THESIS

ECONOMIC ANALYSIS OF PROFITABILITY FACTORS IN CATTLE FEEDING: MODELING OPTIMAL FEEDING TO ACHIEVE MAXIMUM PROFITABILITY

Submitted by

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ABSTRACT

ECONOMIC ANALYSIS OF PROFITABILITY FACTORS IN CATTLE FEEDING: MODELING OPTIMAL FEEDING TO ACHIEVE MAXIMUM PROFITABILITY

Past research indicates that the profitability of a feedlot can be determined by both production and economic factors. This study seeks to evaluate specific production and economic factors in order to deduce which of these factors has the greatest impact on profitability. This study uses economic and production data from feedlots located in the West, Midwest, and Southwest United States. Results of this study indicate that economic factors such as cattle prices and feed costs have the greatest effect on profitability. It was also found that production variables including dry matter intake, dry matter conversion, average daily gain, days on feed, percent of pen that grade quality Prime and Choice, and percent of pen that are dark cutters have a large impact on the variation of profit. Using these factors, production functions were created to determine optimal days on feed and optimal out-weights to maximize profitability. These production functions indicated that as prices increased for corn and feeder cattle, profit decreased and feedlot managers should feed fewer days to minimize profit losses. As the price of fed cattle increased, the results suggest that feedlot managers should feed cattle longer to maximize profit.

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CHAPTER 1- INTRODUCTION

In today's feedlot environment, there are many factors that determine profitability of fed cattle. These factors can be divided into biological, environmental, and economic. Biological factors include production traits such as daily feed intake and average daily gain and carcass traits which consist of quality and yield grades. Other biological factors include breed and sex of the animal. These factors can also be affected by environmental factors such as weather. Economic factors include the prices of inputs and outputs like feed and cattle prices.

Before examining the specific factors that may contribute to the profitability of fed cattle, it is important to have an overview of the feedlot industry and the happenings within that industry in recent years. Figure 1 shows the U.S. cattle inventory from 1956 to 2016. The January 2014 cattle inventory was at 87.7 million head, which is the smallest it has been since the 1950s (USDA-NASS, 2016).

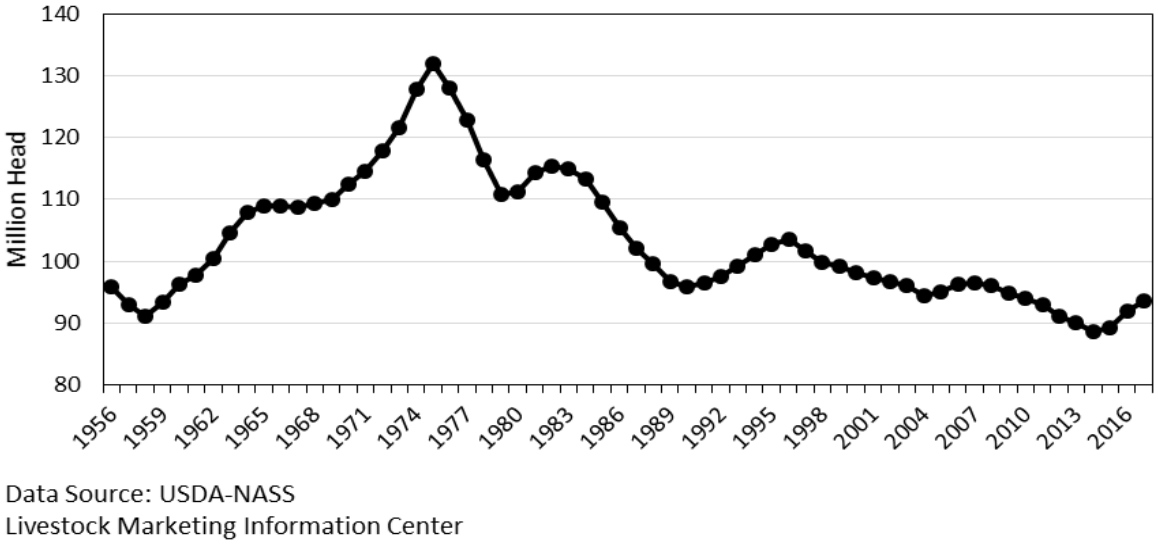
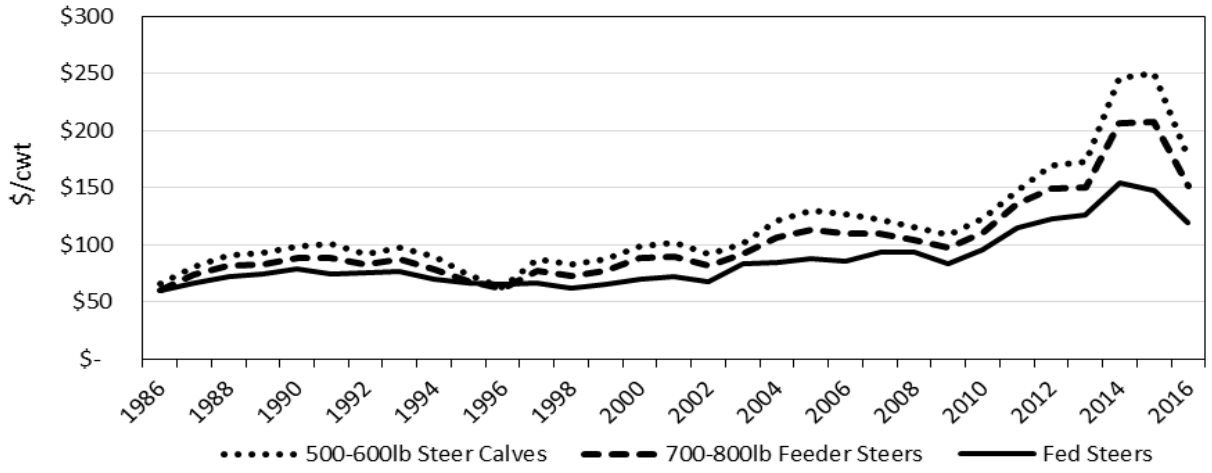


Figure 1. United States January 1 Total Cattle Inventory

In April 2014, feeder cattle prices rose above $180 per hundredweight (cwt) while fed cattle prices reached $150 per cwt. With the low 2014 inventories, feeder and fed cattle prices saw historic highs. Although cattle inventories today have been increasing since 2014, they are still lower than historical inventories. Feeder and fed cattle prices today are still being affected by this volatility in cattle numbers. For example, as inventories started to increase in 2014, the price of feeder and fed cattle decreased to around $150 and $120 per cwt, respectively. Figure 2 shows U.S. historic cattle prices from 1986 to 2016 for 500 to 600 lb. steers, 700 to 800 lb. steers and fed cattle (LMIC, Historic Cattle Prices, 2017).

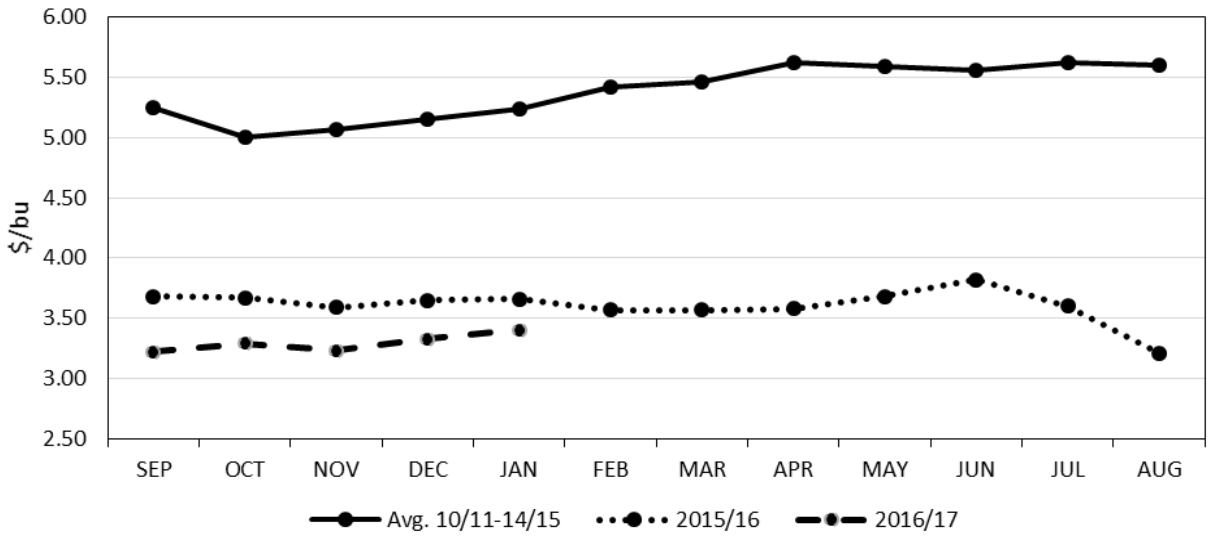


Data Source: Livestock Marketing Information Center

Figure 2. United States Historic Cattle Prices by Weight Category

Along with changes in cattle inventory, feed costs have also changed over the past several years. Corn prices in 2014 averaged $4.48 per bushel compared to the five year average at $5.26 per bushel and continued to decline in 2015 and 2016. Figure 3 displays the monthly average corn prices from 2010 to 2014 compared to 2015 and 2016 monthly prices (LMIC, Corn- Monthly Average Price, 2017). Because feed is one of the largest costs that feedlots incur

(Albright, Schroeder, & Langemeier, 1994), many cattle feeders were able to see an increase in net returns in 2014 due to the lower prices of corn and higher fed cattle prices. An example of these returns are shown in Figure 4 which represent projected historical net returns for fed steers in Kansas feedlots (Tonsor, 2016). Since 2014, there has been a major turnaround in the net returns for feedlots in 2015.



Source: USDA-NASS
Livestock Marketing Information Center

Figure 3. Historic Monthly Average Price of Corn

Throughout the history of the cattle feeding industry, which began in the United States in the mid-1800s (Ball, 1992), the factors affecting feedlot profitability have changed. With the use of new technologies and marketing techniques, along with a higher concentrated cattle processing industry, feedlot managers must look more closely at the specific factors that affect profitability in order to be successful.

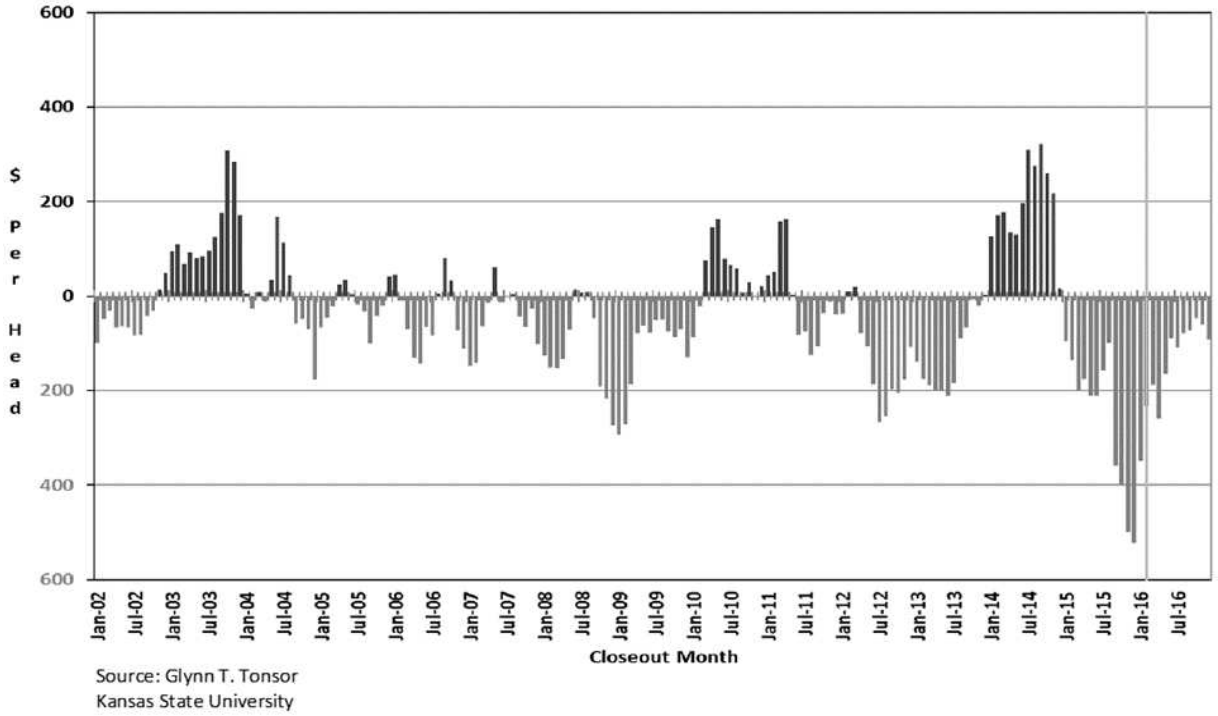


Figure 4. Historic Average Net Returns for Finishing Steers in Kansas Feedyards

Along with understanding the factors that affect profitability, cattle feeders must also understand when the best time is to market cattle given varying economic conditions.

1.1 Objective

The objective of this study is to determine what factors affect profitability in the fed cattle industry. A second objective is to evaluate the timing of marketing cattle under various feeder cattle and feed prices. This information will be applicable to feedlot managers to assist managing those factors that affect profitability. Additionally, this study will attempt to provide a model using those factors to determine animal out-weights (i.e., end weights) that are most profitable and the optimal days on feed, given different in-weights and input prices of feeder cattle and feedstuffs.

1.2 Organization of Thesis

The following chapter will provide insight on research that has been constructed in the past that has guided the work done here and helped confirm the findings of this research. Chapter three explains the data and methodology behind this study. After discussing data and economic methods, chapter four reports the results of this study. Finally, chapter five comprises the conclusion that summarizes the implications of this study and ideas for extended research.

CHAPTER 2 - LITERATURE REVIEW

As time goes on, perspectives and focuses continue to change in the cattle feeding industry. For example, determining which breeds have the best traits and which technologies improve profitability continually change across time. Northcutt et al. (1996) surveyed 47 feedlot firms, with 10 feedlots having a onetime capacity of less than 35,000 head of feeder cattle while the remaining 37 have a onetime capacity greater than 35,000 head, to determine what feeder cattle traits were most important. They found that cattle feeding firms viewed feed efficiency (i.e., dry matter conversion) followed by health, and misfits as the three most important feeder cattle traits. In their study, price was the fourth most important trait with average daily gain and weight ranked seventh and eighth, respectively. Today these same traits might be ranked differently given new technologies and new information. The current study has been designed to evaluate these possible changes in ranking of these factors according to profitability importance.

2.1 Profitability in Feedlots

There have been several studies that have examined factors that affect feedlot profitability. Schroeder et al. (1993) conducted a study that looked at the profitability of two feedlots in Kansas using data on 6,696 pens of steers between January 1980 and May 1991. Using ordinary least squares (OLS) regression analysis, it was determined that fed cattle price, feeder cattle price, corn price, feed efficiency, average daily gain, and interest rates explained more than 90% of feeding profits of steers.

Lawrence et al. (1999) replicated Schroeder et al.'s (1993) study while attempting to determine if the model would work for other feedlots in the Midwest. In their study, pen data

from January 1987 to December 1996 were retrieved from 1,626 pens of cattle in the Midwest and the same OLS regression model was applied to estimate profit per head. Overall, the results were similar to Schroeder et al. with some variation on a few of the variables. It was suggested that this variation came from the location of the feedlots. The study found that the feeder cattle price and fed cattle price accounted for 70% of profitability. Additionally, the authors found that placement weight (i.e., in-weight) had a large effect on performance and thus on profit.

Another study evaluated the profitability of fed cattle and the consequences of changing the number of days on feed (Feuz, 2002). This study analyzed three different pricing grids used on eight different pens of cattle. Feuz concluded that increasing the number of days on feed increased profitability given a stable price. It was found that the additional pounds gained resulted in higher revenues, offsetting the carcass discounts incurred for feeding longer. Additionally, cattle that graded between low Choice and Select would be affected more by changing the days on feed than those cattle that grade a solid Choice or a solid Select. Feuz also stated that in order for a manager to be profitable by altering days on feed to fit a certain price grid, then other factors like carcass weight and feeding costs should be taken into account.

Mark et al. (2000) examined high risk factors so that feedlots could manage those factors, and thus, manage their risk more effectively. They used standardized beta coefficients to compare the impact that fed cattle price and feeder cattle price along with corn price and cattle performance had on profit. The study found that as feeder cattle placement weight increased, feeder cattle price had a larger effect on profitability while corn price had a larger effect on profitability of lighter feeder cattle. They also discovered that the feeder cattle price had a greater impact on profit for feeder cattle that were placed in the spring and fall while corn price had a larger effect on profits of feeder cattle placed in the months of July through September.

In another study, coefficients of separate determination were used to rank the factors that had the greatest impact on cost of gain (Albright, Schroeder, & Langemeier, 1994). In this study, the price of corn, feed conversion, and average daily gain were used as factors that have the greatest effect on cost of gain. It was found that the price of corn had the largest impact on cost of gain followed by feed conversion and average daily gain, respectively (Albright, Schroeder, & Langemeier, 1994).

2.2 Carcass Profitability

More recent studies have been conducted with the purpose of determining carcass factors and the role these factors play in calculating cattle feeder profitability. Tatum et al. (2012) analyzed the different carcass-based measures that determine cattle performance and feeding profitability. Tatum et al. developed a formula that determined the relationship of an animal's body weight to its hot carcass weight. Additionally, they generated a formula that explained what the projected carcass weight would be as the animal increased in weight. It was found that finishing cattle for longer periods of time added carcass weight which in turn increased value. However, this was only profitable as long as the animals were able to convert feed to pounds of carcass efficiently.

A recent study by Maples et al. (2014) compared traditional carcass end-point decisions and profit maximizing decision rules. Maples et al. used a dynamic nonlinear growth function to incorporate into the profit function. It was found that by using a growth model to determine the maximum number of days on feed, rather than the traditional end-point visual analysis, reduced the number of days on feed while maximizing profit.

Walter and Hale (2011) examined six years of cattle and carcass data at the pen level and split the data in thirds according to profitability to determine what factors drive cattle feeding profitability. They found that it was more profitable for feedlots to feed their cattle to a heavier out-weight. Although these heavier out-weights resulted in a larger percentage of the pen receiving yield grades 4 and 5, the profit from the added weight was greater than the yield grade and heavy carcass discounts. As expected, this study also found that cattle that were most profitable had higher average daily gains.

Retallick et al. (2013) analyzed cattle and carcass performance traits and tried to determine if these traits could be used to predict profitability. Data for 736 steers were recorded on the live animal performance and then carcass data were also collected after harvest. Economic data from 2011 were used which included feed prices, cattle prices, and carcass premium and discount values. Regression models were ran analyzing how live animal performance and carcass performance affects profit on a per head basis and how cost of gain effects profit on a per pound basis. This study also considered how feed efficiency and carcass traits influenced profit and cost of gain. The results stated that average daily gain and marbling score had the largest impact on profit. It was also determined that feed conversion ratio had a large impact on measuring cost of gain.

CHAPTER 3 - DATA & METHODOLOGY

This chapter describes the data used to evaluate the objectives of this study starting with the production and carcass data. Along with this information, figures showing historic production trends and cost and price data used are included. This chapter then describes the calculations and assumptions used to generate estimated profit at the pen level.

3.1 Production Data

Pen level close-out production data from nine different feedlots located throughout the Midwest, West, and Southwest are used to determine what factors affect profitability of feedlots in these areas. These data include 34,440 pens of steers and heifers from 2007 to 2014. A list of production and economic variables along with their summary statistics are located in Appendix A. The variables that are pertinent to this study include: sex of the animal, in-weight (InWt), average daily gain (ADG), dry matter intake (DMI), dry matter conversion (DMC), days on feed (DOF), out-weight (OutWt) which is the finishing weight when the animal was sold, hot carcass weight (HotWt), dressing percentage (DRESS), percentage of the pen that graded quality grade: Prime and Choice (PRCH), percentage of the pen that graded sub-select (SUBSEL), percentage of the pen that received yield grades 1 and 2 (YG12), and percentage of the pens that received yield grades 4 and 5 (YG45), and heavies (Heavies) and lights (Lites) which are heavy calves weighing greater than 1,400 lbs. and light calves weighing less than 1,000 lbs., respectively.

Along with the original production data, other variables are calculated. The calculated variables include: pounds gained and as-fed intake. Past studies have used feed-to-gain and feed intake on a dry matter basis (Lawrence, Wang, & Loy, 1999; Schroeder, Albright, Langemeier,

& Minert, 1993). However, in this study, feed cost is calculated and dry matter intake is converted to an as-fed intake on a pounds per head per day basis (see section 3.3 for additional details).

3.2 Carcass Data

Carcass data include the percentage of cattle that graded quality grade Prime and Choice. Because the original quality grade data are combined and reported as a single value, this study breaks these two apart for the purpose of calculating profit. To do this, the percentage of cattle that graded Prime is determined using weekly USDA data that tracks the percentage of cattle that grade Prime throughout the United States. These data are split into three regions (Texas and Oklahoma; Kansas and Colorado; Idaho) and the estimated percentage of cattle that graded Prime that week for that particular region was taken from the USDA report (USDA-AMS, 2014; Figure 5).

Because the current study began in 2007 and the USDA began tracking carcass data in 2009, two years of data had to be estimated based on averages of the corresponding weeks from the years 2009 and 2010 because of the cyclical nature of the data. Figure 5 shows the estimated percentage of cattle that graded Prime by region from 2007 to 2009 and the actual data from 2009 to 2014 that graded Prime.

Once the percentage of pens that graded Prime is estimated, weekly USDA premium and discount data are collected for animals by region. Carcasses that graded prime and yield grades 1 and 2 received premiums. Carcasses that graded Select or sub-select, yield grades 4 and 5, and/or dark cutters or any combination of these received discounts. Other carcasses that received discounts are carcasses that weighed over 900 lbs. and carcasses that weighed over 1,000 lbs.

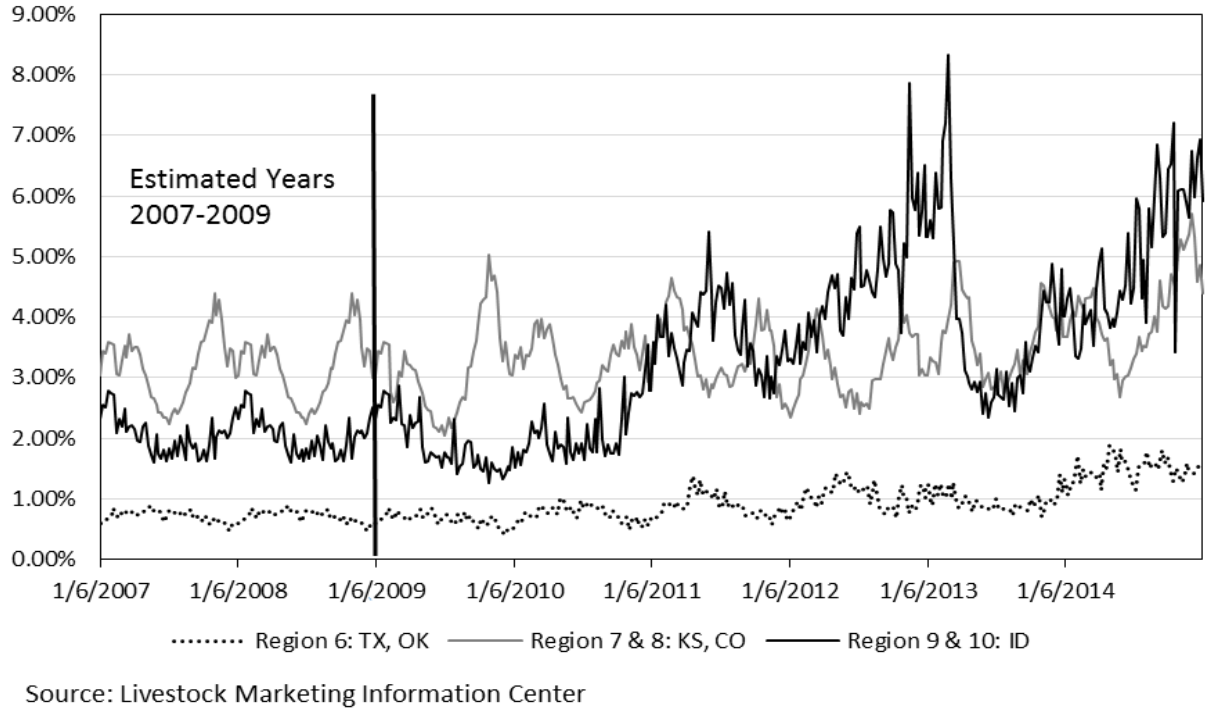
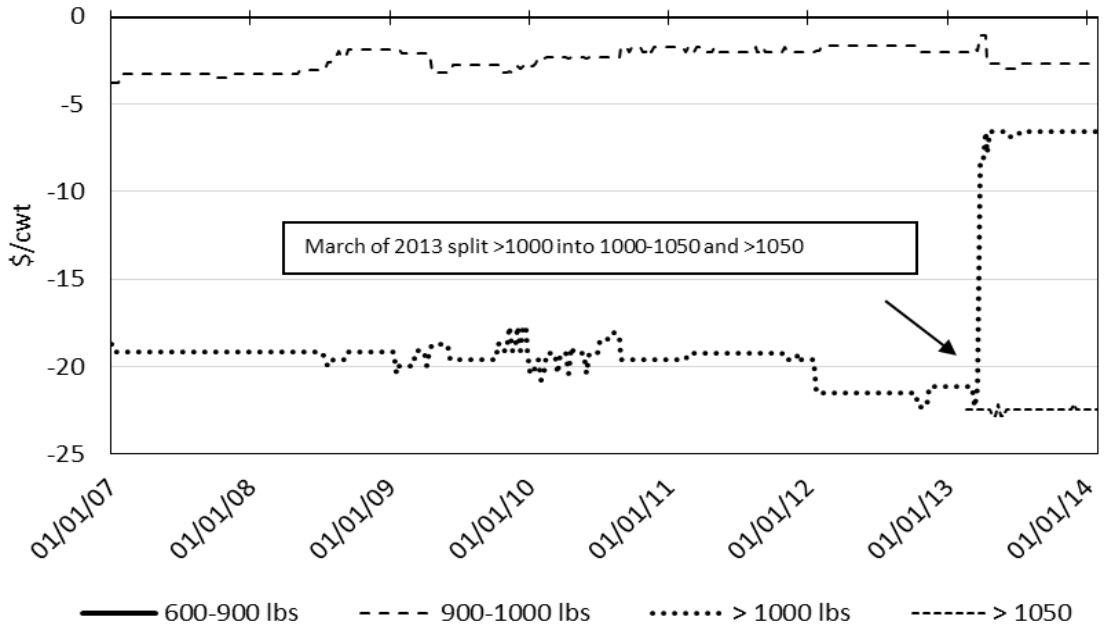


Figure 5. Historic Percentage of Cattle that Graded Prime by Region

received a larger discount. However, in 2013, the USDA began recording an additional discount for carcasses weighing over 1,050 lbs. Beginning in 2013, if a carcass weighed between 900 to 1,000 lbs., or 1,000 to 1,050 lbs., or over 1,050 lbs. it would receive a discount, with the heavier carcass weights receiving a greater discount (USDA-AMS, 2014; Figure 6). The calculated total premiums and total discounts for each weight category for steers and heifers can be found in Appendix D.

