**Dairy-Beef Retention Options**

by

Will Basham

B.S., Tarleton State University, 2003

---

A THESIS

Submitted in partial fulfillment of the requirements

for the degree

**MASTER OF AGRIBUSINESS**

Department of Agricultural Economics

College of Agriculture

**KANSAS STATE UNIVERSITY**

Manhattan, Kansas

2020

Approved by:

Major Professor
Dr. Jason Bergtold

## ABSTRACT

The efficient implementation of sexed semen from Holstein bulls has created an opportunity for dairy producers to change how dairy heifer replacement programs are managed. This technological advance has shortened the genetic lag interval in dairy herds by changing the historical need to produce a replacement heifer from every cow in the milking herd. Now producers can create future replacements from a targeted younger population with higher genetic value and breed other less desirable animals terminally to beef sires. This terminal mating to beef breeds has created a more favorable feedlot placement from commercial dairies than the usual Holstein steer. As these technologies have emerged dairies will now need evaluate marketing options and determine the most profitable choice for their business.

In evaluating multiple marketing channels, including selling day-old dairy-beef crosses; back-grounding dairy-beef crosses and selling as four-weights; or retaining ownership until harvest, this research indicates, at current market conditions, that marketing dairy-beef crosses from the calf grower at approximately 400 pounds is the most profitable decision.

Marketing day-old dairy-beef cross calves transfers future risk to the buyer and immediately takes the market premium over Holstein bull calves, however at current market conditions, this option is not the most profitable decision.

When marketing four-weight dairy-beef calves directly from the calf ranch was evaluated, it was found that this market is the most profitable choice. Local raising costs in

addition to day-old dairy-beef calf costs were found to be lower than the current market value for crossbred animals at this weight creating increased profit opportunity. This market is easily monitored at online cattle auction sites such as Overland Stockyards, where video markets sell thousands of animals from across the U.S. creating a well-traded exchange for market observation.

Certainly the most risk and capital intensive marketing channel evaluated is maintaining ownership through harvest. When modeled with current market conditions this option was not found to be profitable, being the highest risk option based on the length of ownership and currently experiencing negative margins, this marketing channel is currently not the most profitable. It should be stated that the feeding period of these animals from birth to harvest is approximately 15 months and this length of time could span both profit and loss situations as market conditions change.

As markets change, the most profitable channel for these dairy-beef calves will change also. Observing markets and maintaining a current marketing model is imperative to the producer to be prepared to respond to profitable marketing conditions.

## TABLE OF CONTENTS

## LIST OF FIGURES

## LIST OF TABLES

## ACKNOWLEDGMENTS

I'd like to start by thanking my wife Molly, and my children Brooke, Kase and Mason for their support, motivation, and patience throughout this process. Undoubtedly, the impact of my participation in this program has been felt directly by you all. I'd like to thank the Royal Farms Dairy ownership group for making this adventure possible. Your support and encouragement all along were greatly appreciated. Additionally, I'd like to say a heartfelt thank you to the management and operational teams at Noble Dairy for your hard work and dedication to our business while I have been away working through this program.

I would also like to say thank you to the countless persons along the way that have provided guidance, advice, friendship, mentoring, leadership and so much more. The roles you all have played have allowed me to get to this point today and for that I am deeply thankful.

To my new friends from within the program, you all are a fantastic group of peers I feel privileged to have had the chance to get to know you all. Obviously, value from the MAB program isn't only academic, it is also about the networking and the new friendships created, and the new resources discovered along the way.

Lastly, I would like to thank the new friendships made at Kansas State University in the Agricultural Economics department. The Masters of Agribusiness Program and Kansas State University staff truly invests in each of their student's success.

# CHAPTER I: INTRODUCTION

Modern technologies continue to diffuse into agriculture including dairy production. The examples of these technologies are many. Robotics have entered the commercial dairy business in a robust way with products capable of robotically milking cows, reducing the industry's plaguing labor issues. The milking process, once intensive in human labor has now been placed in the capable arms of robots. In some form, the largest dairy equipment companies in the world have created and are marketing robotic milking solutions for the commercial dairy industry. Lely, GEA, DeLaval and others are manufacturing robotic milking solutions for the dairy industry. A visit to any of their respective websites can better illustrate current robotic technology for the dairy industry.

Herd health management has also experienced an influx of technology aimed at improving cow health and dairy profitability. Cow Manager, based in the Netherlands, has developed and is offering intelligent ear tags. These ear tags are performing far more than the historic function of basic identification; these tags are communicating real time data from the cow's ear. Ear temperature, activity, eating and resting time and location are all being logged and analyzed with algorithms to improve overall herd health. Fertility, health, and nutrition are top management concerns on dairies and are now being supported and improved by intelligent ear tags.

Another example of technology aimed at the dairy industry is a class of drugs known as immunomodulators. While these drugs are early-on in their life cycle, their focus is prevention. In a world with increased focus at all levels on judicious antibiotic usage, this treatment is designed to prevent disease by arming the cow's immune system in advance of the disease risk. Imrestor, marketed by Elanco Animal Health, is the common name for

pegbovigrastim, and is labeled to reduce the incidence of clinical mastitis. Mastitis is a common and expensive disease in the dairy industry – this infection in the mammary gland is being battled in new and innovative ways.

These are only a few of the technologies coming to market in the dairy industry. As with any healthy industry, the marketplace will continue to search for and provide new and problem-solving options for producers. These technologies will target many areas, but the central theme has to be financially viable in a low-margin commodity business.

As dairy businesses continue to evaluate production costs, management is finding that much inefficiency has already been removed. Production costs are continually under pressure in this competitive and volatile market. Dairymen have become experts at controlling costs and leveraging both human and capital assets to stay competitive in an efficient milk market.

Evidence of this can be found in some recent dairy statistics. According to the Progressive Dairymen, a popular dairy-industry trade magazine, the following changes have taken place over a 15 year period from 2004 to 2018. The total number of U.S. dairy farms have decreased from 66,830 to 37,467 a decrease of 29,362 herds or approximately 44%. Alongside this decrease in farm numbers, cow numbers have actually increased by 389,000 head or approximately 4.3% over the same time period. Average herd size over the same period has almost doubled. The average herd size in 2004 was reported to be 135 cows, and as of 2018, herd size was reported at 251 cows (Progressive Dairy n.d.).

These statistics illustrate the rapid consolidation currently taking place in the dairy industry. As seen by herd numbers, cows are not leaving the U.S. dairy herd; in fact the domestic dairy herd has grown slightly. This statistic, alongside the growing herd size

points to the fact that at the same time many are exiting the dairy industry, others are expanding. While there are many possible reasons why producers may choose to exit the business, profitability cannot be ignored as a potential reason.

Revenue for dairies are almost entirely from milk sales, however cull cattle and bull calf sales are also important revenue sources for dairy businesses. Bull calf values exhibit wide value swings, and can even experience values of $0, creating a challenging financial scenario for the dairy. Packers have discounted Holstein steers as native cattle (beef breeds of non-dairy origin) numbers have increased in recent years, and regionally some large packers have completely discontinued Holstein steer slaughter in favor of native cattle, creating market losses that dairy businesses need to address (Moore 2018).

Royal Farms Dairy is a multi-site dairy business located in western Kansas. Like many of its peers, Holstein bull calves are born on this dairy. In the case of Royal Farms Dairy, at natural sex ratios, over 5,000 Holstein bull calves are born and sold annually. In recent history the value of Holstein bulls at birth, commonly known as “day-olds”, has ranged from $0 – $400 per head between market highs and lows. In addition to the loss of income, the loss of a competitive slaughter market for these animals creates the need to develop a path for these animals to leave the farm in both a profitable and socially responsible way.

Reproductive technologies are also evolving to meet the needs of the dairy industry. Recently, many producers are taking advantage of new reproductive technologies to improve the economics of the Holstein bull calf.

