

**Lauver Family Farms: Utilizing the Conservation Reserve Program as a risk
management tool**

by

ANDREW JAMES LAUVER

B.S., Iowa State University, 2012

A THESIS

Submitted in partial fulfillment of the requirements

for the degree

MASTER OF AGRIBUSINESS

Department of Agricultural Economics

College of Agriculture

KANSAS STATE UNIVERSITY

Manhattan, Kansas

2017

Approved by:

Major Professor
Dr. Christine Wilson

ABSTRACT

For five generations, Lauver Family Farms has been founded upon faith, family, and farming near Rockwell City, IA. It is these core principles and beliefs that drive everyday actions through conservation minded decisions, community involvement, and a passion for the land. Presently, the farm is operated by Grandfather Don Lauver, Father Kevin Lauver, and sons Andrew and Jacob Lauver. The Lauver Family Farm was originally purchased in 1942 by Joseph Gordon, who at his peak held 700 acres in his name. In 1945 Glen and Viola Lauver purchased what is now Lauver Family Farms, located on the Des Moines Lobe land region of Iowa. The Des Moines Lobe is a glacial lobe encompassing rich, heavy soils with high organic matter, requiring dredge ditches and tiling in many areas.

Through a commitment to conservation, corn and soybean acres are rotated annually. With regard to corn cultivation and planting practices, soybean stubble is field cultivated once, followed by planting. On soybean ground, the corn stalks are disk ripped, and then field cultivated twice before planting soybeans. The goal is to minimize trips through the field by exhibiting these conservation tillage practices. If land has much slope or erosion potential, then it is only disked and then planted. Currently, the farm is comprised of 400 acres of row crops and 50 acres of wetland, 30 acres on the Home Farm and 20 acres on the Obye Farm, enrolled in the Conservation Reserve Program in 2002.

Kevin and Don Lauver, the primary decision makers, requested an analysis of the environmental and economic impact of the Conservation Reserve Program on the farm. By

taking acres out of production for at least 10 to 15 years that perennially drown due to often wet soil conditions, they will be able to utilize the Conservation Reserve Program as a risk management tool. Now, Lauver Family Farms is faced with a decision to determine if a 10 or 15 year enrollment in the Conservation Reserve Program has the greatest economic and environmental return, since the current enrollment expires in 2016.

Procedures and methods were established to meet the purpose of this thesis to determine which option was the most profitable long-term for the operation. The purpose includes evaluating the sources of data relevant to Lauver Family Farms decision by utilizing decision tools to make a collective decision on the future of the farmland and opportunity costs analyzed.

Lauver Family Farms' objective for this project was to determine how the Conservation Reserve Program provides a return on the investment of the decision to re-enroll, or even enroll more acres in the program. This analysis will be used each time an enrollment decision must be made, and will be of significant importance as sons Andrew and Jacob Lauver make management decisions in the years to come.

TABLE OF CONTENTS

List of Figures	vi
List of Tables	viii
Acknowledgments	ix
Chapter I: Introduction	1
1.1 Introduction	1
1.2 Objective and Motivation.....	2
Chapter II: Literature Review	6
2.1 Issues Oriented	6
2.2 Methods Oriented	8
2.3 Theory Oriented.....	9
2.4 Conclusion	12
Chapter III: Data	13
3.1 Crop Yields and Prices	13
3.3 Direct Input Costs.....	18
3.3.1 Labor.....	18
3.3.2 Land.....	20
3.3.3 Seed, Chemicals, and Fertilizer	21
3.3.4 Machinery Costs for Growing and Harvesting	23
3.3.5 Total Cost Per Bushel and Price Per Bushel	25
3.3.6 Total Cost Per Acre Corn and Soybean Production.....	28
3.3.7 Total Land Rental Rates in Calhoun County Iowa	29
3.3.8 Corn and Soybean Production Profit versus Conservation Reserve Program Bids	31
Chapter IV: Conceptual Model and Methods	34
4.1 Conceptual Model Introduction	34
4.2 Conservation Reserve Program Opportunity Cost and Net Present Value	37
Chapter V: Procedures and Methods	41
Chapter VI: Results	46
6.1 Results.....	46
Chapter VII: Conclusion	53