3.3 Price/Cost Data

All price and cost data have been adjusted to 2010 prices to account for inflation. Weekly feeder cattle prices are from the Livestock Marketing Information Center (LMIC) starting in January 2007 and ending in January 2014. Feeder cattle prices are from the Nebraska,



Source: Livestock Marketing Information Center

Figure 6. Historic Carcass Weight Discounts

Oklahoma City, and Washington state markets. Not all weeks had prices for each weight category for each of the area. 16.5 percent of the price data are missing due to a lack of animals sold of that weight category in that area that week. Missing weekly data are estimated by taking the average from the week before and the week after. The feeder prices used for each pen are based on the week that they entered the feedlot and the proximity of the feedlot to either the Nebraska, Oklahoma City, or Washington state feeder cattle markets. The values for the variables corn, feeder prices, and fed prices are also from LMIC (LMIC, Prices and Production, 2014).

Other economic variables are calculated or assumed to be a sunk cost. Costs that are assumed sunk include: veterinary medicine, utilities, marketing, and professional fees. Feed costs (FDC) are calculated using as-fed intake (AFI). To determine AFI and FDC, a ration is

formulated using the following ingredients: steam flaked corn, corn silage, dried distillers grains (DDG), tallow, limestone, urea, and salt. Table 1 lists the percentage of each feed ingredient used on an as-fed basis.

Table 1. Percentage of Each FeedIngredient For Ration on an As-Fed Basis

As-Fed % of Ration	
Steam Flaked Corn	68.0%
Corn Silage	18.5%
DDG	8.3%
Tallow	3.2%
Limestone	1.0%
Urea	0.8%
Salt	0.2%

Prices for corn, corn silage, and DDG are from LMIC and converted from dollars per bushel to dollars per pound (LMIC, Prices and Production, 2014). Other ingredients prices: tallow, limestone, urea, and salt are from Feedstuffs Magazine (Ingredient Market, 2014). See Appendix B for graphs of weekly ingredient prices. Weekly corn prices are from the Colorado, Garden City, and North of the Canadian River markets. The weekly December corn futures are used to calculate the cost of silage (LMIC, Prices and Production, 2014) using equation 1:

$$Corn\ Silage\ Price\ (\$/ton) = (December\ Futures\ Price * 9) + \$12. \quad (1)$$

A $12 charge is added to cover the cost of tarping, packing, and shrink. The weekly DDG price is from the Nebraska and Kansas markets. Using weekly prices, a weekly feed cost is calculated. The as-fed feed cost ($/lb.) is calculated as follows:

$$AsFed\ Feed\ Cost\ \left(\frac{\$}{lb}\right) = \sum(\%\ of\ Ingredient\ in\ AsFed\ Ration * Price\ of\ Ingredient). \quad (2)$$

Before a daily feed cost per head can be calculated, the amount of feed on an as-fed basis is calculated. Equation 3 is used to convert the dry matter intake (DMI) to an AFI:

$$AFI = \frac{DMI}{\sum(AsFed\ \%\ of\ ration * \%\ Dry\ Matter)}. \quad (3)$$

This conversion, DMI to an AFI basis, allows the calculation of the feed cost on an as-fed basis. The final feed cost ($/lb.) is calculated using equation 4:

$$Feed\ Cost\ (\$/lb) = AFI * As\ Fed\ feed\ cost. \quad (4)$$

A variable cost ($/head) is calculated at the pen level using the feed cost and feeder cattle price. Total variable cost (TVC) on a per head basis is calculated as follows:

$$Total\ Variable\ Cost\ (\frac{\$}{head}) = [InWt * FDRP] + (FDC * DOF) \quad (5)$$

where FDRP represents the feeder price ($/lb.).

In past studies, profit at the pen level is calculated on a live weight or cash basis. At the time of those studies, that was a common marketing practice for cattle feeders. That is not the

case in today's cattle feeding industry where some alternative category of marketing is often used such as formula pricing, value-based grids, forward contracts, and others. According to the USDA, about 50% of fed cattle in 2005 were sold using cash marketing while the remaining 50% were sold using some alternative marketing form. In 2014, fed cattle sold under cash pricing was reduced to about 20%, with the remaining 80% of fed cattle sold under an alternative marketing agreement (Mathews et al., 2015). For the purpose of this study, an alternative form of marketing is used to calculate profit on a per head basis to better represent today's cattle feeding industry.

In this research, total revenue is calculated based on carcasses being sold using a grid/formula marketing plan. Total revenue is calculated on a per carcass or per head basis using equation 6:

$$Total\ Revenue\ \left(\frac{\$}{head}\right) = \left\{\left(\frac{FEDP}{DRESS}\right) + (\%PR * PRp) + (\%SEL * SELd) + (\%SUBSEL * SUBSELd) + (\%DARK * DARKd) + (\%YG12 * YG12p) + (\%YG45 * YG45d) + (\%G1000 * G1000d) + (HotWtd)\right\} * HotWt. \quad (6)$$

FEDP is fed cattle price ($/lb.), DRESS is the dressing percent, %PR is the percentage of cattle that graded Prime, and PRp is the premium received for a Prime quality grade. %SEL is the percentage of cattle that graded Select while SELd is the discount received for a Select quality grade. %SUBSEL is the percentage of cattle that graded sub-select and SUBSELd is the sub-select discount received. %DARK is the percentage of carcasses that are dark cutters and the associated discount for a dark cutter carcass is DARKd. %YG12 and YG12p are the percentage of cattle that graded yield grades 1 and 2 and the premium received for these yield grades, respectively. %YG45 represents the percentage of cattle that graded yield grades 4 and 5. The

discount received for a yield grade 4 or 5 is represented with YG45d. %G1000 is the percentage of the pen that had carcasses that weighed over 1,000 lbs. and G1000d is the discount for the carcasses that weighed over 1,000 lbs. HotWtd is the carcass weight discount for carcasses that weigh between 900 and 1,000 lbs.

Using equations 5 and 6, equation 7 calculates total profit ($/head):

$$Profit = Total\ Revenue - Total\ Variable\ Cost. \quad (7)$$

It is important to note that the data received for the quality and yield grades, along with dark cutters and carcasses over 1,000 pounds, are a percentage of the total pen. This makes it somewhat difficult to determine what the actual TR and TVC is on a per head basis. To determine TVC on a per head basis, equation 5 used the average in-weight with the assumption that each animal in the pen weighed the average. Similarly, equation 6 is calculated by summing the product of the percentage of quality and yield grades at the pen level to their respective discounts and premiums, then multiplying that sum by the average pen level HotWt. It is known that each animal is not average; therefore, future improvement to this calculation could be to use close out data for each individual animal.

After the above data calculations are made, these data are split into steers and heifers with each sex being organized into four different weight categories according to their in-weights. The steers are split into the following weights: less than 650 lbs., 650 to 799 lbs., greater than or equal to 800 lbs., and all steer weights. Heifers are divided into the following: less than 600 lbs., from 600 to 749 lbs., greater than or equal to 750 lbs., and all heifer weights. The data are then filtered by extracting all the pens that fell outside of the 3rd standard deviation from the mean in each weight category for both steers and heifers to remove the impact any outliers might

have on the results of this study. The variables chosen to filter for outliers include: in-weight, average daily gain, dry matter intake, dry matter conversion, days on feed, hot carcass weight, out-weight, and dressing percentage. After filtering these data, 3.58% of the steer observations and 3.45% of the heifer observations are excluded from the original data because they are outside the 3rd standard deviation from the mean.

In the previous literature that analyzed profitability in cattle feeding, OLS analysis was used to identify and explain factors affecting profitability (Albright, Schroeder, & Langemeier, 1994; Lawrence, Wang, & Loy, 1999; Langemeier, Schroeder, & Minert, 1992; Schroeder et al., 1993; Tatum et al., 2012). Similarly in this study, after equation 6 is calculated, OLS is used to analyze profit per head via equation 8:

$$Profit_i = \beta_0 + \beta_1 FEDP_i + \beta_1 FDRP_i + \beta_2 FDC_i + \beta_3 DMI_i + \beta_4 DMC_i + \beta_5 ADG_i + \beta_6 DOF_i + \beta_7 G1000_i + \beta_8 PRCH_i + \beta_9 SUBSEL_i + \beta_{10} DARK_i + \beta_{11} YG12_i + \beta_{12} YG45_i + \epsilon_i. \quad (8)$$

i refers to the average pen level data for that specific animal, FEDP is the fed cattle price ($/cwt), FDRP is the feeder cattle price ($/cwt), FDC is feed cost ($/lb.), DMI is dry matter intake (lbs./head), DMC is dry matter conversion (lbs./head), ADG is average daily gain (lbs./head), DOF is days on feed, G1000 is the percentage of the pen that had carcass weights greater than 1,000 lbs., PRCH is the percentage of the pen that graded quality grades Prime and Choice, SUBSEL is the percentage of the pen that graded quality grade sub-select, DARK is the percentage of the pen that were dark cutters, YG12 is the percentage of the pen that graded yield grades 1 and 2, and YG45 is the percentage of the pen that graded yield grades 4 and 5. The intercept and error terms are defined by β_0 and ϵ_i, respectively. Equation 8 is calculated for the four weight categories for both steers and heifers.

The independent variables listed above have various units of measurement. To explain the impact each independent variable has on profit, coefficients of separate determination are estimated. This process standardizes each independent variable so that the variables can be compared to each other, and thus they can be ranked according to the amount that they contribute to the explanation of profit (Burt & Finley, 1968; Langemeier, Schroeder, & Minert, 1992; Albright, Schroeder, & Langemeier, 1994; Lewis et al., 2016).

CHAPTER 4 - RESULTS & DISCUSSION

This chapter reports the results of using the methodology and formulas explained in Chapter 3. First, the regressions results for the coefficients of separate determination are discussed. Next, the explanation of the production function and the OLS regression used to create it followed by a description of profit maximization and how it fits in with the production function. Finally, the results of the production function of the various weight categories and profit maximization are shown followed by the impacts that changing markets have on profitability.

4.1 Coefficients of Separate Determination

The OLS results for profit (equation 8) are reported in Table 2. The regression model that best explained profit includes FEDP, FDRP, FDC, DMI, DMC, ADG, DOF, G1000, PRCH, SUBSEL, DARK, YG12, and YG45 and explained 91.9% to 95.2% of the variability in profits per head for the steers. All the variables of the steer weight categories had the correct sign and were significant at the 1 and 5 percent levels except for ADG for all steer weights, steers less than 650 lbs., and steers weighing 650 to 799 lbs. Langemeier et al. (1992) found that ADG for steers in three different weight categories was significant at the 1 percent level.

The results for the heifers show that the variables listed above explained 92.5% to 94.4% of the variability in profits. All the variables for the heifers had the correct sign, except for two weight categories for carcasses that weigh greater than 1000 lbs. Almost all of the variables were statistically significant except for the DMC.

Table 2. Estimated Regression Equations of Factors Explaining Steer and Heifer

VARIABLES	All Wts Strs	< 650 Strs	650-799 Strs	≥ 800 Strs	All Wts Hfrs	< 600 Hfrs	600-749 Hfrs	≥ 750 Hfrs
FEDP	12.828***	12.522***	12.800***	13.164***	11.604***	10.990***	11.340***	12.169***
	(0.031)	(0.101)	(0.042)	(0.039)	(0.047)	(0.208)	(0.056)	(0.068)
FDRP	-7.492***	-6.046***	-7.126***	-8.596***	-7.104***	-5.717***	-6.707***	-7.916***
	(0.025)	(0.072)	(0.034)	(0.034)	(0.039)	(0.139)	(0.047)	(0.056)
FDC	-4,408.450***	-4,773.800***	-4,585.509***	-3,953.603***	-3,679.000***	-4,021.592***	-3,642.831***	-3,509.148***
	(15.802)	(47.480)	(20.892)	(20.423)	(24.553)	(94.329)	(29.108)	(36.627)
DMI	-6.737***	-1.330	-7.229***	-13.019***	-13.463***	-20.876*	-19.272***	-14.362***
	(1.231)	(5.511)	(1.958)	(1.375)	(1.837)	(12.203)	(2.934)	(2.131)
DMC	-64.868***	-75.393***	-65.517***	-25.923***	-23.647***	-8.822	-0.308	-3.576
	(4.102)	(16.988)	(6.318)	(4.699)	(5.342)	(34.414)	(8.392)	(6.361)
ADG	9.844	25.484	16.329	48.267***	74.355***	129.632*	126.254***	86.676***
	(7.487)	(31.384)	(11.582)	(8.528)	(11.695)	(73.870)	(18.211)	(13.939)
DOF	1.017***	0.885***	0.596***	0.399***	0.741***	0.828***	0.562***	0.114***
	(0.014)	(0.060)	(0.023)	(0.020)	(0.020)	(0.094)	(0.029)	(0.033)
G1000	-113.189***	-48.730**	-32.770***	-101.209***	-50.376**	550.096**	-66.938	73.080***
	(4.752)	(21.415)	(6.752)	(5.711)	(24.711)	(252.347)	(54.781)	(27.021)
PRCH	99.777***	90.863***	98.777***	107.500***	86.271***	51.817***	76.799***	88.979***
	(2.345)	(7.104)	(3.219)	(2.914)	(3.303)	(11.766)	(4.066)	(4.672)
SUBSEL	-31.817***	-74.132**	-23.110*	-63.851***	-50.227***	-230.420***	-62.060***	-36.396**
	(9.225)	(32.131)	(12.447)	(11.365)	(11.263)	(52.074)	(13.942)	(15.271)
DARK	-412.616***	-433.025***	-412.664***	-337.966***	-192.859***	-324.526***	-225.573***	-173.261***
	(11.923)	(35.366)	(13.808)	(18.155)	(15.834)	(61.112)	(16.511)	(28.698)
YG12	9.119***	23.617***	12.332***	2.186	21.468***	51.615***	20.277***	13.024**
	(2.760)	(8.562)	(3.928)	(3.363)	(3.798)	(16.172)	(4.821)	(5.090)
YG45	-43.784***	-60.252***	-33.150***	-71.419***	-43.208***	7.887	-34.025***	-36.536***
	(6.449)	(17.328)	(8.441)	(8.702)	(8.478)	(35.842)	(10.388)	(11.939)
Constant	284.178***	132.425	321.385***	173.981***	5.896	-170.418	-169.999***	-52.445
	(26.500)	(101.266)	(39.470)	(30.991)	(35.801)	(215.423)	(54.032)	(44.084)
# Obs	25,554	1,638	10,708	13,208	7,662	400	3,900	3,362
R-squared	0.919	0.952	0.942	0.929	0.925	0.936	0.944	0.937

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3 and Table 4 reports the coefficients of separate determination for the independent variables used to explain profit for steers and heifers, respectively. Coefficients of separate determination are used to describe the portion that each independent variable contributes to the explanation of the variation in the dependent variable. For example, the interpretation of the coefficient of separate determination for FDRP for steers in the all weights category is that 40.70% of the variation in profit is described by the FDRP. Langemeier et al. (1992) found fed price (FEDP), corn price, and feeder price (FDRP) ranked as the top three independent variables that explained profit while production variables accounted for the remaining variation in profit.

Table 2. Coefficients of Separate Determination for Steers

	All Weights Strs		< 650 Strs		650-799 Strs		≥ 800 Strs	
Variable	Coefficient	Rank	Coefficient	Rank	Coefficient	Rank	Coefficient	Rank
FEDP	4.3263	(3)	0.8022	(8)	0.7615	(7)	8.4615	(3)
FDRP	40.6971	(1)	40.4492	(2)	44.7760	(1)	48.6195	(1)
FDC	38.6582	(2)	48.2260	(1)	43.8901	(2)	31.7470	(2)
DMI	1.0602	(6)	-0.0474	(13)	0.2050	(9)	0.8752	(5)
DMC	2.9199	(4)	4.0491	(3)	2.0926	(3)	0.6707	(6)
ADG	-0.0126	(13)	0.8784	(7)	0.1901	(10)	0.2342	(10)
DOF	0.8240	(8)	-2.7620	(4)	-1.1150	(6)	-0.4394	(8)
G1000	0.6187	(9)	0.2262	(9)	0.2173	(8)	0.4084	(9)
PRCH	1.9727	(5)	1.7305	(5)	1.8447	(4)	1.7570	(4)
SUBSEL	0.1125	(10)	0.2946	(10)	0.0801	(12)	0.2128	(11)
DARK	0.8931	(7)	1.3422	(6)	1.3798	(5)	0.4531	(7)
YG12	-0.0989	(11)	-0.1098	(11)	-0.0940	(11)	-0.0249	(13)
YG45	-0.0804	(12)	0.0851	(12)	-0.0265	(13)	-0.0659	(12)
R^2	91.8908		95.1643		94.2015		92.9094	

Tatum et al. (2012) focused on how production data contributed to the explanation of net returns and found gain-to-feed, DOF, and ADG describe the most variability in net returns.

This study combined both production and price/cost variables to examine their effect on profit. This study found that price/cost data still explain the greatest amount of the variation of profit in both steers and heifers across most weight groups. Production variables for steers that had the greatest effect on profit included DMC, DOF, PRCH, and DARK. Results indicate that for steers weighing less than 650 lbs., FDC had the greatest influence on profitability while FDRP and DMC had the second and third greatest. Production variables most significant were DOF, PRCH, DARK, and ADG having the next greatest impact, respectively. For steers weighing 650 to 799 lbs., FDRP and FDC explained the most variation in profit with DMC, PRCH, DARK, and DOF ranking the next most important, respectively. An interesting find for

Table 3. Coefficients of Separate Determination for Heifers

	All Weights Hfrs		< 600 Hfrs		600-749 Hfrs		≥ 750 Hfrs	
Variable	Coefficient	Rank	Coefficient	Rank	Coefficient	Rank	Coefficient	Rank
FEDP	18.6094	(3)	5.9102	(3)	12.3009	(3)	29.1713	(2)
FDRP	40.2718	(1)	37.6677	(2)	43.9999	(1)	40.7986	(1)
FDC	27.0517	(2)	42.3331	(1)	33.7153	(2)	17.3560	(3)
DMI	0.2064	(9)	4.8231	(4)	-0.5474	(8)	-1.9645	(6)
DMC	2.1225	(6)	0.3820	(10)	0.0178	(13)	0.3583	(7)
ADG	2.8453	(4)	-2.0230	(5)	3.9431	(4)	5.7713	(4)
DOF	-1.2839	(7)	0.9803	(9)	-2.1103	(6)	-0.3286	(8)
G1000	-0.0262	(13)	-0.2000	(11)	0.0452	(12)	0.1713	(11)
PRCH	2.3181	(5)	1.3462	(6)	2.1144	(5)	2.3187	(5)
SUBSEL	0.1120	(11)	1.2273	(8)	0.2263	(9)	-0.0015	(13)
DARK	0.3769	(8)	1.2317	(7)	0.6786	(7)	0.1738	(10)
YG12	-0.1640	(10)	-0.0747	(12)	-0.0508	(11)	-0.1827	(9)
YG45	0.0755	(12)	-0.0176	(13)	0.1141	(10)	0.0317	(12)
R^2	92.5156		93.5862		94.4470		93.6735	

steers weighing less than 650 lbs. and steers weighing 650 to 799 lbs. was that FEDP ranked eighth and seventh, respectively, in explaining the variation in profit. These results seem contradictory to findings in past studies (Langemeier, Schroeder, & Minert, 1992; Lawrence, Wang, & Loy, 1999). The greater than 800 lbs. steer group showed FDRP, FDC, and FEDP were the top independent variables that explained the greatest variation in profit. PRCH, DMI, DMC, and DARK followed the top three in explaining the variation in profit.

Coefficients of separate determination for heifers were consistent across all weight groups for the top three independent variables that explained profits. These variables were all cost/price variables FDRP, FDC, and FEDP. Production followed the cost/price variables in relative importance across all weight groups. Heifers weighing less than 600 lbs. showed DMI, ADG, PRCH, and DARK had the next greatest impact on profitability. Heifers weighing 600 to 749 lbs. indicate that ADG, PRCH, DOF, and DARK are the production variables that follow FDRP, FDC, and FEDP in explaining the variation in profitability for this weight category. The

greater than 750 lbs. weight group for heifers had similar results, but showed that ADG, PRCH, DMI, and DMC account for the next greatest influence on profits.

Other insights gained from these results when comparing steers to heifers include: price/cost influences profitability greatly in both steers and heifers; DMC was ranked higher for steers when compared to heifers in explaining the variation in profit; and DOF was also of greater importance for steers when compared to heifers in explaining profit.

4.2 Regression Analysis & Production Function

A production function describes the relationship between inputs and output. A production function can be shown as a mathematical formula as follows:

$$Y = f\left(X_1, X_2, \dots\dots, X_J \,\middle|\, X_K, \dots\dots, X_L\right) \tag{9}$$

where Y refers to an output and X refers to an input. In this case variables $X_1,\dots,X_J$ represent inputs that are "variable" while $X_K,\dots,X_L$ represent variables that are assumed to be "fixed" at a certain level (Debertin, 2012).

Using the results from section 4.1 and OLS regression analysis, a production function is generated to determine profit maximization and optimal days on feed for different entry weights of steers and heifers. Equation 10 reports the OutWt regression while equations 11 through 17 shows how the independent variables for equation 10 are estimated.

$$OutWt\ (lbs.) = \beta_0 + \beta_1 DOF + \beta_2 DOF^2 + \beta_3 InWt + \beta_4 InWt^2 + \beta_5 DMI + \beta_6 ADG + \beta_7 ADG^2 + \beta_8 InWt * DOF + \epsilon_i \tag{10}$$

$$HotWt\ (lbs.) = \beta_0 + \beta_1 DOF + \beta_2 OutWt + \epsilon_i \quad (11)$$

$$\%PR = \beta_0 + \beta_1 DOF + \beta_2 DOF^2 + \beta_3 InWt + \beta_4 HotWt + \epsilon_i \quad (12)$$

$$\%SEL = \beta_0 + \beta_1 DOF + \beta_2 DOF^2 + \beta_3 InWt + \beta_4 HotWt + \epsilon_i \quad (13)$$

$$\%YG12 = \beta_0 + \beta_1 DOF + \beta_2 DOF^2 + \beta_3 InWt + \beta_4 HotWt + \beta_5 DMC + \beta_6 DMI + \beta_7 OutWt + \beta_8 DRESS + \epsilon_i \quad (14)$$

$$\%YG45 = \beta_0 + \beta_1 DOF + \beta_2 DOF^2 + \beta_3 InWt + \beta_4 HotWt + \beta_5 DMC + \beta_6 DMI + \beta_7 DRESS + \epsilon_i \quad (15)$$

$$DMI\ (lbs.) = \beta_0 + \beta_1 DOF + \beta_2 DOF^2 + \beta_3 InWt + \beta_4 ADG + \beta_5 DMC + \epsilon_i \quad (16)$$

$$AFI\ (lbs.) = \beta_0 + \beta_1 DOF + \beta_2 DOF^2 + \beta_3 InWt + \beta_4 ADG + \beta_5 DMC + \epsilon_i \quad (17)$$

The β_i are the estimated coefficients and ϵ_i is the error term. All other variables were previously defined. Models used in the production function were chosen based on how well the independent variables described the dependent variables for all four weight categories for both steers and heifers. It was found that certain models did a better job of explaining the dependent variable for a weight category, but not for others. To have uniformity and consistency throughout each weight category, the model that best described all weight categories combined was used. When using equations 10 through 17, not all weight categories for a specific model had the same results and some independent variables had incorrect signs for certain weight categories. The results of these models can be found in Tables 5 through 12.

