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Determining Profitability Strategies for Various Retained Ownership Enterprises in Utah

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DETERMINING PROFITABILITY STRATEGIES FOR VARIOUS RETAINED

OWNERSHIP ENTERPRISES IN UTAH

by

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ABSTRACT

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With the price of corn now over $6 per bushel, and with feedlot total cost per pound of gain now approaching $1.00 per pound of gain there are new incentives to try and add weight to calves outside of feedlots. The question then arises of how to add weight to a calf in the most economical manner. There are many different feeding programs to consider. However, with few exceptions, the cheapest way to add weight outside of a feedlot usually involves the calf grazing for an extended period of time. Winter pasture grazing, wheat pasture grazing and corn stalk grazing followed by summer pasture grazing are examples of these programs.

However, with the exception of California, most of the area west of the Great Plains lacks the resources and climate for most of these winter grazing programs. For those states, cattle producers can background calves through the winter and then allow them to graze pastures in the summer. Backgrounding calves is essentially taking calves at weaning and feeding them to heavier weights without placing them directly in a feedlot on a finishing ration.

The overall objective of this research is to evaluate the level and variability of returns to several background feeding alternatives. The returns will be evaluated in an expected value-variance analysis and ranked using stochastic dominance procedures.

It appears that there are several different background alternatives that producers could utilize to increase returns with an acceptable level of risk and add additional value to their calves.

(105 pages)

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Matt Hirschi

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CHAPTER 1

INTRODUCTION

Utah has a diverse compilation of agricultural commodities. From fruits and vegetables to grains and livestock, Utah has an important role in the aggregate food supply. One major commodity is beef, which accounts for 20% of total agricultural commodity cash receipts for Utah. The total receipts for the beef industry during 2008 were $301,492,000 (Utah Ag Statistics 2009).

Utah has many cattle operations throughout the state. There are cattle operations within every county, but the top 5 ranking counties for beef production include: Box Elder, Duchesne, Rich, Millard, and Uintah. These five counties make up about 40% of the total state inventory. Total state cattle numbers are estimated at 350,000 cows during 2009 and 47% of all operations run between 100-500 head of mother cows (Utah Ag Statistics, 2009).

Like most of the western United States, Utah beef producers traditionally have cow- calf operations. A typical cow-calf operation is where mother cows give birth to calves in the spring. Calves are then raised during the summer months and are weaned and sold in the fall. The majority of the calves are sold in late October and early November. According to a survey for enterprise budgets performed in 2007 the average weaning weight of calves over most of the state of Utah is approximately 550 lbs (Feuz et.al.). Those calves that are not retained for replacement stock are sold directly to the feedlot as calf feds or are sent to backgrounding lots, and are fed during the winter months to enter the feedlot in spring or go onto grass during the next summer.

There are a few retained ownership opportunities throughout the state that producers practice. These are, namely, preconditioning, placing calves directly in the feedlot, and backgrounding.

Pre-conditioning is one aspect in which calves are weaned and given booster vaccinations and retained on the ranch for about 30 to 60 days. This decreases stress on calves and helps build immunity before entering the next stage of production. Pre-conditioning often results in a higher market price for calves and this can increase returns above the pre-conditioning costs. Although there may be value added in pre-conditioning, this research will not focus on the economics of pre-conditioning.

Placing calves directly in the feedlot is a typical practice often utilized for heavier calves. Utah has few feedlots in which calves can be fed out. Calves that are retained and placed in a feedlot end up being sent to Colorado, Nebraska, or Kansas. Although, this is a viable concept for retaining ownership, there has been considerable prior research on this topic as shown in Dhuyvetter, Schroeder, Prevatt; Lawrence, Loy, Wang; and Swanson and West and therefore it is not a focus of this research.

Backgrounding calves is essentially taking calves at weaning and feeding them to heavier weights without placing them directly in the feedlot on a finishing ration. There are several different backgrounding alternatives. One of which is leaving the calves on winter range, or sending calves to Kansas on winter wheat pastures. The most typical alternatives in Utah are 90 to 120-day backgrounding, 180-day backgrounding, and 180-day backgrounding and then placing calves on grass for 120-days.

The 90 to 120-day backgrounding take calves from weaning and adds additional weight for marketing in February and March. Most of these calves are fed to enter the feedlot at the end of the backgrounding phase. Cattle in this type of backgrounding program can be fed all different types of feed, and can be fed for many different rates of gain. This backgrounding scenario occurs because fall calf prices more often than not are seasonally low and prices typically improve after the first of the New Year. Also, many producers may have surplus feed and labor that can be economically used in a backgrounding program. This allows producers the opportunity to try to profitably add weight to the calves and take advantage of seasonal price increases.

The 180-day backgrounding takes calves from weaning and adds additional weight for marketing in May when many producers are looking for cattle to pasture on grass. The increased demand for cattle to be pastured on grass generally results in price increases in the spring for feeder cattle. The demand is greatest for lighter weight feeder cattle (500-700 lbs) to be placed on grass. Calves that have been backgrounded for 180-days, that are heavier than desired for grass stocker programs, generally are placed directly into feedlots for finishing. In a 180-day backgrounding lot there are many different rations that can be fed at many different rates of gain to meet end weight goals.

Feeding calves for 180-days and then placing them on grass is another typical backgrounding strategy. To accomplish this, adequate pasture resources have to be available. This strategy focuses on getting calves through the winter and then onto pasture in the spring and summer where cattle can increase weight while grazing on relatively inexpensive grass. This is often referred to from a retained ownership perspective as a cow-long yearling operation. If cattle are being purchased at weaning or in the spring and pastured on grass throughout the summer, it is called a stocker cattle operation. Once cattle have grazed for the summer months they are sold to a feedlot for finishing. Sales most often take place in late August or early September.

These are a few of the strategies in which a cattle producer looks to increase net returns by retaining calves in a backgrounding alternative. Retaining calves beyond weaning is not without risk. During 2008 the US economy started into a recession and many industries and financial institutions went out of business. Many industries throughout agriculture also saw large economic changes. The beef industry suffered; futures prices for live cattle decreased to between seventy and eighty cents which in turn depressed the futures price for feeder cattle below one dollar (Feuz & Holmgren). During this time many cow- calf producers were worried about taking a large loss for their calves. In previous years, they had received $1.20 to $1.40/ lb for their weaned calves (Feuz & Holmgren). Many of these producers had received offers of more than $1.15 for their calves' only months prior but had declined the offers and were now stuck with calves, bad prices, and a gloomy look on the future. These producers started to look for alternative ways to "beat the market." Many turned to backgrounding their calves as the solution. Cattle Fax, a well known market analysis group, reported that backgrounding calves was profitable 18 out of the past 23 years. Historically backgrounding has appeared to be profitable with an average return of $58/head with a maximum return of $101 and a minimum return of -$61.25.

Many producers thought if they would hold their calves they would be able to receive a larger return by retaining ownership. Was it profitable to retain ownership?

Feed prices were very high. Alfalfa hay was close to $180/ton, and corn increased well above $6/cwt (Feuz & Holmgren). These input costs increased cost-of-gain above historical levels. According to Matt Poore, a North Carolina State University Extension livestock nutritionist, “Historically, we've used a value of gain of about 50¢/lb on growing cattle, but with lighter weight feeder cattle now priced similarly to heavier weight feeders, it suggests value of gain in this new environment may be worth as much $1/lb, which is what the feedlot cost of gain is currently” (Ishmael). This is just one example of some of the risks of retained ownership.

Although this paper will not focus very much attention on production risks, they are real and need to be mentioned. The largest production risk is the weather. Drought, floods, winter storms, mud, and heat are production risks that occur every year in the cattle production sector. Some of these scenarios can be mitigated by changing management plans. For example calving dates can be moved back so that calves are not being born in winter blizzards and mud. Calves can be retained and if a drought occurs than calves can be sold before going onto grass to save sufficient feed for the mature mother cows. A large risk of retaining ownership is adverse winter weather. Severe cold temperatures, oscillating temperatures, and wet and snowy conditions that may lead to muddy lots can all increase the incidence of sickness in cattle. Sickness almost always leads to decreased animal performance and, in more severe cases, may result in the death of the animal. This results in returns being substantially reduced for the backgrounding program.

There are also financial risks that can take shape when looking at a retained ownership program. Very few cattle ranches operate on their own cash. Therefore, producers use a line of credit in order to finance their business endeavors. Often time's lines of credit are set up to be paid off at the end of an operating cycle. In relation to retaining ownership if calves are not going to be sold and they are going to be cash flow can be affected. Interest rates become a large factor. If credit lines are not paid off in the fall and the excess money outstanding is still accruing interest, at what rate does the interest cost too much to allow for a profitable retained ownership program? There are strategies to mitigate financial risks which will not be explained in this paper, but are mentioned to make a point that there are risks that need to be addressed.

Objectives

So, a question can be posed, is there a return in retaining ownership? There has been a significant amount of research done looking at the difference of cattle feeding profitability, but there has not been a lot done to consider backgrounding phases and the impact that it could have on a typical Utah cow/calf producer. This study will evaluate the return variability of backgrounding calves through backgrounding programs for different lengths of time. The specific objectives of this research are to:

1. Evaluate historic returns to backgrounding alternatives for Utah producers;
2. Determine for each retained ownership scenario which ration and rate of gain has produced the highest net returns over time;

3. Evaluate which size of calf has the potential for the largest return for each retained ownership scenario; and
4. Quantify the market and financial risk factors which have the largest impact on backgrounding returns.

The results of this study will help cattle producers understand difference in returns among various backgrounding alternatives. Furthermore, it should provide understanding as to which market or financial factors have the biggest impact on backgrounding returns. Applying these findings will allow producers to be more informed of the risks and returns associated with different backgrounding alternatives.

Methods

Enterprise budgets will be used to evaluate historic returns to several backgrounding alternatives. For each alternative, production parameters, e.g., initial weight, days fed, and average daily gain, will be fixed. However, cattle prices, feed prices, interest rates and some other feeding costs will vary by year based on historical observations of these data. These enterprise budgets help in showing the costs and the returns for each different backgrounding scenario. The time period of the analysis will be from 1999 through 2010.

Since Utah has such a diversity of different types of calf sizes, feed rations, and possible average daily gains (ADG), there had to be some limiting factors on how these variables would be allowed to change. Although there are a wide range of calf weights throughout the state, weights average from 450 to 650 lbs. For this study weights will range from 450 to 600 lbs, and analyses will be drawn on every 50 lb increment.

All feedstuffs are not available in all areas of the state, so different rations have been combined to show rations for different areas of the state. Therefore, a range of different types of rations and feedstuffs were used to represent a larger picture of what is possible throughout the state. It is important to note that there are many other feeds and diets that could be utilized. The rations that have been selected for this study are as follows: "GRASS HAY" this consists of strictly grass hay. "ALFALFA HAY" this consists of strictly alfalfa hay. "ALFALFA SILAGE" consists of a combination of alfalfa hay and corn silage. "GRASS SILAGE" this ration consists of a combination of grass hay and corn silage. "ALFALFA CORN" this ration consists of alfalfa hay and corn grain. "ALFALFA SILAGE CORN" consists of feeding a mixture of alfalfa hay, corn silage and corn grain.

These feeds can be fed at many different levels to achieve different rates of gain in calves. ADG is the amount of weight added to an individual animal every day. The range that will be considered for backgrounding is an ADG of .5 to 2.5 in .5 lb increments.

Appropriate techniques will be used to compare the returns across these rations, calf weights, and backgrounding alternatives. Once this information is compiled a regression analysis using least squares will be used to quantify the market and financial factors that have the largest impact on backgrounding returns.

Thesis Overview

Chapter 2 will look at different reports and studies that have been previously conducted on related topics. These studies will be analyzed to see the results and how they may be similar or different to the findings of this present study. Chapter 3 will discuss the methodology in much greater detail. A description of the data used for the analysis will also be presented. Chapter 4 will look at the results and which alternative produce the largest returns and the return-variance trade off frontier. Chapter 5 will contain the results of the OLS regression to determine the most important factors in explaining net return difference. Chapter 6 will provide a summary of this research and focus on the key finding of the study.

CHAPTER 2

LITERATURE REVIEW

This literature review will be divided into four main sections. The first section will deal with studies on the number of producers, who do retain ownership of calves, and why they do and others do not. The next section will review studies that have evaluated returns over time and across various geographic locations of the U.S. Literature on risk and the retained ownership decision will then be reviewed. The last section will look at studies that have tried to explain what factors are most important in explaining profitability in a retained ownership program. A summary of the literature and the resulting need for this research will then be presented.

Who Retains Ownership of Calves

Each cattle operation has a specific management style that sets it apart from the neighboring operations. All operations have different land, labor, and capital resources which enable these managers to maximize profits in different ways. Cow-calf operations are throughout the west. Cow-calf producers often times follow a traditional production and marketing strategy which consists of a spring calving season and the sale of calves at weaning (Schroeder and Featherstone). A study performed by North Dakota State reported 74% of the survey cattle producer respondents marketed some or all of their calves at weaning (Hodur et al.). While this strategy may be optimal for many producers; there are other opportunities that may allow for an increase in profits. Other types of operations are a spring-yearling operation, which calves are born in the spring and are not marketed until the following spring. Cow- yearling or cow- long yearling is when calves are born in the spring and held over approximately 18 months before marketing. A cow- two year old is an operation in which calves are born in the spring and held for two years and then marketed.

Often times cattle producers stay in the cattlemen's paradigm (Richardson). This paradigm suggests that cattlemen get in a one track mind set and do not explore alternative options. Traditional methods may have been tested for years, but may not be the best present alternatives. The cattle industry has changed over the past 30 years with introductions of new genetics, new feeding technologies, and more sophisticated marketing options. Traditional methods of selling calves at weaning may still be the most profitable for some producers. However, it has been shown that there are other opportunities to improve profits for some producers.

Producers that have invested time and money into improved genetics may not be rewarded if they sell their calves at weaning. To capture the added value within their cattle, some form of retained ownership may be necessary. Producer's cattle that have a known feedlot potential or improved genetics could be better off retaining ownership of their cattle and marketing them on the basis of the feedlot potential and improved genetic ability. Research finds price differentials consistent with risk premiums for cattle of unknown quality, which might suggest new advantages for producers of above average quality cattle to improve their position from retained ownership (Fausti and Feuz; White et al.).

Franken et al. and Gillespie, Basarir, and Schupp found statistical significance between age of the cattle producer and the interest in retained ownership. They also found that typically younger-aged producers were more apt to explore new marketing methods of retained ownership than the older-aged producers. Since the younger-aged producers are the ones really exploring these options, is it because this is a relatively new idea?

Retained Ownership Profitability

In a study performed by Kearl, Gleason, and Feuz evaluations of alternatives to produce suitable feeder cattle in Wyoming's high mountain valleys were performed. Some ranches that have operated as long term cow-calf operations are finding that they may not be maximizing their resources. In this study the idea was to take a basic cow-calf ranch and measure differences between cow-spring yearling, cow-yearling, and cow-2 year old scenarios and measure the different possible returns. Returns increased when retained ownership was incorporated into the operation. Feuz and Kearl presented in a continuation of the study a combination of enterprises for mountain valley cattle ranches. They observed production of feed and grazing in order to produce their results. They do note that the land base and production are better than average because information was gathered from above average producers. The initial results showed that the cow-long yearling was the most profitable and netted $71,137 while the cow-calf model only netted $55,778. The income from the cow-spring yearling model was approximately $69,000.

