	=	$ 20.00	$ 10,000.00
Management Software	=	$ 2.50	$ 1,250.00
Marketing Costs	=	$ 5.00	$ 2,500.00
Operating Capital Cost	=	$ 13.71	$ 6,856.96
Total Variable Costs		**$ 304.27**	**$ 152,135.55**

Fixed Costs	**$/Head**	**Total**
Depreciation	$ 28.20	$ 14,100.00
Pasture Lease	$ 25.60	$ 12,800.00
Professional Fees, Memberships, etc.	$ 10.00	$ 5,000.00
Insurance	$ 6.00	$ 3,000.00
Total Fixed Costs	**$ 69.80**	**$ 34,900.00**
Total Costs	**$ 374.07**	**$ 187,035.55**
Income Over Operating Costs	***$ 219.01***	***$ 109,504.27***
Income over Total Costs	***$ 149.21***	***$ 74,604.27***

Figure 4.6: 2023-2024 Winter Enterprise Budget Summary

Inter-Seeded Small Grain & Supplemental Feed — **2023 Production Year**

Production Efficiency Information

				CWT Produced
				3.25
Death Loss	**2%**	Head Count	**300**	
				Cost of Gain/CWT
Days on Grass	**192.0**	Average Daily Gain	**1.70**	$ 130.90

Production	Price	Unit		Qty	Unit		$/Head	Total
Feeder Sale	$ 246.95	*per cwt*	x	775	*lbs*	=	$ 1,913.86	$ 574,158.75
Purchase price	$ 303.00	*per cwt*	x	450	*lbs*	=	$ (1,363.50)	$ (409,050.00)
Death Loss						=	$ (27.27)	$ (8,181.00)
Total Gross Return/Calf							**$ 523.09**	**$ 156,927.75**

Operating Inputs							$/Head	Total
Forage Production	$ 110.84	*per acre*	x	1.1	*acres per calf*	=	$ 118.23	$ 35,467.83
Harvested Forage	$ 40.80	*per calf*	x	1	*head*	=	$ 40.80	$ 12,240.00
Grain/Protein Supplements	$ 39.60	*per calf*	x	1.0	*head*	=	$ 39.60	$ 11,880.00
Mineral/Salt	$ 14.40	*per calf*	x	1.0	*head*	=	$ 14.40	$ 4,320.00
Labor	$ 20.00	*per hour*	x	1.3	*hours*	=	$ 25.95	$ 7,784.14
Vet Medicine/Drugs	$ 9.58	*per head*	x	1.0	*head*	=	$ 9.58	$ 2,874.54
Risk Management- LRP Wt. 2	$ 7.85	*per CWT*	x	7.8	*cwt*	=	$ 60.84	$ 18,251.25
Utilities	$ 2.00	*per head*	x	1.0	*head*	=	$ 2.00	$ 600.00
Mach/Equip, Fuel, Lube, Rep.	$ 20.00	*per head*	x	1.0	*head*	=	$ 20.00	$ 6,000.00
Management Software	$ 2.50	*per head*	x	1.0	*head*	=	$ 2.50	$ 750.00
Marketing Costs	$ 5.00	*per head*	x	1.0	*head*	=	$ 5.00	$ 1,500.00
Operating Capital Cost	8%	*percent*	x	$ 208.98		=	$ 16.72	$ 5,015.61
Total Variable Costs							**$ 355.61**	**$ 106,683.36**

Fixed Costs	$/Head	Total
Depreciation	$ 28.20	$ 8,460.00
Pasture Lease	$ 25.60	$ 7,680.00
Professional Fees, Memberships, etc.	$ 10.00	$ 3,000.00
Insurance	$ 6.00	$ 1,800.00
Total Fixed Costs	**$ 69.80**	**$ 20,940.00**

Total Costs	**$ 425.41**	**$ 127,623.36**
Income Over Operating Costs	***$ 167.48***	***$ 50,244.39***
Income over Total Costs	***$ 97.68***	***$ 29,304.39***

Figure 4.7: 2023 Summer Enterprise Budget Summary

Improved Bermuda/Fescue Mix & Supplemental Feed	**2023 Production Year**

Production Efficiency Information

				CWT Produced	
				2.80	
Death Loss	**2.0%**	Head Count	**200**		
				Cost of Gain Per CWT	
Days on Grass	**160.0**	Average Daily Gain	**1.75**	$ 106.09	