### 1.1 Sexed Semen

Producers are taking advantage of advancements in reproductive technologies to solve current market issues. Sexed semen is a reproductive product that is lab sorted post semen collection to skew the gender of animals born of this semen. In this case, dairy businesses can purchase and implement the use of this semen in their artificial insemination programs resulting in approximately 90% female offspring. Historical issues of poor reproductive efficiency and a lack of high genetic quality "sexed" sires are no longer limiting, making this alternative more attractive than it was before. Today, producers can choose from increased depth of high value genetic bulls with improved reproductive efficiency (Thomin 2016).

The utilization of sexed semen also allows producers to select which animals future replacements are created from. This creates an opportunity to improve the desirability of Holstein progeny destined for feeding systems by crossbreeding beef sires to dams that are no longer needed to supply future replacement heifers. Combining the opportunities to select calf gender and thus use beef semen in dairy breeding programs, producers have potentially found a solution to marketing the Holstein bull calf. By concentrating the pool of genetics used to create herd-replacements and by improving the marketability and profit opportunity of the cross-bred progeny the economics are greatly improved.

### 1.2 Cross-breeding

Cross-breeding is an age-old and well-studied practice. The results of hybrid-vigor or heterosis are well documented and adopted by most areas of agriculture in both plant and animal production – heterosis or hybrid vigor is the performance advantage that crossbreds wield over the average of their strait bred parents; it can amount to up to 25% greater

productivity (Peck 2006). The adoption of crossbreeding in the dairy industry as it relates to beef sires mated to Holstein dams is proving to be a profitable solution for hard to market Holstein bull calves.

There are several fundamental carcass differences that exist between beef and dairy breeds. First, Holstein steers are not as efficient feed converters as beef breeds in feedyard settings – where up to 85% US beef cattle are fed until harvest (USDA 2019). Next, Holstein steers do not yield as well at harvest as their native steer competitors, and additionally, cuts from Holstein steers face presentation issues on the plate because consumers are not accustomed to the shape of high-end cuts from Holstein steers. This adds further weakness to the day-old bull calf market.

From a feedyard performance perspective, native cattle have the advantage in many areas, including yield, feed conversion, and health traits. However, Holstein steers do have some favorable feeding characteristics. Where native cattle may exhibit significant variation between and among breeds, Holsteins feed consistently in a feedyard setting. Many base this consistency on the tight genetic range within the Holstein breed. In addition to feeding and carcass consistency, Holstein steers also receive better quality grades than native cattle due to their breed characteristic of depositing more fat into the muscle, or marbling (R. Grant 1993).

### 1.3 Genetic Improvement

In addition to helping solve the industry issue of Holstein bull calf values, a strategy of sexed semen usage and crossbreeding to beef semen allows for herd wide genetic improvement. As producers implement sexed semen on their dairies, many are choosing to target genetic improvement in two ways. First, by concentrating sexed semen usage in virgin heifers, producers are creating more females for future dairy replacements out of

their highest genetic value population. Secondly, by creating terminal dairy-beef progeny from the older animals in the herd with lower genetic value, these dated genetics are not producing Holstein heifer calves for future dairy production. This genetic advancement directly improves the bottom line by creating higher genetic value heifers to be future replacements in the herd. While there are many indexes that producers can reference for genetic characteristics, Lifetime Net Merit (normally abbreviated as Net Merit) has been largely adopted by US dairy producers and allied industries. Lifetime Net Merit is an index that ranks dairy animals based on their combined genetic merit for economically important traits, these indexes are updated periodically to include new traits and to reflect prices in the next few years (P.M. Van Raden 2018). For example, a sire with a Net Merit Index value of $1,000 will produce offspring that based on sire genetics alone, will outperform peers with a hypothetical Net Merit Index value of $0 in the same herd by $1,000 in revenue over their lifetime. However, with the dam providing 50% of the genetic makeup of the offspring, this number effectively becomes an average of both parents. Overall herd Net Merit is likely to be lower based on the lower female genetic levels in most commercial dairy herds as compared to the individual sire genetics marketed by genetic firms known as bull or "A.I Studs".

To this point, choosing which animals future replacements are generated from will have a meaningful impact on herd productivity from a genetic perspective. From researching on-farm records, it was found that Royal Farms Dairy currently has a $232 dollar improvement in effective net merit dollars between new born replacement females and replacement heifers that are calving within the same month. This improvement

illustrates the opportunity that may be taken advantage of when creating future replacements from the higher genetic value animals in the cow herd.

### 1.4 Purpose

With the ability to place more desirable dairy-beef animals into feeding programs, dairy businesses now have a decision to make regarding the marketing channels for these dairy-beef animals. The question is very simply about length of ownership. When should the animal be marketed for maximum profitability, at birth for a day-old premium; as a 400 pound animal from the calf grower directly to a feed yard; or as finished animals to the packer at harvest?

The purpose of this thesis is to compare these marketing channels and determine which adds the most profit to the dairy business. Modeling the feeding enterprise options helps in exploring the market value of these animals at different ages and into different markets. Learning from the results of these feeding options and marketing channels should instruct management on how to most profitably market these dairy-beef animals.

# CHAPTER II: LITERATURE REVIEW

The scope of this thesis has been well researched and documented. The intended value of this thesis is not in conducting additional research on sexed semen use, the benefits of cross-breeding or genetic improvement, rather, the objective is to apply the results of previous research to the current dairy business model and then choose the most profitable marketing channel based on this information. This thesis relies upon the utilization of newly adopted reproductive technologies on commercial dairies, including sexed semen implementation and dairy-beef crossbreeding, thus works in these areas will be reviewed. The resulting opportunities from these new technologies include an improved genetic advancement rate within the milking herd and also creates the need to evaluate the feeding these dairy-beef animals for further profitability.

## 2.1 Sexed Semen

Technological advances over the last decade have been made in sexed semen products, making the choosing of the gender of a calf born on a dairy farm a reality. In fact, over the last decade, historical challenges of low fertility and poor sire selection have been remedied. Improved science behind the sorting process has created lower cost of production and given dairymen access to a portfolio of elite genetics (Thomin 2016). Other important applications of sexed semen allow dairy producers to select among their herd's potential dams and produce dairy replacement heifers from the genetically superior animals. Historically, female offspring from all heifers and cows were needed to produce enough dairy replacement heifers to replace culled cows. The use of sexed semen allows a decoupling of breeding decisions necessary to obtain an adequate supply of dairy replacements. Although much improved with modern technology (A. Devries 2007), it must be noted that there can be negative effects of sexed semen in that it may decrease the

reproductive performance of dairy herds owing to low fertility. This is due to lower conception rates that ultimately reduce reproductive efficiency and increase the generational interval (S. Kjalajzadeh 2011). The generation interval is described as the difference in the genetic merit between sires and dams. DeVries et al. (2007) explains that faster genetic improvement through AI sires also results in faster genetic improvement in heifers. Following asset replacement theory, cows should then be replaced a little faster and spend decreased time in the herd. Their expected accelerated genetic improvement reduces their economically optimal longevity to the herd (A. D. Vries 2016).

De Jarnette (2009) finds that sexed semen allows dairy producers to increase the percentage of heifers born and to capitalize on associated benefits. He further describes that on-farm records indicate that sexed semen achieves conception rates at approximately 80% of conventional semen and that this percentage is likely biased by preferential use of sexed semen at first service. Sexed semen was responsible for creating an 89-90% female skew in herds, while female offspring noted no increased incidence of stillbirth, in the remaining 10% of males born stillbirth was higher than those reported for conventional semen (J.M. DeJarnette 2009).

**2.2 Holstein Steer Feeding and Carcasses**

It is well documented that Holstein steers feed and finish differently than native cattle. Some comparative differences are that Holstein steers require 10-12% more energy for maintenance and use feed energy more efficiently for protein and less efficiently for fat deposition than beef breeds. Holsteins also require 8-10% more feed per unit of gain over the entire feeding period than smaller frame beef breeds and have less muscling than beef breeds with a greater ability to marble with less external fat. Holstein steers have lower dressing percentages, and respond with greater gains to high grain diets than beef steers.

The muscle shape and dimension of Holstein finished cattle differ from that of native steers. Holstein rib-eye and loin muscles are described as more triangular in shape, tapering toward the tail end of the rib or loin and/or are thinner in dimension. These are undesirable traits as compared to native cattle (H. Chester-Jones n.d.).