7.1 Conclusion	53
7.2 Future Research	55
References	57

LIST OF FIGURES

Figure 1.1 Lauver Family Farms Acreage Allocation 2002-2016.....	1
Figure 3.1 Average for Selected Soybean Crop Yields on Lauver Family Farms (bushels/acre).....	14
Figure 3.2 Average Selected Corn Crop Yields on Lauver Family Farms (bushels/acre).....	15
Figure 3.3 Average Corn and Soybean Prices Received, Iowa, 1994-2015 (\$/bushel) .	16
Figure 3.4 Conservation Reserve Program Payments to Lauver Family Farms 2002 & 2017.....	17
Figure 3.5 Average and Estimated Cost of Labor for Corn and Soybean Production in Iowa	19
Figure 3.6 Average and Estimated Land Rental Rate for Crop Production in Iowa ..	21
Figure 3.7 Average and Estimated Seed, Chemicals, Fertilizer, etc. Costs for Corn and Soybean Production in Iowa.....	22
Figure 3.8 Average and Estimated Machinery Costs for Corn and Soybean Growing and Harvesting in Iowa	25
Figure 3.9 Average and Estimated Corn and Soybean Production, Total Cost Per Bushel and Price Per Bushel in Iowa, 2002-2030.....	27
Figure 3.10 Average and Estimated Corn and Soybean Production Total Cost per Acre in Iowa.....	29
Figure 3.11 Summary Statistics for Iowa Land Rental Rates, 2005-2016, Calhoun County, Iowa	31
Figure 3.12 Home Farm Corn and Soybean Profit Versus Conservation Reserve Program Bids.....	32
Figure 3.13 Obye Farm Corn and Soybean Profit Versus Conservation Reserve Program Bids.....	33
Equation 4.1 Present Value of Conservation Reserve Program Payments.....	37
Equation 4.2 Present Value of Corn and Soybean Production.....	38
Equation 4.3 Opportunity Cost.....	38

Figure 6.1 Net Return over Total Costs (\$/acre).....	46
Figure 6.2 Net Present Values of Crop and Conservation Reserve Program Acres	47
Figure 6.1 Home Farm Net Present Value Table in Excel Decision Tool.....	48
Figure 6.2 Obye Farm Net Present Value Table in Excel Decision Tool.....	49
Figure 6.3 Home Farm Sensitivity Analysis Net Present Value	51
Figure 6.4 Home Farm Sensitivity Analysis Net Present Value	52

LIST OF TABLES

Table 3.1 Summary Statistics for Selected Soybean Crop Yields on Lauver Family Farms (bushels/acre) 13

Table 3.2 Summary Statistics for Selected Corn Crop Yields on Lauver Family Farms (bushels/acre)..... 14

Table 3.3 Summary Statistics for Selected Corn Cash Crop Prices Received Data in Iowa (\$/bushel 2006-2015) 15

Table 3.4 Summary Statistics for Selected Soybean Cash Crop Prices Received Data in Iowa (\$/bushel 2006-2015)..... 16

Table 3.5 Summary Statistics for Corn and Soybean Production Labor Costs in Iowa, 2005-2016 (\$/acre)..... 19

Table 3.6 Summary Statistics for Corn and Soybean Production Land Rents in Iowa, 2005-2016 \$ per acre..... 21

Table 3.7 Summary Statistics for Corn and Soybean Production Seed, Chemicals, Fertilizer, etc. Costs in Iowa, 2005-2016 \$ per acre..... 23

Table 3.8 Summary Statistics for Corn and Soybean Production Machinery Costs for Growing and Harvesting in Iowa, 2005-2016 \$ per acre 24

Table 3.9 Summary Statistics for Corn and Soybean Production Total Cost per Bushel and Price per Bushel in Iowa, 2005-2016 \$ per bushel..... 27

Table 3.10 Summary Statistics for Corn and Soybean Production Total Cost per Acre in Iowa, 2005-2016 \$ per acre..... 29

Table 3.11 Summary Statistics for Iowa Land Rental Rates, 2005-2016, Calhoun County, Iowa 30

Table 6.1 Home Farm Net Present Value Table 48

Table 6.2 Obye Farm Net Present Value Table 49

Table 6.3 Home Farm Sensitivity Analysis Results..... 50

Table 6.4 Obye Farm Sensitivity Analysis..... 51

ACKNOWLEDGMENTS

I would like to thank Dr. Christine Wilson for her continual guidance and encouragement throughout the entire thesis writing process. I would also like to thank Deborah Kohl, Mary Emerson-Bowen, and Gloria Burgert for their support not only during this thesis writing process, but throughout the entire MAB program. Their prompt responses and support have been extremely helpful as I continually worked through each assignment, concluding with my thesis. Furthermore, Dr. Mykel Taylor and Dr. Bryan Shurle provided significant insight through their extensive experiences as my thesis was developed for Lauver Family Farms. The focus of research within this thesis required significant communication and cooperation by Lauver Family Farms, the Farm Service Agency, and numerous faculty members at Kansas State University. I would also like to thank Lauver Family Farms for their cooperation and interest in this thesis topic. As a 5th generation family farm, this thesis will provide supporting guidance to ensure Lauver Family Farms remains in business for generations to come.