Production	**Price**	**Unit**		**Qty**	**Unit**		**$/Head**	**Total**
Feeder Sale	$235.53	*per cwt*	x	765	*lbs*	=	$ 1,801.77	$ 360,353.25
Purchase price	$258.38	*per cwt*	x	485	*lbs*	=	$ (1,253.14)	$ (250,628.60)
Death Loss						=	$ (25.06)	$ (5,012.57)
Total Gross Return/Calf							**$ 523.56**	**$104,712.08**

Operating Inputs							**$/Head**	**Total**
Forage Production	$ 44.21	*per acre*	x	1.6	*acres per calf*	=	$ 70.73	$ 14,146.03
Harvested Forage	$ -	*per calf*	x	1	*head*	=	$ -	$ -
Grain/Protein Supplements	$ 20.80	*per calf*	x	1.0	*head*	=	$ 20.80	$ 4,160.00
Mineral/Salt	$ 12.00	*per calf*	x	1.0	*head*	=	$ 12.00	$ 2,400.00
Labor	$ 18.00	*per hour*	x	1.8	*hours*	=	$ 31.75	$ 6,349.71
Vet Medicine/Drugs	$ 9.67	*per head*	x	1.0	*head*	=	$ 9.67	$ 1,934.10
Risk Management- LRP Wt. 2	$ 5.70	*per CWT*	x	7.7	*cwt*	=	$ 43.61	$ 8,721.00
Utilities	$ 2.00	*per head*	x	1.0	*head*	=	$ 2.00	$ 400.00
Mach/Equip, Fuel, Lube, Rep	$ 20.00	*per head*	x	1.0	*head*	=	$ 20.00	$ 4,000.00
Management Software	$ 2.50	*per head*	x	1.0	*head*	=	$ 2.50	$ 500.00
Marketing Costs	$ 5.00	*per head*	x	1.0		=	$ 5.00	$ 1,000.00
Operating Capital Cost	8%	*percent*	x	$ 115.08		=	$ 9.21	$ 1,841.35
Total Variable Costs							**$ 227.26**	**$ 45,452.19**

Fixed Costs	**$/Head**	**Total**
Depreciation	$ 28.20	$ 5,640.00
Pasture Lease	$ 25.60	$ 5,120.00
Professional Fees, Memberships, etc.	$ 10.00	$ 2,000.00
Insurance	$ 6.00	$ 1,200.00
Total Fixed Costs	**$ 69.80**	**$ 13,960.00**
Total Costs	**$ 297.06**	**$ 59,412.19**
Income Over Operating Costs	***$ 296.30***	***$ 59,259.89***
Income over Total Costs	***$ 226.50***	***$ 45,299.89***

4.3.1 Production (Market Conditions)

The market conditions captured in the model include the cost to purchase the weaned calf and the expected sale price, whether that be negotiated on a forward contract or estimated using CME futures and covered with LRP. The purchase price is based on the most recent sale results for Tulsa Stockyards #1 steers for the closest pay weight to the

estimated purchase weight in the model. Discussion with local cow-calf producers suggested this method was the most repeatable, understandable, and appropriate means of valuing calves prior to purchase. Likewise, wherever possible, the local market was used to estimate the performance metrics of the growing calves and the expected death loss. One of the expected benefits of having a known source of calves, and a known veterinary history is a lower-than-average death loss. This amount was fixed at 2%, though it is expected that this could be even lower at close to 1.5% considering the lower risk associated with the weaned, local calves.

The CME Feeder index was used for an approximation of an expected sales price on each group of calves. The initial estimate only incorporates steers to avoid estimating discounts on heifers. Likewise, feeder cattle basis was ignored since the business model predicates the sale be either forward contracted or covered by Livestock Revenue Protection insurance. The LRP indemnity price is shown on the pricing worksheet within the budget but does not factor into the model since the difference is immaterial at the 99%+ coverage level. In practice, the model pricing would be a blend of heifer and steer prices and would not require nearly as much estimation since the prices would be known quantities.