Industry closeout information documents the performance differences between Holstein and native steers. Eleven trials on carcass characteristics of Holstein and beef steers representing 1.4 million head of Holstein steers and 20.5 million head of native steers found the following. Holstein steers showed less back-fat, smaller rib-eye area, and increased KPH% (percent of total fat found in the body cavity of a carcass within the kidney, pelvic, and heart areas) with lower yield grades and marbling. The ranges of feed conversion efficiency from 300-900 lb. starting weights for Holsteins and beef steers were 6-9.4 and 5.9-6.93, respectively. There was similar cost of gain across starting weights for beef steers but more variable for Holstein steers. Cost of gain in Holstein steers progressively increased as starting weight increased. Poor feed efficiency and greater yardage costs due to longer stays in the feedlot explain a large portion of the higher costs of gain. Health and death loss were similar with light-weight beef calves having slightly higher health costs at similar weights (Steven Rust n.d.)

Grant, Stock and Mader (1993) found that at above 1,000 lbs. of live weight, feed conversion for Holstein steers is much higher (less efficient). Dressing percentage is generally 6 to 8 percent lower for Holsteins compared with beef breeds at a constant weight. Holstein steer carcasses have less back-fat, marbling and total fat with more protein and bone compared with beef breeds. Meat from Holstein steers compares favorably to meat from other breeds. Grant, Stock and Mader (1993), found that Holstein

steers reach the beef industry standard of Choice quality grade at acceptable carcass weights and produce leaner carcasses with as much or sometimes more boneless retail yield at 1/8-1/4 inch fat trim compared with conventional beef breeds. But the lower dressing percentage for Holstein steers is probably the single most important fact contributing to lower market value of Holstein steers (R. Grant 1993).

Siemens (n.d.) found similar characteristics of Holstein carcasses as other studies in the literature. He summarized that Holstein carcasses are less muscular, with lower muscle to bone ratio and smaller rib-eye areas. They also have different muscle shapes, less external back fat (usually less than 0.3") and grade YG-2. Holstein carcasses have higher KPH% fat and producer lower yields of boneless, sub-primal cuts. Product from Holstein carcasses is lean and well-marbled when cattle are properly fed, however, Holstein cuts have altered appearance (narrower, longer strip steaks) due to differences is muscle size and shape. Products from Holstein beef has an eating quality very similar to beef breed products when fed and managed to the same grade (Siemens n.d.).

**2.3 Crossbreeding Beef Sires and Holstein Dams**

As noted by Keane et al. (2010), the rationale for crossing dairy cows with beef bulls is to increase beef productivity and the value of the progeny. The performance of cross-bred cattle is generally superior to the mean of the parent breeds because of heterosis. Keane et al. found that crossing dairy cows with early maturing beef breeds (Angus, Hereford) has little effect on growth but improves carcass conformation and reduces feed intake. This study also found that beef animals had a higher kill-out percentage than Holstein animals and that beef crosses outperform Holsteins in confirmation (M.G. Keane 2010).

From these studies, and other data reviewed, pertinent areas that must be included in the modeling piece of this thesis were discovered. Feed yard performance metrics such as average daily gain and feed conversion, and carcass characteristics such as yield and quality are all major factors in the financial performance of cattle feeding. From this literature review, the framework was developed to identify and compare different marketing channels for cross-bred animals now being bred on commercial dairies.

Historically in western Kansas there was not a premium for day-old dairy-beef for consideration. Additionally, video auctions were not available via the internet as marketing channels for animals born and grown in western Kansas. Finally, although cattle feeding is not new to western Kansas, feeding dairy-beef cross animals in large numbers may be. Feeding and carcass characteristics of dairy-beef crosses are not the same as native cattle; therefore, one cannot assume the same economic outcome given the same market or feeding conditions.

## 2.4 Risk Management

### *2.4.1 Introduction*

Entire theses have been done regarding risk management and more specifically risk management in cattle feeding. Producers have multiple options for managing market risk in cattle feeding. Insurance policies, futures contracts and option strategies are just a few of the tools available to today's cattle producer to help manage market volatility and protect profits. Directly relative to this thesis are the live cattle, feeder cattle and corn markets. Risk management programs are voluntary and whether or not to participate is each producer's decision. No risk management expenses are represented in this enterprise budget as the there is no common protocol or expense to predict.

### *2.4.2 Risk and Volatility*

Risk is defined as the potential for uncontrolled loss of something of value. Volatility in finance terms is defined as the degree of variation of a trading price series over time and is usually measured by the standard deviation of logarithmic returns. However these terms are defined or calculated, both are present in cattle feeding. While risk can be found in multiple forms, in the terms of this thesis and risk management portion, we are largely referring to market risk. As defined previously, the uncontrolled loss we are seeking to manage is market risk, more specifically, the risk of prices turning lower over the feeding period.

Within volatile cattle markets, prices can move in and out of positive economic profitability over the course of as little as one trading session. Volatility in the cattle market is caused by uncertainty, with multiple supply and demand challenges adding to this volatility. In the case of cattle prices, weather – drought, corn price, total meat production, export demand, trade policy and negotiations (Petry 2018). While specific strategies to manage risk aren't discussed in this thesis, it is important that it is understood that there is significant risk and volatility in cattle markets and participants should be aware and align risk management strategies with the business' risk tolerance.

### *2.4.3 Chicago Mercantile Exchange (CME)*

The CME group (Chicago Mercantile Exchange, Chicago Board of Trade, New York Mercantile Exchange, and The Commodity Exchange) has a wide range of agricultural commodity futures and options available to assist market participants. The CME platform has options for both managers seeking to manage risk and for traders looking to capitalize on the markets. These markets are available on CME Globex. The CME Globex is an electronic trading platform that provides global connectivity to a broad

array of futures and options across all asset classes (CME Group n.d.). Within the CME Globex platform futures and options can be traded when the CME is open, generally Monday – Friday 8.30am to 1:05 pm.

# CHAPTER III: DATA DESCRIPTION

## 3.1 Introduction

This thesis is based from the development of a Feeding Enterprise Budget based using EXCEL. This budget was developed with data from future markets, current market values and expenses, allowing for a historical analysis to be completed. A temporal profitability analysis was done to evaluate which marketing channel would have been the most profitable decision based on recent market conditions.

The tools developed here for dairy-beef management consider the best channel for marketing dairy-beef crossbred animals. Each tool captures many different elements of profitability. Feedyard performance, carcass performance and market conditions all impact net return and can been accounted for in these tools. Data are needed to populate these spreadsheet models for baseline and scenario assessments developed in the next chapter and the purpose of this chapter is to present the data.

## 3.2 Historical Price Data

To lend credibility to the model and to gain perspective on current market conditions historical values were evaluated on the primary markets driving the spreadsheet model and to develop the temporal profitability assessment.

### *3.2.1 Live Cattle Prices*

For historical live cattle prices, ten years of monthly data from CattleFax were used (2010-2019). This data represents the western Kansas local fed cattle price. These historical values are important when evaluating current market conditions. At the time of this thesis these prices are in the mid $120 dollar range (CattleFax Fed Steer Price n.d.). In terms of this thesis, fed cattle prices are used in the spreadsheet model to predict profitability at

harvest if the business chose to maintain ownership of the beef-dairy cross animals until harvest; this is one of the marketing channels evaluated.

### *3.2.2 Historical Feeder Cattle Prices*

For the 2010-2019 feeder cattle prices, monthly auction data was sourced from contacting the Livestock Marketing Information Center for 400-450 western Kansas feeders (Group 202). This data is compiled from Southwest Kansas auction results. At the time of this thesis Feeder Cattle prices are approximately $189/cwt. Feeder cattle prices are important to this thesis for comparative values between dairy-beef crosses, native cattle and Holstein steers.

### *3.2.3 Historical Corn Price*

2010-2019 monthly western Kansas corn price was sourced from Kansas State University's Agmanager.info website (Daniel O'Brien 2019). As the single largest input in feeding and finishing cattle understanding the risk and opportunities created by movements upwards or downwards in corn price is relevant to the overall profitability equation.