Tables 5 and 6 report the results for OutWt and HotWt, respectively. The results of the OutWt models showed correct signs and all variables were significant for all four steer weight categories. For the heifer models, three of the four weight categories were similar to those of the

Table 4. Estimated Regression Equations for Out-Weight

VARIABLES	All Wt Strs	< 650 Strs	650-799 Strs	≥ 800 Strs	All Wt Hfrs	< 600 Hfrs	600-749 Hfrs	≥ 750 Hfrs
DOF	22.1013***	11.0399***	22.4932***	24.2573***	7.6378***	8.9989***	5.6200***	10.2799***
	(0.3508)	(1.1141)	(0.5589)	(0.5150)	(0.4006)	(1.7820)	(0.5950)	(0.6742)
DOF2	-0.0268***	-0.0137***	-0.0269***	-0.0319***	-0.0088***	-0.0075***	-0.0070***	-0.0113***
	(0.0005)	(0.0014)	(0.0007)	(0.0007)	(0.0006)	(0.0020)	(0.0008)	(0.0010)
lnWt	6.0029***	2.8848***	7.0229***	6.4171***	1.9013***	5.0649***	0.2829	2.3284***
	(0.1040)	(0.8284)	(0.2899)	(0.2127)	(0.1225)	(1.4415)	(0.3851)	(0.3557)
lnWt2	-0.0019***	-0.0010*	-0.0026***	-0.0021***	-0.0004***	-0.0027***	0.0006**	-0.0004**
	(0.0001)	(0.0006)	(0.0002)	(0.0001)	(0.0001)	(0.0010)	(0.0002)	(0.0002)
DMI	2.9098***	3.8055***	2.6015***	2.8413***	3.4456***	4.0539***	3.5019***	2.8168***
	(0.1566)	(0.6898)	(0.2665)	(0.1921)	(0.2761)	(1.3569)	(0.3910)	(0.3993)
ADG	328.6318***	337.0636***	275.6768***	203.2542***	244.4904***	310.8118***	186.8289***	169.4322***
	(5.6922)	(30.0685)	(10.4996)	(7.6606)	(10.5860)	(54.2888)	(17.8031)	(15.3798)
ADG2	-29.8437***	-24.8655***	-19.7645***	-13.4948***	-21.1442***	-26.2516***	-9.7967***	-10.2701***
	(0.8286)	(4.7260)	(1.5794)	(1.0893)	(1.7356)	(9.6691)	(3.0130)	(2.4643)
lnWt*DOF	-0.0136***	-0.0040***	-0.0140***	-0.0145***	-0.0031***	-0.0060***	-0.0009	-0.0055***
	(0.0003)	(0.0013)	(0.0005)	(0.0004)	(0.0003)	(0.0022)	(0.0006)	(0.0006)
Constant	-4,173.9559***	-2,182.8539***	-4,518.4136***	-4,265.1524***	-1,229.1010***	-2,412.3488***	-450.0079***	-1,445.8702***
	(69.3447)	(332.3808)	(145.8055)	(124.1862)	(76.2579)	(542.5606)	(168.5434)	(178.2896)
# Obs	25,554	1,638	10,708	13,208	7,662	400	3,900	3,362
R-squared	0.8622	0.8892	0.8521	0.8273	0.9055	0.8834	0.8708	0.8714

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5. Estimated Regression Equations for Hot Carcass Weight

VARIABLES	All Wts Strs	< 650 Strs	650-799 Strs	≥ 800 Strs	All Wts Hfrs	< 600 Hfrs	600-749 Hfrs	≥ 750 Hfrs
DOF	0.2798***	0.2769***	0.2769***	0.3216***	0.2593***	0.1779***	0.2828***	0.2918***
	(0.0033)	(0.0252)	(0.0082)	(0.0073)	(0.0064)	(0.0350)	(0.0126)	(0.0155)
OutWt	0.6905***	0.6502***	0.6979***	0.6849***	0.6803***	0.6985***	0.6935***	0.6605***
	(0.0017)	(0.0067)	(0.0028)	(0.0027)	(0.0024)	(0.0124)	(0.0041)	(0.0045)
Constant	-105.5699***	-56.3291***	-114.4256***	-103.7140***	-81.0612***	-89.9062***	-99.5519***	-61.1668***
	(2.5074)	(8.8043)	(3.6646)	(3.7432)	(3.1095)	(14.3717)	(4.4878)	(5.1679)
# Obs	25,554	1,638	10,708	13,208	7,662	400	3,900	3,362
R-squared	0.8625	0.8691	0.8684	0.8381	0.9159	0.8970	0.9036	0.8929

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

steers except for heifers in the 600 to 750 lb. weight category. Here, InWt squared had an incorrect sign and was significant at the 5% level. We found in the HotWt models, all the weight categories had the correct expected signs and all independent variables were highly significant.

Table 7 reports the results for percent Prime (%PR) model. The results for steers report three of the weight categories having the correct expected signs for each of the independent variables except for steers weighing less than 650 lbs. The results on the heifer side showed three of the weight categories having the HotWt independent variables with an incorrect sign. The overall results, however, show that the independent variables explain only a small portion of the variation in %PR, 9% to 14% for steers and 30% to 35% for heifers.

Table 6. Estimated Regression Equations for Percent of Prime Carcasses

VARIABLES	All Wts Strs	< 650 Strs	650-799 Strs	≥ 800 Strs	All Wt Hfrs	< 600 Hfrs	600-749 Hfrs	≥ 750 Hfrs
DOF	0.0005***	0.0005	0.0016***	0.0008***	0.0004***	0.0004	0.0003**	0.0001
	(0.0001)	(0.0003)	(0.0001)	(0.0001)	(0.0001)	(0.0003)	(0.0001)	(0.0001)
DOF2	-0.0000***	-0.0000	-0.0000***	-0.0000***	-0.0000	-0.0000	0.0000	0.0000**
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
InWt	0.0001***	0.0001***	0.0001***	0.0001***	0.0002***	0.0001***	0.0002***	0.0002***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
HotWt	0.0000***	-0.0000	0.0000***	0.0000***	-0.0000***	-0.0001***	-0.0001***	0.0000
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Constant	-0.1397***	-0.0900**	-0.2545***	-0.1756***	-0.1326***	-0.0207	-0.1336***	-0.1429***
	(0.0033)	(0.0350)	(0.0104)	(0.0070)	(0.0044)	(0.0339)	(0.0122)	(0.0102)
# Obs	25,554	1,638	10,708	13,208	7,662	400	3,900	3,362
R-squared	0.1254	0.0890	0.1367	0.1269	0.3465	0.3040	0.3069	0.3344

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 8 contains the results for percent Select (%SEL). The models report consistent signs for the steers models, but showed incorrect signs for the InWt variable for heifers. Overall, the independent variables only explained 2% to 12% of the variation in %SEL for steers and 2% to 11% for heifers.

Table 7. Estimated Regression Equations for Percent of Select Carcasses

VARIABLES	All Wts Strs	< 650 Strs	650-799 Strs	≥ 800 Strs	All Wts Hfrs	< 600 Hfrs	600-749 Hfrs	≥ 750 Hfrs
DOF	-0.0049***	-0.0074**	-0.0074***	-0.0085***	-0.0009*	-0.0022	-0.0015	-0.0036***
	(0.0002)	(0.0032)	(0.0009)	(0.0007)	(0.0005)	(0.0049)	(0.0015)	(0.0013)
DOF2	0.0000***	0.0000**	0.0000***	0.0000***	0.0000	0.0000	0.0000	0.0000***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
lnWt	-0.0001***	-0.0000	-0.0001***	-0.0002***	0.0001***	0.0004	0.0000	0.0000
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0000)	(0.0003)	(0.0001)	(0.0001)
HotWt	-0.0004***	-0.0002**	-0.0004***	-0.0004***	-0.0007***	-0.0005**	-0.0006***	-0.0009***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0001)	(0.0001)
Constant	1.3890***	1.3867***	1.5901***	1.7451***	0.8868***	0.6936	0.9190***	1.2518***
	(0.0291)	(0.3331)	(0.0927)	(0.0628)	(0.0471)	(0.5196)	(0.1393)	(0.1029)
# Obs	25,554	1,638	10,708	13,208	7,662	400	3,900	3,362
R-squared	0.1247	0.0214	0.0713	0.1154	0.0684	0.0211	0.0454	0.1117

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 9 reports yield grades 1 & 2 (%YG12). Three of the steer weight categories were able to explain %YG12 with correct signs while only the combination of all the weight categories for heifers had all the independent variables with the correct sign. DMI had an incorrect sign, but was insignificant in the all weights heifer category. Overall, the models explained 14% to 26% of the variation in %YG12 between all four weight categories for steers and heifers.

Table 10 reports the percent yield grades 4 & 5 (%YG45) where dry matter intake (DMI) had an unexpected sign for steers in the greater than 800 lbs. and heifers in the all weight and greater than 750 lbs. categories. Interestingly, in the %YG12 and %YG45 models, DOF and DOF^2 had an unexpected sign for heifers in the 600-650 lb. weight category (Tables 9 and 10). The independent variables explained around 11% to 19% of the variation in %YG45.

Table 8. Estimated Regression Equations for Percent of Yield Grades 1 & 2 Carcasses

VARIABLES	All Wts Strs	< 650 Strs	650-799 Strs	≥ 800 Strs	All Wts Hfrs	< 600 Hfrs	600-749 Hfrs	≥ 750 Hfrs
DOF	-0.0030***	-0.0017	0.0032***	-0.0065***	-0.0008	0.0135**	0.0066***	0.0003
	(0.0003)	(0.0036)	(0.0010)	(0.0008)	(0.0006)	(0.0053)	(0.0017)	(0.0016)
DOF2	0.0000***	0.0000	-0.0000***	0.0000***	0.0000**	-0.0000***	-0.0000***	0.0000
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
InWt	0.0008***	0.0006***	0.0008***	0.0008***	0.0009***	0.0007	0.0011***	0.0010***
	(0.0001)	(0.0002)	(0.0001)	(0.0001)	(0.0001)	(0.0004)	(0.0001)	(0.0001)
HotWt	-0.0002	-0.0005	-0.0005**	0.0000	-0.0013***	-0.0008	-0.0009**	-0.0019***
	(0.0002)	(0.0004)	(0.0002)	(0.0002)	(0.0003)	(0.0010)	(0.0004)	(0.0004)
DMC	-0.0538***	-0.0909***	-0.0478***	-0.0562***	-0.0210***	-0.0382	-0.0304***	-0.0169**
	(0.0029)	(0.0176)	(0.0050)	(0.0038)	(0.0049)	(0.0347)	(0.0078)	(0.0066)
DMI	-0.0033***	-0.0202***	-0.0170***	0.0074***	0.0012	-0.0245*	-0.0036	0.0102***
	(0.0010)	(0.0063)	(0.0018)	(0.0014)	(0.0020)	(0.0132)	(0.0030)	(0.0027)
OutWt	-0.0011***	-0.0007**	-0.0006***	-0.0016***	-0.0007***	-0.0002	-0.0009***	-0.0005**
	(0.0001)	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0008)	(0.0003)	(0.0003)
DRESS	2.5253***	3.4534***	2.6862***	2.3914***	3.9409***	1.6430	3.6291***	4.7970***
	(0.2122)	(0.5966)	(0.2999)	(0.3423)	(0.3237)	(1.2850)	(0.4482)	(0.5017)
Constant	0.5412***	0.2460	-0.2419	1.0460***	-0.6696***	-0.8250	-1.1758***	-1.3255***
	(0.1384)	(0.5132)	(0.2147)	(0.2276)	(0.2099)	(0.9309)	(0.3196)	(0.3402)
# Obs	25,554	1,638	10,708	13,208	7,662	400	3,900	3,362
R-squared	0.2043	0.2328	0.1861	0.2038	0.2327	0.1470	0.2322	0.2624

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 9. Estimated Regression Equations for Percent of Yield Grades 4 & 5 Carcasses

VARIABLES	All Wts Strs	< 650 Strs	650-799 Strs	≥ 800 Strs	All Wts Hfrs	< 600 Hfrs	600-749 Hfrs	≥ 750 Hfrs
DOF	0.0003***	0.0022	-0.0008	0.0020***	-0.0002	-0.0022	-0.0037***	-0.0011*
	(0.0001)	(0.0017)	(0.0005)	(0.0003)	(0.0003)	(0.0022)	(0.0007)	(0.0006)
DOF2	-0.0000***	-0.0000	0.0000	-0.0000***	-0.0000	0.0000	0.0000***	0.0000
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
InWt	-0.0003***	-0.0003***	-0.0004***	-0.0002***	-0.0004***	-0.0004**	-0.0005***	-0.0004***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0001)	(0.0001)
HotWt	0.0006***	0.0005***	0.0005***	0.0006***	0.0010***	0.0008***	0.0010***	0.0009***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0001)	(0.0001)
DMC	0.0172***	0.0322***	0.0196***	0.0125***	0.0155***	0.0157	0.0174***	0.0109***
	(0.0011)	(0.0075)	(0.0022)	(0.0014)	(0.0020)	(0.0131)	(0.0033)	(0.0026)
DMI	-0.0001	0.0135***	0.0059***	-0.0037***	-0.0044***	0.0073	-0.0019	-0.0069***
	(0.0004)	(0.0027)	(0.0008)	(0.0005)	(0.0008)	(0.0048)	(0.0013)	(0.0011)
DRESS	-1.3212***	-1.7834***	-1.2372***	-1.2806***	-1.6600***	-1.1277***	-1.8088***	-1.5658***
	(0.0413)	(0.1894)	(0.0665)	(0.0564)	(0.0849)	(0.3833)	(0.1215)	(0.1256)
Constant	0.5368***	0.3141	0.5503***	0.4098***	0.7392***	0.5210*	1.0604***	0.8714***
	(0.0269)	(0.2144)	(0.0609)	(0.0425)	(0.0560)	(0.3070)	(0.1004)	(0.0920)
# Obs	25,554	1,638	10,708	13,208	7,662	400	3,900	3,362
R-squared	0.1551	0.1957	0.1270	0.1122	0.1847	0.1867	0.2155	0.1657

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Tables 11 and 12 include the results for DMI and as-fed intake (AFI), respectively. As expected, these two models had almost the exact same results. All weights category for steers and heifers had unexpected signs for the variables DOF and DOF^2. All the other weight categories had the expected signs.

Table 10. Estimated Regression Equations for Dry Matter Intake

VARIABLES	All Wts Strs	< 650 Strs	650-799 Strs	≥ 800 Strs	All Wts Hfrs	< 600 Hfrs	600-749 Hfrs	≥ 750 Hfrs
DOF	-0.0022***	0.0083***	0.0059***	0.0100***	-0.0012**	0.0071**	0.0020*	0.0073***
	(0.0003)	(0.0019)	(0.0007)	(0.0007)	(0.0006)	(0.0027)	(0.0011)	(0.0014)
DOF2	0.0000***	-0.0000***	-0.0000***	-0.0000***	0.0000***	-0.0000**	-0.0000	-0.0000***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
lnWt	0.0001***	0.0002***	0.0001***	0.0004***	0.0003***	0.0002	0.0003***	0.0007***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0001)	(0.0001)
ADG	6.0246***	5.6565***	5.8943***	6.1390***	6.2775***	6.0012***	6.1391***	6.4371***
	(0.0043)	(0.0100)	(0.0044)	(0.0049)	(0.0080)	(0.0224)	(0.0076)	(0.0111)
DMC	8.3058***	9.4311***	9.8218***	9.7459***	6.7855***	8.0271***	7.7949***	8.3422***
	(0.0305)	(0.0999)	(0.0363)	(0.0366)	(0.0473)	(0.2367)	(0.0643)	(0.0654)
DMC2	-0.4052***	-0.5496***	-0.5499***	-0.5057***	-0.3003***	-0.4362***	-0.3939***	-0.4037***
	(0.0024)	(0.0086)	(0.0030)	(0.0029)	(0.0036)	(0.0196)	(0.0051)	(0.0048)
Constant	-35.2548***	-36.7977***	-39.4011***	-41.8984***	-30.9299***	-33.3476***	-33.3849***	-38.0905***
	(0.1022)	(0.3386)	(0.1307)	(0.1318)	(0.1672)	(0.7442)	(0.2306)	(0.2526)
# Obs	25,554	1,638	10,708	13,208	7,662	400	3,900	3,362
R-squared	0.9947	0.9959	0.9954	0.9941	0.9941	0.9963	0.9951	0.9920

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 11. Estimated Regression Equations for As-Fed Intake

VARIABLES	All Wts Strs	< 650 Strs	650-799 Strs	≥ 800 Strs	All Wts Hfrs	< 600 Hfrs	600-749 Hfrs	≥ 750 Hfrs
DOF	-0.0028***	0.0106***	0.0075***	0.0127***	-0.0015**	0.0090**	0.0025*	0.0093***
	(0.0003)	(0.0024)	(0.0008)	(0.0009)	(0.0007)	(0.0035)	(0.0014)	(0.0018)
DOF2	0.0000***	-0.0000***	-0.0000***	-0.0000***	0.0000***	-0.0000**	-0.0000	-0.0000***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
lnWt	0.0001***	0.0003***	0.0001***	0.0005***	0.0003***	0.0002	0.0003***	0.0009***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0001)	(0.0001)
ADG	7.6905***	7.2206***	7.5241***	7.8365***	8.0133***	7.6607***	7.8366***	8.2170***
	(0.0055)	(0.0127)	(0.0056)	(0.0063)	(0.0102)	(0.0286)	(0.0097)	(0.0141)
DMC	10.6024***	12.0389***	12.5376***	12.4408***	8.6617***	10.2466***	9.9502***	10.6489***
	(0.0389)	(0.1275)	(0.0464)	(0.0467)	(0.0604)	(0.3022)	(0.0821)	(0.0835)
DMC2	-0.5173***	-0.7016***	-0.7020***	-0.6455***	-0.3834***	-0.5569***	-0.5028***	-0.5153***
	(0.0031)	(0.0109)	(0.0038)	(0.0037)	(0.0046)	(0.0250)	(0.0065)	(0.0061)
Constant	-45.0032***	-46.9728***	-50.2961***	-53.4839***	-39.4825***	-42.5686***	-42.6162***	-48.6231***
	(0.1305)	(0.4322)	(0.1668)	(0.1682)	(0.2134)	(0.9499)	(0.2944)	(0.3224)
# Obs	25,554	1,638	10,708	13,208	7,662	400	3,900	3,362
R-squared	0.9947	0.9959	0.9954	0.9941	0.9941	0.9963	0.9951	0.9920

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

4.3 Profit Maximization

This study assumes that the goal of the feedlot manager is to maximize profit and not just produce the most pounds of meat. Profit maximization is calculated as follows:

$$\pi = TR - TVC. \tag{18}$$

TR is total revenue, TVC is the total variable cost, and π represents profit. It was assumed that the fixed costs were sunk; thus, TVC will be used instead of total cost (TC). Equation 18 can be broken down further as follows:

$$\pi = (P_Y * Y) - (P_X * X) \tag{19}$$

where P_Y represents the price of the output, Y is the production function, P_X represents the price of the input, and X is the amount of input used. To calculate profit maximization, marginal revenue (MR) must equal the marginal variable cost (MVC). The MR and MVC can be calculated by taking the first derivative of equation 19 with respect to *X* or the change in (Δ) π with respect to *X* (equations 21 and 22) and setting it equal to zero (equations 23 and 24):

$$\frac{\Delta \pi}{\Delta X} = \frac{\Delta TR}{\Delta X} - \frac{\Delta TVC}{\Delta X} = 0 \tag{20}$$

$$MR = \frac{\Delta TR}{\Delta X} \tag{21}$$

$$MVC = \frac{\Delta TVC}{\Delta X} \tag{22}$$

$$MR - MVC = 0 \quad (23)$$

$$MR = MVC \quad (24)$$

where MR is the additional revenue received by using one more unit of input *X* and MVC is the additional variable cost of using one more unit of input *X*.

Multiple models were run to project the inputs *X*. These models are previously listed in equations 10 through 17. The results of these models were then used to calculate TR. Equation 25 is different from equation 6 in that the variables SUBSEL, DARK, and G1000 were not used in the calculation of TR. The reason for this is that at the pen level each of these variables determined a very low percentage of the overall pen on average, thus, to find TR equation 25 is used instead:

$$TR\left(\frac{\$}{head}\right) = \left[\left(\frac{FEDP}{DRESS}\right) + (\%PR * PRp) + (\%SEL * SELd) + (\%YG12 * YG12p) + (\%YG45 * YG45d) + (HotWtd)\right] * HotWt. \quad (25)$$

Regression analysis was used to calculate each of the variables, HotWt, %PR, %SEL, %YG12, %YG45, and OutWt. OutWt was used to calculate dressing percent (DRESS) as shown in equation 26:

$$DRESS\ (\%) = \frac{HotWt}{OutWt}. \quad (26)$$

TVC was calculated as follows:

$$TVC\ \left(\frac{\$}{head}\right) = (InWt * FDRP) + (AFI * FDC * DOF) \quad (27)$$

where FDC is the cost of feed and AFI is in pounds of feed consumed. Regression analysis was also used to calculate AFI. In the FDC calculation, the price of DDG was calculated as 89% of the price of corn (Schill, 2013). The results of the regressions were used to determine the optimal amount of output given multiple inputs (see equation 9).

On the revenue side, variables OutWt, HotWt, %PR, %SEL, %YG12, and %YG45 were outputs used given different variable inputs, like DOF and OutWt. In this study, different output variables had to be projected to then be used as inputs in the final calculation of TR. Fixed inputs include: InWt, ADG, and DMC. On the cost side, AFI was the output given different inputs of DOF and InWt.

4.4 Results

Averages from each weight category were used for the fixed variables InWt, ADG, and DMC. Average cattle prices by weight category were used for 2007 to 2014 to calculate TR and TVC. In calculating FDC, average prices for each of the feedstuffs was used. The average FDC was the same across all the weight categories given the assumption that the amount of the main ingredient, corn, was already purchased at the time the animal entered the feedlot and so the price of corn would have been constant during the length of the animals stay at the feedlot. Thus, the corn price was the same for all weight categories. The average price of corn from 2007 to 2014 was $5.21 per bushel given the average feed cost $0.09 per pound on an as-fed basis.

Table 12. Average Production and Price Data from 2007 to 2014

	All Wts Strs	< 650 Strs	650-799 Strs	≥ 800 Strs	All Wts Hfrs	< 600 Hfrs	600-749 Hfrs	≥ 750 Hfrs
InWt (lbs)	802.17	617.80	731.03	882.72	736.28	563.07	682.00	819.85
ADG (lbs)	3.40	3.18	3.31	3.50	3.01	2.80	2.95	3.11
DMC (lbs)	6.06	5.75	5.94	6.20	6.37	6.00	6.22	6.58
FEDP ($/cwt)	$ 102.87	$ 102.85	$ 103.07	$ 102.72	$ 103.76	$ 103.06	$ 103.07	$ 104.64
FDRP ($/cwt)	$ 116.26	$ 125.24	$ 120.40	$ 111.79	$ 110.99	$ 118.24	$ 112.50	$ 108.38
CORNP ($/bu)	$ 5.21	$ 5.21	$ 5.21	$ 5.21	$ 5.21	$ 5.21	$ 5.21	$ 5.21
FDC ($/lb)	$ 0.09	$ 0.09	$ 0.09	$ 0.09	$ 0.09	$ 0.09	$ 0.09	$ 0.09

Average values used for each weight category for steers and heifers can be found in Table 13. The average InWt for steers in the all weights category was 802 lbs. because more steers were purchased in the greater than 800 lb. category than any of the other weight categories. Results indicate that given these average inputs, the optimal DOF would be 169 days resulting in a max profit of $77.03/head and a final OutWt of 1,372 lbs. The data for the all weights category showed that cattle were being fed for an average of 159 days. Assuming that the models used are correct, cattle could have been fed for an additional ten days. The results of the model shows that by feeding cattle for 159 days, feedlots would generate about $74.28/head. By feeding an additional ten days, feedlots could make an additional $2.75/head. Figure 7 shows the production function for this weight category with TR and TVC on the primary axis and the MR and MVC on the secondary axis. It is interesting to note the sharp decline in MR followed by an immediate return to its previous downward trend for each weight category. This sharp decline in MR is the first day that the HotWtd is included in the MR.