A very similar study was performed in which they looked at optimal enterprise combination and resource use on mountain cattle ranches in Colorado. Three enterprises were available to the Colorado typical mountain ranch. The three options were cow-calf, cow-calf, and yearling stocker. Also the enterprises consisted of three different meadow use practices. Under the above mentioned practices the highest profit was the cow-yearling enterprise. If the operation was able to use the highest producing meadows the cow-calf enterprise compiled with a hay operation was the most profitable.

Stokes, Farris, and Cartwright examined retained ownership in Texas as a deterministic formula. They found that the returns were higher when calves were weaned and retained and custom fed rather than being marketed outright at the time of weaning.

A more recent study conducted in Iowa by Lawrence and Ostendorf show that purchasing calves to background, whether steers or heifers, has not been profitable on average. The past 14 years (1995-2008) data used show that given the performance and costs used retaining ownership was only profitable about 40% of the time.

In 2004 Cattle fax produced a retained ownership analysis from 1981 to 2003. In this analysis they discovered that backgrounding 475 lb steer calves through the winter in a dry lot winter program with a 1 lb ADG was profitable 11 out of the 23 years analyzed. The overall average return was $14.62/head. Although the profit was positive it was $11/ head less than the return would have been if the cattle were sold at weaning. Once the calves were placed on grass with an ADG of 1.5 lbs the enterprise was profitable 15 out of 23 years with an overall advantage of retaining ownership versus selling at weaning of $31.44/head. In the scenario in which 475 calves were retained in a backgrounding lot with an ADG of 2.25 lbs the enterprise was profitable 18 out of 23 years, with a net return above the weaning profit of

$37.32/head. In comparison to a heavier calf weighing 575 lbs, in a backgrounding lot with an ADG of 2.5 lbs, the enterprise was profitable 20 out of 23 years and returned $35.23/head above the expected profit from the sell at weaning.

As shown in the first four studies it was profitable to retain ownership of calves. These studies were completed in the 1980's, which suggests that the idea of retained ownership has been around for many years, and it has been shown that it can be profitable. In the Iowa State and Cattle fax studies the results were mixed suggesting that possible locations may have different returns to the retained ownership enterprises. The question may be posed: is the profit margin the reason to or not to retain ownership, or are there other reasons for producers to not consider retained ownership?

Risk and Retained Ownership

Producers may be risk adverse. According to Schroeder and Featherstone, and Rawlins Bernardo the option to retain ownership involves complex decisions that depend on environmental, market, and financial factors that increase risk. Producers that are more risk averse find retaining ownership less attractive because of the increased risk factors. Van Tassell et al. found that as a producer became less risk adverse, expected income increased and the standard deviation increased. This suggests that the higher the risk the higher the premium.

When producers were asked why they do not retain ownership of their calves, two-thirds cited feed shortages resulting from weather conditions were the major factors preventing them from backgrounding. Dry conditions create hay shortages; so many producers were using the hay that they had to maintain the cow herd. Those that had excess hay did background some calves but with high hay prices the past couple of years, any excess hay was typically sold (Hodur et al.).

Although the environmental factors are a large issue, Huber et al. found that some producers believed that they did not have enough experience or expertise to feed calves. When calves are being retained there are some market considerations that must be taken into account. Holmgren, Bailey, and Zobell found that these considerations consisted of out of pocket expenses for inputs, opportunity costs, facilities, market variability, taxes, and price risk. Because retaining ownership may be a different procedure than most management had encountered, here may be a learning curve to managing a retained ownership background lot. According to University of Minnesota beef specialist Alfred DiCostanzo, when retaining ownership into a backgrounding lot a manager must strive to integrate economic and management factors to make decisions that will enhance the profit potential of the cattle. Keeping good records and management goals are a key to profitability. Purchase Price, feed costs, and futures markets are the factors that effect profitability. Price seasonality is a very important part of marketing (DiCostanzo).

Factors Impacting Retained Ownership Profitability

Some of the market and financial factors are shown in Schroeder et al. in the research “Factors Affecting Cattle Feeding Profitability.” They found that feeder cattle purchase price, sales price, and corn prices were the three major factors that influenced profitability. Feeder and Fed cattle prices accounted for 75% of the variation in profitability. This study also showed that performance characteristics such as ADG accounted for around 7% of the variation in profitability. As intuition would suggest, the largest input costs and the final sale price would have the largest effect on profitability.

A study that evaluated the direct financial and market factors that affect profitability was completed by Lawrence, Loy, and Wang. Using regression analysis they also found which factors were significant in cattle feeding and which factors had the highest correlation with profits. "Purchase Price, Sale price" explained about 70% of profitability. Other important input variables such as feed prices and interest rate negatively effected return as would be expected.

Swanson and West evaluated the impact on returns using data that was collected from the Illinois Farm Bureau Farm Management Service spanning from 1955-1960. Regression analysis was used to analysis 50 pens of cattle fed in 1960-1961. Price margin and feed cost /cwt of gain were the independent variables and return per $100 feed fed was the dependent variable. For every $ change in feed costs /cwt there was a higher influence on returns than a $ change in price margin. It was found that price margins explained a greater fraction of variation in returns in heavier cattle then with lighter cattle. Difference in price margin accounted for 19 percent of the variation in returns from steer calves but 38 percent in the case of yearlings. On average the effect of feed cost, when expressed as a percentage of variation, was similar between calves and yearlings.

Lambert looked at taking calves through the winter on harvested forages. He found that the important decisions on retaining ownership would have to be based on expected future input and output prices, and the relationship between the price, weight, and performance of the animal during the winter feeding period and subsequent summer grazing season. Input demand levels varied depending upon price over the winter period. In general, the higher the expected price, the higher was the optimal rate of gain. Optimal rates of gain over the winter feeding period were 2 and 2.25 lbs. Rates of gain were highest over the winter when all animals were to be sold in the spring. ADG was lower when the animals were to be placed on rangeland following the winter period. Taking these cattle through the winter and onto grass during the summer months decreased the ADG during the winter feeding period.

Literature Summary

The research that has been presented has shown that retained ownership of calves was profitable in some scenarios and was not profitable in others. However, one short coming of this prior research is that for each retained ownership scenario a specific weight of calf was chosen, and a specific ration and rate of gain was assumed. The reality is that calves are weaned at many different weights and producers often use different feed resources to target weight gains from less than one pound per day to over three pounds per day. Is there a different ration and rate of gain target that is most profitable for different weights of weaned calves? The answer to that question is part of the objective of this research. Also, following the general methodology of several of the studies cited above, a modified form of regression analysis will be used to determine what factors are most important in explaining variations in profit from various background retained ownership alternatives.

CHAPTER 3

METHODOLOGY AND PROCEDURES

As specified in chapter one, the goal of this research is to explore retained ownership opportunities within the state of Utah. The objectives of this research are to evaluate historic returns to backgrounding alternatives for Utah producers; and determine for each retained ownership scenario; which ration and rate of gain has been the most profitable over the eleven year time frame. Also calf sizes will be evaluated to find which size has the largest potential return for each retained ownership scenario. These objectives will be completed through constructing enterprise budgets scenarios and modeling different backgrounding scenarios. Once the first three objectives have been completed, regression analysis will be used to quantify the market and financial risk factors which have the largest impact on backgrounding profitability.

Enterprise Budgets

Enterprise budgets will be constructed in order to compare different calf weights, feed rations, and ADG's across different backgrounding scenarios. The budget displayed is similar to the Utah State University feeder cattle budget developed by Godfrey, Holmgren, and Zobell, and example is shown in table 3.1.

While not shown here there are over 500 of these budgets constructed to evaluate all of the calf weight (5), rates of gain (5), and ration (6) combinations for each of the three different backgrounding alternatives. Each budget will also be evaluated over each year from 1999 to 2009 to determine the level and variability of returns.

Table 3.1 1999 450 lb Calf, Grass Hay Diet, 1lb. ADG

Revenue				
	lbs.	$/lb		**Total**
Sales	570	94.02		**535.91**
Expenses				
Purchase Price	lbs.	$/lb	**Total**	
	450	89.14	401.14	
Feed	lbs./day	$/Ton	Total	
Grass Hay	15.78	62	58.32	
Other Expenses				
Interest	120	11.00%	16.61	
Vet & Vaccine	1	7.50	7.5	
Transportation	1	2.51	2.5	
Death Loss	1	1.50%	6.02	
Yardage	120	0.27	32.616	
			Total	123.57
			Net Return	11.20

The five weight classes of weaned calves to enter the retained ownership programs are 450 lb, 500 lb, 550 lb, 600 lb, and 650 lb steer calves. Rations that are evaluated are common throughout the intermountain area. The rations evaluated are as follows: GRASS HAY, this consists of strictly grass hay; ALFALFA HAY, this consists of strictly alfalfa hay; ALFALFA SILAGE, this consists of a combination of alfalfa hay and corn silage; GRASS SILAGE, this ration consists of a combination of grass hay and corn silage; ALFALFA CORN, this ration consists of alfalfa hay and corn grain; and ALFALFA SILAGE CORN, this consists of feeding a mixture of alfalfa hay, corn silage, and corn grain. The average daily gains analyzed for each weight class and ration are 0.5, 1.0, 1.5, 2.0, and 2.5 lbs. However, not all weight gains are feasible with all rations and calf weights, due to the different nutrient levels of the feed and the nutrient requirements of the animal. The three alternative retained ownership programs are the 120-day feeding program, the 180-day feeding program, and the 180-day feeding plus 120-day on grass program.

The 650 lb steers are not considered in the 180-day program and the summer grazing alternative because the final weights are too large. These animals become too large to enter a feedlot for finishing, and remain within industry standards for hot carcass weights. Most producers will not try and background calves so large, and for that reason they have been removed from the study. ADG of 2.5 lbs is removed from the summer grass scenario. According to Dale Zobell, Utah State University beef specialist, if calves are backgrounded at an ADG of 2.5 lbs during the winter, initial weight loss will incur when placed on grass and summer gains will be negatively affected.

Budget Coefficients

There are many different factors that are included in these enterprise budgets, some of which vary annually, and others that are fixed in each scenario. The factors that vary annually are the PURCHASE PRICE, SALE PRICE, ALFALFA HAY PRICE, GRASS HAY PRICE, SILAGE PRICE, CORN PRICE, INTEREST, TRANSPORATION, and YARDAGE. The other factors such as VET and VACCINE and DEATH LOSS remain fixed over time and for each specific budget.

The nutritional requirements are determined using a program developed by Minnesota State University Extension called Professional Nutritionist. Rations are balanced for net energy, crude protein, calcium, and phosphorus and calculated on a dry matter basis. Linear Programming is used to determine rations based on nutrient requirement of the cattle and the nutrients supplied by the various feeds. For example the ALFALFA SILAGE ration uses linear programming to combine the feeds while staying within the bounds of the constraints. The nutritional requirements and the constraints are shown in Appendix A for each weight and each rate of gain. Rations are than calculated on an as fed basis so as to determine the correct cost of feed over the allotted time frame. The actual as fed rations are shown in Appendix B.

Although feed costs are the largest cost of backgrounding, there are other costs that are incurred and in backgrounding costs. Backgrounding cost (BC) is the cost of feeding the calves over the allotted time frame and is calculated as follows on a per head basis.

3.1 BC= Feed + Interest Cost + Transportation + Yardage+ Vet and Vaccine+ Death loss

The majority of the feed costs are gathered from USDA reports that have been compiled into a data set by Feuz and Holmgren. November feed prices are used since that is the time the calves are placed into the retained ownership program. All feeds are presumed to be purchased in November so as to have sufficient feed inventory for the duration of feeding. It is worthy to note that many producers will not purchase all the feed up front and can reduce inventory and interest cost and therefore reduce their breakeven. These producers usually will have a good working relationship with suppliers and obtain contracts so that they are confident that they will have sufficient feed for the feeding period. For the purposes of this paper all feed inventory will be purchased in November and fed throughout the feeding period.

INTEREST is the cost of borrowing money from a lender. Although there are many producers that can operate on their own personal cash reserves, there is an opportunity cost of using that money. There is a cost of receiving money from an institution or from personal reserves. Historical prime rate interest rates are used to calculate the interest cost (Money Café). Since producers never get the prime rate as their interest rate, a bank margin has been included at 2.50% above prime. According to an agricultural lender in Utah, a typical bank spread on an operating line during the time frame that is being analyzed was approximately 2.50% above prime (Holt). Interest cost for the purchase price of the animals and the feed cost is calculated as follows:

3.2 INTEREST = (Animal Purchase Price + Total Feed Cost) * Interest Rate /365 * Days Fed

The number of days fed is 120, 180, or 300 days depending upon the retained ownership alternative.

TRANSPORTATION is the cost of moving cattle from one location to another. This occurs usually at the time of sale or if cattle are being purchased instead of retained, transportation costs would include the cost of moving the cattle to the backgrounding lot. Transportation cost per head is calculated as follows:

3.3 TRANSPORTATION = Fuel Price *150 miles/ number of head shipped

150 miles is used, as shown in equation 3.3, as an average transportation distance. Since sale data is being used from Salina Utah Producer’s livestock auction, most

destinations within the state of Utah can reach Salina Utah from 150 miles. However the cost of transportation could be excluded in some retained ownership situations. With different marketing strategies cattle can now be sold from the ranch headquarters and remove the excess transportation costs by marketing cattle on the video auctions. For this study the transportation has been included so that USDA sale data can be incorporated.

The term YARDAGE refers to the daily overhead costs associated with maintaining cattle in a lot (or yard). It includes costs such as building depreciation and repair, labour, taxes, and water costs. Next to feed costs, yardage is usually the second largest expense when calculating cost of production. The industry average yardage cost is approximately thirty cents per head per day. Yardage has not been consistent over the time. Custom feedlots have increased the cost of yardage, due to increase maintenance costs. Yardage costs were supplied from Professional Cattle Consultants Northern Plains Data.

VET and VACCINE refers to costs incurred from veterinary services and utilizing an animal health program. These prices are to be held constant at $7.50/head as shown on the feeder cattle budget created by USU extension (Godfrey, Holmgren, & Zobell). There are many different numbers that can be used for this cost, mainly due to different management practices and environmental factors, but for consistency the extension budget cost will be used.

DEATH LOSS refers to the loss of animals throughout the production stage. If one animal dies in the lot it affects the bottom line of the entire enterprise. Therefore, it is calculated at 1.5% as found on the Utah State University feeder cattle budget (Godfrey, Holmgren, & Zobell). There are multiple different numbers that can be used for this cost, mainly due to different management practices and environmental factors, but for consistency the extension budget cost will be incorporated.

There is an additional cost that is included in the winter backgrounding to summer grass budget. This cost is the cost to GRAZE cattle on pasture forage during the summer months. The grazing season is from May 1 to September 1. Interest is not charged on grazing cost, because many producers do not pay for the grass until the end of the grazing season. Grazing rates of gain are held constant over time and across the different weights of cattle. Information provided by Utah State Extension (Godfrey, Holmgren, & Zobell) and from Kansas State Extension (Dhuyvetter & Langemeier) show that gains typically range from 1.5 to 2 lbs per day. An average of these gains is used in this research. Calves that are retained on grass are assumed to gain 1.75 lbs per day.

Total cost has been calculated using purchase price plus the background cost explained above. Total Cost is calculated as shown below.

3.4 Total Cost = PURCHASE PRICE + BC

To determine total revenue, both final sale weight and sale market price needs to be determined. Final weight is arrived at based on the following equation:

3.5 Final Weight = ADG * Days + Beginning Weight

"ADG" is the average daily gain, "Days" is the number of days in the retained ownership program (120 or 180) and "Beginning Weight" is the weight of the calf at weaning. If the cattle are then placed on a grazing program, another 120-days are added (120-days X 1.75 lbs /day).