4.3.2 Operating Inputs

This section contains all operational input costs, broken down into by calf and on a whole-herd basis. Throughout the budgets, unit input costs are adjusted based on parameters and requirements within the model and used to formulate a realistic approximation of the cost to meet the required performance metrics. Because of the untested nature of the operation, various research articles and analyses were used to

approximate input requirements needed to achieve expected performance. The summer grazing performance metrics were created using Oklahoma State University research that provided well established evidence as to the reaction of Bermudagrass pasture to nitrogen, and its direct correlation to beef production (Redfearn, et al. 2016). Some modifications were made to incorporate the presence of cool-season Fescue and the effect of nitrogen on yield/forage performance, though research was harder to come by. A KSU Extension research paper completed in 2010 indicated that nitrogen does increase yield, but more importantly that average daily gain and DM yield could be comparable to Bermuda at appropriate times of the year (Shoup, Kilgore and Brazle 2010). A benefit of purchasing local calves is their ability to handle the fescue pastures, that are commonly "endophyte infected" and can cause issues in non-acclimated cattle. Fescue, while not as preferred as Bermuda as a forage provides extended grazing from March to May and from September through November and complements the Bermuda population in an estimated 50/50 split locally. In most cases, the bermudagrass is the primary forage, and so is the lion's share of the input costs and performance consideration.

The winter pasture inputs and expenses were generally supported by both a Kansas State University Extension Service Fact Sheet and an Oklahoma State University fact sheet. The OSU literature indicated that more specific utilization and yield figures could be obtained by using information from Oklahoma State University research done on small grain forage production (Marburger, et al. 2018). The report focuses on traditionally seeded small grains for forage and dual purpose (forage and harvest) as opposed to inter-seeded (sod-seeded) small grains, however the available information suggests that yields can be similar if certain conditions are met. The key factors for successful stands are increased

planting population, appropriate fertilization rates, proper preparation of the pasture (native species suppressed chemically or mechanically) and the use of a heavy no-till drill. With proper management, the yield and quality can be analogous to standard small-grain stands; the paper even suggested that sod-seeded small grains could potentially produce enough excess to harvest, though this would never be the intent. The cattle performance expectations were hard to estimate on the inter-seeded pasture, as less academic research has been done to establish benchmarks for that environment. It was determined that the most reasonable way to determine the winter performance metrics was to use similar methodology to the summer grass and look at production versus DM intake requirements on small grains. The outcome was supported by traditional wheat pasture cattle performance that was indicated to be close to properly sod-seeded small-grain pasture performance.

To every degree possible, the expenses within this section are specifically tailored to the local area. This granularity was necessary since performance metrics such as average daily gain, stocking rate and forage production are dependent on location and are key components of stocker profitability.

4.3.3 Fixed Costs

This section incorporates all the fixed costs of the operation. In the case of the semi-annual herds, the fixed costs are allocated via user input on the annual overview worksheet. These allocations are not auto calculated on a percentage basis since the business owner will not have a true annual head count as a basis for allocation until the second turn of calves is purchased. Fixed cost accuracy is important, but these typically tend to be lower costs when considered on a per head basis. The important thing to acknowledge is that the

more calves that can be sustainably grazed per year, the lower the unit fixed cost becomes, de facto increasing unit profitability and providing an impetus to graze at the maximum sustainable stocking rate for the inputs required.

4.3.4 Net Revenue, Profit/Loss

Net revenue is identified within the model in several ways. Both individual herds show the expected net profit/(loss), as well as an annualized summary that incorporates both herds for a holistic view of the year's operation. The single-herd summaries are important individually, but the annual summary is most important. The business model itself, contracting the purchase of only local calves, requires purchasing in both late spring and late fall to account for both spring and fall calving herds. The single herd summaries serve as the decision models, but the annual view is what matters; profitability of the operation will always be the sum of the two herds.

4.4 Limiting Factors, Assumptions

The purpose of this thesis is to determine if a stocker operation can be profitable in NE Oklahoma if it employs supply chain management, a value-added mentality and sound business management. The secondary consideration of the thesis is to determine if the goal of increasing net economic welfare for the supply chain is achieved, and if the business is manageable, sustainable, and scalable. Stocker enterprise budgets available prior to the creation of this project's custom model had too many vague or estimated variables to accurately portray the proposed stocker operation. This model was specifically developed to try and determine the actual costs of growing calves in this immediate area, under the proposed business model.