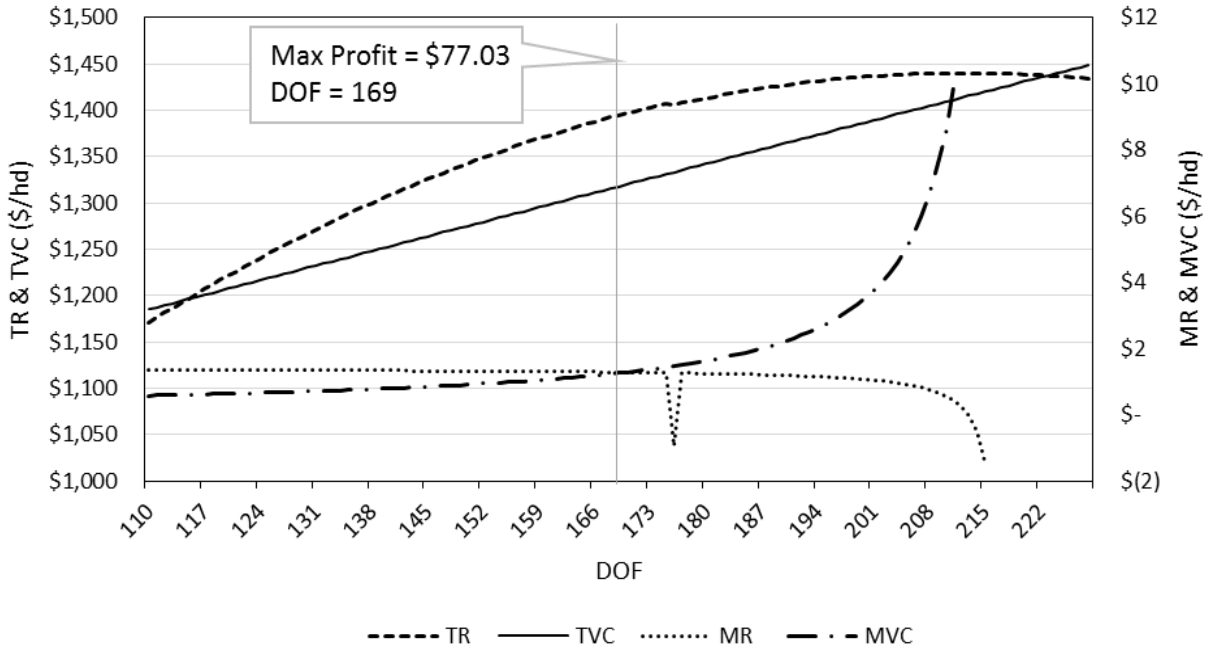


Figure 7. Production Function for Steers in the All Weights Category

The production function for heifers in the all weights category indicated that the optimal DOF would be 184 days resulting in a profit of $98.49/head and an end weight of 1,278 lbs. The data received showed that these heifers on average were being fed 152 days with an end weight of 1,194 lbs. The production function results in profit at 152 DOF at $89.55/head. The model estimates that by feeding these heifers to the optimal DOF, an additional $8.94/head could be achieved. Figure 8 shows the production function for heifers in the all weights category.

Steers weighing less than 650 lbs. showed that feeding them for 238 days would result in a max profit of $130.67/head and an end weight of 1,366 lbs. given the average data. The data given for steers weighing less than 650 lbs. showed that they had been feeding this weight category for an average of 208 days.

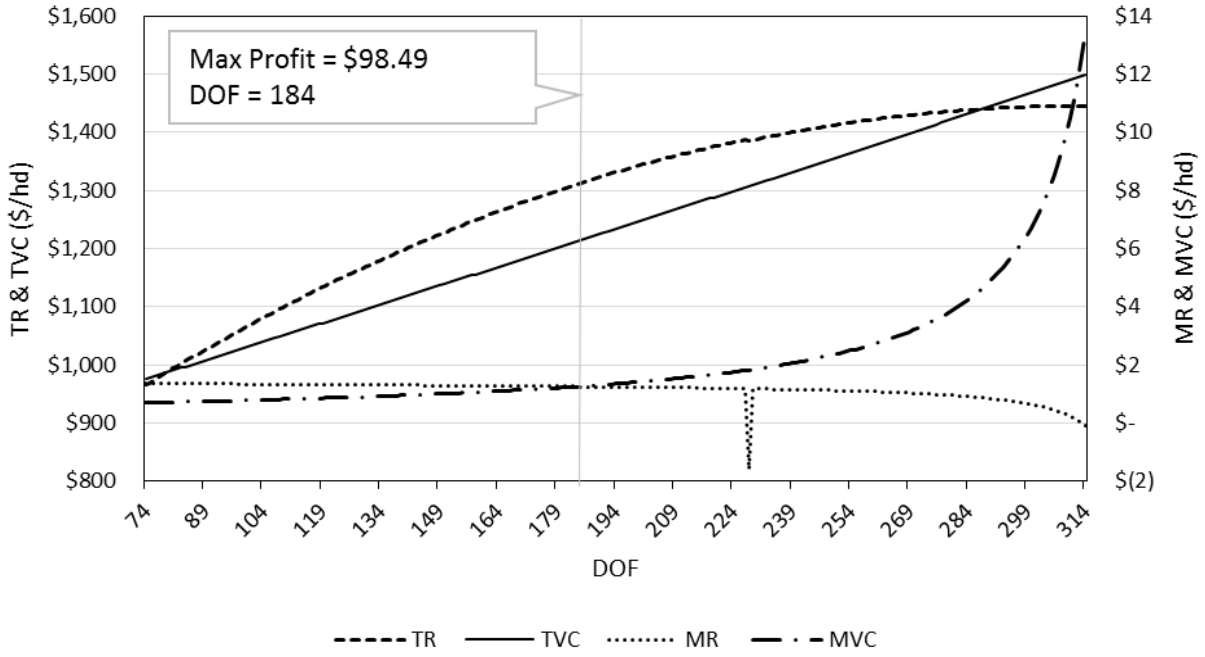


Figure 8. Production Function for Heifers in the All Weights Category

According to the model, this weight category would have been most profitable if they had fed the steers weighing less than 650 lbs. for an additional 30 days. At 208 days, the model states that the profit was $118.45/head; however, the model also states that if they had fed to the max profit of 238 days they could have made an additional $12.22/head. Figure 9 shows the production function for this weight category.

Heifers weighing less than 600 lbs. at entry into the feedlot should be fed 241 days according to the production function. Feeding them this long would result in a profit of $130.38/head. On average, heifers in this weight group were being fed 199 days. By feeding them to 254 days an additional profit of $15.72/head could possibly be achieved. Figure 10 has the results for heifers weighing less than 600 lbs.

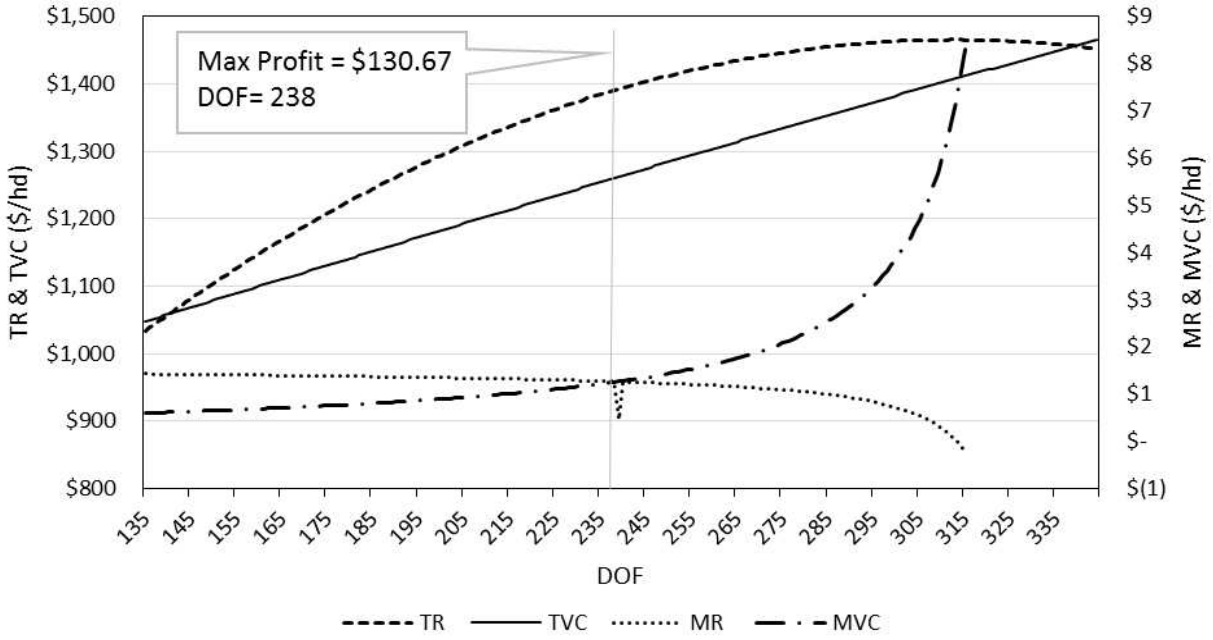


Figure 9. Production Function for Steers Weighing Less than 650 lbs.

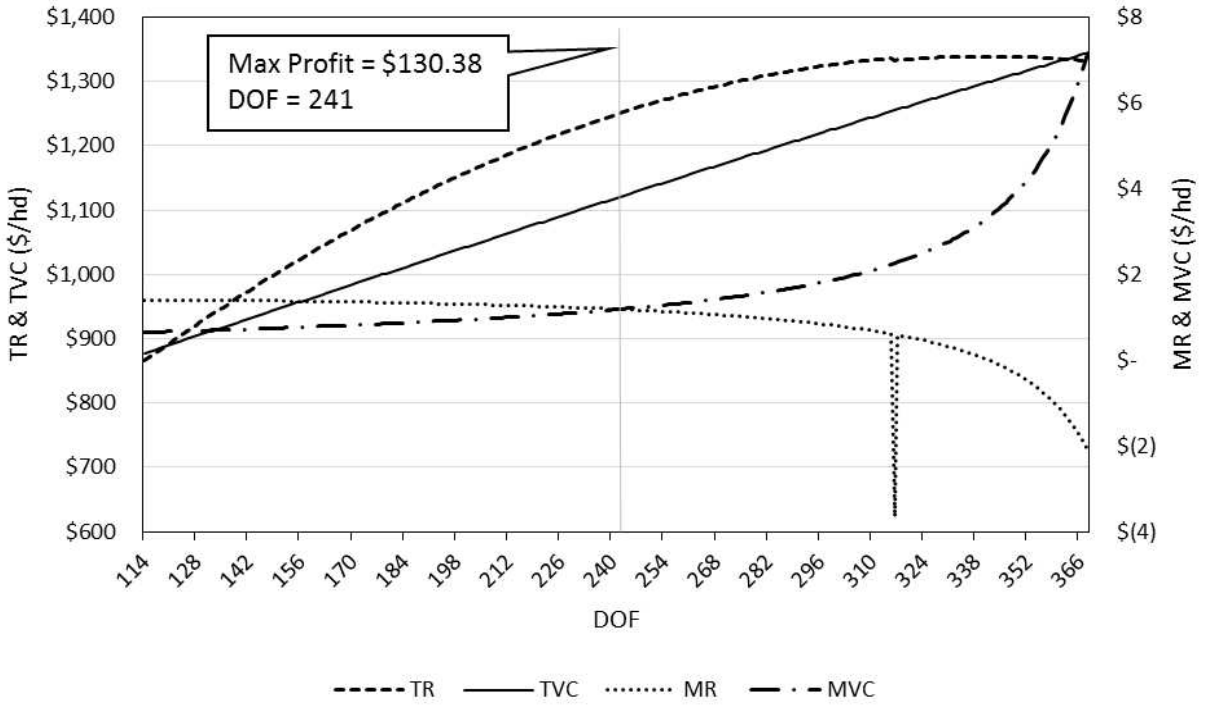


Figure 10. Production Function for Heifers Weighing Less than 600 lbs.

The next steer category were steers weighing between 650 and 799 lbs. The max profit for steers weighing between 650 and 799 lbs. was $84.24/head and this was attained with 189 as the optimal DOF. The final OutWt resulting with this optimal DOF was 1,356 lbs. According to the data used, steers in the 650 to 799 lb. category were being fed 178 days. Steers of this weight being fed to 178 days were making an average of $80.91/head. If steers from this weight category would have been fed to the optimal DOF, there would have been an additional $3.33/head made. Figure 11 shows the production function for this weight category.

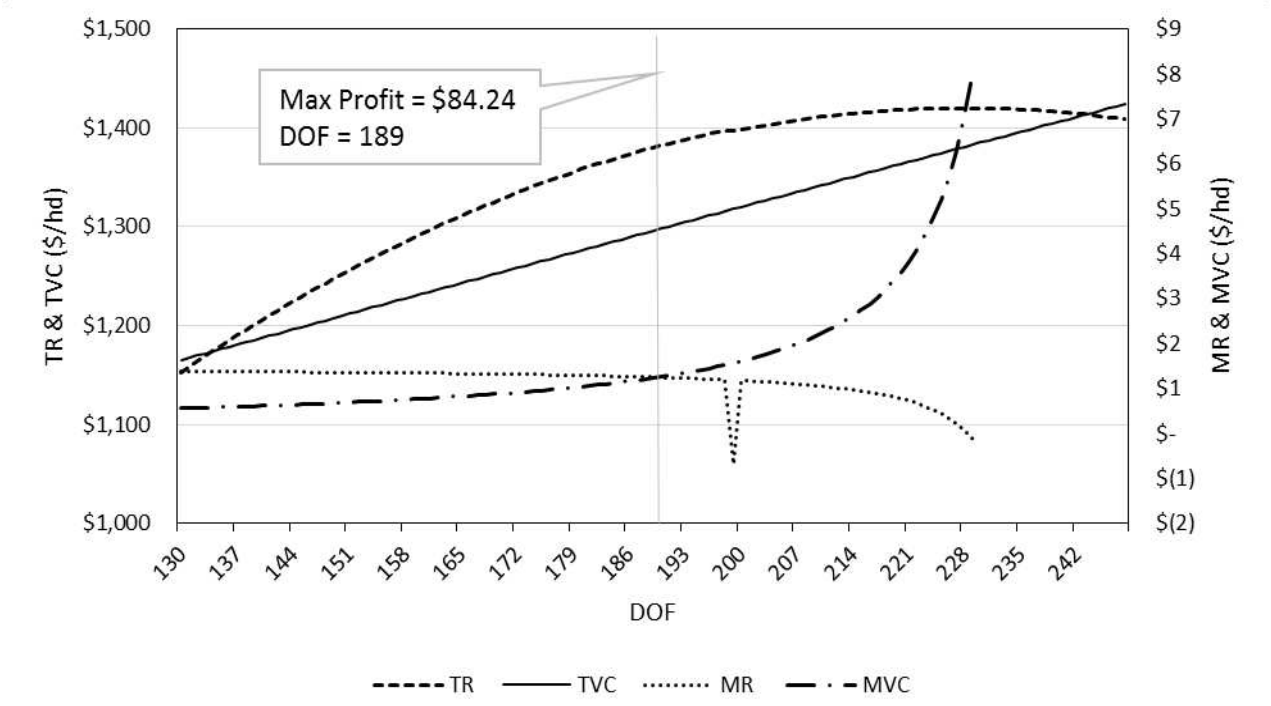


Figure 11. Production Function for Steers Weighing 650-799 lbs.

Heifers weighing in the range of 600 to 749 lbs. came out with 200 days being the optimal feed time giving them a projected $102.97/head profit and an ending weight of 1,260 lbs. Comparing this to the average DOF this weight group has been fed, 163 days, an additional

$12.02/head could be achieved. See Figure 12 for the production function for heifers weighing 600 to 749 lbs.

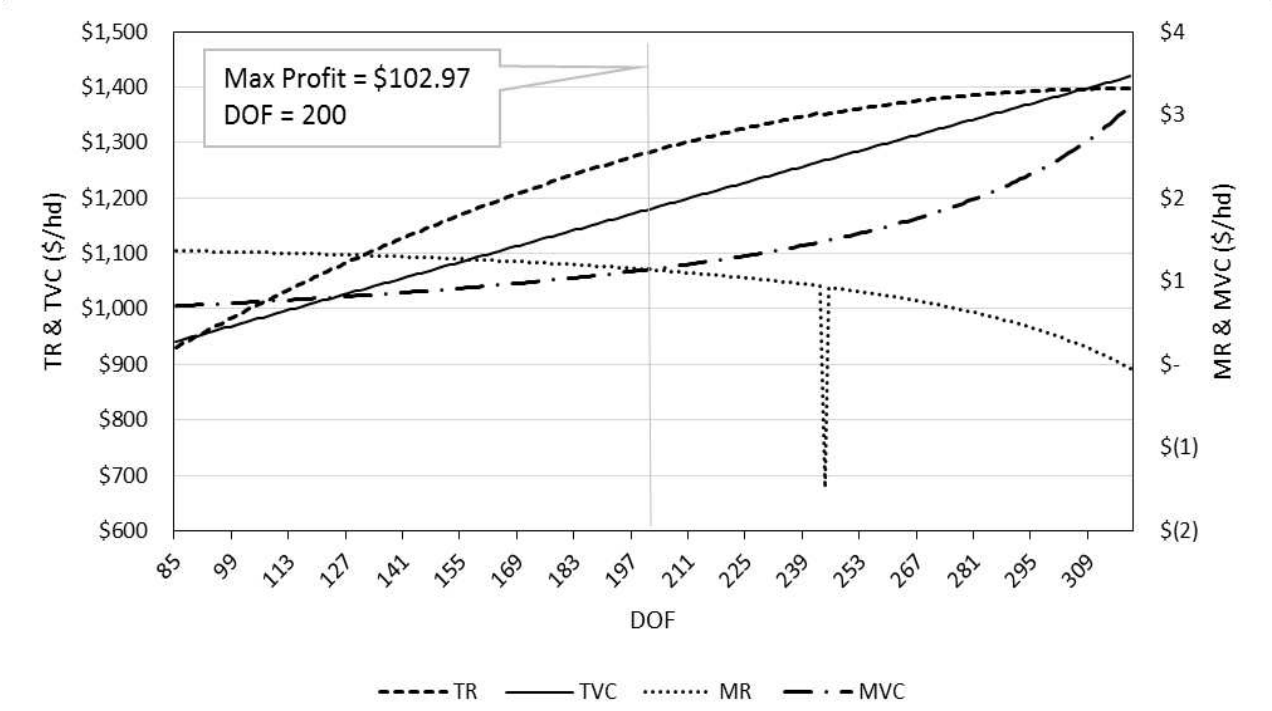


Figure 12. Production Function for Heifers Weighing 600-749 lbs.

Steers and heifers that weighed greater than 800 lbs. and 750 lbs. respectively, comprised the last two weight categories. For these steers model, the optimal DOF was 143, with a final OutWt of 1,381 lbs., and a max profit of $65.38/head. For this weight category, the data used stated that on average steers 800 lbs. and greater were being fed for about 137 days. The model indicates that feeding these steers to 137 days would result in a profit of $64.18/head. To attain the additional $1.20/head and thus reach the max profit, the model shows that these steers would need to be fed an additional six days to see these results. The results of this model for the steers weighing 800 lbs. and greater is fairly close compared to the actual data, which shows that

feedlot managers were efficiently feeding heavier weight cattle to DOF that maximized their profit. Figure 13 shows the production function for this weight category of steers.

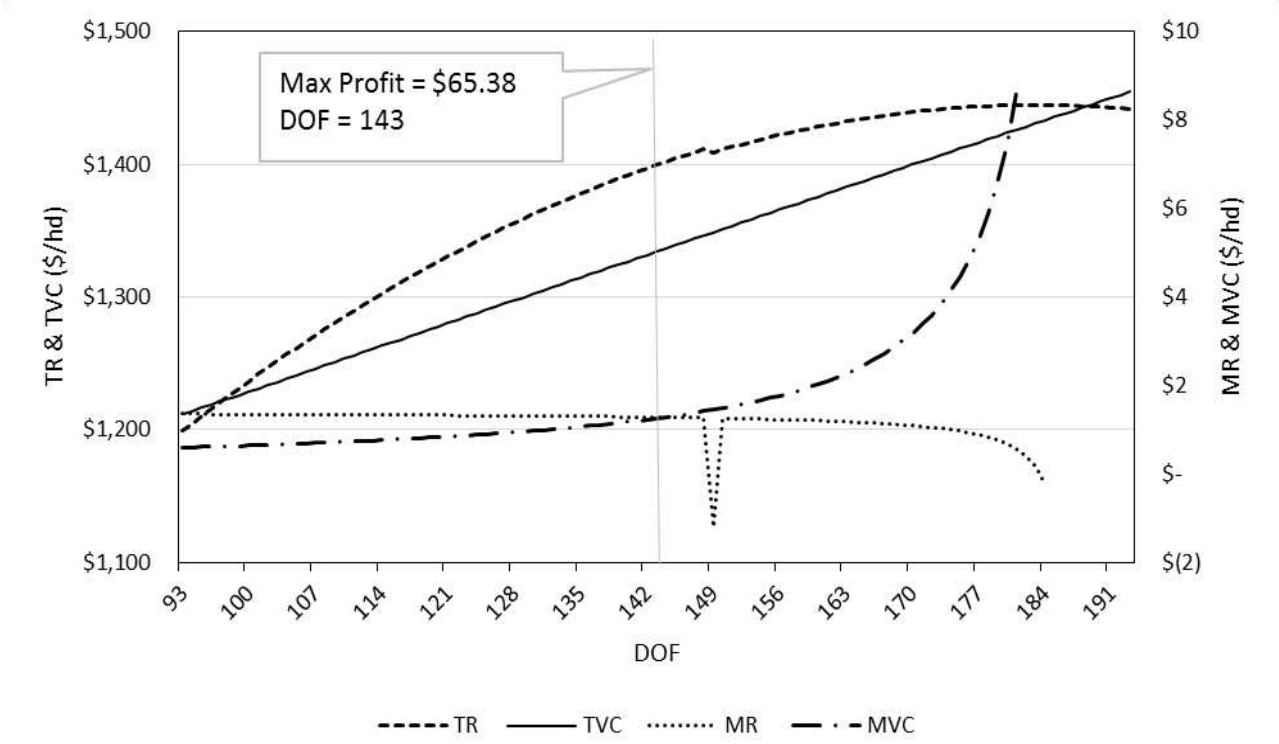


Figure 13. Production Function for Steers Weighing Greater than 800 lbs.

Heifers weighing greater than 750 lbs. maximized their profit at 154 DOF giving this group a profit of $94.94/head, and a final out-weight of 1,291 lbs. Comparing this to the groups' actual average DOF, the production function indicated that this group of heifers need to be fed an additional 20 days to maximize profits. Figure 14 shows the results of the production function for heifers weighing 750 lbs. and greater.

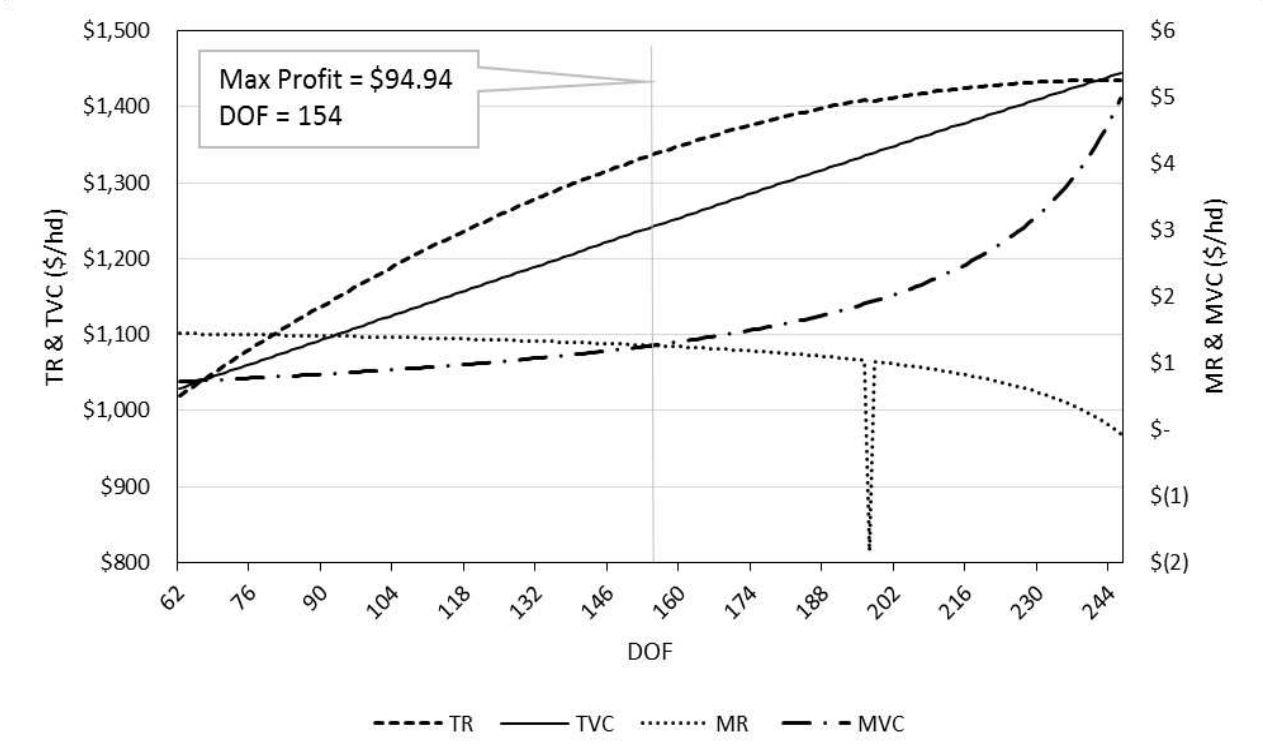


Figure 14. Production Function for Heifers Weighing Greater than 750 lbs.