Feeder cattle prices used in this study compiled by Feuz, & Holmgren (2010) is in one hundred pound increments. The final ending weights for the background calves do-not always end on hundred pound increments so a simple econometric model is created to discover the price in ten pound increments.

3.6 $\text{Price} = \beta + \beta 1 * \text{weight} + \beta 2 * \text{weight}^2$

For example a 450 lb calf may receive $100/ cwt and a 550 lb calf may receive $90/ cwt. This would constitute a $10 slide for the excess 100 lbs of gain. When looking at heavier weights the excess 100 lbs may only constitute a $5 price slide. For this reason a quadratic equation was used to in determining the price on ten pound increments.

Once the final weights are determined and the price per lb is estimated, total revenue per head can be determined by multiplying the final weight and price.

3.7 Total Revenue= Final Weight * Price

This equation will give the total revenue on a per head basis. This is not to be confused with return. Although this revenue may be higher than the revenue that could have been achieved in the fall by selling calves at weaning it may not have been a profitable enterprise. Net return per head needs to be calculated in order to find the return margin. Net return per head is calculated as follows:

3.8 Net Return = Total Revenue – Total Cost

Average return is then calculated for each weight, ration, and rate of gain situation, over the eleven year time frame, and in each backgrounding scenario.

Simulation Analysis

There is a great deal of variability in the returns over the 11 year time period for each of the retained ownership scenarios. With only 11 observations, the variance is quite large relative to the mean return for most of the scenarios. As a result, a test for significant difference in mean returns over the 11 years would indicate that most of the returns are equal, even when they would appear quite different in actual magnitude. Furthermore, because of the variability in cattle prices and feed costs, there is no guarantee that the 11year sample captures all of the possible return variability going into the future.

Therefore a Monte Carlo simulation analysis will be conducted using 500 iterations. The stochastic variables for the simulation are the cattle prices, feed costs, transportation costs and yardage. The 11 years of actual data for each of these variables is used to estimate the distribution from which to draw the sample. SIMETAR (Richardson) is the software that is used to conduct the simulation analysis.

The mean and variance will be determined from each of simulated returns for all weight, ration, rate of gain, and retained ownership scenarios. Difference of means will be tested using a standard t-Test and difference of variance will be tested using an F-Test. Each of these tests can be performed within the SIMETAR software.

Econometric Regression Analysis

The next step in this study is to evaluate which market and financial risk factors have the largest impact on the returns to backgrounding. This is done by compiling all the data that were collected to complete the enterprise budgets, as previously mentioned above, and compile them into a data set. Least squares econometric regression is then used to evaluate the variables. The first evaluation is going to use the net return margin per head as the independent variable regressed against return and cost variables as shown in equation 3.9.

Since all of these variables have been defined previously, they will not be redefined at this point. The data are going to be regressed on all three scenarios separately. A relationship for each variable should be different for each backgrounding scenario. The only difference in the equation is in the winter backgrounding summer grass model, the variable GRAZE is included. This will include the cost per head of grazing cattle during the summer months.

3.9 NET RETURN=β + β1* WEIGHT + β2* WEIGHT^2 + β3* GRASS HAY + β4* ALFALFA HAY + β5* GRASS SILAGE + β6* ALFALFA CORN + β7* ALFALFA SILAGE CORN + β8* PURCHASE PRICE + β9* SALE PRICE + β10 CORN PRICE + β11* SILAGE PRICE + β12* ALFALFA PRICE + β13* GRASS PRICE + β14* DIESEL +β15* YARDAGE + β16*INTEREST + U

Each variable is believed to have an effect on the net returns, and for that reason has been included in the data set. WEIGHT is expected to have a negative effect on the net return to backgrounding. ADG is expected to have a positive effect on net return as shown in the study on cattle feeding profitability (Lawrence, Loy, and Wang): the higher the gain the higher the return. All of the ration variables have been included as dummy variables with the ALFALFA SILAGE ration being the ration which was omitted out of the regression model. Until the model is run, it is unknown which ration(s) will have a positive or a negative effect on the net returns. The PURCHASE PRICE is expected to have a negative effect on the net returns. If the calf purchase price is high than there should be a reduction in the return (Lawrence, Loy, and Wang). SALE PRICE is expected to be the opposite of PURCHASE PRICE, and have a positive effect on the net return. All of the input costs are expected to cause a negative effect (Lawrence, Loy, and Wang). CORN PRICE, SILAGE PRICE, ALFALFA HAY PRICE, and GRASS HAY PRICE are all expected to have a negative effect on the net return. Also the other input costs such as the YARDAGE, DIESEL, and INTEREST costs are also expected to have a negative effect. The variable GRAZE in the winter-backgrounding-summer grazing scenario is also considered an input cost and therefore it is expected to produce a negative effect on net returns.

Once the regression models are completed, tests for multicolinearity, heteroskedasticity, and auto correlation will be conducted. Final results should allow an evaluation of what factors have the largest effect on the net return of a backgrounding enterprise. The factors that have the largest effect on net returns are expected to be PURCHASE PRICE, SALE PRICE, CORN PRICE, ALFALFA PRICE, GRASS HAY PRICE, and SILAGE PRICE as was observed in the cattle feeding study performed by Schroeder et al.

Data

Some producers might consider the production cost of the input as the purchase prices. However, for this research the economic opportunity cost of the calf and the input variables will be used. Therefore the purchase price is the actual value of the animal at the time the calf would be weaned and could be sold. Typical operations in Utah wean calves in late October or in early November. The average historical November price was used as the purchase price for calves. This information has been gathered from USDA market reports from Salina Utah Producers' Livestock Auction, and has been compiled into a data set by Feuz, and Holmgren. Those prices are displayed in Table 3.2.

As shown below there has been some variability in calf prices over time. Mean values have been calculated for the 11-year time frame. On average smaller calves receive a higher price with respect to larger calves. During some of the time analyzed, weight could be added cheaper than purchasing the weight so many smaller calves received a premium. The coefficient of variance suggests that the weight with the least variation is the 600 lb calves.

Table 3.2 Yearly Historical November Calf Price

Year	450 lb	500 lb	550 lb	600 lb	650 lb
1999	89.14	83.61	75.86	74.08	71.61
2000	95.89	86.99	82.19	77.72	74.63
2001	92.77	85.31	81.95	80.08	77.55
2002	86.46	80.10	77.31	78.85	70.97
2003	110.67	100.74	97.24	93.69	93.85
2004	121.71	109.88	102.85	97.06	89.61
2005	132.20	121.81	112.33	106.52	102.71
2006	112.03	103.00	95.58	91.83	89.25
2007	115.21	107.24	99.39	95.13	93.35
2008	104.84	95.30	89.74	88.59	85.81
2009	104.19	97.42	85.59	82.58	81.46
Mean	105.92	97.40	90.91	87.83	84.62
SD	14.23	12.80	11.54	9.99	10.26
C of V	13.43%	13.15%	12.70%	11.37%	12.12%

Feed prices from 1999 to 2009 are listed in Table 3.3. Actual historical information has been used on alfalfa hay price and corn grain price (Feuz, & Holmgren). Grass hay and corn silage prices were not compiled, and therefore a formula has been used to correlate these feeds with alfalfa hay and corn grain.

According to Don Peterson (personal communication 15 Aug. 2010), a Utah farm and ranch appraiser, grass hay typically runs at eighty percent of the price of feeder alfalfa hay. This is the formula that is used in discovering grass hay prices. As used by Purdue University animal scientist, corn silage prices are determined by multiplying the price/cwt of corn by a factor of 9 (Hendrix).

Table 3.3 Historic Utah Commodity Prices

Year	November Corn Price	November Sileage Price	November Alfalfa Hay Price	November Grass Hay Price
1999	2.25	20.28	77.00	61.60
2000	2.47	22.19	82.00	65.60
2001	2.61	23.51	97.00	77.60
2002	3.11	27.97	97.00	77.60
2003	2.72	24.46	70.00	56.00
2004	2.49	22.37	92.00	73.60
2005	2.56	23.00	100.00	80.00
2006	4.04	36.36	99.00	79.20
2007	4.59	41.31	135.00	108.00
2008	4.46	40.14	170.00	136.00
2009	4.52	40.68	85.00	68.00
Mean	3.26	29.30	100.36	80.29
SD	0.94	8.48	28.61	22.89
Cof V	28.96%	28.96%	28.50%	28.50%

Variability of these commodities over the time period analyzed is large. For example alfalfa hay has a range of $70 to $170 per ton, which equates to a 240% increase in price. The coefficient of variation shows a 28% variance in all of the commodities. The year that incurred the highest average commodity feed prices was in 2008.

The other cost factors that are variable throughout this study are diesel fuel, interest rate, yardage cost, and yearly grazing cost. These factors and the values for each year are shown in Table 3.4.

No academic sources for historical trucking costs were located. Jack Brown, owner of Jack Brown Trucking in Hyrum, Utah, was asked how prices are set in the trucking industry. He responded that the price of diesel fuel was the marker for the trucking costs. The cost per loaded mile is the cost of one gallon of diesel fuel. Historical Intermountain Diesel fuel prices have been used to calculate the cost of transportation (U.S. Energy Information Administration). As shown above the mean price of trucking per loaded mile was $2.13/ gallon. The coefficient of variance suggests that there is a large amount of variance during this time frame. Looking at the data provided prices have ranged from $1.15 to $3.57/ gallon. This is consistent with observations made during this same time frame. The interest cost shown above is representative of the prime rate plus 2.5%. Yardage costs were supplied from Professional Cattle Consultants Northern Plains Data.

Table 3.4 Other Variable Costs

Year	Diesel Fuel March cents/ gallon	Interest Rate	Yardage Cost cents/day	Yearly Grazing Cost
1999		11.00%	0.27	
2000	146.5	12.00%	0.29	11.30
2001	149.1	8.00%	0.29	11.50
2002	115.7	7.25%	0.28	12.10
2003	173.6	6.50%	0.28	12.50
2004	159.9	7.25%	0.32	13.10
2005	222.9	9.50%	0.32	13.00
2006	254.5	10.75%	0.33	13.50
2007	265.8	10.00%	0.34	14.20
2008	357.3	6.50%	0.37	15.50
2009	209.1	5.75%	0.34	16.20
2010	285.1			16.50
Mean	212.68	0.09	0.31	13.58
SD	72.79	0.02	0.03	1.81
C of V	34.23%	24.87%	10.35%	13.36%

Grazing information was obtained through Utah Ag statistics grazing prices from 1999-2009. Grazing prices have slowly increased over the past 11 years. There has not been a lot of variability as compared to the other feed commodities. It appears to be the least volatile of all possible feedstuffs.

Sale prices for all of the scenarios are taken from historical monthly feeder cattle prices as shown in Table 3.5. This information has been gathered from USDA market reports from Salina Utah Producers' Livestock Auction that have been compiled into a data set by Feuz and Holmgren.

Table 3.5 Yearly Historic Feeder Cattle Prices

	MARCH					MAY				
	450	550	650	750	850	450	550	650	750	850
2000	103.75	97.94	87.13	79.24	75.63	104.20	98.35	88.06	81.88	75.74
2001	114.28	102.55	88.44	81.50	77.01	105.94	96.29	87.44	81.46	77.70
2002	105.60	92.59	85.98	78.16	72.16	88.81	86.74	80.05	73.77	70.10
2003	97.41	90.25	78.46	71.65	70.42	96.85	91.64	86.35	78.32	74.94
2004	117.72	109.42	95.14	83.96	81.58	120.92	112.21	101.11	93.96	88.32
2005	129.41	118.11	108.41	98.82	93.83	147.65	129.58	116.29	107.00	99.54
2006	137.94	122.60	109.52	98.39	93.88	135.22	124.63	107.94	98.11	89.52
2007	120.67	113.52	104.59	95.59	90.98	114.97	112.35	103.99	96.74	92.75
2008	118.10	115.47	99.47	91.83	87.75	116.07	114.83	107.07	99.11	94.40
2009	112.77	109.74	95.66	86.38	81.73	113.36	110.03	103.31	93.09	86.25
2010	120.80	118.35	106.89	98.55	94.75	127.56	121.50	110.44	103.59	98.56
Mean	116.22	108.23	96.33	87.64	83.61	115.60	108.92	99.28	91.55	86.17
SD	11.53279	10.9382	10.4158	9.53579	9.08548	16.9755	13.973	11.8084	10.9793	10.1195
CofV	9.92%	10.11%	10.81%	10.88%	10.87%	14.69%	12.83%	11.89%	11.99%	11.74%

Table 3.5 Continued

	SEPTEMBER								
	450	550	650	750	850	950	1050	1150	1250
2000	96.47	89.65	83.22	78.13	76.86	75.86	74.86	74.36	73.93
2001	105.83	97.41	88.25	83.67	82	81	80	79.5	79.07
2002	85.63	79.32	73.97	72.98	70.66	69.66	68.66	68.16	67.73
2003	103.08	98.5	93.66	90.94	86.74	85.74	84.74	84.24	83.81
2004	125.72	114.24	106.33	103.1	96.22	95.22	94.22	93.72	93.29
2005	127.08	118.79	110.44	103.27	99.9	98.9	97.9	97.4	96.97
2006	131.28	119.44	109.36	105.8	101.44	100.44	99.44	98.94	98.51
2007	119.96	112.69	108.18	103.45	99.11	98.11	97.11	96.61	96.18
2008	107.85	101.91	97.91	97.14	94.11	89.41	88.41	87.91	87.48
2009	105.78	95.77	87.75	86.11	86.67	79.92	78.92	78.42	77.99
2010	123.75	113.63	107.38	105.56	100.5	96.08	95.08	94.58	94.15
Mean	112.04	103.76	96.95	93.65	90.38	88.21	87.21	86.71	86.28
SD	14.48725	13.00241	12.4383	11.88099	10.52835	10.478	10.48	9.98	9.55
Cof V	12.93%	12.53%	12.83%	12.69%	11.65%	11.88%	12.01%	11.51%	11.07%

These prices were recorded in one hundred pound increments. As stated previously econometrics ordinary least squares to predict the prices in ten pound increments to match the final end weights. The coefficient of variation throughout all of the scenarios shows the price volatility. The May seasonal prices show the largest average volatility, while the March prices show the lowest volatility.

The data presented above is used to create the enterprise budgets and determine the net returns for each situation within each backgrounding scenario. It will also be used to find the characteristics that have the largest effect on profits. Given the information above the results produced should be able to be reproduced at any given time. The following chapters will show the results of the methods and data presented above.

CHAPTER 4

ENTERPRISE BUDGET RESULTS

As specified in chapter one, the goal of this research is to explore retained ownership opportunities within the state of Utah. The objectives of this research are to evaluate historic returns to backgrounding alternatives for Utah producers; and determine for each retained ownership scenario, which ration and rate of gain has been the most profitable over the time frame. Also calf sizes will be evaluated to find which size has the largest potential return for each retained ownership scenario. These objectives have been completed by constructing enterprise budgets for each backgrounding scenario over the time frame from 1999-2009. Backgrounding budgets were created using variables that were modeled after the Utah State University feeder cattle budget (Godfrey, Holmgren, and Zobell).

This chapter is broken into six sections. The first section is going to analyze the 120-day backgrounding scenario and determine which calf size, ration, and rate of gain returns the largest profit. The 180-day backgrounding scenario follows with the same analysis of which calf size, ration, and rate of gain create the largest return. The third section of the summer grass scenario follows and answers the same questions as mentioned above with the other two scenarios. The fourth section focuses on the probability of realizing a net return for each situation and backgrounding scenario. This is followed by the EV frontiers and risk return tradeoffs. The last section is a summary and discusses familiar trends and important differences in the net returns and the variability throughout the different backgrounding scenarios.