4.4.1 Forage Production Capability: Identifying a realistic Stocking Rate

Determining actual forage production capability for the region was the first hurdle to overcome in the creation of an advanced enterprise budget. Stocker cattle are relatively rare in this part of NE Oklahoma, where most available pasture acres are devoted to cow-calf production. To estimate the realistic stocking rate for the grass and region, research was conducted to estimate forage yields for the grasses in question: primarily Bermuda and Fescue mix. Previous research has been completed on the local improved grasses, so forage production capability was an easily estimable factor in the model. Likewise, the utilization rate, and forage requirements of a calf are estimable and have been researched thoroughly. By estimating the number of calves that could likely be purchased and comparing that number to the assumed pasture available, the required forage production per acre and the inputs that would be necessary to reach that production level can be determined. This same process was employed for estimating the winter forage of inter-seeded small grains, though pertinent information was harder to find. There is no data to directly support this method of grazing for this area, though the limited information available indicated that the performance estimates are reasonable. Within the region there is limited use of this grazing method, however it mostly seems to be in Central Oklahoma, Kansas and Missouri. Per the OSU sod-seeding small grains fact sheet, information pertaining to conventionally planted wheat and triticale was used to help support the assumptions within the model. Nitrogen requirements, and seeding rates were both increased to the upper end of the recommended levels to maintain a conservative approach (Edwards, Warren and Redfearn 2017).

4.4.2 Assumptions in the model

As discussed above, the model required several assumptions to complete. Aside from obvious climatic variables such as rainfall, soil temperature and growing conditions, some other variables required assumptions as well. The largest assumption is that the inter-seeded pasture will work in the same manner that it does in neighboring states, with similar inputs. If managed properly, it seems that this should be the case, but this factor remains unknown until a test can be completed. Other assumptions are on input units; fuel, doctoring, death loss, etc. are all estimated based on prior experience grazing cattle in the region and estimated time for completion of projects. Realistically the largest assumptions lie in the business model but are unimportant as far as budget validity is concerned. If the business plan requirements cannot be met, the model would fail prior to purchase of the calves and would create a zero-profit, zero-loss scenario. The base assumptions are that a material number of smaller cow-calf producers could be engaged and contracted to participate in the buying program, that the research indicating the potential for premiums above and beyond the feeder index price for value added calves is possible, and that a facility could be found and leased within a reasonable distance of the current ranch headquarters.

4.4.3 Limiting Factors

A limiting factor within the project was the ability to get supportable information regarding premiums that could be obtained on the value-added cattle. This information may be available internally at cattle feeding companies, but many of the sales that would record such data are private treaty and are not disclosed. Information available indicates that a

premium is likely, even in an auction setting but definitively stating that a premium for these calves could be “x” within the budget is not feasible.

CHAPTER V: RESULTS

5.1 Introduction

The estimated enterprise budget indicated that the proposed stocker business had an average profit of $149.21 per head over the first year, with the cattle covered by LRP as opposed to a forward contract. Full LRP premiums were included since during the first year or two, cattle performance may need to be proven prior to a serious buyer forward contracting the stockers for future delivery. Ideally, positive carcass data would be available for the first calves through the program, enticing buyers to pay premiums due to consistency and proven quality. If cattle were forward contracted and marketed even with the CME, the first year's annual profitability is $183.68 per head. The model was estimated with May and November 2023 cattle prices and input cost approximations for both the summer and winter grazing herd. Further permutations of the full model were not estimated since the operational paradigm is fixed. Modification to the structure of the model would change the basic structure of the operation outside of its intended purpose. Instead of multiple permutations, a table of modified outcomes is shown in a matrix within the model to offer a quick reference for differing purchase and sales unit amounts.

5.2 Breakeven Analysis

Aside from attempting to estimate the most accurate outcome of the business possible, an enterprise budget can also help the user understand the business' sensitivity to risk. In terms of a stocker operation, the three most important break evens to understand are the purchase price, sales price, and death loss. Every input can also be analyzed with respect to break evens, though that is a more in-depth analysis and would be completed

using the goal-seek function. For quick reference, three variables were made to auto-calculate on the Budget summary.

Table 5.1 shows the breakeven levels for three key variables within the winter herd budget. In the case of the winter herd, the purchase price could increase by 7.02% to $324.28 per cwt, holding all else constant before causing the model to break even. The sales price on the winter calves could decrease by 5.10% to $234.35 per cwt before the budget broke even, and the death loss percentage could increase to 9.2% before the breakeven level would be reached. As the largest single expense item aside from the cattle purchase, fertilizer cost was also individually analyzed for its effect on the breakeven amount. Fertilizer would need to increase in price from $550 per ton to $1,620 per ton, holding all else constant, before net income revenue would break even.