Given average data from each weight category, the models indicate that lighter-weight cattle that enter the feedlot can be more profitable than cattle with heavier entry weights, holding all else constant. This finding is consistent with previous studies (Lawrence, Wang, & Loy, 1999).

4.5 Market Impacts on Profitability

The final step in this research is to analyze how the optimal days on feed for an animal will change given different entry weights and different market scenarios. Price shocks were entered for the price of corn, feeder cattle, and fed cattle. There were six different shocks given to each of these prices: a 10, 20, and 30 percent price increase and a 10, 20, and 30 percent decrease for the three price categories for each weight category. Each price shock was given to a

single price category at a time while holding the other two price categories constant. All three prices started out using the average prices from 2007 to 2014 for the given data.

It is assumed that most feedlots locked in the corn price at harvest in the fall. This feed cost would be consistent throughout the year and would not change until harvest the following year. Therefore, a change in the price of corn would not have that great of an effect on cattle that are currently being fed, unless the feedlot did custom feeding. With this noted, it was still of interest to look at how a change in the price of corn would affect profitability and how long a manager should feed a pen of cattle.

As shown in Table 13, the average price of corn during this time period was $5.21 per bushel. Given the 10, 20, and 30 percent increase and decrease in corn price, the optimal DOF changed for all four weight categories for steers and heifers. As expected, as the price of corn increased, the DOF decreased with all the weight categories of steers and heifers with the lighter steers and heifers having the largest decrease in DOF. It was found that these lighter steers would be fed up to 19 fewer days and up to 27 fewer days for lighter weight heifers given a 30 percent increase in the corn price. The models also indicate that as the price of corn falls, each weight category should be kept on feed longer with heifers weighing less than 600 lbs. being kept 27 days longer than if the price of corn had not changed. Additionally, the change in the price of corn had a larger impact on profitability of calves that had a lighter in-weight compared to those with a heavier in-weight. This finding is consistent with findings from past studies (Mark, Schroeder, & Jones, 2000).

The next price that was evaluated was FDRP. It was found that as the prices increased and decreased for feeder cattle, there was no change in the number of days that managers should keep the cattle on feed. Results suggest cattle should still be fed to the original optimal DOF

given that the other prices are held constant. These results were the same when using data from each weight category for steers and heifers. Another finding that was consistent with other studies in relation to the impact that FDRP had on profitability was that FDRP had a larger impact on calves that had heavier in-weights (Mark, Schroeder, & Jones, 2000).

Lastly, FEDP was investigated given these percent increases and decreases in prices. As the price increased for fed cattle, feedlot managers would maximize profit if they kept their cattle on feed longer. As the price of fed cattle decreased, the models suggest that cattle should be sold earlier; even up to 34 days earlier, as was the case for steers weighing less than 650 lbs. and up to 52 earlier for heifers weighing in between 600 and 749 lbs. Early 2015 feeder and fed prices were at all-time highs and began to fall in mid-2015. As prices fell, feedlots held onto their cattle longer to try and add additional pounds. In November 2014, steer carcass weights reached record highs and those were reached and exceeded in 2015 (Peel, 2016).

According to the model, feedlot managers may have been more profitable had they sold their fed cattle sooner. However, more research in this area would be beneficial. At this time, feedlot managers were already losing a significant amount of money and the only thing a manager could do was try and find the optimal point where losses were the smallest. Appendix C reports the results of the price shocks for corn, FDRP, and FEDP in each weight category for steers and heifers.

CHAPTER 5 - CONCLUSIONS & IMPLICATIONS

This research suggests that feedlot managers could focus on the following economic factors to increase profitability in their feedlots: feeder cattle price, feed cost, and fed cattle price. The models in this study indicate that these three factors explain over 80% of profitability. These factors are consistent with past studies in what economic factors affect profitability (Langemeier, Schroeder, & Minert, 1992; Schroeder et al., 1993; Lawrence, Wang, & Loy, 1999). One difference that was found in this study that was contradictory to other studies was that fed cattle price did not play as big of a role in explaining profitability for steers weighing less than 650 lbs., and steers weighing 650 to 799 lbs. (Langemeier, Schroeder, & Minert, 1992). Further research in this area needs to be considered.

Feedlot managers should also consider production factors like dry matter conversion, percent Prime and Choice, days on feed, and dark cutters in order to increase profitability. Though this research and others have found how much each variable contributes to profitability, days on feed is the only variable that feedlot managers have complete control over. This study found prices have the largest effect on profitability, but managers can do little other than some risk protection to help with prices. By focusing on these factors, a production function can be created to determine optimal days on feed for profit maximization.

Developing production functions can be advantageous in the feeding industry given they do a good job of reflecting the production of that feedlot. Production functions can help managers assess different areas where they might be able to improve profitability such as narrowing down that optimal time on feed and estimated out-weights. More research needs to be done to compare how well the production function works compared to actual data.

Given average production data and average prices, the production function created for each weight category suggests that feeding cattle longer coordinates with increased profitability. It also suggests that lighter weight calves upon entry into the feedlot have the potential of being more profitable than heavier weight calves at entry. This supports the findings of Lawrence, et al. (1999).

Optimal days on feed and out-weights changed given different market price shocks to corn price, feeder cattle price, and fed cattle price. It was found that as corn prices increase, the number of days on feed that cattle were fed should be shortened, and as corn prices go down, cattle should be fed longer. This is consistent across all weight categories, with lighter weight calves being impacted the most given changes in corn prices. As feeder cattle prices changed, the optimal days on feed remained unchanged. This is true given both increases and decreases in feeder cattle prices. When fed cattle price increased, the results indicate that feedlot managers should feed cattle longer. When fed cattle price decreased, the study suggests that feedlot managers should feed their cattle fewer days. In 2015, fed cattle prices decreased and managers kept their cattle on feed longer to try to sell more pounds. This is contrary to the findings of this study which suggest that managers may have had smaller losses per head, had they fed their cattle for fewer days. This needs further consideration to understand the difference in what the model suggests and the actions actually taken.

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APPENDIX A: FILTERED DATA SUMMARY STATISTICS

Filtered All < 650 Weight Steer Data

Live Production	Unit	Obs	Mean	Std. Dev.	Min	Max
# Head In	#	1,638	183.36	84.83	50.00	580.00
Net Weight	lbs	1,638	230,981.60	107,918.30	63,460.00	744,304.00
Pay Weight	lbs	1,638	113,586.30	53,467.57	29,092.00	350,851.00
In Weight	lbs	1,638	617.80	27.38	510.00	649.00
Total Dry Pounds	lbs	1,638	676,632.20	324,464.60	159,051.00	2,250,799.00
Dry Matter Convertion Dead's In	lbs/hd/day	1,638	5.75	0.37	4.70	6.97
Dry Matter Intake	lbs/hd/day	1,638	18.21	1.06	14.74	21.49
As Fed Intake	lbs/hd/day	1,638	23.24	1.36	18.82	27.43
Head Days		1,638	37,045.79	17,455.00	9,265.00	120,147.00
Average Daily Gain Dead's In	lbs/hd/day	1,638	3.18	0.28	2.31	4.04
Days On Feed	days	1,638	207.51	15.98	159.00	262.00
# Head Sold	#	1,638	179.47	82.44	50.00	565.00
Out Weight	lbs	1,638	1,284.63	59.94	1,096.62	1,461.04
Death Loss	%	1,638	0.02	0.02	-	0.15
Avg Feeding Wt (outwt +inwt)/2	lbs	1,638	951.21	35.84	809.49	1,044.02
Pounds Gained	lbs	1,638	666.83	59.57	487.74	873.84

Carcass Production	Unit	Obs	Mean	Std. Dev.	Min	Max
Hot Carcass Weight	lbs	1,638	836.43	43.34	697.46	956.25
Dressing Percent	%	1,638	0.65	0.01	0.61	0.68
Carcasses > 1000 lbs	%	1,638	0.03	0.04	0.00	0.36
Heavies	%	1,638	0.09	0.10	0.00	0.58
Lites	%	1,638	0.00	0.00	0.00	0.03
Percent Prime & Choice	%	1,638	0.59	0.13	0.05	0.99
Percent Prime	%	1,638	0.02	0.01	0.00	0.05
Percent Choice	%	1,638	0.57	0.13	0.03	0.96
Percent Sel	%	1,638	0.38	0.12	0.01	0.80
Percent Sub Select	%	1,638	0.03	0.03	0.00	0.30
Percent Dark Cutters	%	1,638	0.01	0.02	0.00	0.22
Percent Yield Grade 1 & 2	%	1,638	0.52	0.14	0.03	0.96
Percent Yield Grade 3	%	1,638	0.39	0.10	0.04	0.75
Percent Yield Grade 4 & 5	%	1,638	0.09	0.07	0.00	0.58

Cost Data	Unit	Obs	Mean	Std. Dev.	Min	Max
Feeder Cattle Price	$/cwt	1,638	125.24	18.17	93.28	182.74
Feed Cost	$/lb	1,638	0.09	0.02	0.05	0.13
Feed Cost	$/hd/day	1,638	2.02	0.55	1.07	3.30
Total Variable Cost	$/hd/day	1,638	5.76	1.00	3.55	8.80
Total Variable Cost	$/hd	1,638	1,192.72	216.63	808.54	1,669.79

Revenue Data	Unit	Obs	Mean	Std. Dev.	Min	Max
Fed Cattle Price	$/cwt	1,638	102.85	12.84	79.63	128.74
Total Revenue	$/hd	1,638	1,300.31	178.34	930.05	1,799.06
Total Revenue	$/hd/day	1,638	6.29	0.91	4.15	9.03
Profit	$/hd	1,638	107.59	129.11	-291.31	536.17
Profit	$/hd/day	1,638	0.53	0.64	-1.47	2.39

Premiums & Discounts	Unit	Obs	Mean	Std. Dev.	Min	Max
Carcasses weighting 900-1000 lbs Discount	$/cwt	1,638	-0.14	0.54	-3.32	0.00
Carcasses weighting > 1000 lbs Discount	$/cwt	1,638	-13.79	8.58	-21.00	0.00
Prime Premium	$/cwt	1,638	11.11	2.21	7.41	15.05
Choice Premium & Discount	$/cwt	1,638	0.00	0.00	0.00	0.00
Select Discount	$/cwt	1,638	-6.94	3.78	-19.90	-1.24
Sub Select Discount	$/cwt	1,638	-16.83	6.91	-28.30	0.00
Dark Cutter Discount	$/cwt	1,638	-14.41	15.57	-33.84	0.00
Yield Grade 1 & 2 Premium	$/cwt	1,638	3.13	0.19	2.69	3.43
Percent Yield Grade 3 Discounts	$/cwt	1,638	-0.01	0.03	-0.08	0.00
Percent Yield Grade 4 & 5 Discounts	$/cwt	1,638	-11.41	2.04	-13.91	0.00

Data Received

Filtered 650-799 Weight Steer Data

Live Production	Unit	Obs	Mean	Std. Dev.	Min	Max
# Head In	#	10,708	226.04	89.06	50.00	628.00
Net Weight	lbs	10,708	294,016.00	116,349.30	61,228.00	826,808.00
Pay Weight	lbs	10,708	165,691.60	66,763.26	34,274.00	478,379.00
In Weight	lbs	10,708	731.03	42.85	650.00	799.00
Total Dry Pounds	lbs	10,708	761,907.30	309,879.50	142,953.00	2,306,681.00
Dry Matter Convertion Dead's In	lbs/hd/day	10,708	5.94	0.40	4.64	7.31
Dry Matter Intake	lbs/hd/day	10,708	19.57	1.11	16.04	23.11
As Fed Intake	lbs/hd/day	10,708	24.98	1.42	20.48	29.50
Head Days		10,708	38,967.53	15,779.23	8,005.00	124,022.00
Average Daily Gain Dead's In	lbs/hd/day	10,708	3.31	0.29	2.35	4.27
Days On Feed	days	10,708	177.81	17.65	122.00	234.00
# Head Sold	#	10,708	222.61	87.37	50.00	598.00
Out Weight	lbs	10,708	1,320.15	52.31	1,151.62	1,486.40
Death Loss	%	10,708	0.01	0.01	-	0.13
Avg Feeding Wt (outwt +inwt)/2	lbs	10,708	1,025.59	36.52	908.48	1,139.03
Pounds Gained	lbs	10,708	589.13	61.74	371.63	819.93

Carcass Production	Unit	Obs	Mean	Std. Dev.	Min	Max
Hot Carcass Weight	lbs	10,708	856.17	40.54	729.00	983.23
Dressing Percent	%	10,708	0.65	0.01	0.61	0.68
Carcasses > 1000 lbs	%	10,708	0.04	0.06	0.00	0.47
Heavies	%	10,708	0.10	0.12	0.00	0.73
Lites	%	10,708	0.00	0.00	0.00	0.03
Percent Prime & Choice	%	10,708	0.56	0.13	0.00	1.00
Percent Prime	%	10,708	0.02	0.01	0.00	0.07
Percent Choice	%	10,708	0.54	0.12	0.00	0.97
Percent Sel	%	10,708	0.41	0.11	0.00	0.99
Percent Sub Select	%	10,708	0.03	0.03	0.00	0.36
Percent Dark Cutters	%	10,708	0.01	0.02	0.00	0.38
Percent Yield Grade 1 & 2	%	10,708	0.53	0.12	0.00	0.92
Percent Yield Grade 3	%	10,708	0.39	0.09	0.08	0.99
Percent Yield Grade 4 & 5	%	10,708	0.08	0.05	0.00	0.49

Cost Data	Unit	Obs	Mean	Std. Dev.	Min	Max
Feeder Cattle Price	$/cwt	10,708	120.40	16.83	89.12	171.32
Feed Cost	$/lb	10,708	0.09	0.02	0.05	0.13
Feed Cost	$/hd/day	10,708	2.20	0.59	1.14	3.80
Total Variable Cost	$/hd/day	10,708	7.19	1.28	4.15	11.34
Total Variable Cost	$/hd	10,708	1,270.79	222.07	876.60	1,814.97

Revenue Data	Unit	Obs	Mean	Std. Dev.	Min	Max
Fed Cattle Price	$/cwt	10,708	103.07	12.74	79.49	131.54
Total Revenue	$/hd	10,708	1,332.55	183.62	926.09	1,827.40
Total Revenue	$/hd/day	10,708	7.55	1.15	4.76	11.59
Profit	$/hd	10,708	61.76	129.19	-339.47	464.84
Profit	$/hd/day	10,708	0.36	0.74	-1.78	2.55

Premiums & Discounts	Unit	Obs	Mean	Std. Dev.	Min	Max
Carcasses weighting 900-1000 lbs Discount	$/cwt	10,708	-0.29	0.73	-3.36	0.00
Carcasses weighting > 1000 lbs Discount	$/cwt	10,708	-14.24	8.03	-21.00	0.00
Prime Premium	$/cwt	10,708	10.97	2.06	0.00	15.05
Choice Premium & Discount	$/cwt	10,708	0.00	0.00	0.00	0.00
Select Discount	$/cwt	10,708	-7.45	3.95	-19.90	0.00
Sub Select Discount	$/cwt	10,708	-17.84	6.38	-28.30	0.00
Dark Cutter Discount	$/cwt	10,708	-17.10	15.61	-33.84	0.00
Yield Grade 1 & 2 Premium	$/cwt	10,708	3.12	0.20	0.00	3.43
Percent Yield Grade 3 Discounts	$/cwt	10,708	-0.01	0.03	-0.08	0.00
Percent Yield Grade 4 & 5 Discounts	$/cwt	10,708	-11.64	1.45	-13.91	0.00

Data Received

Filtered ≥ 800 Weight Steer Data

Live Production	Unit	Obs	Mean	Std. Dev.	Min	Max
# Head In	#	13,208	234.77	90.66	50.00	609.00
Net Weight	lbs	13,208	316,364.80	123,444.50	65,079.00	873,086.00
Pay Weight	lbs	13,208	207,040.10	81,424.75	41,290.00	598,043.00
In Weight	lbs	13,208	882.72	53.48	800.00	1,000.00
Total Dry Pounds	lbs	13,208	677,063.90	283,320.30	106,932.00	2,006,610.00
Dry Matter Convertion Dead's In	lbs/hd/day	13,208	6.20	0.47	4.73	7.80
Dry Matter Intake	lbs/hd/day	13,208	21.59	1.41	17.17	26.04
As Fed Intake	lbs/hd/day	13,208	27.56	1.80	21.92	33.24
Head Days		13,208	31,433.83	13,058.52	5,304.00	91,092.00
Average Daily Gain Dead's In	lbs/hd/day	13,208	3.50	0.34	2.43	4.61
Days On Feed	days	13,208	137.25	17.80	86.00	195.00
# Head Sold	#	13,208	232.55	89.63	50.00	600.00
Out Weight	lbs	13,208	1,359.30	48.64	1,204.77	1,515.95
Death Loss	%	13,208	0.01	0.01	-	0.10
Avg Feeding Wt (outwt +inwt)/2	lbs	13,208	1,121.01	41.57	1,006.25	1,255.48
Pounds Gained	lbs	13,208	476.58	59.48	282.07	687.68

Carcass Production	Unit	Obs	Mean	Std. Dev.	Min	Max
Hot Carcass Weight	lbs	13,208	871.42	37.06	755.57	987.28
Dressing Percent	%	13,208	0.64	0.01	0.61	0.67
Carcasses > 1000 lbs	%	13,208	0.04	0.06	0.00	0.46
Heavies	%	13,208	0.11	0.13	0.00	0.74
Lites	%	13,208	0.00	0.00	0.00	0.04
Percent Prime & Choice	%	13,208	0.52	0.14	0.04	1.00
Percent Prime	%	13,208	0.02	0.01	0.00	0.08
Percent Choice	%	13,208	0.50	0.13	0.04	0.97
Percent Sel	%	13,208	0.45	0.12	0.00	0.85
Percent Sub Select	%	13,208	0.03	0.03	0.00	0.50
Percent Dark Cutters	%	13,208	0.01	0.02	0.00	0.35
Percent Yield Grade 1 & 2	%	13,208	0.57	0.14	0.02	0.96
Percent Yield Grade 3	%	13,208	0.37	0.11	0.04	0.82
Percent Yield Grade 4 & 5	%	13,208	0.06	0.05	0.00	0.47

Cost Data	Unit	Obs	Mean	Std. Dev.	Min	Max
Feeder Cattle Price	$/cwt	13,208	111.79	15.01	81.83	144.50
Feed Cost	$/lb	13,208	0.09	0.02	0.05	0.13
Feed Cost	$/hd/day	13,208	2.44	0.67	1.22	4.23
Total Variable Cost	$/hd/day	13,208	9.77	1.96	5.29	17.06
Total Variable Cost	$/hd	13,208	1,320.22	213.05	878.31	1,878.09

Revenue Data	Unit	Obs	Mean	Std. Dev.	Min	Max
Fed Cattle Price	$/cwt	13,208	102.72	13.23	79.49	133.26
Total Revenue	$/hd	13,208	1,361.69	187.41	975.28	1,958.40
Total Revenue	$/hd/day	13,208	10.08	1.88	5.46	17.94
Profit	$/hd	13,208	41.47	117.59	-416.28	464.99
Profit	$/hd/day	13,208	0.31	0.86	-2.46	3.16

Premiums & Discounts	Unit	Obs	Mean	Std. Dev.	Min	Max
Carcasses weighting 900-1000 lbs Discount	$/cwt	13,208	-0.46	0.88	-3.36	0.00
Carcasses weighting > 1000 lbs Discount	$/cwt	13,208	-14.45	7.93	-21.00	0.00
Prime Premium	$/cwt	13,208	11.00	2.11	7.41	15.05
Choice Premium & Discount	$/cwt	13,208	0.00	0.00	0.00	0.00
Select Discount	$/cwt	13,208	-7.99	4.14	-19.90	0.00
Sub Select Discount	$/cwt	13,208	-18.55	6.05	-28.30	0.00
Dark Cutter Discount	$/cwt	13,208	-13.42	15.58	-33.84	0.00
Yield Grade 1 & 2 Premium	$/cwt	13,208	3.12	0.20	2.69	3.43
Percent Yield Grade 3 Discounts	$/cwt	13,208	-0.01	0.03	-0.08	0.00
Percent Yield Grade 4 & 5 Discounts	$/cwt	13,208	-11.42	2.12	-13.91	0.00

Data Received

Filtered All Weights Heifers

Live Production	Unit	Obs	Mean	Std. Dev.	Min	Max
# Head In	#	7,662	201.44	92.18	50.00	600.00
Net Weight	lbs	7,662	237,854.40	110,885.50	53,713.00	796,595.00
Pay Weight	lbs	7,662	149,388.30	73,075.97	27,754.00	551,222.00
In Weight	lbs	7,662	736.28	87.91	460.00	955.00
Total Dry Pounds	lbs	7,662	564,520.50	276,774.90	94,218.00	2,000,735.00
Dry Matter Convertion Dead's In	lbs/hd/day	7,662	6.37	0.53	4.80	8.46
Dry Matter Intake	lbs/hd/day	7,662	19.09	1.72	14.02	24.64
As Fed Intake	lbs/hd/day	7,662	24.36	2.19	17.90	31.45
Head Days		7,662	29,711.33	14,665.68	5,039.00	107,596.00
Average Daily Gain Dead's In	lbs/hd/day	7,662	3.01	0.31	2.07	4.16
Days On Feed	days	7,662	152.08	25.37	89.00	265.00
# Head Sold	#	7,662	198.53	90.64	50.00	596.00
Out Weight	lbs	7,662	1,194.76	68.74	991.64	1,429.12
Death Loss	%	7,662	0.01	0.01	-	0.12
Avg Feeding Wt (outwt +inwt)/2	lbs	7,662	965.52	70.75	737.04	1,182.56
Pounds Gained	lbs	7,662	458.49	69.91	223.70	756.58

Carcass Production	Unit	Obs	Mean	Std. Dev.	Min	Max
Hot Carcass Weight	lbs	7,662	771.17	48.37	632.00	934.27
Dressing Percent	%	7,662	0.64	0.01	0.59	0.69
Carcasses > 1000 lbs	%	7,662	0.01	0.02	0.00	0.22
Heavies	%	7,662	0.02	0.04	0.00	0.44
Lites	%	7,662	0.00	0.01	0.00	0.19
Percent Prime & Choice	%	7,662	0.62	0.13	0.08	0.99
Percent Prime	%	7,662	0.02	0.01	0.00	0.08
Percent Choice	%	7,662	0.60	0.13	0.05	0.98
Percent Sel	%	7,662	0.35	0.12	0.01	0.85
Percent Sub Select	%	7,662	0.04	0.04	0.00	0.33
Percent Dark Cutters	%	7,662	0.01	0.02	0.00	0.34
Percent Yield Grade 1 & 2	%	7,662	0.55	0.15	0.04	0.98
Percent Yield Grade 3	%	7,662	0.37	0.11	0.02	0.83
Percent Yield Grade 4 & 5	%	7,662	0.08	0.06	0.00	0.60

Cost Data	Unit	Obs	Mean	Std. Dev.	Min	Max
Feeder Cattle Price	$/cwt	7,662	110.99	15.33	77.29	162.71
Feed Cost	$/lb	7,662	0.09	0.02	0.05	0.13
Feed Cost	$/hd/day	7,662	2.20	0.60	0.98	3.93
Total Variable Cost	$/hd/day	7,662	7.74	1.79	3.10	14.19
Total Variable Cost	$/hd	7,662	1,148.53	204.63	691.53	1,702.30

Revenue Data	Unit	Obs	Mean	Std. Dev.	Min	Max
Fed Cattle Price	$/cwt	7,662	103.76	13.10	79.57	132.90
Total Revenue	$/hd	7,662	1,223.71	187.87	828.61	1,827.70
Total Revenue	$/hd/day	7,662	8.26	1.83	3.77	15.00
Profit	$/hd	7,662	75.18	107.14	-313.02	396.36
Profit	$/hd/day	7,662	0.52	0.74	-2.06	3.52

Premiums & Discounts	Unit	Obs	Mean	Std. Dev.	Min	Max
Carcasses weighting 900-1000 lbs Discount	$/cwt	7,662	-0.01	0.15	-2.47	0.00
Carcasses weighting > 1000 lbs Discount	$/cwt	7,662	-5.04	8.19	-21.00	0.00
Prime Premium	$/cwt	7,662	11.12	2.08	7.41	15.05
Choice Premium & Discount	$/cwt	7,662	0.00	0.00	0.00	0.00
Select Discount	$/cwt	7,662	-7.74	4.20	-19.90	-1.24
Sub Select Discount	$/cwt	7,662	-18.06	6.53	-28.30	0.00
Dark Cutter Discount	$/cwt	7,662	-17.53	15.56	-33.84	0.00
Yield Grade 1 & 2 Premium	$/cwt	7,662	3.11	0.21	2.69	3.43
Percent Yield Grade 3 Discounts	$/cwt	7,662	-0.01	0.03	-0.08	0.00
Percent Yield Grade 4 & 5 Discounts	$/cwt	7,662	-11.51	1.78	-13.91	0.00