120-day Backgrounding

This part of the analysis will look at each retained ownership scenario for which calf size, ration, and rate of gain has been the most profitable from 1999 to 2009. This information was compiled in enterprise budgets and averaged over the eleven year time frame. The 120-day backgrounding results are shown in Table 4.1.

Table 4.1 120-Day Backgrounding Return Margins

		Grass Hay	Alfalfa Hay	Alfalfa, Silage	Grass, Silage	Alfalfa, Corn	Alfalfa, Silage, Corn
		450 lb Calves					
0.5	Mean	-48.05	-65.43	-60.37	-44.15	-59.19	
	Stan Dev	32.58	36.42	33.54	27.84	33.43	
1	Mean	-26.29	-45.84	-40.15	-24.76	-38.82	-25.74
	Stan Dev	35.44	39.49	35.98	33.12	35.91	33.81
1.5	Mean			-21.18	-4.61	-24.46	-6.47
	Stan Dev			39.02	35.88	41.51	34.67
2	Mean			7.33		-1.68	9.98
	Stan Dev			35.68		42.28	35.53
2.5	Mean					30.51	27.77
	Stan Dev					37.95	38.09
		500 lb Calves					
0.5	Mean	-38.59	-57.31	-51.86	-33.81	-50.59	
	Stan Dev	33.11	37.11	33.93	27.13	33.83	
1	Mean	-20.34	-41.30	-35.19	-17.70	-33.77	-17.19
	Stan Dev	36.91	41.11	37.34	32.98	37.28	34.30
1.5	Mean			-18.67	-2.56	-22.18	1.44
	Stan Dev			40.61	39.82	43.25	34.64
2	Mean			9.11		-0.47	14.33
	Stan Dev			36.62		43.53	35.68
2.5	Mean					23.71	30.71
	Stan Dev					42.36	37.39

Table 4.1 Continued

		Grass Hay	Alfalfa Hay	Alfalfa, Silage	Grass, Silage	Alfalfa, Corn	Alfalfa, Silage, Corn
				550 lb Calves			
0.5	Mean	-34.48	-54.51	-48.68	-28.84	-47.32	
	Stan Dev	44.40	47.78	44.29	36.44	44.28	
1	Mean	-18.98	-41.33	-34.82	-15.26	-33.31	-13.49
	Stan Dev	49.36	52.98	49.01	43.72	49.03	45.96
1.5	Mean			-19.98	-1.64	-23.71	5.25
	Stan Dev			52.57	50.40	55.34	45.72
2	Mean			7.82		-2.34	15.55
	Stan Dev			47.99		55.20	46.50
2.5	Mean					22.56	31.29
	Stan Dev					53.44	47.39
				600 lb Calves			
0.5	Mean	-46.88	-68.20	-61.99	-40.39	-60.54	
	Stan Dev	52.27	55.77	52.13	43.35	52.13	
1	Mean	-33.37	-57.08	-50.17	-28.58	-48.57	-25.76
	Stan Dev	56.94	60.80	56.68	49.95	56.69	52.88
1.5	Mean			-36.26	-15.73	-40.21	-6.19
	Stan Dev			59.81	55.65	62.66	51.52
2	Mean			-7.71		-18.43	2.49
	Stan Dev			54.73		62.10	52.46
2.5	Mean					7.94	18.36
	Stan Dev					60.63	53.86
				650 lb Calves			
0.5	Mean	-56.58	-79.14	-72.57	-49.24	-71.04	
	Stan Dev	55.50	59.19	55.68	46.94	55.64	
1	Mean	-44.29	-69.34	-62.04	-38.46	-60.30	-34.76
	Stan Dev	59.71	63.92	59.92	52.35	59.88	55.37
1.5	Mean			-25.92	-25.61	-52.46	-14.91
	Stan Dev			57.87	57.26	65.74	54.18
2	Mean			-18.25		-29.53	-5.61
	Stan Dev			59.26		65.96	56.41
2.5	Mean					-0.94	11.15
	Stan Dev					66.96	60.75

The data shows that most of the rations and rates of gain produce a negative return. The largest return was incurred when 550 lb calves were retained and fed a ration of alfalfa silage corn with an ADG of 2.5 lbs. This situation brought a $31.29/ head return. Although this is the highest return it also has a large standard deviation of 47 signifying a large variation. There are other situations that are very close to the same return with smaller standard deviations. Feeding 500 lb calves the same ration and rate of gain returned $30.71/ head and feeding 450 lb calves alfalfa corn returned $30.51/ head and both of these had a standard deviation of 37. When comparing difference of means each weight class was significantly different. The variances were not statistically different, signifying that the risk is statistically equal. Therefore, the ration situation that created the highest level of profitability would be selected, because the risk levels were all equal. Because the risk levels are all equal the 550 lb calf with the return of $31.29/ head would be the alternative that produced the highest net return. Feeding calves that weigh between 450, 500, and 550 lb in a 120-day backgrounding enterprise is more profitable than feeding the 600 and the 650 lb calves.

The ration that is fed appears to have a large influence in the net returns of the backgrounding scenario. According to the information displayed feeding the grass hay ration, alfalfa hay ration, and grass silage ration were never profitable. These rations across all the weights analyzed averaged from -$32 per head to -$57.95 per head. The largest losses occurred when alfalfa hay was fed as the sole feed. Logically this should be true because alfalfa hay is an expensive source of protein which when fed straight, does not allow the animals to utilize all the protein in the feed.

At weights from 450 to 550 lbs feeding alfalfa silage produces a minimal return when fed at an ADG of 2 lbs. Once weights increase to 600 lbs this ration on average produces a negative return at all rates of gain.

Feeding a ration of alfalfa corn was profitable when ADG reaches 2.5 lbs. The cost of this ration incurs the largest standard deviation, which would suggest that this is the ration with the most variation in cost. Intuitively this makes sense, because alfalfa hay and corn grain seem to have been extremely volatile over the eleven year time frame. The only calf size in which an ADG of 2.5 lbs, feeding alfalfa corn does not incur a return is 650 lbs

On average the most profitable ration is the alfalfa silage corn ration. Feeding 500 and 550 lb calves, this ration on average will incur a positive return with an ADG of 1.5 lbs and higher. With 450 and 600 lb calves, a positive return can be produced with an ADG of 2 lbs and higher; and with 650 lb calves, a return can be realized with an ADG of 2.5 lbs

Returns relating to ADG suggest a higher rate of return when rates of gain increase. The difference of means test was administered and shows that the means are statistically different, and on average the higher the rate of gain the higher the return on investment. A 0.5 and 1 lb ADG never incurred a return to the enterprise. When ADG reaches 1.5 lbs profitability was obtained on the 500 lb and 550 lb calves feeding the alfalfa silage corn ration. A return was achieved at 2 lbs ADG when alfalfa silage and alfalfa silage corn was fed to calves that weighed 450 -550 lbs

Once calves reached 600 lbs a 2 lb ADG was not sufficient to produce a return unless they were fed an alfalfa silage corn ration. When ADG was increased to 2.5 lbs positive returns were realized on all the calf weights expect for when feeding 650 lb calves, which then was profitable only when feeding the alfalfa silage corn ration. All cattle were able to return a profit once they were fed an ADG of 2.5 lbs. On average the largest profits were obtained when cattle were fed at an ADG of 2.5 lbs

180-day Backgrounding

Taking calves an extra 60 days to a 180-day backgrounding enterprise generates many of the same trends that were discovered in the 120-day backgrounding enterprise. As explained in the introduction seasonal calf prices tend to increase in the spring to meet demand for cattle to move onto grass. The 180-day backgrounding is set up to market these cattle when these prices are seasonally high. The net returns of backgrounding calves for 180-days are shown in Table 4.2.

Table 4.2 180 Day Backgrounding Return Margins

		Grass Hay	Alfalfa Hay	Alfalfa, Silage	Grass, Silage	Alfalfa, Corn	Alfafa, Silage, Corn
				450 lb Calves			
0.5	Mean	-94.45	-121.49	-113.61	-88.11	-111.78	
	Stan Dev	56.55	62.36	58.37	50.19	58.18	
1	Mean	-59.59	-90.60	-81.57	-56.25	-108.52	-56.33
	Stan Dev	56.88	63.35	58.19	52.43	63.88	53.82
1.5	Mean			-53.78	-29.64	-59.08	-24.00
	Stan Dev			60.28	58.96	64.11	51.48
2	Mean			-12.16		-26.92	-3.47
	Stan Dev			55.88		66.07	54.25
2.5	Mean					6.25	18.24

Table 4.2 Continued

	Grass Hay	Alfalfa Hay	Alfalfa, Silage	Grass, Silage	Alfalfa, Corn	Alfafa, Silage, Corn
			500 lb Calves			
0.5 Mean	-84.20	-113.27	-104.80	-76.53	-102.83	
Stan Dev	56.18	62.31	57.95	48.50	57.76	
1 Mean	-54.45	-87.60	-77.94	-49.45	-75.69	-47.49
Stan Dev	58.06	64.80	59.27	51.49	59.12	53.67
1.5 Mean			-53.93	-26.38	-59.56	-16.33
Stan Dev			63.51	59.41	67.51	52.65
2 Mean			-13.82		-29.45	-1.31
Stan Dev			62.22		72.37	59.63
2.5 Mean					3.00	17.57
Stan Dev					83.42	75.13
			600 lb Calves			
0.5 Mean	-91.34	-124.32	-114.71	-81.07	-112.48	-24.03
Stan Dev	66.58	72.94	67.24	53.11	67.15	123.77
1 Mean	-70.00	-107.28	-96.42	-61.77	-93.89	-56.65
Stan Dev	73.23	80.16	73.48	61.17	73.42	66.12
1.5 Mean			-78.21	-44.02	-84.50	-27.82
Stan Dev			83.55	74.45	88.11	69.19
2 Mean			-39.40		-56.73	-143.01
Stan Dev			89.78		100.67	95.33

This table would suggest that backgrounding calves for 180-days does not produce a positive return. Comparing calf weights across rates of gain and rations indicates that most of the average returns are negative. The largest return was incurred when 450 lb calves were fed an alfalfa silage corn ration with an ADG of 2.5 lbs. This combination on average returned an $18.24/ head profit. A standard deviation of 64.53 demonstrates there is some variance. A difference of means test was performed on the data presented in table 4.2 and all means are statistically different. The initial calf weights show a linear relationship. If this was graphed it would show a negative slope from 450 lb calves down to 650 lb calves.

All of the rations that can not be fed to achieve an ADG of 2.5 lbs do not produce a positive return. Therefore, the only two rations that can be fed to achieve this rate of gain are the alfalfa corn and the alfalfa silage corn rations. These rations only produced a positive net return when feeding calves at weights of 450 and 500 lbs. Once weights reach 550 lbs the only ration with a positive return is the alfalfa silage corn ration and this produces a return of $13.90/ head.

Average daily gain follows the same trend that was seen in the 120-day backgrounding enterprise, which shows that the higher the rate of gain the higher the return. The only ADG that shows a positive return is the 2.5 lbs. Although it does show a positive return it has the highest standard deviation when compared to the other rates of gain and suggests that it is the most variable.

Summer Grass Backgrounding

If the 180-day backgrounding does not look profitable, there has to be a profit in keeping calves onto grass during the summer or producers would not do it. Taking calves from November to September the following year allows producers to take advantage of the cheap summer feed. Table 4.3 shows the profitability of taking calves onto grass.

Table 4.3 Summer Grass Backgrounding Return Margins

		Grass Hay	Alfalfa Hay	Alfalfa, Silage	Grass, Silage	Alfalfa, Corn	Alfafa, Silage, Corn
				450 lb Calves			
0.5	Mean	-51.74	-79.50	-71.41	-45.22	-69.53	
	Stan Dev	78.75	85.12	80.30	70.03	80.14	
1	Mean	-11.18	-43.02	-33.75	-7.74	-61.42	-7.83
	Stan Dev	85.03	92.31	86.68	80.12	92.94	81.67
1.5	Mean			12.32	37.11	6.88	42.91
	Stan Dev			92.68	90.29	96.57	82.76
2	Mean			81.11		65.95	90.04
	Stan Dev			88.66		98.85	86.56
				500 lb Calves			
0.5	Mean	-39.89	-69.73	-61.03	-32.00	-59.01	
	Stan Dev	81.86	88.68	83.61	71.80	83.43	
1	Mean	1.40	-32.63	-22.71	6.55	-20.40	8.56
	Stan Dev	88.52	96.28	90.42	81.54	90.22	83.79
1.5	Mean			25.24	53.53	19.45	63.85
	Stan Dev			96.94	91.56	100.94	84.53
2	Mean			98.82		82.76	111.67
	Stan Dev			93.62		103.89	90.31
				550 lb Calves			
0.5	Mean	-30.21	-62.09	-52.80	-20.98	-50.64	
	Stan Dev	87.40	94.57	88.78	74.25	88.63	
1	Mean	12.55	-23.63	-13.08	19.37	-10.63	23.14
	Stan Dev	94.66	102.81	96.23	84.66	96.06	88.23
1.5	Mean			37.43	69.16	31.30	83.66
	Stan Dev			103.33	95.21	107.80	87.99
2	Mean			116.52		99.58	133.22
	Stan Dev			99.73		111.15	95.13

Table 4.3 Continued

		Grass Hay	Alfalfa Hay	Alfalfa, Silage	Grass, Silage	Alfalfa, Corn	Alfafa, Silage, Corn
		600 lb Calves					
0.5	Mean	-34.57	-68.43	-58.56	-24.01	-56.27	
	Stan Dev	92.27	100.08	93.85	77.12	93.67	
1	Mean	10.41	-27.87	-16.71	18.88	-14.12	24.13
	Stan Dev	100.44	109.26	102.26	88.14	102.07	92.68
1.5	Mean			37.05	72.15	30.58	88.79
	Stan Dev			110.46	99.46	115.13	93.14
2	Mean			122.35		104.55	15.99
	Stan Dev			108.08		119.82	119.90

After looking at the other two scenarios, there is a distinct change with the summer grass enterprise. The summer grass enterprise on average has more situations in which a positive return can be realized. The largest returns were realized when 550 lb calves were fed an ADG of 2 lbs with an alfalfa silage corn ration during the winter months. This combination produced a $133.22/ head return. Although that is the highest return, there is a positive return of $100 or more for every beginning weight except for the 450 lb calves which brings a $90/head return. All of the mean returns are statistically different except for the 450 lb calves which have an ADG of 1.5 lbs and are fed the alfalfa silage corn diet and the grass silage diet.

The data presented is contrary to the typical belief of feeding smaller calves and putting them on grass. In this scenario it appears that the larger calves actually produce the largest returns. This may be due to the fact that there is no compensatory gain variable that has been included, but according to Dale Zobell Utah's beef specialist, there is no correct way to add a true compensatory gain variable in this situation.

Also different from the two pervious scenarios the straight grass hay diet produces a return at an ADG of 1lb in all weights except for in the 450 lb calf class. This is the first scenario in which grass hay has incurred a positive return. Alfalfa hay remains negative across every situation. The alfalfa silage ration improves performance and positive returns start to be produced at the 1.5 ADG. The grass hay silage ration incurs a return at the 1 and 1.5 ADG. The highest performing ration across all calf weights and rates of gain is the alfalfa silage corn ration. There is only one incident in which this ration does not provide a return and that is with 450 lb calves when feeding an ADG of 1 lb.

The summer grass enterprise is consistent with the other previously shown enterprises in that the .5 ADG does not produce a positive return. This shows that starving calves through the winter on these rations does not produce a positive return on investment. With an ADG of 1 lb there is some difference from the other two scenarios. This ADG produces a return when using grass hay, grass hay silage, and the alfalfa silage corn rations. All of the other rates of gain, namely 1.5, 2, and 2.5 lbs always produce a positive return throughout this enterprise.