The summer herd proved to be more profitable, partially due to beneficial calf prices, but also to a decreased cost of gain due to lower forage production costs. Table 5.2 shows the breakeven levels for three key variables within the model for the summer herd. To reach breakeven, the purchase cost would need to increase 17.72% to $304.17 per cwt, holding all else constant. Likewise, the sale price of the feeder cattle would need to drop 12.57% to $205.92 per cwt. Death loss would create a breakeven condition at 20.1%. As with the winter herd, fertilizer cost was also analyzed for a breakeven level within the model. Holding all else constant, fertilizer cost would need to increase from $552 per ton to $3,119.13 per ton, an increase of 465.1% before the model breaks even.

To understand potential profitability, a matrix was created as a supplement to the enterprise budgets. The base enterprise budget is used to estimate results if purchase or sales price is modified. With the stocker business predicated upon a managed supply chain,

value added principles and direct marketing of feeder cattle, the matrix provides outcomes for a range of sales price possibilities, rather than requiring manipulation of the actual enterprise budget to test different scenarios.

There are dozens of different breakeven scenarios that could be estimated within the budgets, stress testing every variable until the model nets zero profit; really the break evens above and a single over-arching breakeven are the most important to understand. The over-arching breakeven is the Unit Cost of Production, or Breakeven Cost of Gain. This is identified within the model and indicates the marginal cost of adding a unit of gain to the calf. In the case of the summer model, this number is $106.09/cwt. The interpretation of this number is that if the value of gain falls to or below the $106.09 figure, the cattle cannot be profitable. Using the same Summer 2023 budget, the Value of Gain is $186.99, would be well above the breakeven unit cost of production.

Table 5.1: Breakeven Analysis for 2023-24 Winter Herd

Variable	Limit	% Δ
Purchase Price	$324.28	7.02%
Sale price	$234.35	-5.10%
Death loss	9.2%	7.2%
Fertilizer	$1,620.52	194.64%

Table 5.2: Breakeven Analysis for 2023 Summer Herd

Variable	Limit	% Δ
Purchase Price	$304.17	17.72%
Sale price	$205.92	-12.57%
Death loss	20.1%	18.1%
Fertilizer	$3,119.13	465.1%

5.3 Profitability and Financial Metrics

The enterprise budget was developed to be as specific to the actual pasture characteristics of the area as possible. Research was conducted on forage requirements for calves, the cost of forage production, the required nutrients, and more. The stocking rate is realistic for the region and operation type but more importantly, the required forage per acre for the stocking rate and cattle performance is supported by research.

The profitability of stockers depends on prices, but every care was taken to support the costs and sales. Breakeven analysis is integrated on cattle margins as well as death loss, and a profitability matrix was created to determine the effect if premiums are paid or received outside of the enterprise budget figures. In comparing the budget-calculated cost of gains to the current industry averages, the model is validated in that the outcome is within reason of what would be expected.

Comparing profitability in 2023 directly to previous years directly is difficult, without actual historic performance for the operation. As opposed to feeding cattle to finish, published benchmarks and historical data are more difficult to procure, and when available may not correlate to other operations; input costs are variable, forage types and management types are divergent and weather patterns region to region greatly effect stocking rate, performance, price, and input requirements. That said, if the estimated cost of production is known for a given period, an evaluation of profitability can be completed using the corresponding “value of gain”. Periods in which the Value of Gain is greater than the UCOP are profitable, holding all external factors constant. This is a good method of analysis since it makes the actual purchase and sales price figures irrelevant and only cares about gross margins vs. costs. If the cattle Cost of Gain (UCOP) is greater than the Value

of Gain, the cattle lose money, regardless of any external factors. An animal's Value of Gain is defined as the value per head of each animal at the end of the feeding period (sale Value), less the value of the animal at the beginning of the period (Purchase Value) divided by the weight gain (Rasby 2015). The Unit Cost of Production is defined as the operation's total expenses divided by the units produced (Machen, PhD and Bevers 2021).

In terms of financial metrics, one measure of profitability for the business is the Return on Investment. This simple function is seen below:

$$ROI = \frac{(Total\ Revenue - Total\ Expenses)}{Total\ Expenses}$$

Total Expenses for the two turns of cattle were estimated at $859,908, with Gross Revenue being $934,512. As such, the initial year's ROI would be estimated to be:

$$\frac{(934{,}512 - 859{,}908)}{859{,}908} = 8.68\%$$

If compared to the 20-year average S&P 500 inflation-adjusted return of 6.91% the business seems profitable. Profitability could be pumped up, and ROI increased if premiums were added into the mix.