Data Received

Filtered < 600 Heifers Data

Live Production	Unit	Obs	Mean	Std. Dev.	Min	Max
# Head In	#	400	160.72	70.53	52.00	373.00
Net Weight	lbs	400	177,803.30	79,419.85	57,627.00	445,526.00
Pay Weight	lbs	400	90,698.09	40,875.97	27,754.00	214,854.00
In Weight	lbs	400	563.07	32.59	460.00	599.00
Total Dry Pounds	lbs	400	524,083.50	243,924.90	165,272.00	1,511,842.00
Dry Matter Convertion Dead's In	lbs/hd/day	400	6.00	0.37	5.01	6.97
Dry Matter Intake	lbs/hd/day	400	16.75	1.23	14.02	20.28
As Fed Intake	lbs/hd/day	400	21.39	1.57	17.90	25.89
Head Days		400	31,292.25	14,349.52	10,088.00	85,869.00
Average Daily Gain Dead's In	lbs/hd/day	400	2.80	0.27	2.10	3.51
Days On Feed	days	400	199.66	19.02	147.00	265.00
# Head Sold	#	400	157.67	69.27	52.00	366.00
Out Weight	lbs	400	1,128.04	53.92	991.64	1,262.56
Death Loss	%	400	0.02	0.02	-	0.12
Avg Feeding Wt (outwt +inwt)/2	lbs	400	845.55	36.03	737.04	925.98
Pounds Gained	lbs	400	564.97	52.40	394.64	756.58

Carcass Production	Unit	Obs	Mean	Std. Dev.	Min	Max
Hot Carcass Weight	lbs	400	733.55	40.59	635.28	835.73
Dressing Percent	%	400	0.65	0.01	0.61	0.67
Carcasses > 1000 lbs	%	400	0.00	0.01	0.00	0.04
Heavies	%	400	0.01	0.01	0.00	0.08
Lites	%	400	0.01	0.03	0.00	0.19
Percent Prime & Choice	%	400	0.64	0.15	0.10	0.99
Percent Prime	%	400	0.01	0.01	0.00	0.05
Percent Choice	%	400	0.62	0.16	0.09	0.97
Percent Sel	%	400	0.33	0.14	0.01	0.81
Percent Sub Select	%	400	0.03	0.03	0.00	0.16
Percent Dark Cutters	%	400	0.01	0.02	0.00	0.16
Percent Yield Grade 1 & 2	%	400	0.54	0.15	0.08	0.96
Percent Yield Grade 3	%	400	0.37	0.10	0.04	0.70
Percent Yield Grade 4 & 5	%	400	0.09	0.06	0.00	0.44

Cost Data	Unit	Obs	Mean	Std. Dev.	Min	Max
Feeder Cattle Price	$/cwt	400	118.24	16.74	85.18	162.71
Feed Cost	$/lb	400	0.09	0.02	0.05	0.13
Feed Cost	$/hd/day	400	1.91	0.54	0.98	3.12
Total Variable Cost	$/hd/day	400	5.27	0.99	3.10	7.83
Total Variable Cost	$/hd	400	1,047.88	198.72	691.53	1,486.83

Revenue Data	Unit	Obs	Mean	Std. Dev.	Min	Max
Fed Cattle Price	$/cwt	400	103.06	12.70	80.27	126.52
Total Revenue	$/hd	400	1,152.43	169.57	847.66	1,478.57
Total Revenue	$/hd/day	400	5.80	0.85	3.77	7.80
Profit	$/hd	400	104.55	104.87	-143.91	396.20
Profit	$/hd/day	400	0.53	0.52	-0.63	2.06

Premiums & Discounts	Unit	Obs	Mean	Std. Dev.	Min	Max
Carcasses weighting 900-1000 lbs Discount	$/cwt	400	0.00	0.00	0.00	0.00
Carcasses weighting > 1000 lbs Discount	$/cwt	400	-3.49	7.30	-20.90	0.00
Prime Premium	$/cwt	400	11.15	2.15	7.41	15.05
Choice Premium & Discount	$/cwt	400	0.00	0.00	0.00	0.00
Select Discount	$/cwt	400	-7.06	3.88	-19.90	-2.17
Sub Select Discount	$/cwt	400	-15.98	7.70	-28.30	0.00
Dark Cutter Discount	$/cwt	400	-17.30	15.45	-33.42	0.00
Yield Grade 1 & 2 Premium	$/cwt	400	3.09	0.21	2.69	3.43
Percent Yield Grade 3 Discounts	$/cwt	400	-0.02	0.03	-0.08	0.00
Percent Yield Grade 4 & 5 Discounts	$/cwt	400	-11.39	2.29	-13.91	0.00

Data Received

Filtered 600-749 Weight Heifers Data

Live Production	Unit	Obs	Mean	Std. Dev.	Min	Max
# Head In	#	3,900	197.50	92.71	50.00	600.00
Net Weight	lbs	3,900	226,619.40	106,041.40	53,713.00	700,431.00
Pay Weight	lbs	3,900	134,886.20	64,253.80	32,343.00	410,604.00
In Weight	lbs	3,900	682.00	37.67	600.00	749.00
Total Dry Pounds	lbs	3,900	573,283.10	283,054.30	131,070.00	1,951,381.00
Dry Matter Convertion Dead's In	lbs/hd/day	3,900	6.22	0.43	4.87	7.65
Dry Matter Intake	lbs/hd/day	3,900	18.30	1.21	14.57	21.99
As Fed Intake	lbs/hd/day	3,900	23.36	1.55	18.60	28.07
Head Days		3,900	31,386.30	15,539.06	6,874.00	107,596.00
Average Daily Gain Dead's In	lbs/hd/day	3,900	2.95	0.27	2.11	3.80
Days On Feed	days	3,900	162.66	17.85	116.00	220.00
# Head Sold	#	3,900	194.26	90.72	50.00	588.00
Out Weight	lbs	3,900	1,166.31	54.05	1,004.16	1,336.89
Death Loss	%	3,900	0.02	0.01	-	0.12
Avg Feeding Wt (outwt +inwt)/2	lbs	3,900	924.16	37.66	803.08	1,037.71
Pounds Gained	lbs	3,900	484.31	54.84	299.66	682.67

Carcass Production	Unit	Obs	Mean	Std. Dev.	Min	Max
Hot Carcass Weight	lbs	3,900	755.24	41.72	632.00	897.95
Dressing Percent	%	3,900	0.65	0.01	0.61	0.68
Carcasses > 1000 lbs	%	3,900	0.00	0.01	0.00	0.12
Heavies	%	3,900	0.01	0.02	0.00	0.24
Lites	%	3,900	0.00	0.01	0.00	0.12
Percent Prime & Choice	%	3,900	0.62	0.13	0.08	0.99
Percent Prime	%	3,900	0.02	0.01	0.00	0.07
Percent Choice	%	3,900	0.60	0.13	0.05	0.96
Percent Sel	%	3,900	0.35	0.12	0.01	0.85
Percent Sub Select	%	3,900	0.04	0.03	0.00	0.28
Percent Dark Cutters	%	3,900	0.01	0.03	0.00	0.34
Percent Yield Grade 1 & 2	%	3,900	0.55	0.14	0.05	0.98
Percent Yield Grade 3	%	3,900	0.36	0.10	0.02	0.75
Percent Yield Grade 4 & 5	%	3,900	0.08	0.06	0.00	0.56

Cost Data	Unit	Obs	Mean	Std. Dev.	Min	Max
Feeder Cattle Price	$/cwt	3,900	112.50	15.56	81.31	152.29
Feed Cost	$/lb	3,900	0.09	0.02	0.05	0.13
Feed Cost	$/hd/day	3,900	2.08	0.55	1.03	3.41
Total Variable Cost	$/hd/day	3,900	6.83	1.13	3.91	10.20
Total Variable Cost	$/hd	3,900	1,107.82	198.92	756.29	1,589.07

Revenue Data	Unit	Obs	Mean	Std. Dev.	Min	Max
Fed Cattle Price	$/cwt	3,900	103.07	13.02	79.57	129.69
Total Revenue	$/hd	3,900	1,186.79	177.12	828.61	1,629.17
Total Revenue	$/hd/day	3,900	7.34	1.11	4.39	10.84
Profit	$/hd	3,900	78.97	104.50	-270.82	390.90
Profit	$/hd/day	3,900	0.51	0.66	-1.56	2.44

Premiums & Discounts	Unit	Obs	Mean	Std. Dev.	Min	Max
Carcasses weighting 900-1000 lbs Discount	$/cwt	3,900	0.00	0.00	0.00	0.00
Carcasses weighting > 1000 lbs Discount	$/cwt	3,900	-3.66	7.35	-21.00	0.00
Prime Premium	$/cwt	3,900	11.00	2.09	7.41	15.05
Choice Premium & Discount	$/cwt	3,900	0.00	0.00	0.00	0.00
Select Discount	$/cwt	3,900	-7.54	3.96	-19.90	-1.24
Sub Select Discount	$/cwt	3,900	-17.80	6.55	-28.30	0.00
Dark Cutter Discount	$/cwt	3,900	-18.59	15.38	-33.84	0.00
Yield Grade 1 & 2 Premium	$/cwt	3,900	3.12	0.20	2.69	3.43
Percent Yield Grade 3 Discounts	$/cwt	3,900	-0.01	0.03	-0.08	0.00
Percent Yield Grade 4 & 5 Discounts	$/cwt	3,900	-11.57	1.61	-13.91	0.00

Data Received

Filtered ≥ 750 Weight Heifers Data

Live Production	Unit	Obs	Mean	Std. Dev.	Min	Max
# Head In	#	3,362	210.86	92.20	50.00	600.00
Net Weight	lbs	3,362	258,032.10	115,108.20	56,340.00	796,595.00
Pay Weight	lbs	3,362	173,193.80	77,223.68	37,585.00	551,222.00
In Weight	lbs	3,362	819.85	43.22	750.00	955.00
Total Dry Pounds	lbs	3,362	559,166.70	272,562.00	94,218.00	2,000,735.00
Dry Matter Convertion Dead's In	lbs/hd/day	3,362	6.58	0.57	4.80	8.46
Dry Matter Intake	lbs/hd/day	3,362	20.28	1.42	15.77	24.64
As Fed Intake	lbs/hd/day	3,362	25.89	1.82	20.13	31.45
Head Days		3,362	27,580.24	13,326.68	5,039.00	100,097.00
Average Daily Gain Dead's In	lbs/hd/day	3,362	3.11	0.33	2.07	4.16
Days On Feed	days	3,362	134.15	18.27	89.00	192.00
# Head Sold	#	3,362	208.34	91.06	50.00	596.00
Out Weight	lbs	3,362	1,235.71	62.38	1,042.26	1,429.12
Death Loss	%	3,362	0.01	0.01	-	0.09
Avg Feeding Wt (outwt +inwt)/2	lbs	3,362	1,027.78	45.09	898.98	1,182.56
Pounds Gained	lbs	3,362	415.86	58.18	223.70	606.01

Carcass Production	Unit	Obs	Mean	Std. Dev.	Min	Max
Hot Carcass Weight	lbs	3,362	794.12	46.12	660.00	934.27
Dressing Percent	%	3,362	0.64	0.01	0.59	0.69
Carcasses > 1000 lbs	%	3,362	0.01	0.02	0.00	0.22
Heavies	%	3,362	0.03	0.06	0.00	0.44
Lites	%	3,362	0.00	0.00	0.00	0.07
Percent Prime & Choice	%	3,362	0.62	0.13	0.09	0.99
Percent Prime	%	3,362	0.02	0.01	0.00	0.08
Percent Choice	%	3,362	0.59	0.13	0.06	0.98
Percent Sel	%	3,362	0.34	0.12	0.01	0.84
Percent Sub Select	%	3,362	0.04	0.04	0.00	0.33
Percent Dark Cutters	%	3,362	0.01	0.02	0.00	0.19
Percent Yield Grade 1 & 2	%	3,362	0.54	0.16	0.04	0.97
Percent Yield Grade 3	%	3,362	0.38	0.12	0.03	0.83
Percent Yield Grade 4 & 5	%	3,362	0.07	0.06	0.00	0.60

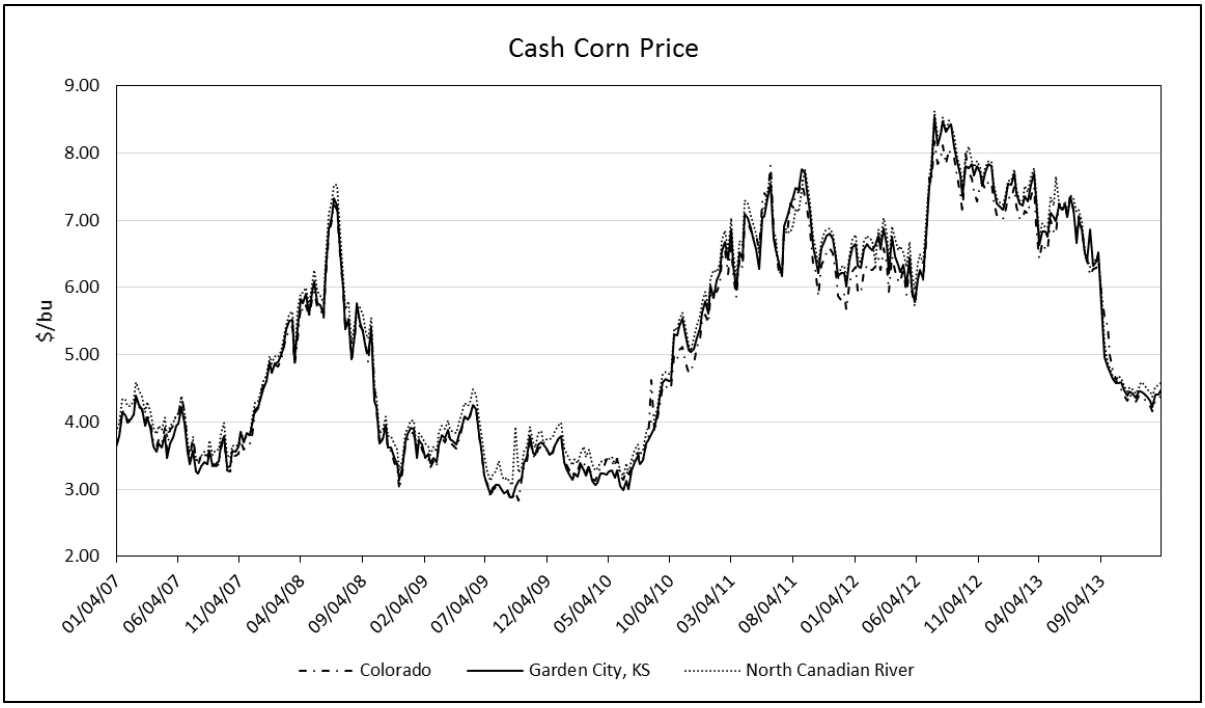
Cost Data	Unit	Obs	Mean	Std. Dev.	Min	Max
Feeder Cattle Price	$/cwt	3,362	108.38	14.34	77.29	140.49
Feed Cost	$/lb	3,362	0.09	0.02	0.05	0.13
Feed Cost	$/hd/day	3,362	2.38	0.61	1.21	3.93
Total Variable Cost	$/hd/day	3,362	9.09	1.50	5.24	14.19
Total Variable Cost	$/hd	3,362	1,207.73	195.50	794.60	1,702.30

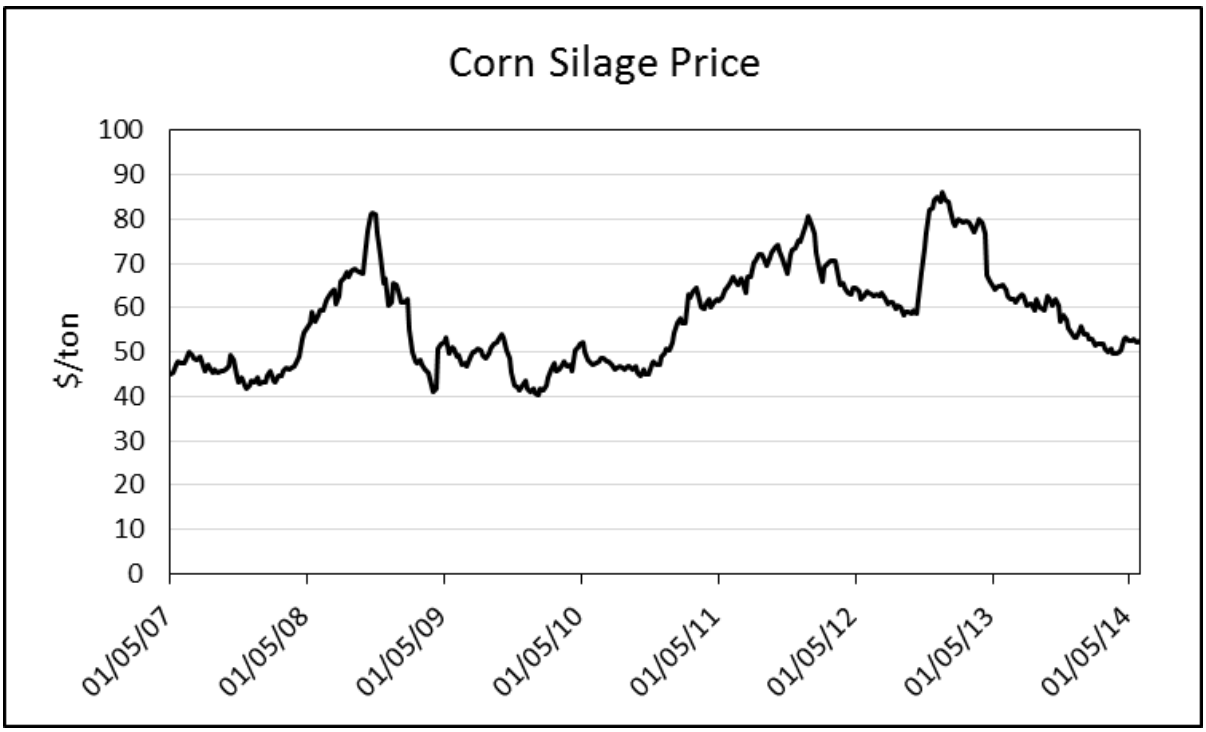
Revenue Data	Unit	Obs	Mean	Std. Dev.	Min	Max
Fed Cattle Price	$/cwt	3,362	104.64	13.19	79.57	132.90
Total Revenue	$/hd	3,362	1,275.02	189.27	900.21	1,827.70
Total Revenue	$/hd/day	3,362	9.62	1.60	5.43	15.00
Profit	$/hd	3,362	67.30	109.60	-313.02	396.36
Profit	$/hd/day	3,362	0.53	0.84	-2.06	3.52

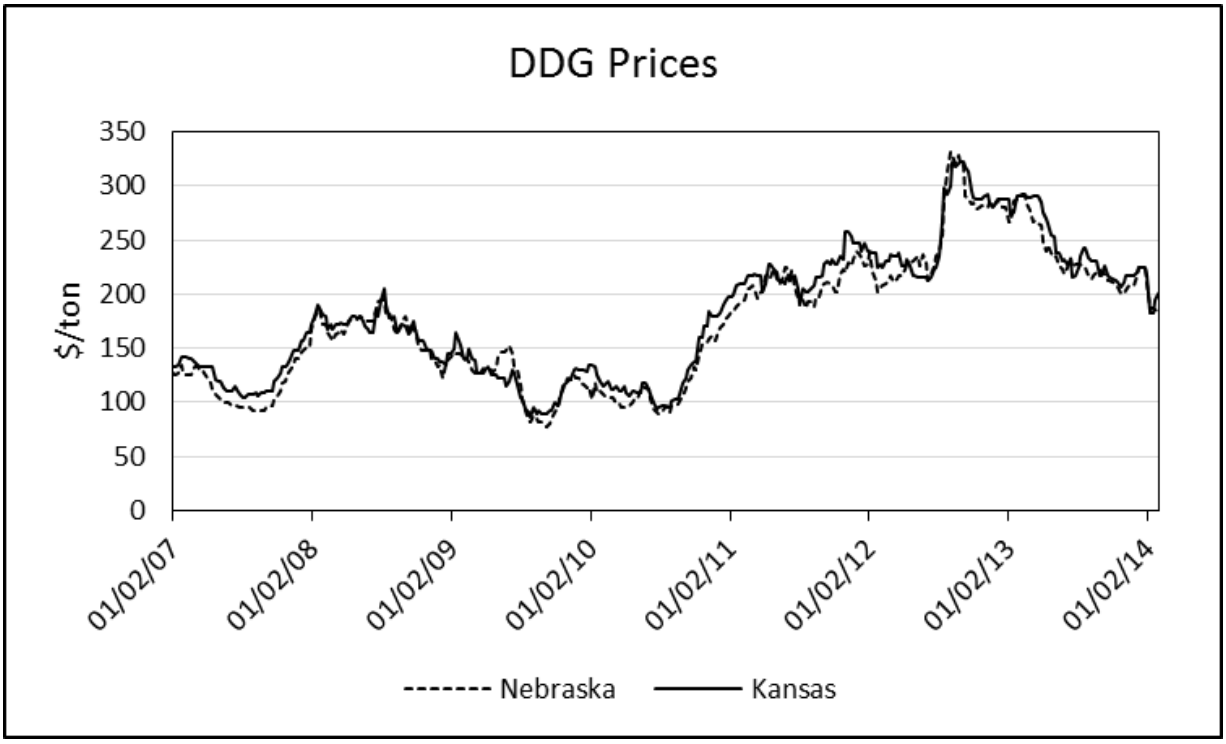
Premiums & Discounts	Unit	Obs	Mean	Std. Dev.	Min	Max
Carcasses weighting 900-1000 lbs Discount	$/cwt	3,362	-0.03	0.23	-2.47	0.00
Carcasses weighting > 1000 lbs Discount	$/cwt	3,362	-6.82	8.86	-21.00	0.00
Prime Premium	$/cwt	3,362	11.25	2.06	7.41	15.05
Choice Premium & Discount	$/cwt	3,362	0.00	0.00	0.00	0.00
Select Discount	$/cwt	3,362	-8.04	4.46	-19.90	-1.24
Sub Select Discount	$/cwt	3,362	-18.60	6.28	-28.30	0.00
Dark Cutter Discount	$/cwt	3,362	-16.32	15.69	-33.84	0.00
Yield Grade 1 & 2 Premium	$/cwt	3,362	3.10	0.21	2.69	3.43
Percent Yield Grade 3 Discounts	$/cwt	3,362	-0.01	0.03	-0.08	0.00
Percent Yield Grade 4 & 5 Discounts	$/cwt	3,362	-11.45	1.90	-13.91	0.00

Data Received

APPENDIX B: RATION INGREDIENT PRICES






DDG Prices
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200
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100
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01/02/08
01/02/09
01/02/10
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01/02/12
01/02/13
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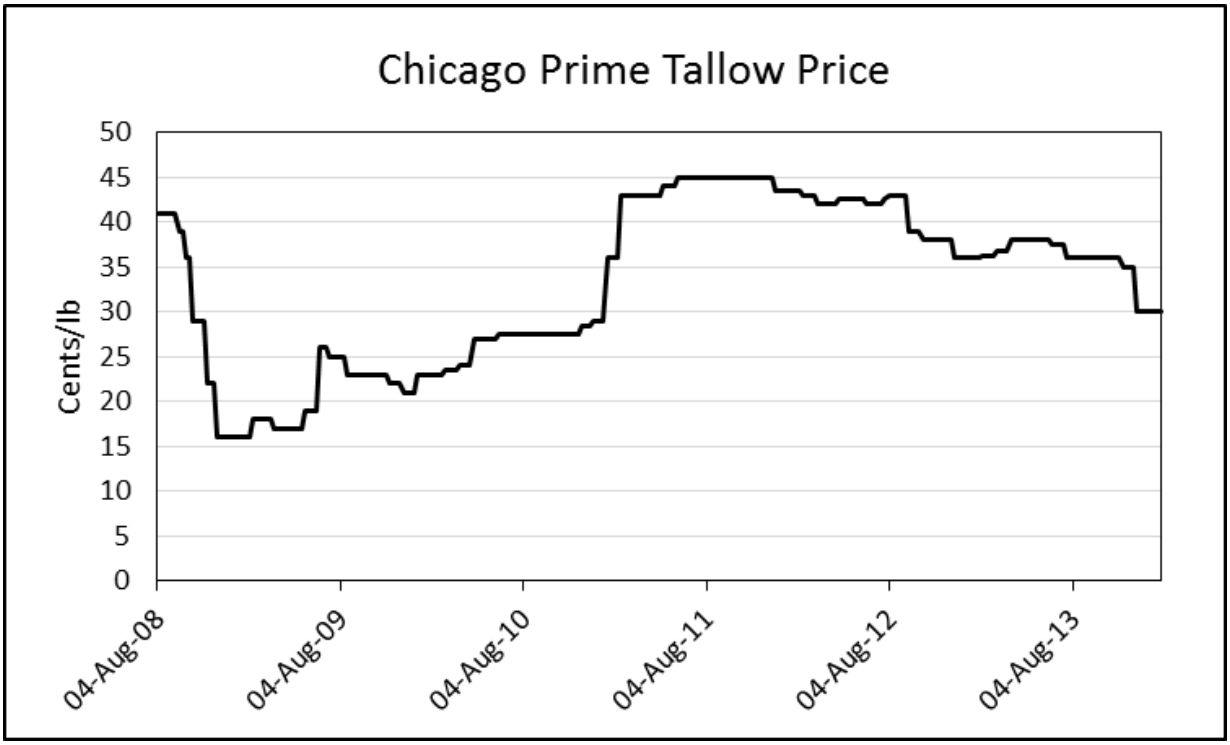
Nebraska
Kansas