Probability of a Return

The data has been organized in such a way to compare across rations and rates of gain to see if there is a more consistent profitable ration or rate of gain. All weights have been averaged. This information is measured in profitable years. For example if feeding grass hay was profitable only during the year 2000, than the cell under the heading profitable years will be populated with a 1. If feeding grass hay was profitable for 9 out of the 11 years the cell labeled profitable years would be populated with a 9. Table 4.4 contains a list of different rations, rates of gain and the years profitable, and the probability of a positive return for each backgrounding scenario over the 11 years. Across all of the different backgrounding scenarios, alfalfa hay has the least probability of incurring a profit, and alfalfa, silage and corn incurs the highest probabilities of incurring a positive return. The probability of a positive return also increases when ADG increases. The highest probabilities occur when ADG reaches 2 and 2.5 lbs.

Table 4.4 Return Probabilities

DIET	ADG	120-Day Profitable Years	120-Day Return Probability	180-Day Profitable Years	180-Day Return Probability	Grass Profitable Years	Grass Return Probability
Grass Hay	0.5	1	11%	1	7%	4	36%
	1	2	22%	1	11%	6	55%
Alfalfa Hay	0.5	1	7%	1	5%	3	25%
	1	1	11%	1	9%	5	41%
Alfalfa Hay & Corn Silage	0.5	1	9%	1	5%	3	27%
	1	2	15%	1	9%	5	48%
	1.5	3	27%	2	18%	8	68%
	2	6	51%	5	41%	9	77%
Grass Hay & Corn Silage	0.5	1	13%	1	5%	4	39%
	1	3	24%	2	18%	7	64%
	1.5	5	42%	4	32%	8	73%
Alfalfa Hay & Corn Grain	0.5	1	9%	1	5%	3	27%
	1	2	16%	1	7%	5	45%
	1.5	2	18%	2	14%	8	68%
	2	5	45%	4	32%	8	73%
	2.5	7	64%	5	48%		
Alfalfa Hay & Corn Silage & Corn Grain	1	3	24%	2	18%	7	61%
	1.5	4	40%	4	34%	8	73%
	2	6	51%	4	39%	9	80%
	2.5	8	76%	6	52%		

Observing strictly the 120-day backgrounding scenario, feeding a grass hay ration on average was not profitable. It was only profitable at best 22% of the time. Alfalfa hay was the least profitable of all the rations with a maximum probability of returning a profit of 11. Alfalfa corn ration has a 64% probability of a profitable return. Finally the best probability of a positive return is by feeding the alfalfa silage corn ration with an ADG of 2.5 lbs. This ration and ADG produces a positive return 76% of the time. It may not be the highest profit obtainable, but on average this brings the most consistent return. ADG's of .5, 1, and 1.5 lbs never reach higher than 42% profitability of a positive return.

The probability of realizing a return with a 180-day backgrounding enterprise is low. The range of returns across the rations and rates of gain show that there is a 50% probability at best that the enterprise will be profitable. The maximum number of years in which a scenario has been profitable over the time frame is 6 years. Trends are similar to the 120-day backgrounding observations; the higher the ADG the higher the probability of return. Although seasonal price trends are high during this time frame the extra cost of getting calves through the winter is higher than the added return.

The probability of a positive return when evaluating the winter backgrounding summer grass scenario ranges from 25% to as high as 80%. Trends continue as the higher rates of gain have the higher probabilities of a positive return and the highest probabilities occur when the alfalfa silage corn ration is fed as the winter feeding ration. Allowing cattle to at least have an ADG of 1 lb gives a 50% chance of a return, except for in the instance of feeding straight alfalfa hay.

Of the three different backgrounding scenarios, the summer grass scenario has the highest probabilities of a positive return. Overall trends in each scenario suggest that the higher the ADG the higher the probability of a positive return. The ration that produces the least chance of a positive return is alfalfa hay, and the ration that produces the highest probability of a positive return is alfalfa silage corn. This is a trend that is seen through all of the backgrounding scenarios.

Return Risk Tradeoff

The first three tables that are displayed above show each backgrounding scenario individually. Many times producers do not have the opportunity to select the starting weight of their calves in a retained ownership program. Therefore, as an addition to this study these tables have been compiled showing the starting weight of the calves across every rate of gain and across every backgrounding scenario. This could allow producers to look at individual weights and see which retained ownership program would allow for increased positive returns. These tables have been attached at the end of this study as Appendix C.

The tables that are contained in Appendix C have been used to calculate the expected value variance frontier (EV frontier) for each weight. The EV frontier is the boundary of the feasible region in the mean variance area. If the decision maker is risk adverse they will choose a point on the EV frontier. It signifies that under risk aversion, utility maximization takes place along the indifference curve, and for any given return the decision maker would prefer a reduction in variance. The roles could be reversed and holding variance constant, the largest plausible return would be selected (Chavas). Obviously producers are going to want to make as much money as they can, given a certain level of risk. The EV frontier is one way of viewing risk, but actual variances may be more or less risky depending how large they are and how large the mean value is. Risk in this instant is being referred as a negative return, or a return less than zero. The points shown in the figure below shows that the lower returns have the lowest variance, and the higher returns have the higher variance. This variance describes the variability around the mean value. Actual risk is shown in the reverse order. For example in figure 4.1, point 5 has a mean value of 90.04 and a standard deviation of 86.56. Although there is a large variance around the mean, one full standard deviation is still above 0. Where as at point 1 the mean is 7 with a standard deviation of 35, suggesting that one standard deviation move to the left puts the value at a -$28. Therefore, looking at this in return mind frame the least risky scenario is the scenario with the largest mean and standard deviation. This also appears to correlate with table 4.4, where the summer grass values have the largest probability of producing a positive return. The numbers shown in the figures below are correlated to a backgrounding scenario, ration, and rate of gain.

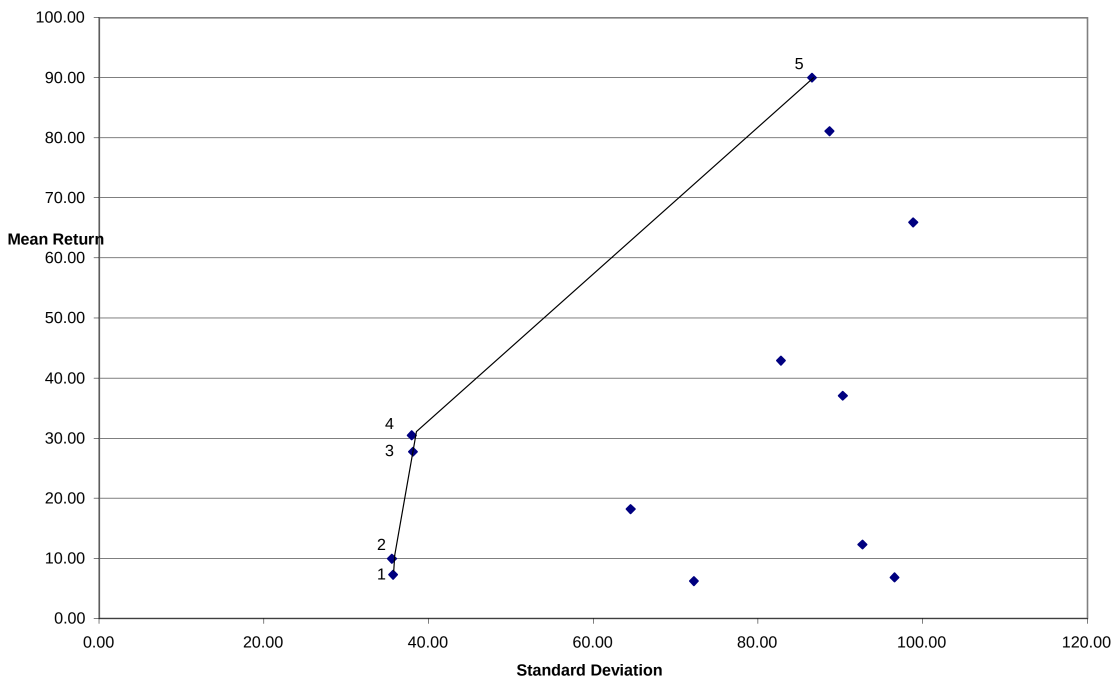

Figure 4.1. 450 lb calf EV frontier

As shown in Figure 4.1 there are five points that fall on the EV frontier. Point 1 has a mean value of 7.33 and a standard deviation of 35.68. This point on the frontier represents a 120-day backgrounding scenario feeding the alfalfa silage ration with an ADG of 2 lbs The second point along the frontier represents the 120-day backgrounding scenario feeding alfalfa silage corn with an ADG of 2 lbs The mean value is 9.98 with a standard deviation of 35.53. Point three is representative of the 120-day backgrounding feeding the alfalfa silage ration at a 2.5 lb ADG. The mean value for this point is 27.77 with a standard deviation of 38.09. Point four represents the 120-day backgrounding scenario while feeding alfalfa silage corn with an ADG of 2.5 lbs. The largest return and the largest variance are shown at point five. This point represents the summer grass scenario while feeding alfalfa silage corn with an ADG of 2 lbs

The conclusion can be drawn that for this weight class the alfalfa silage and alfalfa silage corn rations fed with a rate of gain of 2 and 2.5 pounds, given the risk and return analysis, are the best alternatives for the 450 lb calves. The backgrounding scenarios that produce the highest returns for the amount of risk involved include the 120 and the summer grass scenarios.

Figure 4.2 is the EV frontier for the 500 lb calf class. There are only three points that fall on the EV frontier in this weight class. Point one represents the 120-day backgrounding scenario with a ration of alfalfa silage corn with an ADG of 2. This point has a mean of 14.33 and a standard deviation of 35.68. The second point is representative of the 120-day backgrounding scenario feeding alfalfa silage corn with an ADG of 2.5 lbs. This backgrounding scenario with the feed and rate of gain situation show a mean value of 30.71 and a standard deviation of 37.39. The third point correlates to the summer grass scenario where alfalfa silage corn was fed as the winter ration at a rate of 2 lbs. This point signifies a mean of 111.67 and a standard deviation of 90.31.

Under these circumstances the alfalfa silage corn ration fed at 2 and 2.5 lbs ADG were the points that fit along the EV frontier. The 120-day and summer grass backgrounding scenarios were the optimal options given the return and the risk presented.

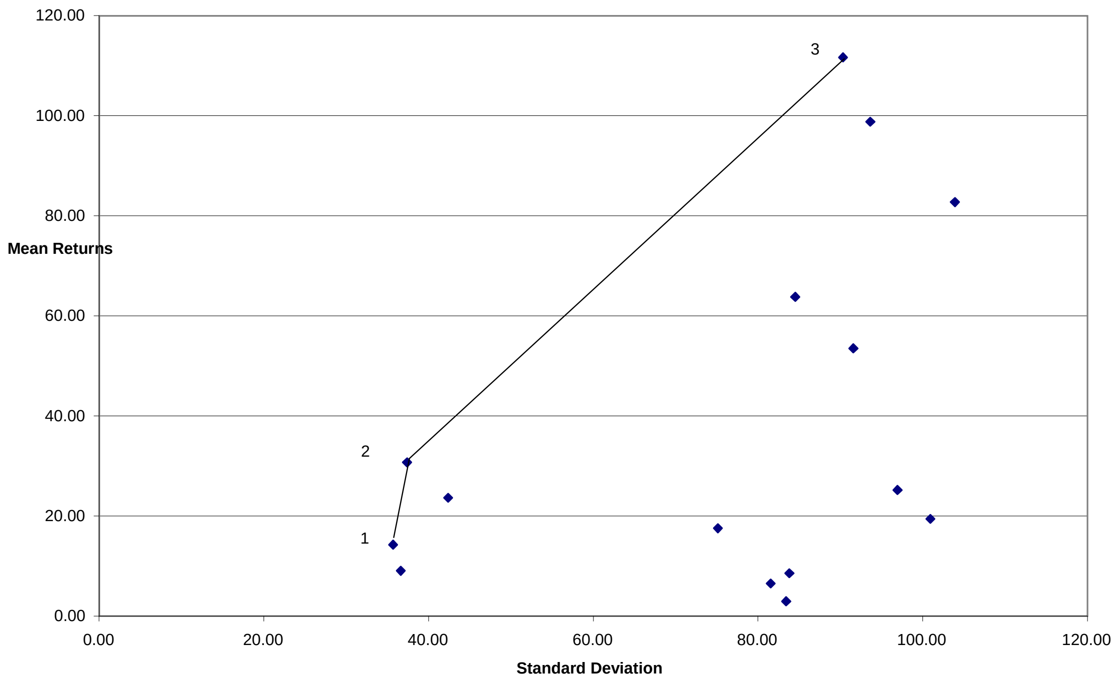

Figure 4.2. 500 lb calf EV frontier

Figure 4.3 shows the EV frontier for the 550 lb weight class. There are four points in which a producer would choose if looking to retain ownership through backgrounding. Point number one coincides with a mean value of 5.25 and a standard deviation of 45.72. This point represents the 120-day back grounding scenario while feeding alfalfa silage corn at an ADG of 1.5 lbs. The second and third points are the same except for the ADG increases to 2 and 2.5lbs. The fourth point represents the summer grass scenario feeding alfalfa silage corn as the winter ration at an ADG of 2.5 lbs and had a mean value of 133 with a standard deviation of 94. Equal to the other weight classes the ration that creates the points on the EV frontier is the alfalfa silage corn combined with the rates of gain for 2 and 2.5 lbs. The two scenarios that show up on the frontier is the 120-day and summer grass backgrounding programs.