### *3.2.4 Historical Bull Calf Prices*

Historical bull calf values were sourced from internal Royal Farms Dairy data. These data are directly from our local area and from our monthly sales tickets on bull calves. In addition to Holstein calf prices, the premium paid by two different calf customers in western Kansas for crossbred calves was obtained. Holstein bull calf values have seen extreme volatility over the last decade. Over the last 8 years, the highest value received for day old Holstein bull calves was $445/head with the lowest values received being $10/head. The average over this period was $123/head. Current Holstein bull calf prices are $40/head.

### 3.3 Feedlot & Carcass Performance Data

Multiple metrics are examined by stakeholders in the feeding cattle feeding industry. These metrics exist to monitor and manage performance. Summarized in the table below are the feeding and carcass characteristics from approximately 1900 dairy-beef steers harvested in Southwest Kansas.

**Table 3.1 Dairy-Beef Feeding and Slaughter Metrics**

| Metric | Dairy-Beef |
|---|---|
| Avg. In Weight, lbs/hd. | 859 |
| Avg. Out Weight lbs/hd. | 1412 |
| Days of Feed | 158 |
| Average Daily Gain, lbs | 3.50 |
| Dressing Percent | 63 |
| Feed Conversion (DM) | 7 |
| % YG 1 | 6.43 |
| % YG 2 | 43.53 |
| % YG 3 | 42.93 |
| % YG 4 | 7.03 |
| % YG 5 | .005 |
| % Choice or Higher | 75.56 |

Source: (Proprietary 2018)

#### *3.3.1 Days on Feed*

Days on feed is a feedlot metric that is simply the number of days an animal is fed (Lardy 2018). Each day required to bring an animal from placement in the yard to slaughter increases costs (not necessarily profitability). As animals from different breeding programs are considered, it is important to realize that different breeds and sexes of cattle require different lengths of time on feed, so each animal has a different expected cost to achieve market readiness and different carcass value at slaughter.

### *3.3.2 Average Daily Gain*

Average Daily Gain or ADG is a performance measure reflecting the rate of weight gain per day over a specific period. ADG is impacted by many factors including diet, use of hormones, genetics, treatments/health, and environmental conditions to list a few (Drovers 2013). Average daily gain impacts how long it will take an animal to finish. Lower gaining animals will take longer to finish than higher gaining animals given they are marketed with similar carcass weights. The longer an animal is fed, the higher the finishing costs can be. For ADG numbers the data are sourced from feedlot closeout information from Kansas State University's "Focus on the Feedlot". As with any model, flexibility is important, ADG and the following metrics to be discussed are all designed in the budget to be changed for more accurate prediction.

### *3.3.3 Feed conversion*

Feed conversion is a performance measure that is the amount of feed consumed by the animal per unit of body weight gained (Lardy 2018). For example, a feed conversion ratio of 6:1 is common in today's feedyard. This means that for every 6 pounds of feed consumed, 1 pound of gain was accomplished. With feed being the largest expense after the purchase of the incoming cattle, it is easy to see how important the efficiency of converting feed to marketable product is. Animals with improved feed conversions are more desirable from a feeding efficiency perspective. In our comparison for example, native steers might be expected to convert at a 6:1 ratio compared to Holstein steers at a 7:1 ratio with native steers being better converters.

From a profitability of feeding point of view, given feed cost is the largest expense after purchasing cattle, feed conversion metrics between breeds and even animal to animal drive profitability from the expense side of the equation. Of course, a blizzard or lightning

that kills an entire pen of cattle would be more expensive, after natural disasters or wet and muddy feeding conditions; it is hard to consider a more important metric to predict profitability. While the current cash price on live cattle is important, the driving factors to the Choice-Select spread drive profitability these topics are on the market side of the equation not the animal performance side.

*3.3.4 Dressing Percent*

Dressing percentage is carcass weight divided by final live weight times 100 (Lardy 2018) . Put another way, dressing percentage is calculated by dividing the warm carcass weight by the shrunk live weight (LW) of the animal. Dressing percentages of native cattle are in the range of 63-64% whereas Holstein steers are expected to dress closer to 60%. This means native cattle would naturally produce a more efficient carcass for slaughter and feeding. This is a large factor when comparing the economics across breeds. Naturally, native cattle deliver more marketable product per unit of weight than Holsteins.

*3.3.5 Yield Grade*

Yield grade is a numerical grade placed on each carcass by the USDA inspector at the packing plant that estimates the differences in the yield of boneless, closely trimmed cuts from the round, loin, rib, and chuck. Factors that determine yield grade are fat thickness at the 12$^{th}$ rib, rib-eye area, hot carcass weight, and the amount of kidney, pelvic and heart fat (Lardy 2018). Lower Yield grades (1-2) are representative of leaner carcasses, while higher yield grades (4-5) represents fatter carcasses.

**Table 3.2 Expected % of Boneless Closely Trimmed Retail Cuts by Yield Grade**

| Yield Grade | % Boneless Closely Trimmed Retail Cuts |
|---|---|
| 1 | >52.3 |

| | |
|---|---|
| 2 | 52.3-50 |
| 3 | 50.0-47.7 |
| 4 | 47.7-45.4 |
| 5 | <45.4 |

Source: (Dan S. Hale 2013)

*3.3.6 Quality Grade*

Beef quality grades are a composite evaluation of factors that affect palatability of the meat such as tenderness, juiciness, and flavor. These factors include carcass maturity, firmness, texture, and color of lean, and the amount and distribution of marbling within the lean. Marbling, or intramuscular fat, is the intermingling or dispersion of fat within the lean. Graders evaluate after the carcass has been ribbed between the $12^{th}$ and $14^{th}$ ribs. The degree of marbling ranges from abundant to practically devoid. Firmness, color and texture are also used to determine quality grades. Maturity or physiological age is also used to quality grade beef. Chronological age isn't widely used because it is almost never known. Indicators of maturity are bone characteristics, ossification of cartilage, color and texture of the rib-eye muscle (Dan S. Hale 2013).

**3.4 Expense and Cost Data**

*3.4.1 Feed Cost*

Feed costs are represented on a dry matter basis in the models and are simply the total expense of feed while the animal was on feed in a feedyard setting. Feed costs are impacted by many different factors such as ADG, feed conversion, days on feed, corn price, Feedlot markups and other expenses. Ultimately feed cost is the largest single line expense after cost of cattle.

*3.4.2 Cost of Gain*

Cost of gain is the total of all feedyard costs divided by the total gain during the feeding period (Lardy 2018). Cost of gain is a measure that can be used to evaluate

different groups of animals within the same feedyard based on sex, breed, diet and other factors.

### *3.4.3 Yardage & Insurance*

Yardage expense is common when feeding cattle in a commercial feedlot setting. This is the daily expense charged, normally by head by day while cattle are being fed (Lardy 2018). Depending on risk tolerance, insuring cattle in the feedlot may or may not be required. However, this is an option some producers elect to utilize.

### *3.4.4 Veterinary, Medicine and Processing*

While in the feedlot setting, animals may need veterinary attention, treatments with antibiotics or other supportive medicines, normal vaccinations and other processing. These expenses are passed on directly to the cattle owner at the end of the feeding period. Implant expense is also included in this area of the budget.

### *3.4.5 Interest Expense*

While not all producers take on debt to feed cattle, the opportunity to leverage capital exists in the cattle feeding business just like other industries. In many cases, the purchase of the cattle and all feed and growing costs are financed with varying degrees of capital required. In this model a 25% equity requirement was chosen following conversations with local lenders.

# CHAPTER IV: METHODS

## 4.1 Introduction

The purpose of this chapter is the development of spreadsheet models to predict the most profitable marketing alternative for dairy-beef animals now being bred for and born on a dairy in western Kansas. There are currently three marketing channels identified to choose from for marketing these dairy-beef animals.

Marketing option 1 is to market the calf at one day of age for the current premium over Holstein bull calves. This option requires a local calf purchaser pick up the calves daily from the dairy at a premium relative to their Holstein counterparts.