Chicago Prime Tallow Price
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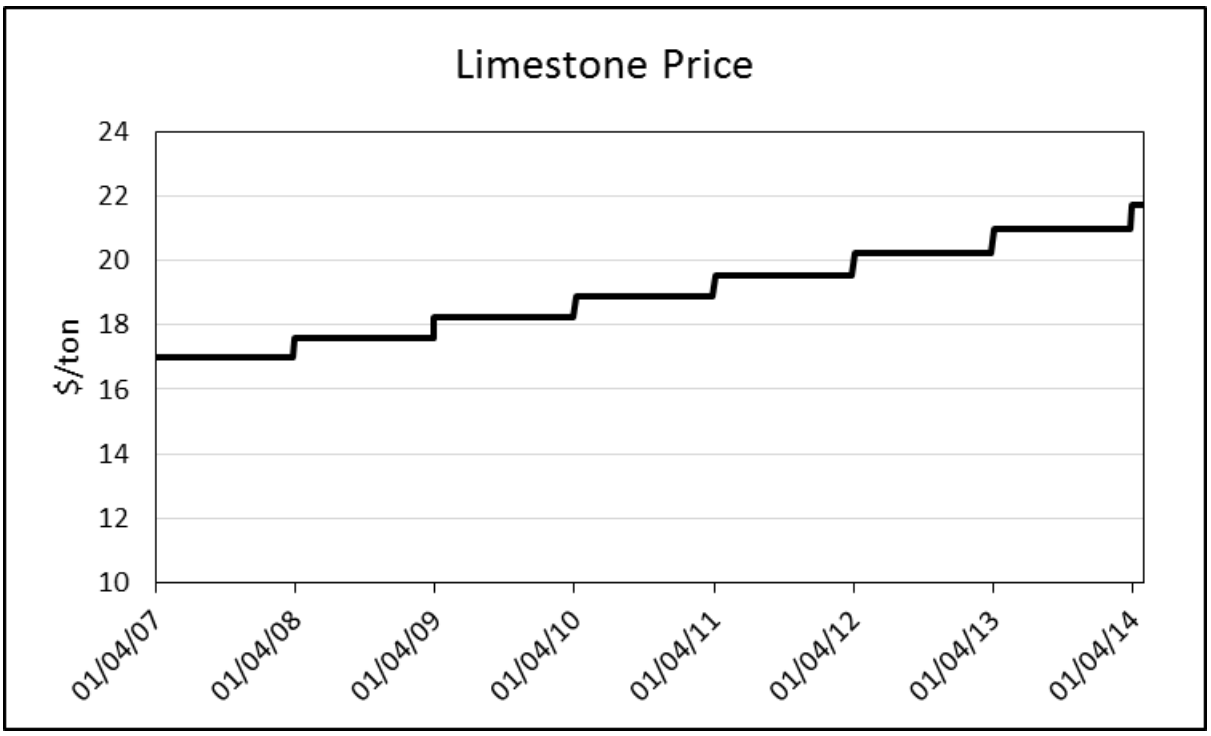
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16
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01/04/12
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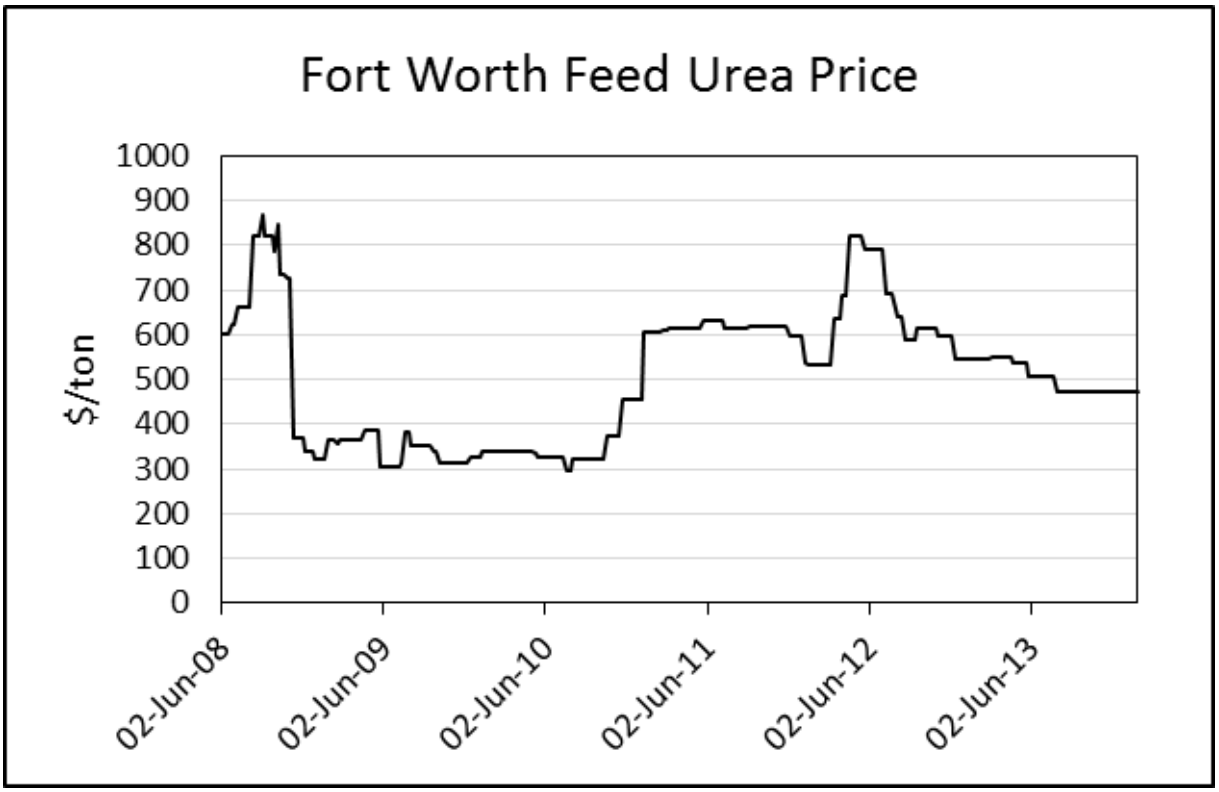
01/04/14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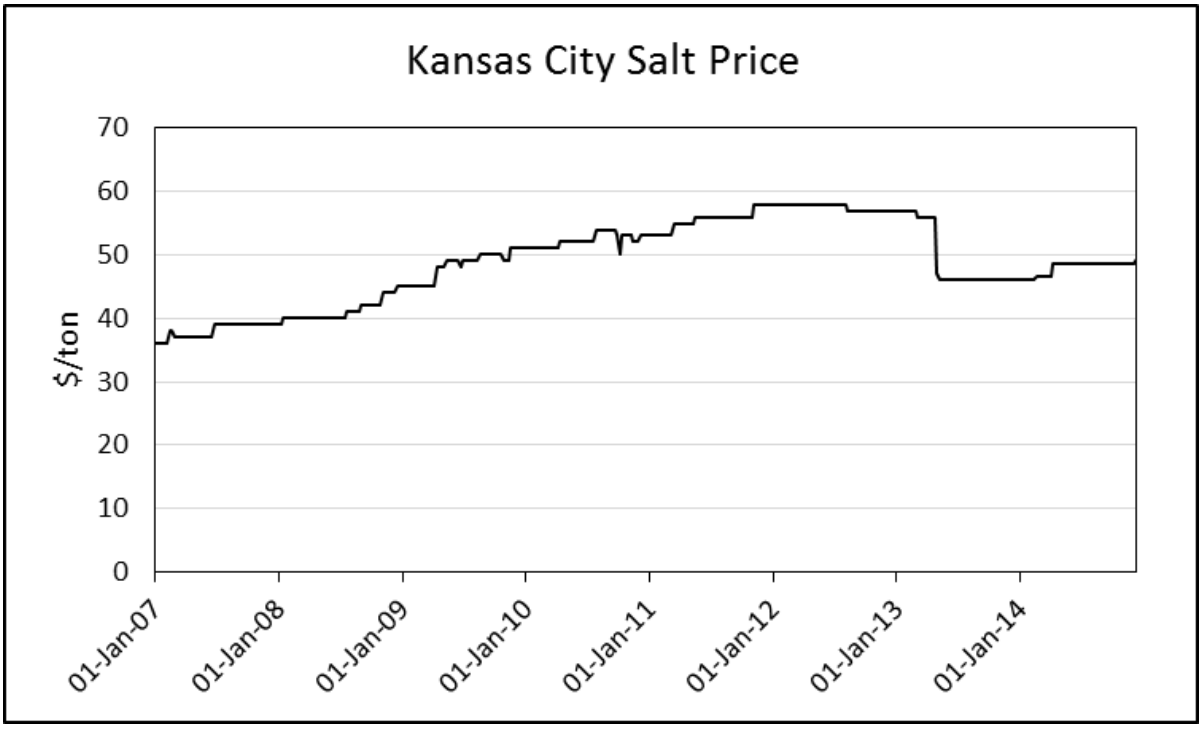
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01-Jan-11
01-Jan-12
01-Jan-13
01-Jan-14

APPENDIX C: OPTIMAL DOF GIVEN CHANGES IN MARKET PRICES

All Weights Steers Optimal DOF Given Different Market Prices							
	Averages	+10%	+ 20%	+30%	-10%	-20%	-30%
fed Price ($/cwt)	$ 102.87	$ 113.16	$ 123.44	$ 133.73	$ 92.58	$ 82.30	$ 72.01
fdr price ($/cwt)	$ 116.26	$ 127.89	$ 139.51	$ 151.14	$ 104.63	$ 93.01	$ 81.38
corn price ($/bu)	$ 5.21	$ 5.73	$ 6.25	$ 6.77	$ 4.69	$ 4.17	$ 3.65
	Opt. w/ Avg	CORNP +10%	CORNP +20%	CORNP +30%	CORNP -10%	CORNP -20%	CORNP -30%
Max Profit	$ 77.03	$ 44.64	$ 12.97	$ (18.01)	$ 110.11	$ 143.82	$ 177.62
DOF	169	166	162	158	173	175	175
OutWt (lbs)	1,372	1,365	1,356	1,345	1,380	1,384	1,384
	Opt. w/ Avg	FDRP +10%	FDRP +20%	FDRP +30%	FDRP -10%	FDRP -20%	FDRP -30%
Max Profit	$ 77.03	$ (16.27)	$ (109.48)	$ (202.77)	$ 170.32	$ 263.53	$ 356.82
DOF	169	169	169	169	169	169	169
OutWt (lbs)	1,372	1,372	1,372	1,372	1,372	1,372	1,372
	Opt. w/ Avg	FEDP +10%	FEDP +20%	FEDP +30%	FEDP -10%	FEDP -20%	FEDP -30%
Max Profit	$ 77.03	$ 218.70	$ 360.87	$ 503.27	$ (63.71)	$ (202.99)	$ (340.48)
DOF	169	173	175	175	165	159	151
OutWt (lbs)	1,372	1,380	1,384	1,384	1,363	1,348	1,325

< 650 Weight Steers Optimal DOF Given Different Market Prices							
	Averages	+10%	+ 20%	+30%	-10%	-20%	-30%
fed Price ($/cwt)	$ 102.85	$ 113.14	$ 123.42	$ 133.71	$ 92.57	$ 82.28	$ 72.00
fdr price ($/cwt)	$ 125.24	$ 137.76	$ 150.29	$ 162.81	$ 112.72	$ 100.19	$ 87.67
corn price ($/bu)	$ 5.21	$ 5.73	$ 6.25	$ 6.77	$ 4.69	$ 4.17	$ 3.65
	Opt. w/ Avg	CORNP +10%	CORNP +20%	CORNP +30%	CORNP -10%	CORNP -20%	CORNP -30%
Max Profit	$ 130.67	$ 89.88	$ 50.22	$ 11.69	$ 171.95	$ 214.32	$ 258.43
DOF	238	232	225	219	238	251	258
OutWt (lbs)	1,366	1,353	1,337	1,322	1,366	1,390	1,401
	Opt. w/ Avg	FDRP +10%	FDRP +20%	FDRP +30%	FDRP -10%	FDRP -20%	FDRP -30%
Max Profit	$ 130.67	$ 53.32	$ (24.09)	$ (101.44)	$ 208.02	$ 285.43	$ 362.78
DOF	238	238	238	238	238	238	238
OutWt (lbs)	1,366	1,366	1,366	1,366	1,366	1,366	1,366
	Opt. w/ Avg	FEDP +10%	FEDP +20%	FEDP +30%	FEDP -10%	FEDP -20%	FEDP -30%
Max Profit	$ 130.67	$ 271.19	$ 413.18	$ 556.69	$ (8.87)	$ (146.21)	$ (280.01)
DOF	238	238	251	256	230	218	204
OutWt (lbs)	1,366	1,366	1,390	1,398	1,348	1,319	1,280

650-799 Weight Steers Optimal DOF Given Different Market Prices							
	Averages	+10%	+ 20%	+30%	-10%	-20%	-30%
fed Price ($/cwt)	$ 103.07	$ 113.38	$ 123.68	$ 133.99	$ 92.76	$ 82.46	$ 72.15
fdr price ($/cwt)	$ 120.40	$ 132.44	$ 144.48	$ 156.52	$ 108.36	$ 96.32	$ 84.28
corn price ($/bu)	$ 5.21	$ 5.73	$ 6.25	$ 6.77	$ 4.69	$ 4.17	$ 3.65
	Opt. w/ Avg	CORNP +10%	CORNP +20%	CORNP +30%	CORNP -10%	CORNP -20%	CORNP -30%
Max Profit	$ 84.24	$ 49.29	$ 14.98	$ (18.70)	$ 119.80	$ 155.98	$ 192.77
DOF	189	186	182	179	192	196	198
OutWt (lbs)	1,356	1,349	1,340	1,332	1,362	1,369	1,372
	Opt. w/ Avg	FDRP +10%	FDRP +20%	FDRP +30%	FDRP -10%	FDRP -20%	FDRP -30%
Max Profit	$ 84.24	$ (3.78)	$ (91.79)	$ (179.81)	$ 172.25	$ 260.27	$ 436.96
DOF	189	189	189	189	189	189	189
OutWt (lbs)	1,356	1,356	1,356	1,356	1,356	1,356	1,356
	Opt. w/ Avg	FEDP +10%	FEDP +20%	FEDP +30%	FEDP -10%	FEDP -20%	FEDP -30%
Max Profit	$ 84.24	$ 224.37	$ 365.02	$ 506.31	$ (55.04)	$ (192.99)	$ (329.39)
DOF	189	192	195	198	185	179	172
OutWt (lbs)	1,356	1,362	1,367	1,372	1,347	1,332	1,312

≥ 800 Steers Optimal DOF Given Different Market Prices							
	Averages	+10%	+ 20%	+30%	-10%	-20%	-30%
fed Price ($/cwt)	$ 102.72	$ 112.99	$ 123.26	$ 133.54	$ 92.45	$ 82.18	$ 71.90
fdr price ($/cwt)	$ 111.79	$ 122.97	$ 134.15	$ 145.33	$ 100.61	$ 89.43	$ 78.25
corn price ($/bu)	$ 5.21	$ 5.73	$ 6.25	$ 6.77	$ 4.69	$ 4.17	$ 3.65
	Opt. w/ Avg	CORNP +10%	CORNP +20%	CORNP +30%	CORNP -10%	CORNP -20%	CORNP -30%
Max Profit	$ 65.38	$ 36.22	$ 7.75	$ (19.99)	$ 95.26	$ 125.70	$ 156.19
DOF	143	140	136	133	147	148	148
OutWt (lbs)	1,381	1,374	1,363	1,355	1,390	1,392	1,392
	Opt. w/ Avg	FDRP +10%	FDRP +20%	FDRP +30%	FDRP -10%	FDRP -20%	FDRP -30%
Max Profit	$ 65.38	$ (33.30)	$ (131.99)	$ (230.68)	$ 164.07	$ 262.76	$ 361.45
DOF	143	143	143	143	143	143	143
OutWt (lbs)	1,381	1,381	1,381	1,381	1,381	1,381	1,381
	Opt. w/ Avg	FEDP +10%	FEDP +20%	FEDP +30%	FEDP -10%	FEDP -20%	FEDP -30%
Max Profit	$ 65.38	$ 207.73	$ 350.66	$ 493.77	$ (76.02)	$ (216.10)	$ (354.34)
DOF	143	147	148	148	139	133	126
OutWt (lbs)	1,381	1,390	1,392	1,392	1,371	1,355	1,332

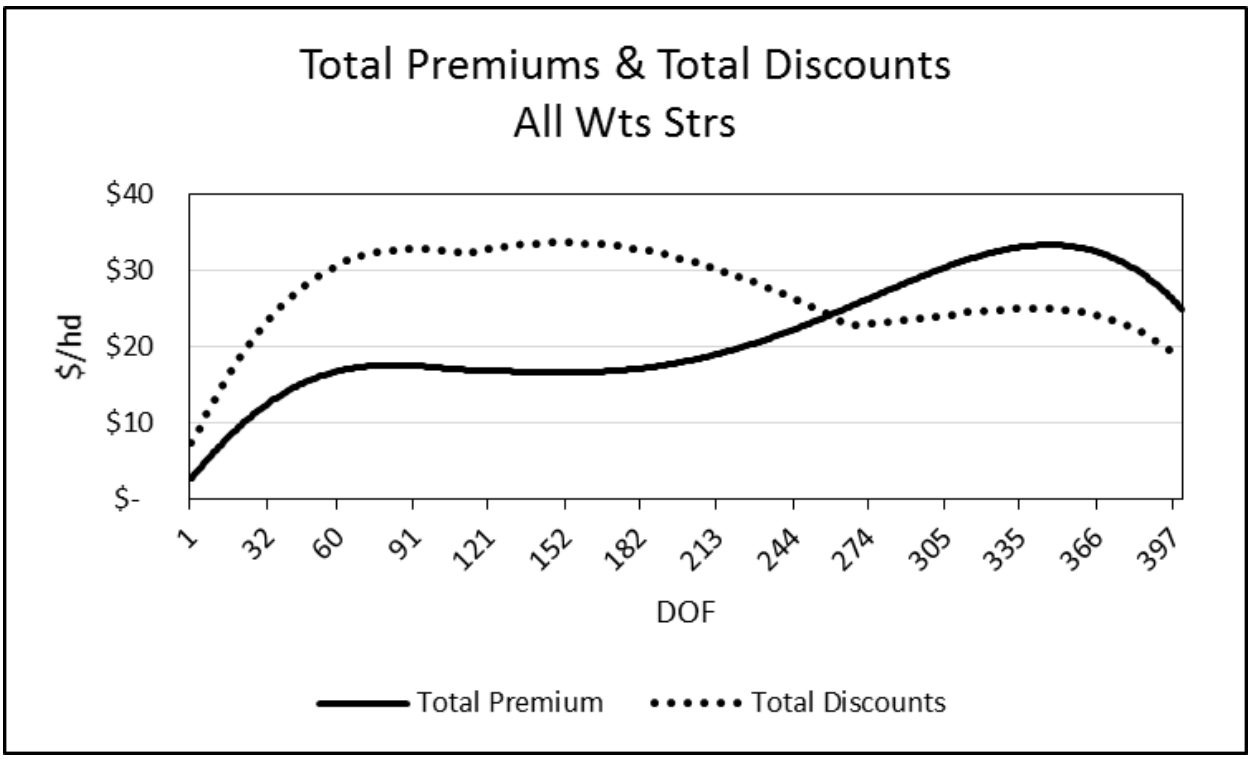
All Weights Heifers Optimal DOF Given Different Market Prices							
	Averages	+10%	+ 20%	+30%	-10%	-20%	-30%
fed Price ($/cwt)	$ 103.76	$ 114.14	$ 124.51	$ 134.89	$ 93.38	$ 83.01	$ 72.63
fdr price ($/cwt)	$ 110.99	$ 122.09	$ 133.19	$ 144.29	$ 99.89	$ 88.79	$ 77.69
corn price ($/bu)	$ 5.21	$ 5.73	$ 6.25	$ 6.77	$ 4.69	$ 4.17	$ 3.65
	Opt. w/ Avg	CORNP +10%	CORNP +20%	CORNP +30%	CORNP -10%	CORNP -20%	CORNP -30%
Max Profit	$ 98.49	$ 66.00	$ 35.39	$ 6.64	$ 132.89	$ 169.22	$ 207.50
DOF	184	173	163	153	194	205	215
OutWt	1,278	1,253	1,229	1,203	1,298	1,319	1,336
	Opt. w/ Avg	FDRP +10%	FDRP +20%	FDRP +30%	FDRP -10%	FDRP -20%	FDRP -30%
Max Profit	$ 98.49	$ 16.76	$ (64.96)	$ (146.69)	$ 180.22	$ 261.95	$ 343.67
DOF	184	184	184	184	184	184	184
OutWt	1,278	1,278	1,278	1,278	1,278	1,278	1,278
	Opt. w/ Avg	FEDP +10%	FEDP +20%	FEDP +30%	FEDP -10%	FEDP -20%	FEDP -30%
Max Profit	$ 98.49	$ 232.32	$ 368.13	$ 505.70	$ (32.50)	$ (159.45)	$ (280.97)
DOF	184	195	205	213	170	152	130
OutWt	1,278	1,300	1,319	1,332	1,246	1,200	1,136

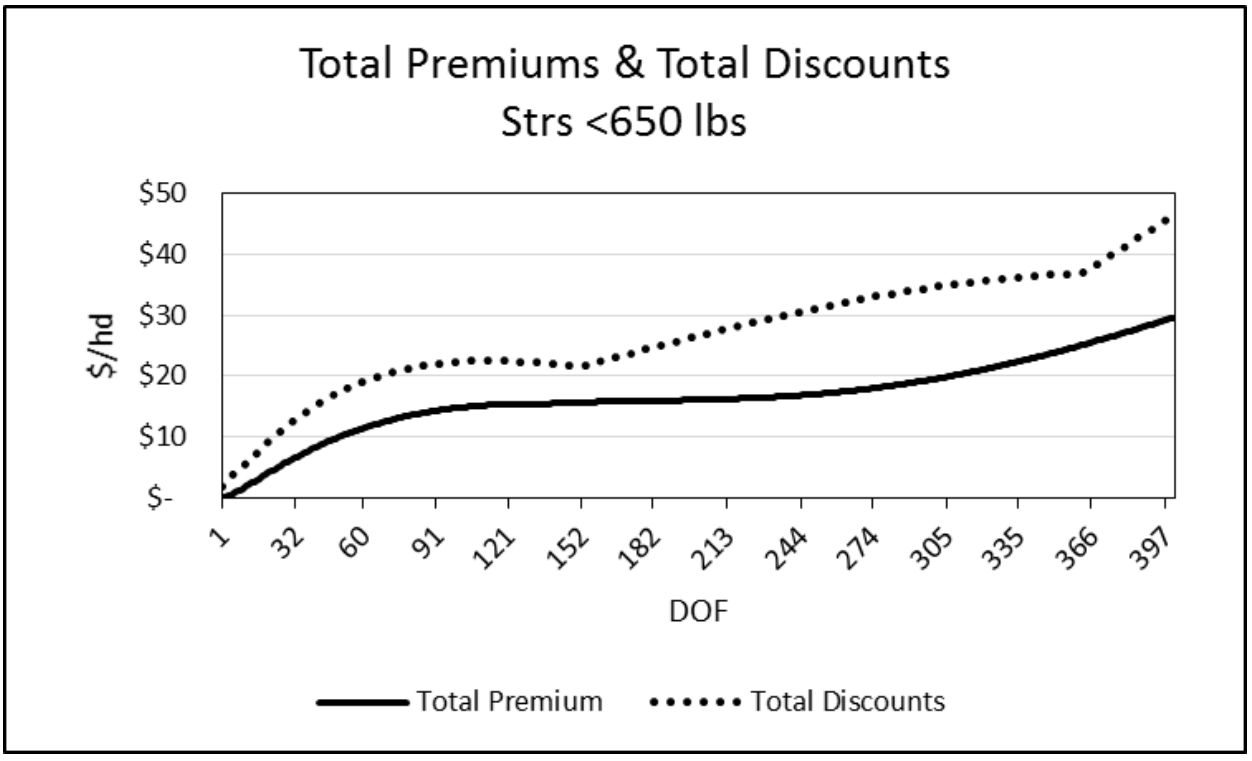
< 600 Weight Heifers Optimal DOF Given Different Market Prices							
	Averages	+10%	+ 20%	+30%	-10%	-20%	-30%
fed Price ($/cwt)	$ 103.06	$ 113.37	$ 123.67	$ 133.98	$ 92.75	$ 82.45	$ 72.14
fdr price ($/cwt)	$ 118.24	$ 130.06	$ 141.89	$ 153.71	$ 106.42	$ 94.59	$ 82.77
corn price ($/bu)	$ 5.21	$ 5.73	$ 6.25	$ 6.77	$ 4.69	$ 4.17	$ 3.65
	Opt. w/ Avg	CORNP +10%	CORNP +20%	CORNP +30%	CORNP -10%	CORNP -20%	CORNP -30%
Max Profit	$ 130.38	$ 92.65	$ 56.34	$ 21.49	$ 169.54	$ 210.09	$ 252.02
DOF	241	232	223	214	250	259	268
OutWt	1,229	1,210	1,190	1,169	1,246	1,262	1,277
	Opt. w/ Avg	FDRP +10%	FDRP +20%	FDRP +30%	FDRP -10%	FDRP -20%	FDRP -30%
Max Profit	$ 130.38	$ 63.83	$ (2.78)	$ (69.34)	$ 196.94	$ 263.55	$ 330.11
DOF	241	241	241	241	241	241	241
OutWt	1,229	1,229	1,229	1,229	1,229	1,229	1,229
	Opt. w/ Avg	FEDP +10%	FEDP +20%	FEDP +30%	FEDP -10%	FEDP -20%	FEDP -30%
Max Profit	$ 130.38	$ 258.19	$ 387.74	$ 518.90	$ 4.99	$ (117.11)	$ (234.99)
DOF	241	252	261	269	228	213	194
OutWt	1,229	1,250	1,266	1,279	1,201	1,167	1,188