Moreover, I appreciate the support of my family, friends, classmates, and mentors throughout these past two years, as I took each step forward through classes and thesis writing. When I started as a student in 2015, I couldn't have imagined how positively graduate school at Kansas State University would impact my life personally and professionally. Finally, my studies these past years have been motivated at every turn by my late fiancée Chelsey Henkenius. Her positive influence, dedication to achieve, and commitment to serve others continually motivates me to become more in this life.

CHAPTER I: INTRODUCTION

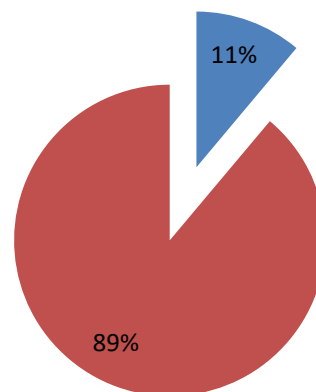
1.1 Introduction

The client this thesis has been developed for is Lauver Family Farms. For five generations, Lauver Family Farms has been founded upon faith, family, and farming near Rockwell City, IA. It is these three core principles and beliefs that drive everyday actions through conservation minded decisions, community involvement, and a passion for the land.

Presently, the farm is operated by Grandfather Don Lauver, Father Kevin Lauver, and sons Andrew and Jacob Lauver. The farm is comprised of 400 acres of row crops and 50 acres enrolled in the Conservation Reserve Program in 2002. Below in Figure 1.1 is a breakout of the acreage allocations within the family farming operation.

Figure 1.1 Lauver Family Farms Acreage Allocation 2002-2016

■ CRP ■ Corn and Soybean Rotated Acres



With a commitment to conservation, Lauver Family Farms rotates the corn and soybean acres annually. With regard to corn cultivation and planting practices, soybean stubble is field cultivated once, followed by planting. On soybean ground, corn stalks are

disk ripped, then field cultivated twice before planting soybeans. The goal is to minimize trips through the field by using conservation tillage practices. If land has much slope or erosion potential, then the corn stalks are simply disked before planting.

1.2 Objective and Motivation

Kevin and Don Lauver, the primary decision makers, have requested an analysis of the environmental and economic impact of the Conservation Reserve Program on the farm. They are also interested in using the program as a risk management tool by taking acres out of production that perennially drown due to often wet soil conditions.

Presently, they are faced with a decision of determining if a 10 or 15 year enrollment in the Conservation Reserve Program has the greatest economic and environmental return. Moreover, the 15 year enrollment on the currently enrolled 50 acres expires in 2016, so the acres must either be renewed or brought back into corn and soybean production. For the past 15 years, Lauver Family Farms has received \$168 per acre on a parcel of land named “Obye’s” and \$174 per acre on the “Home Farm”. These Conservation Reserve Program contracts are signed and after entered ensure set government payments for 10 to 15 years at the agreed to bid. A primary concern with enrolling acres in the program is the fear of higher prices for corn than the Conservation Reserve Program is paying per acre after being locked-in for 10 to 15 years. If Lauver Family Farms elects to opt-out during the contract agreement, they will face significant fines.

So, will enrollment in the Conservation Reserve Program be more profitable than cultivating the acres in a corn and soybean rotation for the next 10 or 15 years?

Lauver Family Farms objective for this project is to examine the Conservation Reserve Program to determine whether the decision to re-enroll, or even enroll more acres in the program should be made.

Furthermore, the projections will help determine if and where the Conservation Reserve Program can be used as a risk management tool on the farm. Lauver Family Farms must determine whether to enroll new acres in the program, re-enroll the existing 50 acres, or not enroll any acres. Therefore, the primary objective of my thesis research begs the question.

Should Lauver Family Farms make a strategic long-term re-enrollment decision, expand enrollment, or cultivate corn and soybeans on high risk acres?

This research is not only important for Lauver Family Farms to make an economic and environmentally related decision, but it goes well beyond the farm gate as well. At the farm gate, profitability has hit lows unseen since the year 2002. Coincidentally, the first and most recent time Lauver Family Farms enrolled crop production acres in the Conservation Reserve Program was 2002. In January 2002, corn was \$1.87/bu. while soybeans were \$4.11/bushel (Iowa State University Extension). At that time, Kevin and Don Lauver felt it made economic sense to enroll in the program at \$175 per acre on the Home Farm. However, in January 2013 corn prices reached \$7.06/bu. and soybeans were \$14.10/bushel (Iowa State University Ag Decision Maker). When this occurred, Kevin and Don questioned their decision, and even began considering un-enrolling acres in the program early to bring crop acres back into production to generate higher profits due to the historically high commodity prices.