Marketing option 2 is to own the calves through the calf ranch and market at approximately 400 pounds. The value of these dairy-beef feeders coming from the calf grower will be compared to the day-old value of dairy-beef feeders plus the calf growing expenses to estimate profitability.

Marketing option 3 is to maintain ownership of these animals from birth until harvest. This option entails placing a newborn calf in a calf ranch where it will be raised until it weighs approximately 400 pounds. At this weight the calves can be placed into local feedyards where they will be fed until they weigh approximately 1400 pounds and then marketed to local beef packers.

## 4.2 Enterprise Budget

An enterprise budget is a financial management tool typically used to project costs and returns for an activity (Missouri Extension n.d.). In this case, an enterprise budget has been created to predict profitability based on current and or future market conditions. This enterprise budget has been organized into sections summarizing market conditions,

expected and calculated inputs, sales and performance. Ultimately the goal of this budget is to be able to be updated with current market information and predict future returns. The enterprise budget is found in Figure 4.1.

## Figure 4.1 Dairy Beef Feeding Enterprise Budget

| | | |
|---|---|---|
| WSKS Local Live Cattle, $/Cwt | $ | 117.00 |
| KS Corn Mar.-Dec., $/Bu | $ | 3.72 |
| WSKS Holstein Basis, $/Cwt | $ | (20.00) |

Current Market Inputs

| | | Holstein Steer | | Dairy-Beef Steer | | Native Steer |
|---|---|---|---|---|---|---|
| Live Cattle, $/Cwt | $ | 97.00 | $ | 117.00 | $ | 117.00 |
| Feeder Cattle, $/Cwt | $ | 115.50 | $ | 155.00 | $ | 191.00 |
| WSKS Corn, $/Bu | $ | 3.72 | $ | 3.72 | $ | 3.72 |
| **Incoming** | | | | | | |
| Incoming, Head | | 60 | | 60 | | 60 |
| Weight (Lb.)/Head | | 400 | | 400 | | 400 |
| Freight/Head | $ | 5.00 | $ | 5.00 | $ | 5.00 |
| Cost/Steer | $ | 462 | $ | 620 | $ | 764 |
| Total Steer Cost | $ | 28,020 | $ | 37,500 | $ | 46,140 |
| **Required Inputs** | | | | | | |
| Interest Rate | | 5.00% | | 5.00% | | 5.00% |
| Mortality Rate | | 5.0% | | 3.5% | | 2.0% |
| Daily Yardage Rate | $ | 0.05 | $ | 0.05 | $ | 0.05 |
| Average Daily Gain | | 3.00 | | 3.25 | | 3.50 |
| Feed Conversion | | 7.77 | | 7.00 | | 6.00 |
| **Calculated Inputs** | | | | | | |
| Pounds to Gain | | 1000 | | 1000 | | 1000 |
| Average Daily Intake (DM) | | 23.31 | | 22.75 | | 21 |
| Calculated Days on Feed | | 333 | | 308 | | 286 |
| Calculated Average Days on Feed | | 167 | | 154 | | 143 |
| Feed Cost, $/ton (DM) | $ | 250.00 | $ | 250.00 | $ | 250.00 |
| Average Feed Cost/Lb (DM) | $ | 0.125 | $ | 0.125 | $ | 0.125 |
| Feed Cost/Head | $ | 971.25 | $ | 875.00 | $ | 750.00 |
| Calculated Daily Feed Cost | $ | 2.91 | $ | 2.84 | $ | 2.63 |
| Feed Cost/Lb of Gain | $ | 0.97 | $ | 0.88 | $ | 0.75 |
| # of Deads | | 3 | | 2 | | 1 |
| Dead Feed Cost | $ | 1,457 | $ | 919 | $ | 450 |
| Dead Yardage Fee | $ | 25.00 | $ | 16.15 | $ | 8.57 |
| **Expenses** | | | | | | |
| Total Cattle Cost | $ | 28,020 | $ | 37,500 | $ | 46,140 |
| Total Feed Cost | $ | 56,818 | $ | 51,581 | $ | 44,550 |
| Total Yardage | $ | 975 | $ | 907 | $ | 849 |
| Veterinary/Processing/Med | $ | 2,970 | $ | 2,970 | $ | 2,970 |
| Cattle Interest | $ | 960 | $ | 1,185 | $ | 1,354 |
| Feed Interest | $ | 1,946 | $ | 1,141 | $ | 523 |
| USPB Slot Rental | $ | - | $ | 290 | $ | 294 |
| Check -off Expense | | 57 | | 58 | | 59 |
| Category Total | $ | 91,746 | $ | 95,632 | $ | 96,739 |
| **Outgoing** | | | | | | |
| Number of Head | | 57 | | 58 | | 59 |
| Weight/Head | | 1400 | | 1400 | | 1400 |
| CWT's Produced | | 798 | | 811 | | 823 |
| **Sales** | | | | | | |
| Cattle Sales | $ | 77,406 | $ | 94,840 | $ | 96,314 |
| Carcass Premium/Discount | $ | - | $ | - | $ | - |
| Category Total | $ | 77,406 | $ | 94,840 | $ | 96,314 |
| **Total Revenue** | $ | (14,340) | $ | (792) | $ | (424) |
| **Net Revenue,$/hd Marketed** | $ | (251.57) | $ | (13.68) | $ | (7.22) |

### *4.2.1 Current Market Conditions*

The market condition segment of this sheet captures input costs. Local live cattle, local corn price, western Kansas Holstein steer basis and feeder cattle input costs. Live cattle values were sourced from Cattlefax and used as pay price for animals marketed upon harvest – basis and carcass values were not modeled for native cattle. For the Holstein cattle, a negative basis of $20 was modeled based on current local market conditions. Feeder cattle values were derived from multiple sources based on breed. Holstein feeder steer input values were sourced from Overland Stockyards where four-weight western Kansas Holstein cattle are traded. Native cattle feeder steer values were sourced from western Kansas auction data for 400-450 pound steers. Dairy-beer steer feeder values were modeled from cost data. This data was found by adding day-old dairy-beef calf price to expected feeding expenses to 400 pounds.

Western Kansas corn price was sourced from Kansas State University's Agmanager.com. While this model is using current local feed cost per ton of dry matter. Local corn price is captured as a comparative data point to feeding costs and profitability.

### *4.2.2 Inputs – Incoming and Required*

These segments of the model capture the actual expected feeding situation. Incoming weight, head count and freight are all based on Royal Farms Dairy specific conditions. Steer costs are modeled as previously described to match local markets. Interest rate was sourced from local lenders and feeding characteristics such as Average Daily Gain (ADG) and Feed Conversion were sourced from local cattle feeders.

*4.2.3 Calculated Inputs*

The model calculates necessary metrics to prepare the data for calculation of future expenses and revenues in this segment. Data input throughout the model is converted in this section into feeding performance (daily intake and calculated days on feed) expected feed costs (feed cost per head and feed cost per pound of gain) and projected death losses (yardage and feed).

*4.2.5 Calculated Expenses*

This expense segment of the spreadsheet model summarizes expected expenses over the feeding period. Total cattle, feed and interest costs are captured in this segment of the model. Other expected expenses to be incurred while on feed, such as veterinary, processing and medicine costs are also summarized in this segment of the model.

*4.2.6 Outgoing Metrics & Sales*

This portion of the model begins to estimate the financial expectations of the feeding project. Based on projected steer weight at market and number of head remaining post death losses, total hundred-weights produced are determined and then multiplied by current live cattle market conditions for sales revenue. This model was developed with a $20 discount on Holstein steers and both native and dairy-beef steers trading at par with the local live cattle. Any additional carcass premium or discounts, or basis adjustments may be modeled by changing the live cattle values represented in this model. It is understood that grid variation and carcass premiums or discounts varies between packers and that cash offers are constantly changing.

*4.2.7 Net Revenue, Profit/Loss per Head, Profit/Loss per CWT*

Finally, the last segment of the model calculates the expected profit or loss. This is the expected net revenue for feeding dairy-beef steers and is illustrated as profit or loss in total dollars and on a by head basis.