It is noted that this business will not be profitable every year; no production agriculture business is. As markets change so does profitability and the business must do what it can to minimize losses. A thorough understanding of the industry, a robust forecasting model, and appropriate risk management measures can help create a managed supply chain stocker business that can be profitable under a range of market conditions. The enterprise budgets developed in the project can help identify cost saving measures, maximize utility of the available resources, provide pricing guidance and preparation for expected losses.

5.4 Marketing Scenarios

As discussed in the introduction, one of the key components of this business involves selling the stockers direct to an off taker allowing negotiation on price, mitigation of risk through a forward contract and a lack of commission fees to a sale barn or intermediary. Direct marketing will allow the Company to take the fullest advantage of value-added processes, and to negotiate the terms of the sale to get the best price. If direct marketing is not possible, cattle will be price protected using LRP and marketed through some other avenue, such as video marketing.

While studying the industry, it became clear that several value-added practices are correlated to premiums on lots of cattle. Research from Oklahoma State University indicated certain premiums at various regional sales during the trial period, though the results were geared more towards calf sales. The research from OSU indicates that the value added on the calves continues through the supply chain, though a basis for valuation is difficult to determine without actually negotiating prices for the cattle. Further research from University of Nebraska shed some additional light specifically on feeder cattle and suggested certain practices, like age and source verification could result in a 1.09% premium on average. Rather than estimate unsupported premium, it was decided to avoid premiums within the enterprise budgets altogether, and instead create a matrix to see the effect of various premiums and discounts on CME pricing, as can be seen in Figures 5.1 and 5.2. In practice, it is assumed that it could be difficult to obtain a meaningful premium on the first year's offering from buyers without proof of feedlot performance. For this reason, LRP costs are incorporated into the enterprise budget. Within the budget, forward

contracted cattle can be indicated as such, and the model will drop LRP coverage to only 10% of the herd. The 10% remainder was determined to be the most conservative approach, since a portion of the herd may fall out of contract specifications, or be ineligible to ship; the 10% coverage maintains these fringe cattle at a reasonable approximation of the expected sales price. If no off taker is identified at the time of sale, the budgets are designed to incorporate LRP on 100% of the cattle. Using LRP is the simplest and most logical tool to use at the intended size and scope of the operation if the cattle are not forward contracted.

Further scenarios were not estimated to determine the profitability potential of the business. Between the sensitivity analysis and the profitability matrix, scenarios within reason are covered by the budgets. Modifying the budgets could result in further permutations for comparison.

Figures 5.1 and 5.2 below show the profitability matrices that were estimated in conjunction with the enterprise budgets. The intent of the figures is to show how various modifications to the gross cattle purchase or sale unit prices affect income per head, holding all other variables constant. Across the horizontal axis are labelled several premium possibilities that could be paid to a cow-calf producer above the stated market rate. On the vertical axis of the chart are rows detailing +/- $5cwt unit sales price, in $1/cwt increments. By selecting the appropriate premium paid to the cow-calf producer, and selecting the appropriate row on the unit sales price, the modified enterprise budget profit per head can be quickly ascertained. As an example, if the winter calves in Figure 5.1 were purchased for $3/cwt more than the Tulsa Stockyards indicated value, and the stockers were able to be negotiated to a sales price $2/cwt above the CME Feeder Index,

then per head profit would be $99.41 per head as opposed to the base model profit of $97.68 per head. The intention of the matrices is to provide the outcome of increased profitability due to supply chain management and value-added practices. The matrices in Figures 5.1 and 5.2 serve as a quick reference for sensitivity analysis, showing profit outcomes within a reasonable band of price changes in both cost and sales.

Figure 5.1: Profitability Matrix per Head Winter Herd 2023-24

Sale Price (CWT Premium/(Discount) from Summary	Purchase Price (/CWT Premium over Summary)					
	$0.00	**$1.00**	**$2.00**	**$3.00**	**$4.00**	**$5.00**
$(5.00)	$58.93	$54.34	$49.75	$45.16	$40.57	$35.98
$(4.00)	$66.68	$62.09	$57.50	$52.91	$48.32	$43.73
$(3.00)	$74.43	$69.84	$65.25	$60.66	$56.07	$51.48
$(2.00)	$82.18	$77.59	$73.00	$68.41	$63.82	$59.23
$(1.00)	$89.93	$85.34	$80.75	$76.16	$71.57	$66.98
$ -	$97.68	$93.09	$88.50	$83.91	$79.32	$74.73
$ 1.00	$105.43	$100.84	$96.25	$91.66	$87.07	$82.48
$ 2.00	$113.18	$108.59	$104.00	$99.41	$94.82	$90.23
$ 3.00	$120.93	$116.34	$111.75	$107.16	$102.57	$97.98
$ 4.00	$128.68	$124.09	$119.50	$114.91	$110.32	$105.73
$ 5.00	$136.43	$131.84	$127.25	$122.66	$118.07	$113.48