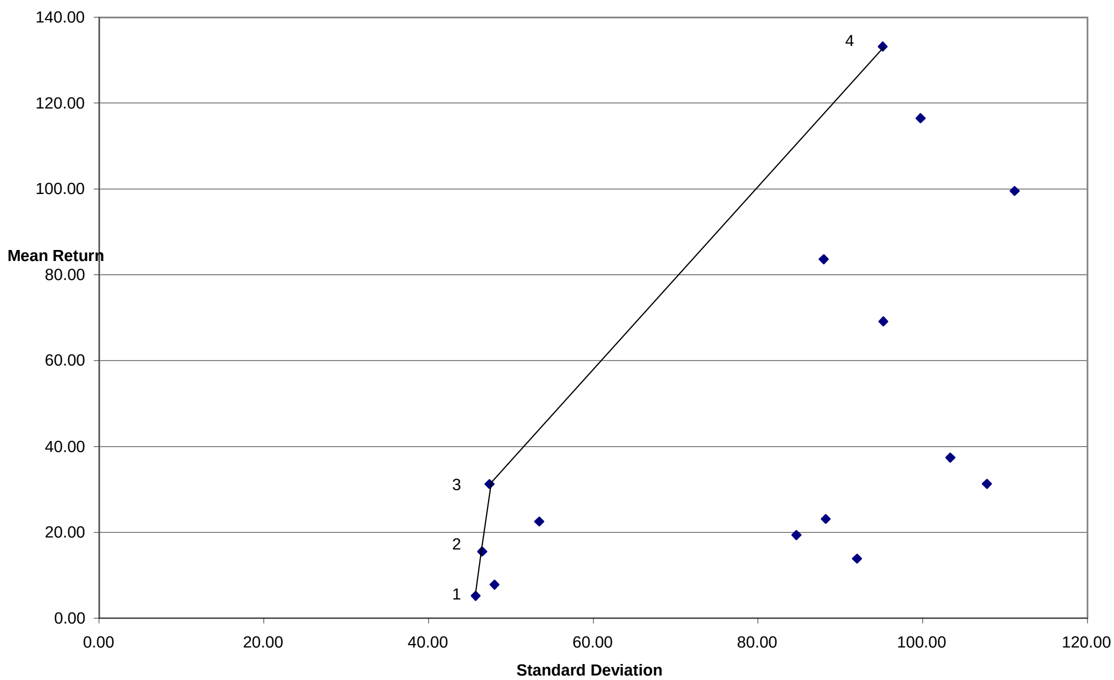

Figure 4.3. 550 lb calf EV frontier

Figure 4.4 shows the EV frontier of the 600 lb weight class. There are three points in which a producer would select given the returns and the risk involved. Points one and two represent the 120-day backgrounding scenario while feeding alfalfa silage corn at an ADG of 2 and 2.5 lbs The third point represents the summer grass scenario with a backgrounding diet of alfalfa silage corn and an ADG of 2 lbs

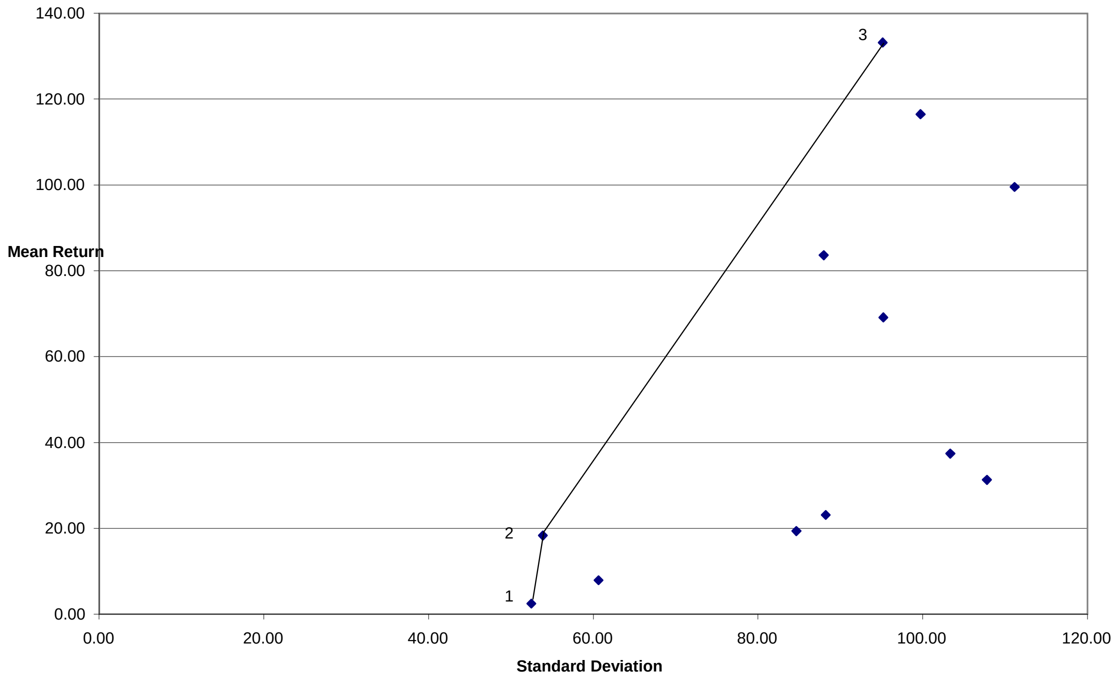

Figure 4.4. 600 lb calf EV frontier

Summary

Comparing all of the scenarios together it appears that the order of highest positive returns go from summer grass to 120-day backgrounding to 180-day backgrounding. The 550 lb calves produces the highest net returns in the 120-day and the summer grass scenarios, and a 450 lb calf produced the highest positive return for the 180-day backgrounding enterprise. Throughout every enterprise the alfalfa silage corn ration on average yielded the highest returns to the operation. Although there were other rations that yielded large returns, this ration was consistently the highest producer. Rates of gain, as mentioned above, produced higher returns with the higher the ADG. This was seen throughout every scenario. An opportunity for a higher return above and beyond the net return received from selling weaned calves was plausible in each scenario.

When risk was factored into the equation the 120-day and the summer grass scenarios were the only plausible scenarios. The only rations that appeared on the EV frontiers were alfalfa silage and alfalfa silage corn. The other rations never appeared on the frontier line. The rates of gain were from 1.5 to 2.5 lbs, but the majority of the rates of gain were 2 and 2.5 lbs. As shown in table 4.4 the 180-day scenario realized a positive return at best 52% of the time and shown as shown in the EV frontiers given the amount of risk there was not sufficient returns to select a situation within the 180-day backgrounding scenario. Actual risk levels were inversely related to the EV frontiers. The points on the right side of the figures were less risky from a return stand point than the points more to the left of the figures. This correlates with what was found in table 4.4 and shows that the probability of positive returns was greatest with the summer grass scenario than followed by the 120-day and 180-day scenarios.

CHAPTER 5

REGRESSION RESULTS

As previously specified, the goal of this research is to explore retained ownership opportunities within the state of Utah. According to Schroeder and Featherstone; Rawlins and Bernardo the option to retain ownership involves complex decisions that depend on environmental, market, and financial factors that increase risk. Producers that are more risk averse find retaining ownership less attractive because of the increased risk factors. Huber et al. found that some producers believed they did not have enough experience or expertise to feed calves. Knowledge of what factors have the largest effect on retained ownership is essential to understand what factors need to be managed. An econometric regression analysis has been used to quantify the market and financial risk factors which have the largest impact on the net returns to backgrounding.

The model used is similar to model that is found in the research presented by Lawrence, Loy, and Wang. A few changes had to be made from what was previously presented in the methodology chapter. These changes will be discussed in the Regression Model Adjustments section. Following the adjustments the regression results will be presented along with a brief interpretation. Following the results the most influential factors will be determined by using the standardized beta test. A brief summary will follow and summarize the findings of this chapter.

Regression Model Adjustments

Return margins have been determined and can now be used to evaluate market and financial risk factors. These factors are the variables that have been used to determine the net return margins in the enterprise budgets, and have been explicitly explained in the methodology chapter of this study. Ordinary least squares regression analysis was performed. Heteroskedasticity, autocorrelation, and multicollinearity were found in the data set. Heteroskedasticity occurs when the error term does not have a constant variance, and causes an increase in the variance of the coefficient distributions. Autocorrelation occurs when the error terms are correlated. This was identified by the Durbin Watson statistic. A Newey-West estimator was used to adjust for heteroskedasticity and autocorrelation. Multicollinearity occurs when independent variables are highly correlated with other independent variables. There was a linear relationship between corn price and silage price, as well as with alfalfa hay and grass hay prices. Therefore, to correct for the multicollinearity silage price and grass hay price were omitted from the model.

Model Results

Once all of the adjustments were completed to the model, the regression was run to determine the impact of the various financial and market factors on the returns for the different backgrounding scenarios.

Table 5.1. OLS-Newey West Parameter Estimates for Retained Ownership Profitability ($/head) Differentials

120- Day Backgrounding

Variable	Coefficient	Standard Error	P-value
Adjusted R-squared	0.944		
WEIGHT	-0.206033	0.010602	0
AVERAGE DAILY GAIN	77.46905	1.853294	0
GRASS HAY	11.75915	2.095429	0
ALFALFA HAY	-9.403829	1.878192	0
GRASS SILAGE	16.00685	1.841337	0
ALFALFA CORN	-2.962406	1.923354	0.1238
ALFALFA SILAGE CORN	15.15315	1.931868	0
PURCHASE PRICE	-4.653001	0.159358	0
SALE PRICE	4.793289	0.236094	0
CORN PRICE	-7.321741	0.803753	0
ALFALFA HAY PRICE	-1.219004	0.046958	0
DIESEL	-0.10085	0.017197	0
YARDAGE	779.8788	95.97776	0
INTEREST	-38.62387	21.65091	0.0747

180-Day Backgrounding

Variable	Coefficient	Standard Error	P-value
Adjusted R-squared	0.905368		
WEIGHT	-0.152699	0.586826	0.7948
WEIGHT^2	-0.000159	0.000577	0.7832
AVERAGE DAILY GAIN	125.8595	2.840853	0
GRASS HAY	17.68573	3.764989	0
ALFALFA HAY	-14.41305	3.329064	0
GRASS SILAGE	25.8171	3.082933	0
ALFALFA CORN	-5.800353	3.018749	0.055
ALFALFA SILAGE CORN	19.27825	6.196437	0.0019
PURCHASE PRICE	-5.448281	0.144366	0
SELL PRICE	6.744953	0.241079	0
CORN PRICE	-13.34222	1.628642	0
ALFALFA HAY PRICE	-1.420968	0.062171	0
DIESEL	0.003473	0.018396	0.8503
YARDAGE	139.7362	82.70386	0.0915
INTEREST RATE	-366.3459	21.6374	0

Table 5.1 Continued

Summer Grass Backgrounding			
Variable	Coefficient	Standard Error	P-value
Adjusted R-squared	0.90498		
WEIGHT	1.256373	0.574074	0.0289
WEIGHT^2	-0.001521	0.000558	0.0066
AVERAGE DAILY GAIN	119.5652	3.933213	0
GRASS HAY	18.2473	3.033726	0
ALFALFA HAY	-14.71279	2.912554	0
GRASS SILAGE	24.96245	2.767287	0
ALFALFA CORN	-6.285632	3.059084	0.0402
ALFALFA SILAGE CORN	20.75798	6.703678	0.002
PURCHASE PRICE	-4.576204	0.264334	0
SALE PRICE	7.376734	0.385657	0
CORN PRICE	-6.328342	3.576894	0.0772
ALFALFA HAY PRICE	-1.960662	0.137443	0
GRAZE	0.444139	2.244377	0.8432
DIESEL	0.118993	0.021885	0
YARDAGE	-247.4312	67.27141	0.0003
INTEREST	-501.2639	50.91232	0

The models have an R-squared of 90 to 94 percent. Therefore the model accounted for 90 to 94 percent of the variation in return. Each one of the coefficients explains how much return would change with a one unit change in the independent variable. Each scenario was regressed individually, and the ALFALFA SILAGE ration was designated as the default ration.

The estimates for WEIGHT were as expected. In the 120-day and 180-day regressions the WEIGHT variable was run independently as shown above and it was also run as a quadratic to identify significance of the variable WEIGHT ^2. WEIGHT has a linear relationship to net return and the quadratic was insignificant. This suggests that there is a negative relationship between net return and weight, or that the smaller weights are more profitable than the larger weights. In the summer grass model a quadratic was effective in explaining the relationship between net return and weight. Since 550 lb calves were the most profitable it shows a curved relationship instead of a linear relationship as was found in the other two models.

The estimates for ADG were as expected and had a direct positive relationship with net return. This independent variable was one of the most influential variables that had a large effect on net return.

The estimates for the different ration variables had no expectations. Please recall the ALFALFA SILAGE ration was used as the default. The GRASS HAY coefficient was positive; signifying that compared to the ALFALFA SILAGE ration the grass hay ration had a positive effect on net return. The estimate for ALFALFA HAY was negative compared to the default. Since the enterprise budgets showed that ALFALFA HAY was the least profitable of any situation this could have been expected. GRASS SILAGE had a positive relation to net return compared to the default ration. The estimate for the ALFALFA CORN variable suggests a negative correlation to net return compared to the ALFALFA SILAGE ration as well. The largest ration estimate came from the ALFALFA SILAGE CORN ration with a positive coefficient of 15. This is no surprise since this is the ration that had the largest and most consistent net return margins over the time frame analyzed. PURCHASE PRICE estimates had a negative effect, and the SELL PRICE had a positive effect on net return as was expected. Feed input costs, such as CORN PRICE and ALFALFA HAY PRICE were as expected and had a negative relationship with net return. As mentioned earlier because of mulicolinearity the SILAGE PRICE and the GRASS HAY PRICE were emitted from the model. The variable DIESEL was different in each of the different scenarios. In the 120-day scenario the coefficient was negative as was expected, but in the other two scenarios it was positive. In the 180-day scenario it was not statistically significant, but it did not have the correct sign. YARDAGE had the same type of effect as diesel. It had the expected sign in the summer grass scenario, but it had a positive sign in the 120-day and 180-day scenarios. The YARDAGE estimate was not significant in the 180-day scenario. Although the signs were not correct, considering that yardage tended to increase over time but not vary from year to year, it is not surprising that it had limited significance in explaining net return variability. INEREST RATE had the expected sign in all three scenarios, but was insignificant in the 120-day scenario.

Factor Influence

To distinguish which factors had the largest effect on net return a standardized beta test was completed to rank the independent variables. This was completed by finding the z scores for each variable and running that through an OLS- regression model.

In the 120-day scenario the factors that had the largest effect on net return listed in order were: PURCHASE PRICE, SALE PRICE, ADG, ALFALFA HAY PRICE, and CORN PRICE. As shown in the literature review section, Schroeder et al. in the research “Factors Affecting Cattle Feeding Profitability” found that feeder cattle purchase price, sales price, and corn prices were the three major factors that influenced net return. This study also shows that three of the five largest factors that influenced net return are the PURCHASE PRICE, SALE PRICE, and CORN PRICE. Corn is not the third most influential factor, because retained ownership programs do not use the same levels of corn as the feedlot industry.

In the 180-day scenario the factors that had the largest effect on net return are listed in order of influence: SALE PRICE, ADG, PURCHASE PRICE, ALFALFA HAY PRICE, and CORN PRICE. Although not in the same order of influence, these major factors are the same as shown in the 120-day scenario.

In the summer grass scenario there is a little bit of a change in the factors. The factors that had the largest effect on net return are listed in order of influence: WEIGHT SQUARED, SALE PRICE, WEIGHT, ADG, and PURCHASE PRICE. In this case the input cost of feeding the animals through the winter were not the most influential factors. One possible reason for that is because the summer feeding period is long enough to allow for a net return when feeding about any type of feed input. Instead of feed input the start weight has a larger influence.

Summary

Huber et al. found that some producers believed that they did not have enough experience or expertise to feed calves. Knowledge of what factors have the largest effect on retained ownership is essential to understand what factors need to be managed. The factors that had the largest influence in all three of the scenarios are: PURCHASE PRICE, SALE PRICE, and ADG. These factors have been shown above in detail. All factors are important but focusing on the factors that will help incur the highest return is essential to creating a positive net return in a backgrounding enterprise.

CHAPTER 6

CONCLUSION

Utah has a diverse compilation of agricultural commodities. Beef is one of the most prevalent commodities which accounts for 20% of total agricultural commodity cash receipts (Utah Agriculture Statistics). Cow-calf operations are the most typical form of cattle enterprise operated throughout the state. There are a few typical marketing opportunities throughout the state that producers practice. These are namely: sell at weaning, preconditioning, placing calves directly in the feedlot, and backgrounding. This study has focused the research on retaining ownership of calves through backgrounding as a way in which producers may look to improve net returns.

There are many different types of cattle, calf sizes, feed rations, and possible average daily gains (ADG) that could be considered in a backgrounding scenario. To limit the number of retained ownership scenarios, specific calf weights, feed rations and average daily gain targets were established for the analysis. Enterprise budgets were used to evaluate the historical net returns of these different scenarios.

Five typical weight classes were analyzed, they consist of 450 lb steer calves, 500 lb steer claves, 550 lb steer calves, 600 lb steer calves, and 650 lb steer calves. Observation suggests these are the typical weight classes that are raised and weaned throughout the state of Utah.