**4.3 Dairy Beef Retention Options**

The purpose of this thesis is to direct management towards the most profitable marketing channel for day-old dairy-beef calves. As these animals are a new "product" that dairy business must now deliver to market, it is prudent to evaluate what marketing options exist and which option will create the most profit. Three channels have currently been identified based on local demand; (1) marketed at day old, (2) marketed at approximately 400 pounds and (3) own until harvest.

*4.3.1 Marketing Day-old crossbred calves*

At birth following processing, a dairy-beef calf would be referred to as a "day-old" or a "wet calf". Businesses known to many as "calf-growers" either custom raise calves from day old, purchase day old calves to raise to market themselves, and/or possibly even feed out to harvest. These grower yards exist across the United States and they set the market price for day old Holstein steers based on current market conditions in large dairy areas such as Idaho, California, New Mexico and the Texas Panhandle. The Royal Farms Dairy business has sold day-old Holstein bull calves and recorded the amount received since this operation began. As dairymen began to crossbreed their Holsteins to beef sires a "premium" system was developed in the market to compensate producers for the improved carcass and feeding merit of dairy-beef animals versus straight Holsteins. Day old pay price for a dairy-beef calf is still based on Holstein values; however, a "crossbred premium" is added. Internally, RFD has been tracking the premiums paid and records the current offer

that changes approximately monthly. Dairy-beef animals marketed as day olds transfer all the risk through the feeding period to the purchaser. Death loss, morbidity, market conditions, and any other factors do not impact the profitability to the dairy as the transaction at day-old changes ownership daily when the calves are picked up. Of the three marketing channels, this is the simplest to measure: current bull calf price + current crossbred premium = day old value.

*4.3.2 Marketing 400 lb. Feeders*

At a weight of approximately 400 pounds dairy-beef animals can be marketed from the calf ranch directly to local feed yards. Due to feeding characteristics of dairy-beef animals, many times these animals will often go onto feed at a younger age relative to their native counterparts. This is because these dairy-beef animals feed more efficiently when placed on feed when younger.

To determine if this option is the most profitable of the 3, a dairy-beef growing budget was developed. This budget estimates growing costs of a dairy-beef animal and adds the value of the day-old to compare the cost to the current local market for these animals. As seen in figure 4.2, this budget considers expected growing costs to 400 pounds including mortality and morbidity from local calf grower expectations. These expenses are then summarized on a per hundred-weight basis. From this per hundred-weight basis, dairy-beef animals can be compared to values on auction sites such as Overland Stockyards where it can be observed if there is profit potential by marketing these animals at 400 pounds. Any positive economic profit from this channel is in addition to the already expensed day-old premium and would make this option favorable of marketing at day-old.

**Figure 4.2 Detailed Growing Budget for Marketing Dairy-Beef Calves at 400 lbs.**

| **Animal Values** | |
|---|---|
| WSKS Bull Calf, $/hd | $40.00 |
| WSKS Dairy-Beef Premium, $/hd | $180.00 |
| Dairy-Beef Value, $/hd | $220.00 |

| **Calf Ranch Assumptions** | |
|---|---|
| Number of Calves | 1 |
| Days at Calf Grower | 150 |
| Ending Weight, Lb./hd | 400 |
| Daily Fee, $/hd | $2.50 |
| Milk Fee, $/hd | $15.00 |
| Mortality Rate | 6.00% |
| Morbidity Rate | 2.00% |
| Processing Fee, $/hd | $5.00 |
| Interest Rate | 5.00% |

| **Growing Cost** | |
|---|---|
| Growing/Processing/Milk | $371.30 |
| Mortality Expense | $12.45 |
| Morbidity Expense | $4.40 |
| Interest expense - Growing | $7.63 |
| Interest Expense - Cattle | $4.52 |
| Total | $400.30 |

| **Expense Summary** | |
|---|---|
| Total expense, $/hd | $620.30 |
| Total expense, $/cwt | $155.08 |

| **Cwt Expense/Hd Comparison** | |
|---|---|
| Overland Values Dairy-Beef | $175.00 |
| RFD Calf+Development Expense | $155.08 |

| | |
|---|---|
| **Marketing Revenue, $/cwt** | **$19.93** |
| **Marketing Revenue, $/hd** | **$79.70** |

### *4.3.3 Owning through Harvest*

The marketing channel that entails the highest amount of risk is the owning of the animals until harvest, in the case of dairy-beef animals, this is approximately a 15 month commitment from one day-old. In addition to the market and performance risks, this option also ties up capital for the longest period of time. Each of these facts should be considered by each dairy-business as a decision of rather or not to "own" the cattle is made. This "ownership" option has been evaluated by modeling local input costs and feeding and marketing conditions in the developed Feeding Enterprise Budget show n in Figure 4.1. This budget estimates the profit per head based on these conditions. Any positive economic profit created from feeding these animals through harvest would be compared to the other marketing channels. The option that has the greatest per head profit from these options is the channel that creates the most profit and should be chosen by management.

### *4.3.4 Temporal Profitability Assessment*

To understand which marketing channel would have performed the best in western Kansas based on recent market conditions, a temporal profitability assessment was performed. In this assessment, a relative comparison of the three identified marketing options was evaluated on a monthly basis from June 2010-June 2018. This timeframe was selected due to the data available and the ability to compare like data. From the harvest month, feeder price was evaluated at a 10 month lag and day-old values were evaluated at a 15 month lag. These lags allow for comparing retrospectively which option would have been the most profitable at a comparable point in time.

For evaluation of the day-old option, historical day-old Holstein bull prices were used as the base price. By adding this base price to the local dairy-beef premium offered we have a comparative day old value from historical data for comparison.

To evaluate four-weight cross bred animals, we were able to run a regression based on current dairy-beef animal values compared to historical feeder values to model historical values of local dairy-beef feeders. This value was then compared to of day-old crossbred values. The formula to forecast historical feeder values ( based on the regression) as compared to Overland Stockyards is illustrated below whereas P- cross represents the expected value of the 400 lb. dairy-beef steer based on the P -wsksfeeder, the historical values of Western Kansas feeder steer values :

$$P_{CROSS}=\$19.996+.89*P_{WSKSFEEDER}$$

To evaluate the historical profitability of "owning" these dairy-beef animals, the Feeding Enterprise Budget was used. By sourcing historical monthly data for western Kansas live cattle price, western cattle feeder price, and western Kansas corn price we were able to recreate market conditions for that time period.

To most accurately represent historical feed cost in this assessment, feed cost received multiple considerations. As with the lags used between harvest, feeder pricing and day-old pricing to be most accurate, feed price was handled similarly. Corn price was averaged for the 10 months preceding animal harvest month and then plugged into a formula to generate expected feed cost per ton. This formula assumes a standard feed yard diet of 60% corn, 20% distillers, and 10% roughage as well as10% vitamins and minerals. Form this formula an estimated markup of 20% was used to match local yards.

# CHAPTER V: RESULTS

## 5.1 Introduction

In order to determine which marketing channel should be selected by management, each of these were compared on a profit per head basis. Day-old dairy-beef values were compared to expected profit by marketing as four-weights and to expected profit per head by owning until harvest.

## 5.2 Feeding Enterprise Budget

The feeding enterprise budget shows that native cattle feed best, Holstein animals feed worst, and cross bred cattle perform markedly better than pure-bred Holstein steers. The enterprise budgets agree directionally with industry beliefs about feeding these groups of cattle. From this budget one can conservatively model margin based on current market conditions and evaluate rather or not the most profitable marketing channel is currently being chosen for maximum profitability. At current market conditions, feeding Holstein steers is generating a per head loss of approximately $250/head. Dairy-beef steers are not-profitable, generating an approximate $13/head loss, and native steers are not- profitable generating an approximate $7/head loss.