Beyond the farm gate, family farmers must be good stewards of the land, while ensuring water, air, and soil quality do not deteriorate, to pass arable lands down to the next generation. Although these issues are local, statewide, and national, these are in addition global issues, and the Conservation Reserve Program has a strong impact on such areas both environmentally and economically from a food security standpoint.

The deliverables from this thesis project include a written thesis to be provided to Kevin and Don Lauver and Kansas State University, an oral defense presented to my Kansas State University thesis committee, classmates, and guests, along with a business meeting with Kevin and Don Lauver to present both the written and oral defense.

Externally, my mission is to create a thesis and decision tool that can be utilized by other growers to make future decisions related to Conservation Reserve Program enrollment on their operations.

The information collected to answer the question of whether or not Lauver Family Farms should re-enroll, expand enrollment, or cease enrollment and bring acres into crop production included, but was not limited to:

- Historical corn prices from universities and/or the United States Department of Agriculture
- Excel sensitivity scenarios
- Net present value analysis of corn and soybean production
- Net present value analysis of the Conservation Reserve Program
- Revenues and costs for corn and soybean production
- Projected corn and soybean prices
- Historical Conservation Reserve Program payment rates for Lauver Family Farms from the United States Department of Agriculture/Farm Service Agency
- Current Conservation Reserve Program Payment bids for Lauver Family Farms from the United States Department of Agriculture/Farm Service Agency
- Crop insurance rates

- Historical, current, future crop input costs for corn and soybean production
- An interview with Kevin Lauver and Don Lauver
- A meeting with the United States Department of Agriculture/Farm Service Agency to discuss 10 or 15 year enrollment

This information utilized was collected from, but not limited to the following sources:

- The United States Department of Agriculture
- Farm Service Agency
- Natural Resources and Conservation Service
- Iowa State University Extension Ag Decision Maker

CHAPTER II: LITERATURE REVIEW

The Conservation Reserve Program was created by the United States Department of Agriculture to reduce soil erosion, enhance water quality, increase food and fiber production, establish wildlife habitat, and improve wetland resources. Through annual payments made directly to the farmer through a multi-year contract, the program encourages the conversion of highly erodible crop ground to grassland crop cover. Often times, this converts land back to native grasses, filter strips, or riparian buffers.

Lauver Family Farms is at a crossroads and must make a decision to re-enroll, expand acreage, or take acreage in the Conservation Reserve Program out of grassland and put back into corn and soybean production. This review of literature examines recent studies on the effectiveness of the conservation program. The topics of focus include, but are not limited to, conservation, economic return, and environmental benefits of the Conservation Reserve Program, all in an effort to aid in Lauver Family Farms Conservation Reserve Program enrollment decision.

2.1 Issues Oriented

Global demand for commodities has continued to increase with the need to feed a growing population. This growing demand has also increased the value of commodities, especially in the upper-Midwestern corn-belt where Lauver Family Farms is located. The Conservation Reserve Program was designed to protect environmentally sensitive land, but higher commodity prices have brought such land back into production. Recently, a study was conducted to assess the benefits provided by the Conservation Reserve Program's intended retirement of highly erodible lands (Johnson et.al.). Specifically, the goal was to

determine if the retirement of the land provided benefits equal to or greater than the cost of rental payments made to farmers. The benefits of the Conservation Reserve Program for reducing flooding, improving water and air quality, and mitigating greenhouse gasses in the Indian Creek watershed in Iowa were studied. The research concluded that the ecosystem benefits of enrolling the land in the Conservation Reserve Program exceed the cost of payments made to farmers. Furthermore, the research study found that although the per-acre payments over 10 years were \$1,311, the benefits provided a net present value of between \$1,710 and \$6,401. The analysis performed concluded that investment in the Conservation Reserve Program in the upper-Midwest provided a benefit both privately and publicly.

According to research performed by the United States Department of Agriculture, the Conservation Reserve Program may provide an economic return in the form of water-quality benefits. Initially, the Conservation Reserve Program was intended to remove 40 to 45 million acres from crop production, but the environmental benefits may also provide an economic return. The downstream benefits of the Conservation Reserve Program include lower water treatment costs, a reduction in the cost of removing sediment, a reduction in the occurrence of flooding, and enhanced fishing (Ribaud 1989). The research included procedures which measured economic, physical, chemical, and biological correlations between soil erosion and water usage.