The constructed diets are common throughout the intermountain area. The rations that have been selected are as follows: GRASS HAY, this consists of strictly grass hay. ALFALFA HAY, this consists of strictly alfalfa hay. ALFALFA SILAGE, this consists of a combination of alfalfa hay and corn silage. GRASS SILAGE, this ration consists of a combination of grass hay and corn silage. ALFALFA CORN, this ration consists of alfalfa hay and corn grain. ALFALFA SILAGE CORN, this consists of feeding a mixture of alfalfa hay, corn silage, and corn grain. These feeds could be fed at many different rates of gain. The range that was considered for backgrounding was ADG's of .5 to 2.5 in .5 lb increments.

Objectives

This study evaluated the profit variability of backgrounding calves through different programs for different lengths of time. The objectives of this research were to:

1. Evaluate historic returns to backgrounding alternatives for Utah producers;
2. Determine for each retained ownership scenario, which ration and rate of gain has produced the highest net returns over time;
3. Evaluate which size of calf has the potential for the largest return for each retained ownership scenario; and
4. Quantify the market and financial risk factors which have the largest impact on backgrounding returns.

The objectives were completed through creating tables of net return for the time frame that was specified. Each situation within each scenario is found in table 4.1, 4.2, and 4.3. Each ration and rate of gain was evaluated over the eleven year time frame. More than half of the 120-day backgrounding situations resulted in negative returns over an 11-year period, and more than three quarters of the 180-day backgrounding returns were negative. The summer grass scenario produced more positive returns, mainly because the low cost of the summer grazing.

Throughout every enterprise the alfalfa, silage, corn grain ration on average yielded the highest returns to the operation, while the alfalfa ration yielded the lowest returns. The other rations at times incurred positive returns but the only other ration that showed up on the EV frontiers was the alfalfa silage ration. Although there were other rations that yielded large returns, the alfalfa silage corn ration was consistently the ration that resulted in the highest net return to producers.

In general, the higher the ADG the larger was the mean net return over the 11-year time period. In the 120- day and 180-day backgrounding scenarios the highest returning ADG was 2.5 lbs and in the summer grass scenario the highest returning ADG was 2 lbs

Once risk was entered in as a factor, the 180-day backgrounding scenario was never selected as a good return on investment. This is shown in the years that a positive return was realized and in the boundary of the feasible region in the EV frontier. There are other options that either produce higher returns or have lower amounts of risk which would out weigh the 180-day backgrounding scenario. Even when the risk factors were entered in the summer grass scenario still incurred a positive return 80 percent of the time while the 120-day scenario only incurred a return 76 percent of the time. Variation around the mean values was much smaller in the 120-day scenario versus the summer grass scenario, but the variation in the 120-day scenario dropped below the breakeven point and incurred negative returns more often than the summer grass scenario.

Comparing all of these scenarios together it appears that the order of highest returns go from summer grass to 120-day backgrounding to 180 backgrounding. The 550 lb calves generated the highest net returns in the 120- day and the summer grass scenarios, and a 450 lb calf had the highest net returns in the 180-day backgrounding enterprise. In the 120-day scenario returns and standard deviations were very similar from the 450 lb calf to the 550 lb calf. Once calves hit the 600 lb mark net return dropped and standard deviation increased. The same general trends also exist for the 180-day scenario as well; the smaller weight calves had the largest returns. Once calves are retained on grass the weights that had the highest return were the 500 and 550 lb calves. Lighter 450 and heavier 600 lb calves returned almost $20 per head less than the 500 and 550 lb calves.

A regression analysis was completed to determine which factors had the largest impact on net return. In the 120-day scenario the factors that had the largest effect on net return listed in order were: PURCHASE PRICE, SALE PRICE, ADG, ALFALFA HAY PRICE, and CORN PRICE. This is what was expected and shown in the study completed by Schroeder et al.

In the 180-day scenario the factors that had the largest effect on net return are listed in order of influence: SALE PRICE, ADG, PURCHASE PRICE, ALFALFA HAY PRICE, and CORN PRICE. Although not in the same order of influence, these major factors are the same as shown in the 120-day scenario.

In the summer grass scenario there is a little bit of a change in the factors. The factors that had the largest effect on net return are listed in order of influence: WEIGHT SALE PRICE, ADG, and PURCHASE PRICE. In this case the input cost of feeding the animals through the winter were not the most influential factors. One possible reason for that is because the summer feeding period is long enough to allow for a net return when feeding about any type of feed input. Instead of feed input the initial weight had a larger influence.

The factors that had the largest influence in all three of the scenarios are: PURCHASE PRICE, SALE PRICE, and ADG. These factors have been shown above in detail. All factors are important but focusing on the factors that will help incur the highest return is essential to creating a positive net return in a backgrounding enterprise.

Shortfalls

There are some shortfalls to this study. Commodity prices that are being used are from USDA reports; all of the sale data is included and averaged from the best and the worst cattle. Therefore, cattle that are in high demand and meet buyer specifications are actually receiving higher prices than those that are reported.

The same shortfall is with the feed input prices. Through this study the feed prices were a state average, although this was the best information available, it is important to know that there are different prices throughout the state. The southern part of Utah is known for its high quality alfalfa hay and typically sales for a premium compared to the alfalfa hay grown in northern Utah. Since these prices were averaged the input costs could be different depending on which part of the state the backgrounding enterprise is going to take place. This same problem may exist in the price of corn.

There are other methods to market cattle, such as direct sales to feedlots or through video marketing which at times allows for higher market prices. If these prices were used for purchase and sale prices, they could have an effect on end profits.

Another shortfall of this study is the feed rations. There are thousands of different rations that can be used in each backgrounding scenario. A few typical rations were selected, but another study could be performed observing different rations and different feed types. For example, barley grain is feed that is used in many of Utah's backgrounding lots. The same study could be redone substituting barley for corn grain. Also, feed supplements could be added, such as protein supplements for the grass hay situations. Grass hay could possibly provide higher rates of gain if a protein block supplement was utilized.

Suggestions for Further Research

A very interesting continuation of this study could be completed by using the data provided and utilizing different marketing strategies to mitigate risk. Futures hedges, options, and forward contracts could be utilized as marketing tools to hedge input and output prices. This would possible result in very different outcomes.

This study has looked specifically at feed prices in an opportunity cost perspective; a different option would be to look at the input costs in a production perspective. Many ranchers put up their own hay and feed cattle through the winter only figuring the production cost of the hay. This is not wrong but it will cause a large difference in the cost of feeding. For example if hay could be produced for $60/ ton, sold for $80/ ton, but is held to feed cattle the production cost of that hay is $60.

That is a $20/ ton difference that will not be shown in the cost of backgrounding calves. Producers who use production costs and forgo some of the market premiums use ways to reduce production costs. A way in which this takes place is through the utilization of round hay bales. The hay is grown and has a value, but since some ranchers do not ever plan on selling this hay they look for the least expensive route to put this hay up. Since round bales are not transportation friendly, if they are sold they are discounted. Ranchers can produce hay much cheaper with a round baler than they can with a large one ton baler. When these round balers. Also many producers grow there own corn for corn grain and many grow there own corn for silage. The same concept is true for the corn, if the production cost is the price that is designated for the corn price than the lower input in the backgrounding scenario will result in a larger net return.

There are other ways in which calves can be backgrounded. Calves that are placed on winter pastures could result in higher returns. One way that calves can be left on pasture is through utilizing winter ranges. Although calves will have to be supplemented this could reduce costs sufficiently to allow for higher net returns. Hay that is left in the row is another opportunity for study. Some producers may not even bale the hay and let the cattle dig for the hay in the row during the winter months. This removes all the opportunity to sell the hay, but it is a much cheaper source of feed and may return dividends.

This research focused solely on retaining ownership of steer calves. Heifer calves are a very important part of the calf crop and can also be retained. Retaining heifers would be a great research idea. These cattle could be fed very similar to steers headed in a terminal production process, or with heifers there is the possibility of backgrounding and breeding these animals for replacement prospects. There are factors such as maternal traits, fertility, and size which would become factors in such a study, but the practice of retaining heifers may be equally or a better practice than retaining steers when looking solely at economic returns. These ideas would be great studies in which to expand the idea of retaining ownership.

There are many ways in which beef producers may create larger returns on their investment; a few of these ways have been discussed in this paper. The data shown throughout this study will help producers look at different alternatives which may help them think outside of traditional operating ways.

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APPENDICES

APPENDIX A
NUTRITIONAL REQUIRMENTS

Nutrient Constraints 450 lb. steer

Nutrient Constraints
450 lbs
.5 lb ADG

	Minimum
Dry matter, lbs	11.9321
NE, mcal/lb	0.2284
Crude protein, %	9.5744
Calcium, %	0.2383
Phosphous	0.1695

Nutrient Constraints
450 lbs
1 lb ADG

	Minimum
Dry matter, lbs	13.4183
NE, mcal/lb	0.288
Crude protein, %	10.501
Calcium, %	0.3099
Phosphous	0.1875

Nutrient Constraints
450 lbs
1.5 lb ADG

	Minimum
Dry matter, lbs	14.6492
NE, mcal/lb	0.3417
Crude protein, %	11.1695
Calcium, %	0.3621
Phosphous	0.2017

Nutrient Constraints
450 lbs
2 lb ADG

	Minimum
Dry matter, lbs	15.6978
NE, mcal/lb	0.3975
Crude protein, %	11.7414
Calcium, %	0.4069
Phosphous	0.215

Nutrient Constraints
450 lbs
2.5 lb ADG

	Minimum
Dry matter, lbs	16.4999
NE, mcal/lb	0.4585
Crude protein, %	12.2711
Calcium, %	0.4486
Phosphous	0.2285

Nutrient Constraints 500 lb. steer

Nutrient Constraints
500 lbs
.5 lb ADG

	Minimum
Dry matter, lbs	12.8527
NE, mcal/lb	0.2284
Crude protein, %	9.3776
Calcium, %	0.2296
Phosphous	0.169

Nutrient Constraints
500 lbs
1 lb ADG

	Minimum
Dry matter, lbs	14.3934
NE, mcal/lb	0.288
Crude protein, %	10.2009
Calcium, %	0.2929
Phosphous	0.1841

Nutrient Constraints
500 lbs
1.5 lb ADG

	Minimum
Dry matter, lbs	15.6552
NE, mcal/lb	0.3417
Crude protein, %	10.7987
Calcium, %	0.3394
Phosphous	0.1963

Nutrient Constraints
500 lbs
2 lb ADG

	Minimum
Dry matter, lbs	16.7196
NE, mcal/lb	0.3975
Crude protein, %	11.3126
Calcium, %	0.3796
Phosphous	0.2079

Nutrient Constraints
500 lbs
2.5 lb ADG

	Minimum
Dry matter, lbs	17.5208
NE, mcal/lb	0.4585
Crude protein, %	11.7907
Calcium, %	0.4172
Phosphous	0.2201

Nutrient Constraints 550 lb. steer

Nutrient Constraints
550 lbs
.5 lb ADG

	Minimum
Dry matter, lbs	13.7517
NE, mcal/lb	0.2284
Crude protein, %	9.2092
Calcium, %	0.2226
Phosphous, %	0.1689

Nutrient Constraints
550 lbs
1 lb ADG

	Minimum
Dry matter, lbs	15.3468
NE, mcal/lb	0.288
Crude protein, %	9.943
Calcium, %	0.2786
Phosphous, %	0.1814

Nutrient Constraints
550 lbs
1.5 lb ADG

	Minimum
Dry matter, lbs	16.64
NE, mcal/lb	0.03417
Crude protein, %	10.478
Calcium, %	0.32
Phosphous, %	0.1918

Nutrient Constraints
550 lbs
2 lb ADG

	Minimum
Dry matter, lbs	17.721
NE, mcal/lb	0.3975
Crude protein, %	10.9394
Calcium, %	0.356
Phosphous, %	0.2019

Nutrient Constraints
550 lbs
2.5 lb ADG

	Minimum
Dry matter, lbs	18.5222
NE, mcal/lb	0.4585
Crude protein, %	11.37
Calcium, %	0.3898
Phosphous, %	0.2128

Nutrient Constraints 600 lb. steer

Nutrient Constraints
600 lbs
.5 lb ADG

	Minimum
Dry matter, lbs	14.6316
NE, mcal/lb	0.2284
Crude protein, %	9.0632
Calcium, %	0.2167
Phosphous, %	0.169

Nutrient Constraints
600 lbs
1 lb ADG

	Minimum
Dry matter, lbs	16.2809
NE, mcal/lb	0.288
Crude protein, %	9.7185
Calcium, %	0.2664
Phosphous, %	0.1793

Nutrient Constraints
600 lbs
1.5 lb ADG

	Minimum
Dry matter, lbs	17.6058
NE, mcal/lb	0.3417
Crude protein, %	10.1974
Calcium, %	0.3032
Phosphous, %	0.1881

Nutrient Constraints
600 lbs
2 lb ADG

	Minimum
Dry matter, lbs	18.7039
NE, mcal/lb	0.3975
Crude protein, %	10.6111
Calcium, %	0.3354
Phosphous, %	0.1969

Nutrient Constraints
600 lbs
2.5 lb ADG

	Minimum
Dry matter, lbs	19.5058
NE, mcal/lb	0.4585
Crude protein, %	10.9981
Calcium, %	0.36559
Phosphous, %	0.2066

Nutrient Constraints 650 lb. steer

Nutrient Constraints
650 lbs
.5 lb ADG

	Minimum
Dry matter, lbs	15.4942
NE, mcal/lb	0.2284
Crude protein, %	8.935
Calcium, %	0.2118
Phosphous, %	0.1693

Nutrient Constraints
650 lbs
1 lb ADG

	Minimum
Dry matter, lbs	17.1975
NE, mcal/lb	0.288
Crude protein, %	9.521
Calcium, %	0.2559
Phosphous, %	0.1776

Nutrient Constraints
650 lbs
1.5 lb ADG

	Minimum
Dry matter, lbs	18.5543
NE, mcal/lb	0.3417
Crude protein, %	9.9494
Calcium, %	0.2886
Phosphous, %	0.185

Nutrient Constraints
650 lbs
2 lb ADG

	Minimum
Dry matter, lbs	19.6698
NE, mcal/lb	0.3975
Crude protein, %	10.3198
Calcium, %	0.3174
Phosphous, %	0.1925

Nutrient Constraints
650 lbs
2.5 lb ADG

	Minimum
Dry matter, lbs	20.4732
NE, mcal/lb	0.4585
Crude protein, %	10.666
Calcium, %	0.3447
Phosphous, %	0.2012

APPENDIX B
120-day BACKGROUNDING
AS FED RATIONS

Grass Hay

450 lb steers

ADG	0.5	1
Lbs. of Grass Hay	14.037	15.786

500 lb steers

ADG	0.5	1
Lbs. of Grass Hay	15.121	16.933

550 lb steers

ADG	0.5	1
Lbs. of Grass Hay	16.179	18.055

600 lb steers

ADG	0.5	1
Lbs. of Grass Hay	17.214	19.154

650 lb steer

ADG	0.5	1
Lbs. of Grass Hay	18.228	20.232

Alfalfa Hay

450 lb steers

ADG	0.5	1
Lbs of Alfalfa Hay	14.037	15.786

500 lb steers

ADG	0.5	1
Lbs of Alfalfa Hay	15.121	16.933

550 lb steers

ADG	0.5	1
Lbs of Alfalfa Hay	16.179	18.055

600 lb steer

ADG	0.5	1
Lbs of Alfalfa Hay	17.214	19.154

650 lb steers

ADG	0.5	1
Lbs of Alfalfa Hay	18.228	20.232

Grass Silage

450 lb steers

ADG	0.5	1	1.5
Grass	7.136	13.070	13.384
Corn Silage	16.759	6.596	9.352

500 lb steers

ADG	0.5	1	1.5
Grass	6.661	12.267	17.139
Corn Silage	20.544	11.332	3.105

550 lb steers

ADG	0.5	1	1.5
Grass	6.188	11.474	16.053
Corn Silage	24.263	15.983	8.558

600 lb steers

ADG	0.5	1	1.5
Grass	5.717	10.690	14.980
Corn Silage	27.920	20.556	13.922

650 lb steers

ADG	0.5	1	1.5
Grass	5.249	9.914	13.921
Corn Silage	31.522	25.059	19.204

Alfalfa Silage

450 lb steers

ADG	0.5	1	1.5	2
Alfalfa	11.230	12.629	13.384	7.905
Corn Silage	6.818	7.668	9.352	25.653