## 5.3 Profitability of Beef Retention Options

When profitability was evaluated based on historical numbers in the temporal profitability assessment spanning the years 2010-2018, the following observations were made. The average value day-old of dairy-beef animals was $208/head, marketing as four-weights averaged a loss of $162/head and owning dairy-beef until harvest averaged a profit of $236/head. Based on these values the most profitable marketing channel throughout this period was “owning” these animals through harvest. Based on the data for this marketing option in found in Table 5.1, owning these animals also held the widest range and largest

standard deviation illustrating the role of market volatility and risk previously discussed in Chapter 2. Marketing dairy-beef animals at 400 pound from the calf grower historically averaged a loss with a very modest maximum profit of $39/head in this period. For the day-old marketing option, historically this option averaged $208 per head, giving reason to consider the $28 difference to the leading option of "owning" the cattle in this period. Is an average of $28 less dollars per head enough to encourage producers to take risk on such a volatile live cattle market and risk the 15 month feeding period?

**Table 5.1Summary of Results from the Temporal Profitability Assessment**

| | **Marketed at Harvest** | **Marketed at 400lbs** | **Marketed at Day-Old** |
|---|---|---|---|
| Mean | $236 | ($162) | $208 |
| Minimum | ($284) | ($380) | $92 |
| Maximum | ($918) | $39 | $515 |
| Standard Deviation | $302 | $108 | $94 |

## 5.4 Marketing Scenarios Summary

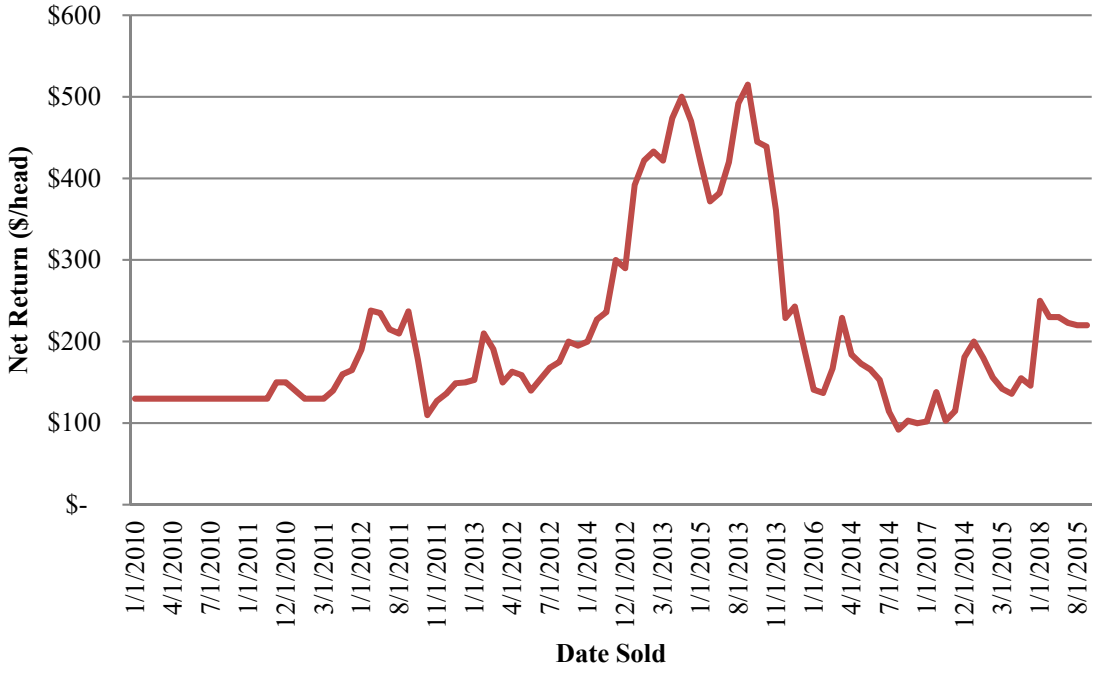
As mentioned many times in this thesis, three marketing channels have been evaluated. Below are the findings of this thesis.

### *5.4.1 Day Old Bull Calf Marketing Analysis*

Day-old crossbred calves have traded at a premium of approximately $200 over Holstein bulls in our local geography. At day-old these calves have approximately fifteen months of risk in front of them. With today's volatile markets, market conditions can become completely reversed in 15 months. Similarly, these animals have 15 months to experience harsh feeding conditions, sickness or even death. The risk proposition is no

doubt high if one chooses to maintain ownership over the feeding period. The first 15 months of developing a steer feeding program creates no cash flow, and is purely investment until animals begin to reach harvest age and are marketed. For many businesses with lower risk tolerances or less willingness to invest capital in a higher risk market, marketing dairy beef animals at day old may be a more favorable option. When looked at over time, this option averaged only $28 per head less than owning cattle until harvest. Again, this raises the question for management if this is this sufficient premium to feed-out? The historical values of day-old dairy beef may be seen in Figure 5.1.

**Figure 5.1 Historical per Head Value for Dairy-Beef Calves Marketed at Day Old**




*5.4.2 Marketing 400# Feeders*

Currently the 400-pound dairy-beef feeder market appears to be the most profitable marketing channel. When growing expenses are added to day old dairy beef values there is currently an $80 premium in the market. This result however, does not match results from

historical analysis. When this market was analyzed historically, it was observed that this marketing channel averaged a loss of $162 over the specified time frame, with a maximum profit achieved in the period of $39. This presents management with reason to be cautious if electing this option based on estimated historical returns which are presented in Figure 5.2.

**Figure 5.2 Historical Return per Head for Dairy-Beef Calves Marketed at 400 lbs**


*5.4.3 Retaining Ownership through Harvest*

As discussed, retaining ownership through harvest is the highest risk and most capital-intensive option of the three options evaluated. Uncertainty begins the moment the calf is born and purchased, and profit or loss isn't decided until harvest. Certainly risk management options exist and must be considered to reduce exposure. Currently, with lower live cattle prices, maintaining ownership through harvest of crossbred steers is not

the most profitable option. Per the enterprise budget developed for this decision, our animals would be harvested at a loss of $14 per head, making this the least profitable option of those considered. As mentioned many times, it is understood that markets are volatile and create profit and loss opportunities across the feeding period. Savvy cattlemen will take advantage of these profitable windows and create positive trades – however, current market conditions do not favor maintaining ownership through harvest based on current day old premiums out paying the current premium by owning through harvest. A historical look at estimated returns and the volatility over time due to market conditions is provided in Figure 5.3.

**Figure 5.3 Historical Return per Head for Dairy-Beef Cattle Owned Through Harvest**

## 5.5 Summary

Based on data presented in Table 5.2, research to determine the most profitable marketing channel at current market conditions indicates that marketing dairy-beef animals from the calf grower to the feed yard is the currently the most profitable marketing channel. This option creates an additional $80 per head profit when compared at a $220 day-old value, and creates an additional $93.68 per head profit when compared to marketing at harvest at same day-old value. Table 5.2 summarizes these results.

**Table 5.2 Marketing Channel Profitability Comparison**

| | Marketing at Day-Old | Marketing as Feeder | Marketing at Harvest |
|---|---|---|---|
| $/Profit/Head | $220 | $80 | ($13.68) |

# CHAPTER VI: CONCLUSIONS

## 6.1 Summary

As laid out in the introduction of this document, the purpose of this thesis is to compare various marketing channels and determine which adds the most profit to the dairy business. Three marketing channels were evaluated based on differing lengths of ownership, marketing at a day-old, marketing as four-weights, and marketing at harvest. A Feeding Enterprises Budget was developed to predict margin based on market conditions and feeding performance expectations. This budget also allowed the illustration of profitability differences among cattle breeds and allowed to us illustrate what market factors are at play while predicting profit or loss when owning until dairy-beef until harvest. Additionally, a temporal profitability assessment was developed to examine the effect the market conditions in the recent past in order to guide management forward based on current market conditions. Lastly, a calf growing budget was developed to evaluate profitability of marketing animals form the calf ranch. This budget summarizes growing costs on a per hundred weight basis in order to compare to other marketing opportunities.

## 6.2 General Findings

Given the findings in this thesis under current market conditions, dairy businesses would gain the most return through marketing these calves as four-weights from the calf grower. Certainly, there is good reason to monitor market conditions being aware of changing profit situations. As discussed previously, there are many sources of volatility that may create hedgeable margins and encourage producers to maintain ownership of these animals through harvest or market as day-olds.