Figure 5.2: Profitability Matrix per Head Summer Herd 2023

Sale Price (CWT Premium/(Discount) from Summary	Purchase Price (/CWT Premium over Summary)					
	$ -	**$ 1.00**	**$ 2.00**	**$ 3.00**	**$ 4.00**	**$ 5.00**
$(5.00)	$188.25	$183.30	$178.36	$173.41	$168.46	$163.51
$(4.00)	$195.90	$190.95	$186.01	$181.06	$176.11	$171.16
$(3.00)	$203.55	$198.60	$193.66	$188.71	$183.76	$178.81
$(2.00)	$211.20	$206.25	$201.31	$196.36	$191.41	$186.46
$(1.00)	$218.85	$213.90	$208.96	$204.01	$199.06	$194.11
$ -	$226.50	$221.55	$216.61	$211.66	$206.71	$201.76
$ 1.00	$234.15	$229.20	$224.26	$219.31	$214.36	$209.41
$ 2.00	$241.80	$236.85	$231.91	$226.96	$222.01	$217.06
$ 3.00	$249.45	$244.50	$239.56	$234.61	$229.66	$224.71
$ 4.00	$257.10	$252.15	$247.21	$242.26	$237.31	$232.36
$ 5.00	$264.75	$259.80	$254.86	$249.91	$244.96	$240.01

CHAPTER VI: CONCLUSIONS

6.1 Summary

The purpose of this thesis was to determine if a managed supply chain stocker business could be profitable in NE Oklahoma. The answer was yes, but with qualifications as discussed later in this chapter. The business set out to create superior value by buying locally, favoring consistency and quality over quantity, using progressive production methods and fostering relationships within the supply chain. The enterprise budgets were developed to be as accurate as possible for the region and intended production requirements. The models use the most supportable averages for gross cattle margin, which were determined to be the local relevant auction results from Tulsa Stockyards on purchase, and the CME Feeder Index value for the shipping price. Short of actual negotiated prices on cattle, these represent the best approximation for analysis of the business.

Expenses were based on local prices wherever possible. Research completed indicates that the value-added practices intended to be an integral part of the operation would demand a premium over the sale value, though actually identifying that number would amount to speculation. While assigning a set premium is inappropriate, it was noted while conducting the market research that 750# Oklahoma Steers did regularly demand a higher price on average than the CME Feeder Index over the same period, indicating that the CME price may be slightly conservative for the estimated out-weight (The models are designed to sell at 750-800# max). This is prior to considering lot size, health, quality or value-added aspects of the cattle.

The return on investment turned out to be adequate at nearly 9%. If ROI were to decrease too much, it would be beneficial to invest the capital elsewhere and reap the earnings.

6.2 General Findings

Under current market conditions, the findings in this thesis indicate that the business would be profitable. The budgets indicate that even at a maximum premium paid to each producer of $5/cwt over market, and a discounted sale value of $5/cwt below market both the summer and winter herds would be profitable. This is certainly not going to be the case every year. This business model, while divergent from the traditional system, is not reinventing the wheel and is still subject to market volatility; pricing risk can be mitigated with LRP or forward contracts but can only work to protect the prices within the bounds of the market. The research completed in this thesis suggests that this model, with the value-added aspects, a more secure supply chain, and progressive pasture management methods would be profitable in a wider range of market conditions than traditional counterparts, but still must adhere to the bounds of what the market would pay. Monitoring market conditions is vital to success, and drastic changes to the operational paradigm may be required at times to maintain the model. Drastically changing markets lead to one of the main qualifications on the profitability of this model.

6.3 Business and Community Implications

By updating and maintaining the enterprise budgets, the stocker business can help stakeholders make informed decisions quickly and negotiate prices using the profitability matrix. As the business progresses, the model should be updated to match actual input costs and units as they are recorded; every iteration of the budgets with updated costs and

performance metrics based on actual data will increase the model's functionality and accuracy. With an accurate model, progressive grazing operation, solid relationships with suppliers and buyers and an understanding of the markets the business can be successful.