500 lb steers

ADG	0.5	1	1.5	2
Alfalfa	12.097	13.547	14.303	8.419
Corn Silage	7.344	8.225	9.994	27.323

550 lb steers

ADG	0.5	1	1.5	2
Alfalfa	12.943	14.444	15.203	8.924
Corn Silage	7.858	8.770	10.623	28.960

600 lb steers

ADG	0.5	1	1.5	2
Alfalfa	13.771	15.323	16.085	9.419
Corn Silage	8.361	9.303	11.239	30.566

650 lb steers

ADG	0.5	1	1.5	2
Alfalfa	14.583	16.186	11.845	9.905
Corn Silage	8.854	9.827	16.951	32.145

Alfalfa Corn Grain

450 lb steers

ADG	0.5	1	1.5	2	2.5
Alfalfa	11.230	12.629	15.587	13.949	7.825
Corn Grain	2.775	3.121	1.628	4.467	11.494

500 lb steers

ADG	0.5	1	1.5	2	2.5
Alfalfa	12.097	13.547	16.657	14.857	12.205
Corn Grain	2.989	3.347	1.740	4.757	8.310

550 lb steers

ADG	0.5	1	1.5	2	2.5
Alfalfa	12.943	14.444	17.705	15.747	12.903
Corn Grain	3.198	3.569	1.850	5.042	8.784

600 lb steers

ADG	0.5	1	1.5	2	2.5
Alfalfa	13.771	15.323	18.733	16.620	13.588
Corn Grain	3.403	3.786	1.957	5.322	9.251

650 lb steers

ADG	0.5	1	1.5	2	2.5
Alfalfa	14.583	16.186	19.742	17.479	14.262
Corn Grain	3.603	3.990	2.062	5.597	9.710

Alfalfa Silage Corn

450 lb steers

ADG	1	1.5	2	2.5
Alfalfa	11.101	9.573	7.783	7.970
Corn	0.780	0.852	0.913	5.221
Silage	3.191	12.375	22.575	14.959

500 lb steers

ADG	1	1.5	2	2.5
Alfalfa	11.139	8.902	7.568	7.503
Corn	0.837	0.910	0.972	4.835
Silage	4.649	15.343	25.196	19.957

550 lb steers

ADG	1	1.5	2	2.5
Alfalfa	11.233	8.299	7.355	7.044
Corn	0.892	0.967	1.030	4.455
Silage	5.985	18.163	27.768	24.867

600 lb steers

ADG	1	1.5	2	2.5
Alfalfa	11.376	7.758	7.144	6.591
Corn	0.947	1.024	1.087	4.080
Silage	7.210	20.848	30.294	29.698

650 lb steers

ADG	1	1.5	2	2.5
Alfalfa	11.566	7.662	6.936	6.145
Corn	1.000	1.079	1.144	3.711
Silage	8.335	22.791	32.779	34.454

180-day BACKGROUNDING
AS FED RATIONS

Grass Hay			**Alfalfa Hay**		
450 lb steers			450 lb steers		
ADG	0.5	1	ADG	0.5	1
Lbs. of Grass Hay	14.366	16.477	Lbs of Alfalfa Hay	14.366	16.477
500 lb steers			500 lb steers		
ADG	0.5	1	ADG	0.5	1
Lbs. of Grass Hay	15.441	17.609	Lbs of Alfalfa Hay	15.441	17.609
550 lb steers			550 lb steers		
ADG	0.5	1	ADG	0.5	1
Lbs. of Grass Hay	16.491	18.717	Lbs of Alfalfa Hay	16.491	18.717
600 lb steers			600 lb steer		
ADG	0.5	1	ADG	0.5	1
Lbs. of Grass Hay	17.520	19.803	Lbs of Alfalfa Hay	17.520	19.803

Grass Silage

450 lb steers

ADG	0.5	1	1.5
Grass	6.994	12.587	17.249
Corn Silage	17.902	9.448	2.555

500 lb steers

ADG	0.5	1	1.5
Grass	6.519	11.790	16.161
Corn Silage	21.667	14.132	8.017

550 lb steers

ADG	0.5	1	1.5
Grass	6.047	11.002	15.087
Corn Silage	25.366	18.736	13.390

600 lb steers

ADG	0.5	1	1.5
Grass	5.576	10.223	14.026
Corn Silage	29.006	23.266	18.680

Alfalfa Silage

450 lb steers

ADG	0.5	1	1.5	2
Alfalfa	11.492	13.182	14.212	8.521
Corn Silage	6.978	8.004	9.930	27.653

500 lb steers

ADG	0.5	1	1.5	2
Alfalfa	12.353	14.087	15.113	9.023
Corn Silage	7.500	8.553	10.560	29.283

550 lb steers

ADG	0.5	1	1.5	2
Alfalfa	13.193	14.974	15.997	9.517
Corn Silage	8.010	9.091	11.178	30.884

600 lb steers

ADG	0.5	1	1.5	2
Alfalfa	14.016	15.843	16.865	10.001
Corn Silage	8.510	9.619	11.785	32.457

Alfalfa Corn Grain

450 lb steers

ADG	0.5	1	1.5	2	2.5
Alfalfa	11.492	15.843	16.551	15.036	12.558
Corn Grain	2.840	3.915	1.729	4.815	8.548

500 lb steers 180 days

ADG	0.5	1	1.5	2	2.5
Alfalfa	12.353	14.087	17.601	15.923	13.247
Corn Grain	3.052	3.481	1.839	5.099	9.019

550 lb steers 180 days

ADG	0.5	1	1.5	2	2.5
Alfalfa	13.193	14.974	18.631	16.793	13.927
Corn Grain	3.260	3.700	1.946	5.377	9.481

600 lb steers 180 days

ADG	0.5	1	1.5	2	2.5
Alfalfa	14.016	15.843	19.642	17.649	14.595
Corn Grain	3.463	3.915	2.052	5.651	9.936

Alfalfa Silage Corn

450 lb steers

ADG	1	1.5	2	2.5
Alfalfa	11.117	8.966	7.525	7.273
Corn	0.814	0.904	0.984	4.644
Silage	4.081	15.053	25.714	22.423

500 lb steers

ADG	1	1.5	2	2.5
Alfalfa	11.189	8.357	7.312	6.817
Corn	0.870	0.962	1.042	4.267
Silage	5.464	17.887	28.276	27.292

550 lb steers

ADG	1	1.5	2	2.5
Alfalfa	11.313	7.809	7.102	6.367
Corn	0.926	1.018	1.099	3.895
Silage	6.732	20.586	30.794	32.085

600 lb steers

ADG	1	1.5	2	2.5
Alfalfa	11.485	7.660	6.895	5.923
Corn	0.979	1.070	33.271	3.528
Silage	7.897	22.606	6.895	36.807

APPENDIX C
PROFIT TABLES BY WEIGHT

450 lb. Calf Profit Margins

		Grass Hay	Alfalfa Hay	Alfalfa, Silage	Grass, Silage	Alfalfa, Corn	Alfafa, Silage, Corn
		120 Day Backgrounding					
0.5	Mean	-48.05	-65.43	-60.37	-44.15	-59.19	
	Stan Dev	32.58	36.42	33.54	27.84	33.43	
1	Mean	-26.29	-45.84	-40.15	-24.76	-38.82	-25.74
	Stan Dev	35.44	39.49	35.98	33.12	35.91	33.81
1.5	Mean			-21.18	-4.61	-24.46	-6.47
	Stan Dev			39.02	35.88	41.51	34.67
2	Mean			7.33		-1.68	9.98
	Stan Dev			35.68		42.28	35.53
2.5	Mean					30.51	27.77
	Stan Dev					37.95	38.09
		180 Day Backgrounding					
0.5	Mean	-94.45	-121.49	-113.61	-88.11	-111.78	
	Stan Dev	56.55	62.36	58.37	50.19	58.18	
1	Mean	-59.59	-90.60	-81.57	-56.25	-108.52	-56.33
	Stan Dev	56.88	63.35	58.19	52.43	63.88	53.82
1.5	Mean			-53.78	-29.64	-59.08	-24.00
	Stan Dev			60.28	58.96	64.11	51.48
2	Mean			-12.16		-26.92	-3.47
	Stan Dev			55.88		66.07	54.25
2.5	Mean					6.25	18.24
	Stan Dev					72.2	64.53
		Summer Grass					
0.5	Mean	-51.74	-79.50	-71.41	-45.22	-69.53	
	Stan Dev	78.75	85.12	80.30	70.03	80.14	
1	Mean	-11.18	-43.02	-33.75	-7.74	-61.42	-7.83
	Stan Dev	85.03	92.31	86.68	80.12	92.94	81.67
1.5	Mean			12.32	37.11	6.88	42.91
	Stan Dev			92.68	90.29	96.57	82.76
2	Mean			81.11		65.95	90.04
	Stan Dev			88.66		98.85	86.56

500 lb. Calf Profit Margins

		Grass Hay	Alfalfa Hay	Alfalfa, Silage	Grass, Silage	Alfalfa, Corn	Alfafa, Silage, Corn
				120 Day Backgrounding			
0.5	Mean	-38.59	-57.31	-51.86	-33.81	-50.59	
	Stan Dev	33.11	37.11	33.93	27.13	33.83	
1	Mean	-20.34	-41.30	-35.19	-17.70	-33.77	-17.19
	Stan Dev	36.91	41.11	37.34	32.98	37.28	34.30
1.5	Mean			-18.67	-2.56	-22.18	1.44
	Stan Dev			40.61	39.82	43.25	34.64
2	Mean			9.11		-0.47	14.33
	Stan Dev			36.62		43.53	35.68
2.5	Mean					23.71	30.71
	Stan Dev					42.36	37.39
				180 Day Backgrounding			
0.5	Mean	-84.20	-113.27	-104.80	-76.53	-102.83	
	Stan Dev	56.18	62.31	57.95	48.50	57.76	
1	Mean	-54.45	-87.60	-77.94	-49.45	-75.69	-47.49
	Stan Dev	58.06	64.80	59.27	51.49	59.12	53.67
1.5	Mean			-53.93	-26.38	-59.56	-16.33
	Stan Dev			63.51	59.41	67.51	52.65
2	Mean			-13.82		-29.45	-1.31
	Stan Dev			62.22		72.37	59.63
2.5	Mean					3.00	17.57
	Stan Dev					83.42	75.13
				Summer Grass			
0.5	Mean	-39.89	-69.73	-61.03	-32.00	-59.01	
	Stan Dev	81.86	88.68	83.61	71.80	83.43	
1	Mean	1.40	-32.63	-22.71	6.55	-20.40	8.56
	Stan Dev	88.52	96.28	90.42	81.54	90.22	83.79
1.5	Mean			25.24	53.53	19.45	63.85
	Stan Dev			96.94	91.56	100.94	84.53
2	Mean			98.82		82.76	111.67
	Stan Dev			93.62		103.89	90.31

550 lb. Calf Profit Margins

		Grass Hay	Alfalfa Hay	Alfalfa, Silage	Grass, Silage	Alfalfa, Corn	Alfafa, Silage, Corn
		120 Day Backgrounding					
0.5	Mean	-34.48	-54.51	-48.68	-28.84	-47.32	
	Stan Dev	44.40	47.78	44.29	36.44	44.28	
1	Mean	-18.98	-41.33	-34.82	-15.26	-33.31	-13.49
	Stan Dev	49.36	52.98	49.01	43.72	49.03	45.96
1.5	Mean			-19.98	-1.64	-23.71	5.25
	Stan Dev			52.57	50.40	55.34	45.72
2	Mean			7.82		-2.34	15.55
	Stan Dev			47.99		55.20	46.50
2.5	Mean					22.56	31.29
	Stan Dev					53.44	47.39
		180 Day Backgrounding					
0.5	Mean	-79.29	-110.34	-101.29	-70.32	-99.19	
	Stan Dev	62.37	68.34	63.17	51.24	63.07	
1	Mean	-54.05	-89.28	-79.01	-47.41	-76.63	-43.73
	Stan Dev	66.79	73.29	67.05	57.15	66.99	60.89
1.5	Mean			-58.20	-27.30	-64.17	-13.19
	Stan Dev			73.85	67.46	78.25	61.01
2	Mean			-19.03		-35.51	-2.77
	Stan Dev			75.03		85.98	71.54
2.5	Mean					-3.23	13.90
	Stan Dev					101.66	92.01
		Summer Grass					
0.5	Mean	-30.21	-62.09	-52.80	-20.98	-50.64	
	Stan Dev	87.40	94.57	88.78	74.25	88.63	
1	Mean	12.55	-23.63	-13.08	19.37	-10.63	23.14
	Stan Dev	94.66	102.81	96.23	84.66	96.06	88.23
1.5	Mean			37.43	69.16	31.30	83.66
	Stan Dev			103.33	95.21	107.80	87.99
2	Mean			116.52		99.58	133.22
	Stan Dev			99.73		111.15	95.13

600 lb. Calf Profit Margins

		Grass Hay	Alfalfa Hay	Alfalfa, Silage	Grass, Silage	Alfalfa, Corn	Alfafa, Silage, Corn
				120 Day Backgrounding			
0.5	Mean	-46.88	-68.20	-61.99	-40.39	-60.54	
	Stan Dev	52.27	55.77	52.13	43.35	52.13	
1	Mean	-33.37	-57.08	-50.17	-28.58	-48.57	-56.65
	Stan Dev	56.94	60.80	56.68	49.95	56.69	66.12
1.5	Mean			-36.26	-15.73	-40.21	-27.82
	Stan Dev			59.81	55.65	62.66	69.19
2	Mean			-7.71		-18.43	-143.01
	Stan Dev			54.73		62.10	95.33
2.5	Mean					7.94	-4.39
	Stan Dev					60.63	113.71
				180 Day Backgrounding			
0.5	Mean	-91.34	-124.32	-114.71	-81.07	-112.48	
	Stan Dev	66.58	72.94	67.24	53.11	67.15	
1	Mean	-70.00	-107.28	-96.42	-61.77	-93.89	-56.65
	Stan Dev	73.23	80.16	73.48	61.17	73.42	66.12
1.5	Mean			-78.21	-44.02	-84.50	-27.82
	Stan Dev			83.55	74.45	88.11	69.19
2	Mean			-39.40		-56.73	-143.01
	Stan Dev			89.78		100.67	95.33
2.5	Mean					-24.03	-4.39
	Stan Dev					123.77	113.71
				Summer Grass			
0.5	Mean	-30.21	-62.09	-52.80	-20.98	-50.64	
	Stan Dev	87.40	94.57	88.78	74.25	88.63	
1	Mean	12.55	-23.63	-13.08	19.37	-10.63	23.14
	Stan Dev	94.66	102.81	96.23	84.66	96.06	88.23
1.5	Mean			37.43	69.16	31.30	83.66
	Stan Dev			103.33	95.21	107.80	87.99
2	Mean			116.52		99.58	133.22
	Stan Dev			99.73		111.15	95.13