### 6.3 Business Implications

By maintaining a functional spreadsheet marketing and budget model, Royal Farms Dairy can monitor premiums offered on day old crossbred cattle and on feeder weight animals. By simply maintaining the model with current market prices, management can easily observe at any time if the day old calf premium is fair to the business, or if the premium is short and the cross bred calves should be marketed later, either out of the calf ranch, or ownership maintained until harvest. Again, being able to correctly model these animals through the feeding period is fundamental to this thesis and the decision-making process.

### 6.4 Future Research

From this thesis there have been several questions arise that have not been answered or that have not been deeply discussed in this body. With future closeouts from dairy-beef animals, it would be possible to further describe the carcass differences between dairy-beef cattle and their native and Holstein counterparts thus preparing to defend future packer moves against this class of cattle. With this information, it would also be advantageous to tie the current dairy-beef to a market other than the day-old Holstein market. This market is largely driven by a few key players in the bull calf feeding industry and is not tied to a independent market.

As it has been shown, dairies no longer need every “uterus” on the dairy to generate a replacement. Currently crossbreeding these terminal type animals is having a positive economic impact on commercial dairies balance sheets by bringing premiums to an animal with historical low values; however, certainly there are other avenues for improving dairy returns. Business models that could be evaluated to further leverage the profitability of these dams could be explored. Renting “uteruses” to various entities for any number of

reasons could possibly create even further economic returns via embryos or other reproductive technologies.

Looking deeply into the economics of using a beef sire of with semen sorted for males would be a possible worthwhile investment. In this thesis all animals were assumed to be male for comparison purposes. The sex ratio of dairy-beef animals born is expected to be approximately 50%, creating further research opportunities to value these animals. As each crossbred heifer calf is discounted to her steer counterparts (based on feeding differences), and sorted semen pricing is continually reduced over time based on technological improvements, it would be worthwhile to understand what level of reproductive "drag" could be tolerated financially and still be a profitable decision based on increased feeding margins of steers over heifers.

Lastly, and mentioned previously, what factors drives the decision for a dairy to abandon custom calf growing and internalize this piece of the supply chain should be examined. Certainly calf ranches are for profit, and considerations of future alignment with beef customers might be easier when a calf never leaves the original ownership facility creating an age and source verified situation with a positive story to tell.

## WORKS CITED


A. Devries, M. Overton, J. Fetrow, K. Leslie, S. Eicker, G Rogers. 2007. "Exploring the IMpact of Sexed Semen on the Structure of the Dairy Industry." *Journal of Dairy Science* 847-856.

n.d. "Animal Range." *Montana.Edu.* Accessed February 9, 2020. http://animalrange.montana.edu/documents/courses/ANSC320/Asfeddm.pdf.

n.d. *Cattle Fax Omaha Corn Price.* Accessed 1 26, 2020. https://www.cattlefax.com/#!/data/feedstuffs/prices/omaha-corn/.

n.d. *CattleFax 450 Lb Feeder Steer Price.* Accessed 1 26, 2020. https://www.cattlefax.com/#!/data/cattle/cf-prices/450-lb-feeder-steer/.

n.d. "CattleFax Fed Steer Price." *CattleFax.* Accessed 1 26, 2020. https://www.cattlefax.com/#!/data/cattle/cf-prices/fed-steer/.

n.d. *CME Group.* Accessed 1 26, 20. https://www.cmegroup.com/trading/agricultural/.

Dan S. Hale, Kyla Goodson, and Jeffrey W. Savell. 2013. "Meat Science." *Texas A&M university.* 3 8. Accessed 26 1, 2020. https://meat.tamu.edu/beefgrading/.

Daniel O'Brien, Robin Reid, Kevin Dhuyvetter. 2019. *Agmanager.info.* Septermber 18. Accessed February 24, 2020. https://www.agmanager.info/seasonal-cash-grain-prices.

Group, Livestock Marketing Information, interview by Will Basham. 202. *400-450 Western Kansas Feeders* (February 24).

H. Chester-Jones, A. DiCostanzo. n.d. *University of Minnesota Extension.* Accessed May 5, 2018. http://www.extension.umn.edu/agriculture/beef/components/docs/holstein_feeding_programs.pdf.

J.M. DeJarnette, R.L. Nebel, C.E. Marshall. 2009. "Evaluating the Success of sex-sorted semen in US dairy herds from on farm records." *Theriogenology* 49-58.

Lardy, Greg. 2018. "North Dakota State University Publications." *North Dakota State Univeristy.* May. Accessed 1 26, 2020. https://www.ag.ndsu.edu/publications/livestock/cattle-producers-guide-to-feedlot-terminology.

M.G. Keane, P. G. Dunne, D. A. Kenny and D. P. Berry. 2010. "Effects of genetic merit for carcass weight, breed type and slaughter weight on performance and carcass traits of beef X dairy steers." *The Animal Consortium 2010* 182-194.

n.d. *Missouri Extension.* Accessed February 9, 2020. http://extension.missouri.edu/henry/documents/newsreleases/Enterprise%20Budgets.pdf.

Moore, Brita. 2018. "Postbulletin." *Postbulletin.com.* 11 22. Accessed 11 22, 2018. https://www.postbulletin.com/news/business/market-delivers-a-blow-to-holstein-feeders/article_01bb681a-67ce-5e2e-bf99-c5800be0f643.html.

P.M. Van Raden, J.B. Cole, K.L. Parker Gaddis. 2018. "Lifetime Net Merit 2018." *USDA Agricultural Research Service.* July 5. Accessed January 12, 2020. https://aipl.arsusda.gov/reference/nmcalc-2018.htm.

Peck, Clint. 2006. *Beef Magazine.* February 1. Accessed February 8, 20202. https://www.beefmagazine.com/mag/beef_crossbreeding_composites.

Petry, Tim. 2018. "Why are cattle prices so volatile?" *Farm Progress.* August 1. Accessed February 9, 2020. https://www.farmprogress.com/livestock/why-are-cattle-prices-so-volatile.

n.d. "Progressive Dairy ." *Progressive Dairy.com.* Accessed 1 26, 2020. https://www.progressivedairy.com/site/stats/us-dairy-stats.

Proprietary. 2018. "Proprietary Feedlot Data ." June 28.

R. Grant, R. Stock, T. Mader. 1993. *Historical Materials from University of Nebraska-Lincoln Extension.* January 1. Accessed May 6, 2018. https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1443&context=extensionhist.

S. Kjalajzadeh, A. Nejati-Javaremi, H. Mehrbani Yenganeh. 2011. "Effect of widespread and limited us of sexed semen on genetic progress and reproducive performance of dairy cows." *Journal of Dairy Science* 1398-1406.

Siemens, Michael G. n.d. *Managing Holstein Steers for Beef Production.* Accessed May 6, 2018. http://learningstore.uwex.edu/assets/pdfs/A3659.pdf.

Steven Rust, Cassie Abney. n.d. "Comparison of Dairy Versus Beef Steers." *UMN Extension Website.* Accessed May 6, 2018. https://www.extension.umn.edu/agriculture/dairy/beef/comparison-of-dairy-versus-beef-steers.pdf.

Thomin, Julien. 2016. "Sexed semen advancements: Opportunites for use on dairies." *Progressive Dairyman.* August 24. Accessed May 6, 2018. https://www.progressivedairy.com/topics/a-i-breeding/sexed-semen-advancements-opportunities-for-use-on-dairies.

USDA. 2019. "USDA Economic Research Service." *USDA Economic Research Service.* August 28. Accessed January 12, 220. https://ers.usda/gov/topics/animal-products/cattle-beef/sector-at-a-glance.

Vries, A. De. 2016. "Economic trade-offs between genetic improvement and longevity in dairy cattle." *Journal of Dairy Science* 4184-4192
.

Vries, Albert De. 2009. *The Economics of Sexed Semen in Dairy Heifers and Cows.* March 1. Accessed May 6, 2018. https://www.researchgate.net/publication/237710281_The_Economics_of_Sexed_Semen_in_Dairy_Heifers_and_Cows1.

2020. *Wikipedia.* January 21. Accessed February 9, 2020. https://en.wikipedia.org/wiki/Volatility_(finance).