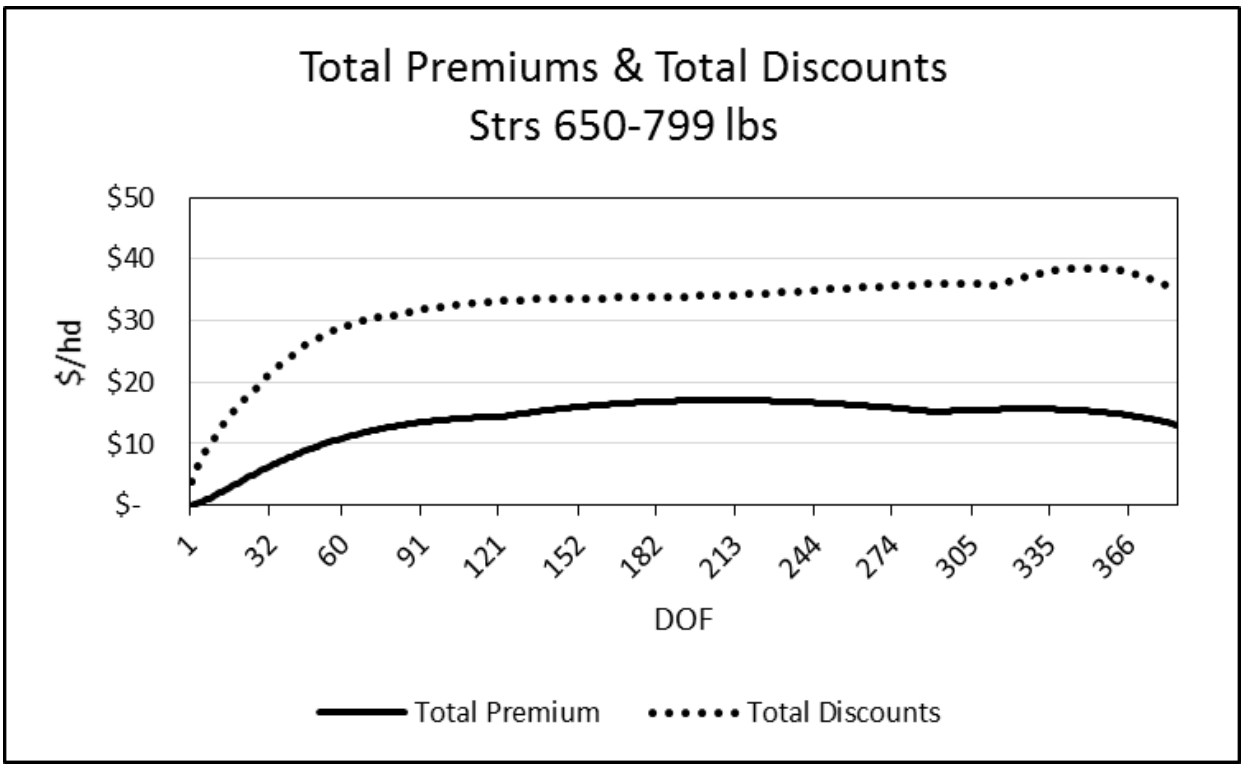
600-749 Weight Heifers Optimal DOF Given Different Market Prices							
	Averages	+10%	+ 20%	+30%	-10%	-20%	-30%
fed Price ($/cwt)	$ 103.07	$ 113.38	$ 123.68	$ 133.99	$ 92.76	$ 82.46	$ 72.15
fdr price ($/cwt)	$ 112.50	$ 123.75	$ 135.00	$ 146.25	$ 101.25	$ 90.00	$ 78.75
corn price ($/bu)	$ 5.21	$ 5.73	$ 6.25	$ 6.77	$ 4.69	$ 4.17	$ 3.65
	Opt. w/ Avg	CORNP +10%	CORNP +20%	CORNP +30%	CORNP -10%	CORNP -20%	CORNP -30%
Max Profit	$ 102.97	$ 68.98	$ 36.73	$ 6.25	$ 138.71	$ 176.19	$ 215.39
DOF	200	190	180	170	210	220	230
OutWt	1,260	1,237	1,213	1,187	1,281	1,301	1,319
	Opt. w/ Avg	FDRP +10%	FDRP +20%	FDRP +30%	FDRP -10%	FDRP -20%	FDRP -30%
Max Profit	$ 102.97	$ 26.25	$ (50.48)	$ (127.20)	$ 179.70	$ 256.42	$ 333.15
DOF	200	200	200	200	200	200	200
OutWt	1,260	1,260	1,260	1,260	1,260	1,260	1,260
	Opt. w/ Avg	FEDP +10%	FEDP +20%	FEDP +30%	FEDP -10%	FEDP -20%	FEDP -30%
Max Profit	$ 102.97	$ 234.24	$ 367.69	$ 503.12	$ (25.35)	$ (149.70)	$ (268.96)
DOF	200	212	222	231	186	169	148
OutWt	1,260	1,285	1,304	1,321	1,228	1,185	1,127

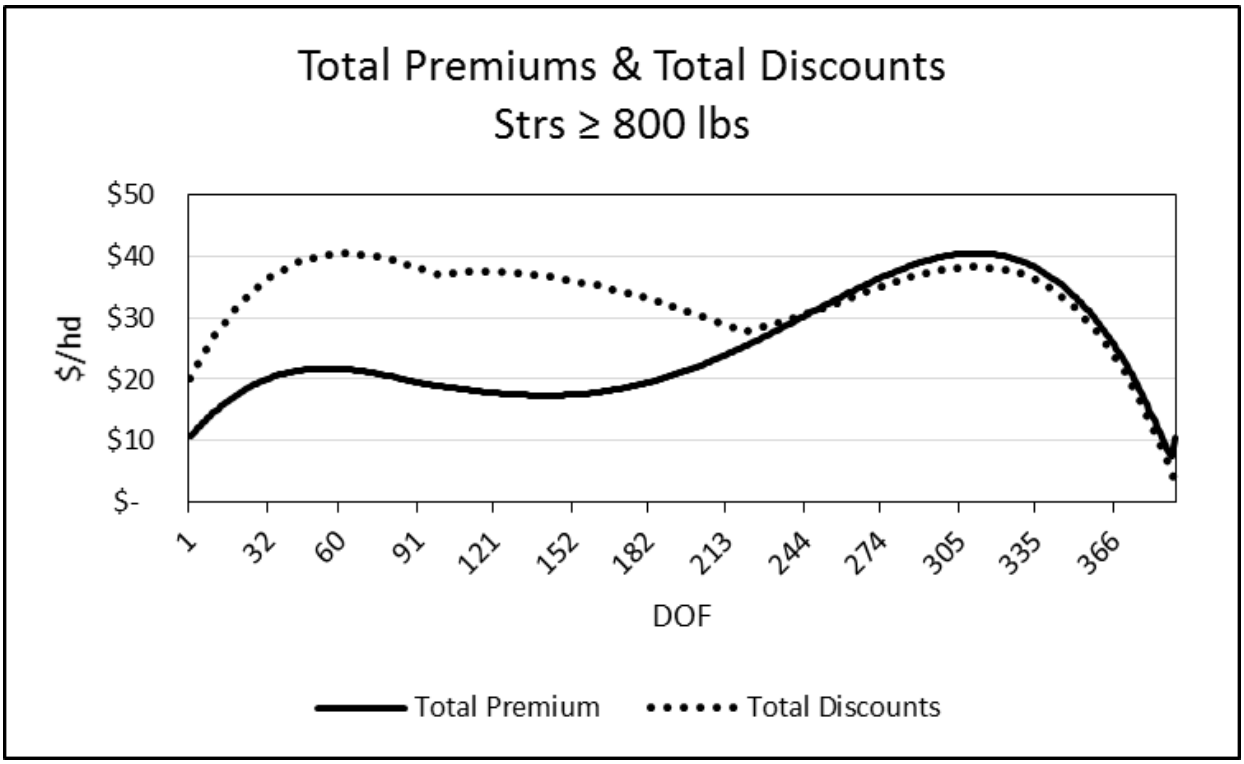
≥ 750 Heifers Optimal DOF Given Different Market Prices							
	Averages	+10%	+ 20%	+30%	-10%	-20%	-30%
fed Price ($/cwt)	$ 104.64	$ 115.10	$ 125.57	$ 136.03	$ 94.18	$ 83.71	$ 73.25
fdr price ($/cwt)	$ 108.38	$ 119.22	$ 130.06	$ 140.89	$ 97.54	$ 86.70	$ 75.87
corn price ($/bu)	$ 5.21	$ 5.73	$ 6.25	$ 6.77	$ 4.69	$ 4.17	$ 3.65
	Opt. w/ Avg	CORNP +10%	CORNP +20%	CORNP +30%	CORNP -10%	CORNP -20%	CORNP -30%
Max Profit	$ 94.94	$ 65.84	$ 38.29	$ 12.28	$ 125.57	$ 157.73	$ 191.40
DOF	154	146	138	130	162	170	178
OutWt	1,291	1,272	1,251	1,229	1,308	1,324	1,339
	Opt. w/ Avg	FDRP +10%	FDRP +20%	FDRP +30%	FDRP -10%	FDRP -20%	FDRP -30%
Max Profit	$ 94.94	$ 6.07	$ (82.81)	$ (171.60)	$ 183.81	$ 272.68	$ 361.47
DOF	154	154	154	154	154	154	154
OutWt	1,291	1,291	1,291	1,291	1,291	1,291	1,291
	Opt. w/ Avg	FEDP +10%	FEDP +20%	FEDP +30%	FEDP -10%	FEDP -20%	FEDP -30%
Max Profit	$ 94.94	$ 230.97	$ 368.92	$ 508.14	$ (38.73)	$ (169.33)	$ (295.36)
DOF	154	163	170	177	143	130	113
OutWt	1,291	1,310	1,324	1,337	1,264	1,229	1,178

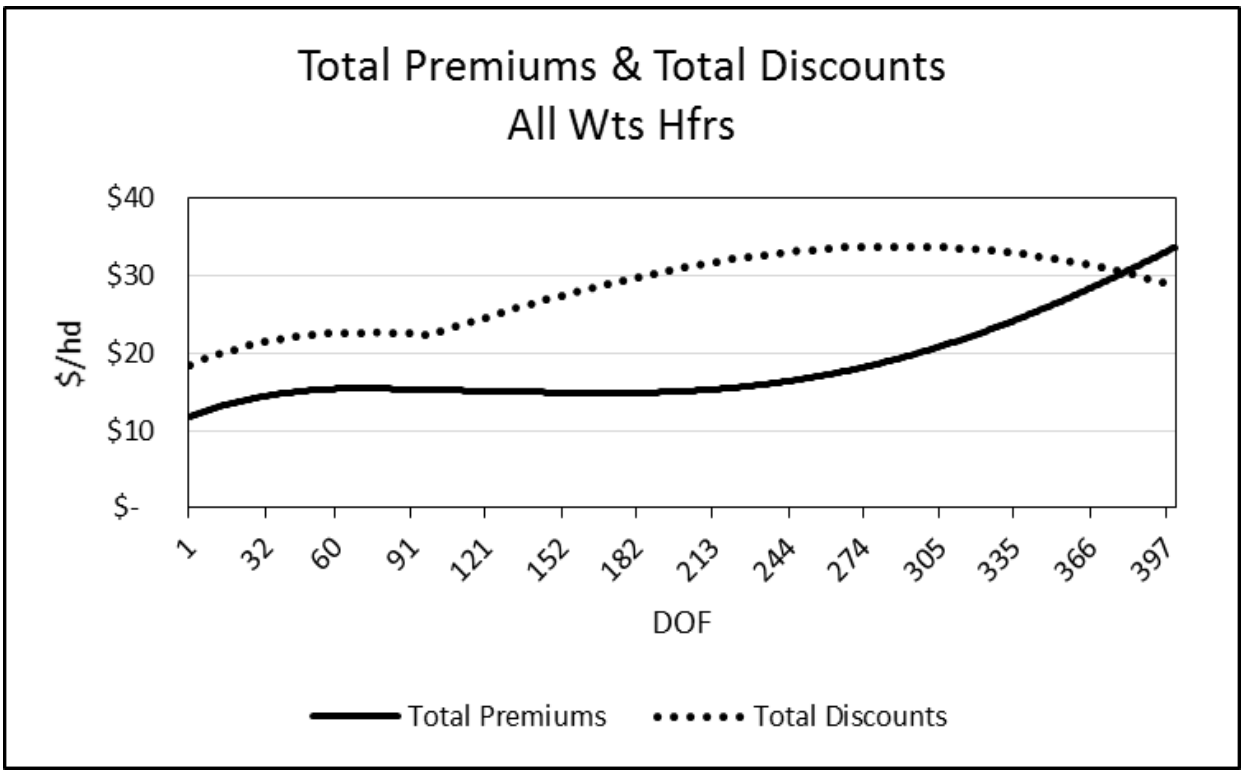
APPENDIX D: TOTAL PREMIUMS & DISCOUNTS BY WEIGHT CATEGORY

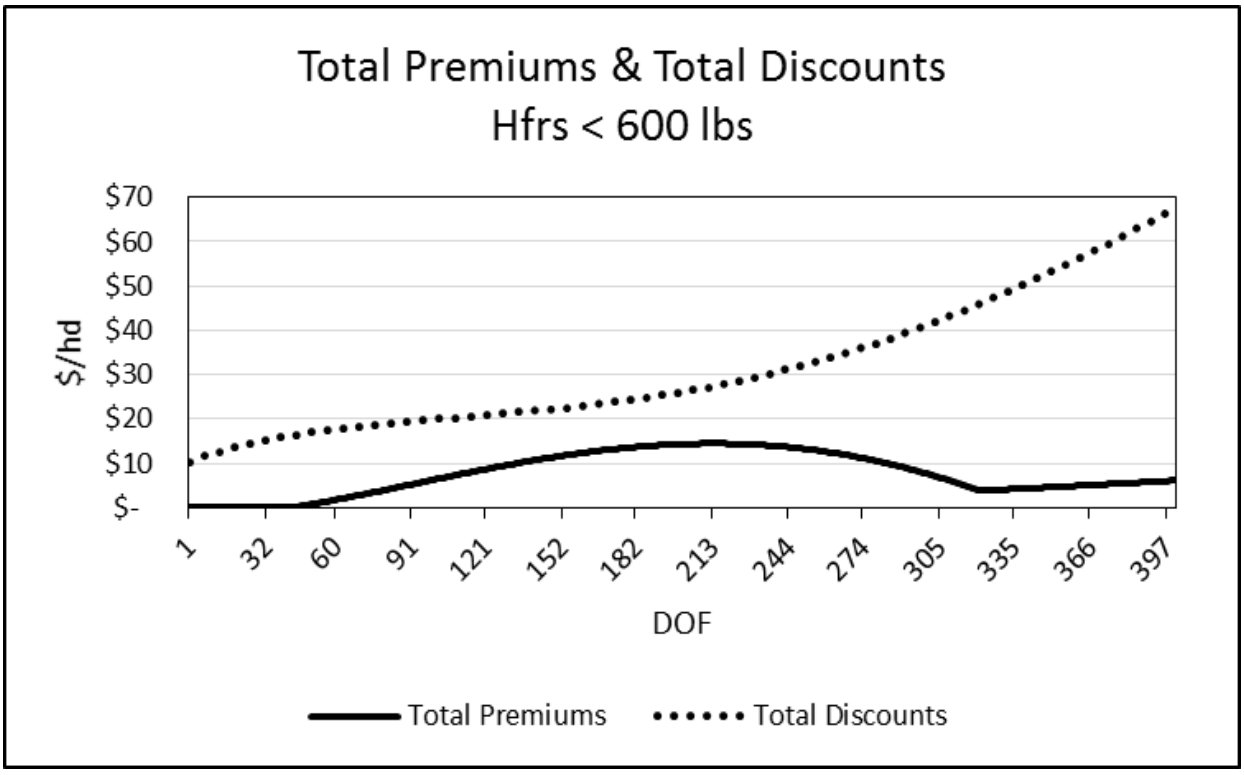


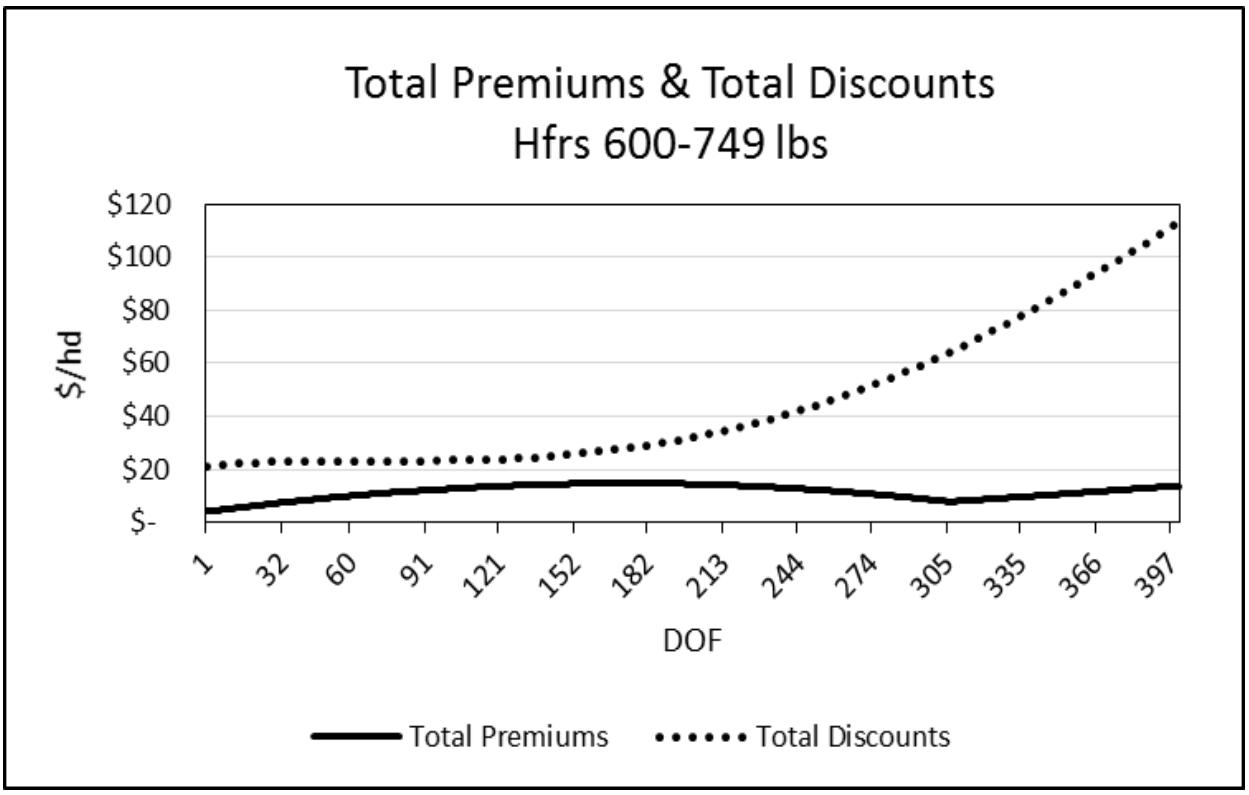


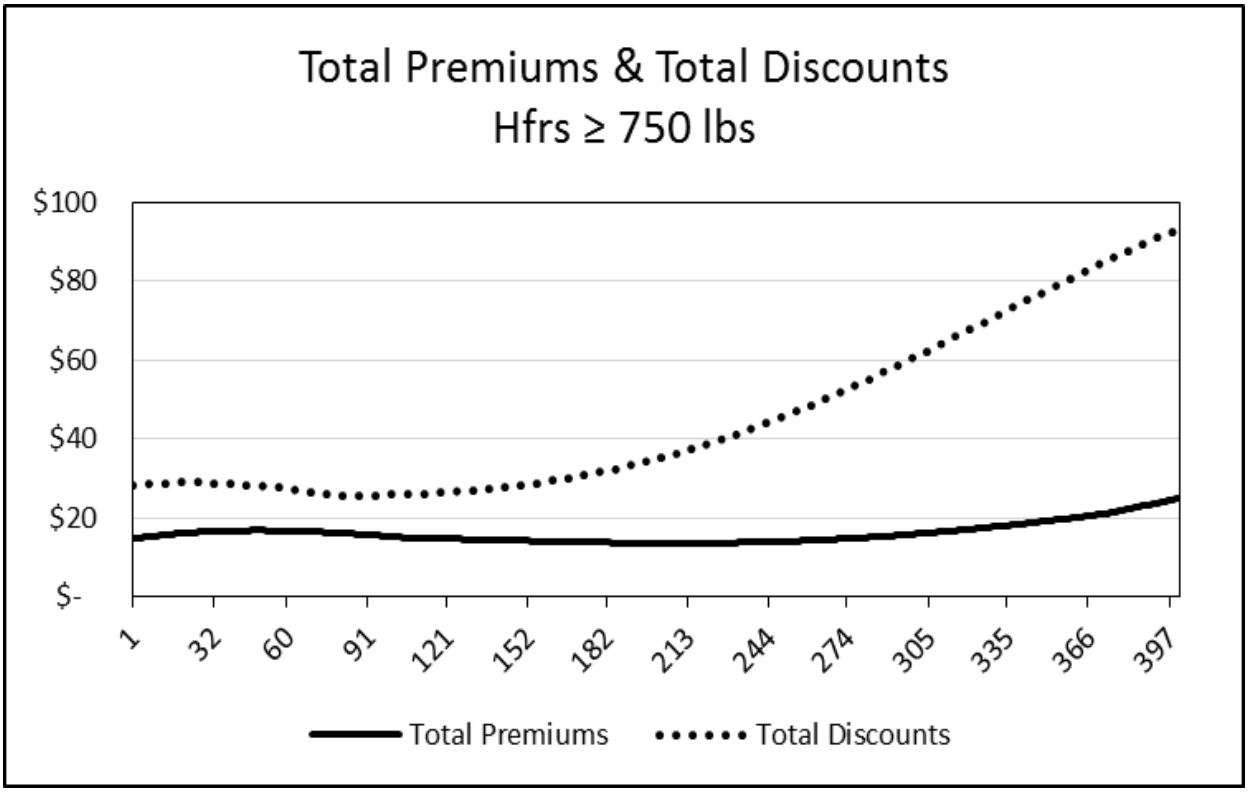

Total Premiums & Total Discounts
Strs 650-799 lbs
$50
$40
$30
$20
$10
$-
$/hd
1
32
60
91
121
152
182
213
244
274
305
335
366
DOF
Total Premium
Total Discounts


Total Premiums & Total Discounts
Strs ≥ 800 lbs
$50
$40
$30
$20
$10
$-
$/hd
1
32
60
91
121
152
182
213
244
274
305
335
366
DOF
Total Premium
Total Discounts


Total Premiums & Total Discounts
All Wts Hfrs
$40
$30
$20
$10
$-
$/hd
1
32
60
91
121
152
182
213
244
274
305
335
366
397
DOF
Total Premiums
Total Discounts


Total Premiums & Total Discounts
Hfrs < 600 lbs
$70
$60
$50
$40
$30
$20
$10
$-
$/hd
1
32
60
91
121
152
182
213
244
274
305
335
366
397
DOF
Total Premiums
Total Discounts


Total Premiums & Total Discounts
Hfrs 600-749 lbs
$120
$100
$80
$60
$40
$20
$-
$/hd
1
32
60
91
121
152
182
213
244
274
305
335
366
397
DOF
Total Premiums
Total Discounts


Total Premiums & Total Discounts
Hfrs ≥ 750 lbs
$100
$80
$60
$40
$20
$-
1
32
60
91
121
152
182
213
244
274
305
335
366
397
Total Premiums
Total Discounts