Outside of profitability, one of the primary goals of this project was to increase net economic welfare. The Business accomplishes this in several ways. The calf suppliers will be better off on average than selling through a sale barn and have a reliable buyer over time. The stocker business gains consistency, quality, cattle health, and larger scale by dealing with local producers and sourcing from the same sellers over time. The off-taker benefits from the lower risk presented by cattle uniformity, high quality, backgrounded calves, and the pass-through ability to negotiate pricing to allow forecasting of their business.

6.4 Further Study/Considerations

As the thesis came together and began to take shape, it became clear that further research would benefit the validity of the model. As stated throughout this thesis, supportable information regarding pricing is hard to obtain. This is because multiple variables come into play when stocker cattle are being sold. These variables include location, market conditions, cattle background, condition, type, sex, etc. Compounding this issue is that larger stocker groups sold on forward contracts are, by definition, private sales and not reported; the CME Feeder Index only includes cattle sold at reporting sale locations in a 12-state region. The lack of pricing availability leads to some ambiguity as to what actual premiums could be obtained on the cattle owned by the managed supply chain stocker business. The best way to determine supportable premiums is to either begin selling the cattle in question, or to try and find any other operators with a similar operation size in

a similar environment and see if they will share results. The latter is unlikely, and requires starting the business with missing information, which equates to increased risk.

Qualifications on the profitability of the business need to be addressed. The findings are that the business would have been profitable in 2023-2024. The same cannot be said for every year. No production agricultural company is profitable every year; as the saying goes, “if it was easy, everyone would do it”. The operational model, as supported by the research conducted during the project does suggest that the value-added aspects, the progressive grazing methods, the supply chain of local calves, and the known off-takers would make the company profitable in a wider range of market conditions than a “traditional” stocker operator of a similar size. The amount for which this is true is to quantify since markets change continuously. Another qualifier to the profitability is that this stocker operation setup could experience some detrimental side effects not experienced by traditional counterparts. The main negative scenario deals with years where profitability is unlikely. Other operators can simply downsize or pass on purchasing calves. In the case of the managed supply chain, there are producers who are expecting to do business, and depending on set up may be contracted. There are risk mitigation strategies that can be employed, but issues like this need to be taken into consideration. Additional risk mitigants may also warrant consideration, particularly the inclusion of PRF (Pasture, Rangeland and Forage Insurance) which would serve to further protect against loss, as well as provide another potential driver of revenue.

After building the enterprise budgets it should also be mentioned that profitability could be enhanced if strategic changes were made. For instance, running grass stockers during the summer months will always prove more profitable than winter calves. Even

though the region is predominantly spring-born calves which would graze through the winter, an effort to identify and target small operators with predominantly fall calving herds should be made. This sets up the business to sell feeder cattle in the months with higher average price in the late fall. Winter cattle could still be run, and inputs would be minimized since the same property would only need to graze a portion of the cattle.

Another consideration for continuing research would be to consider retaining ownership on the cattle to finish. Not discussed in this thesis as it is outside of the project's scope, is that the business is a small cow-calf operation. This operation, which would remain legally separate from the cow-calf ranch, would experience a net gain by selling to the stocker operation, the same as any other cow-calf participants. This begs the question, what would the profitability be if the cattle were fed to finish? Besides stretching working capital thin due to lengthened cash flow periods, this could be analyzed since information surrounding finished beef is easy to obtain and feedlot performance and costs are well understood. The model would become complicated, but the profitability is something that could be estimated.

Lastly, further consideration would be given to advancing the Value-Added portion of the stocker business. Paying the cow-calf producers a premium for adhering to the program is a good start, but there are more options that can increase their profitability, convenience and cattle quality. Among the options to consider would be facilitating the leasing of bulls for these producers from a high-quality seedstock operation. Since these ranchers are small, the need to own a bull uses resources from their operation that could otherwise be used for producing calves. There is also discussion of offering partial management aid in the sense that the producers could buy bulk inputs through the stocker

business en masse, thereby getting a lower unit price and leaning on the business' size to be able to negotiate better prices on things like feed, fertilizer, mineral, etc.

All things considered, the managed supply chain stocker business has the capability to return profit, while increasing the net economic welfare for the suppliers, owners, and off-takers of the company.

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