Lauver Family Farms does have drainage tile installed on the farm, so the effect of drainage related to row crop versus acres enrolled in the Conservation Reserve Program and the rate of nitrate losses through the soil profile is important. A study conducted by (Randall et.al. 1996) concluded continuous corn and corn-soybean rotation systems are 37

and 35 times higher in their nitrogen losses than alfalfa and Conservation Reserve Program systems. In fact, the flow of nitrate in a corn on corn system was 32 mg/L, corn-soybean 24 mg/L, alfalfa 3 mg/L and a Conservation Reserve Program system was 2 mg/L illustrating the positive environmental impact of the Conservation Reserve Program.

Finally, it was noted by the Congressional Research Service (Stubbs 2014) that the 2014 Farm Bill reauthorized the Conservation Reserve Program and reduced the enrollment cap from 32 million acres to 24 million acres by the year 2018. This is important due to the fact that availability to enroll in the Conservation Reserve Program declines when less acres are eligible.

2.2 Methods Oriented

One consideration to be made as enrollment alternatives are viewed is the ability to grow corn and soybeans on the Conservation Reserve Program ground. A study was performed by the American Society of Agronomy and found that residue was a primary concern when the Conservation Reserve Program land was put back into crop production (Sharpio et.al. 2000). Specifically, the study focused on residue management, tillage, and crop choice in the first year of production on acreage that was previously enrolled in the Conservation Reserve Program. This study included three residue management practices for the Conservation Reserve Program grasses including shredding, removal, and leaving the Conservation Reserve Program undisturbed. Furthermore, three tillage systems were studied including moldboard plowing, disking, and no-till followed by the planting of corn, soybeans and sorghum. Sharpio's recommendation for the initial year returning to crop production is to shred the residue, followed by planting no-till soybeans.

Another aspect is the organic matter build-up Lauver family farms will receive by leaving the acreage in the Conservation Reserve Program for another 15 years, or a total of 30 years. A study in the mid-1990's was performed on land that had been cultivated and then put back into grasslands, and also land that was continuously cultivated for the past 50 years. (Burke 1995) found microbial biomass to be very similar to native grasslands. It was their conclusion that fifty years of grasslands provide enough time for soil organic matter and nutrient availability to recover.

2.3 Theory Oriented

Utilizing the Conservation Reserve Program as a least-cost land retirement mechanism was researched by (Smith 1995). As such, mechanism design theory embodies the qualities of a least-cost Conservation Reserve Program. The least-cost Conservation Reserve Program acres are a set of non-linear price schedules, if land rents decrease on cultivated acres. Moreover, a least-cost Conservation Reserve Program is present, if marginal land rents are independent of acres farmed. This least-cost system provides a helpful estimate of the upper bound of a least-cost Conservation Reserve Program. It is suggested that 34 million acres in the Conservation Reserve Program should not cost more than \$1 billion per year (Smith 1995).

The economic impact of terminating the Conservation Reserve Program in the long-run could have significant implications on the local rural economies. Lauver Family Farms is invested in their community, so this is an important aspect to consider. Sullivan et.al. (2004) focus on the economic trends in rural counties and the effect on farm-related business over the long run. If Conservation Reserve Program contracts would have ended in the year 2001, it is estimated that only 51 percent of Conservation Reserve Program acres would have

returned to cropland, and that outdoor spending would be reduced by \$300 million per year in rural areas. As a result, there would be an effect on employment and income in rural areas, depending upon economic conditions in the local rural area.

An evaluation of the Conservation Reserve Program was performed using a conceptual model targeted on farmers' decisions to produce crops, enroll in conservation programs, or sell their land (Parks 1997). The use of an econometric model, served as a tool to study the Conservation Reserve Program and participation in the northeastern United States. The results indicate vast differences in the enrollment of rural versus urban counties.

A real options model was created to examine farmer participation in the Conservation Reserve Program (Isik 2004). The study develops a framework for post analysis of irreversibility and uncertainty. The applications of real options models are used to analyze the farmer's enrollment in the Conservation Reserve Program. The model uses land and owner qualities, and analyzes whether uncertainty and irreversibility affect the likelihood of participation. Option values are a significant determinant in farmer elections to retire land by reducing the likelihood of participating.

Moreover, in 2010 Wu developed a theoretical model to analyze farmers Conservation Reserve Program participation decisions related to land values. This was done using empirical models as an estimation tool to determine the effects of the Conservation Reserve Program on land values. The greatest correlation between the Conservation Reserve Program and land values was in the Mountain, Southern Plains, and Northern Plains regions. In each of these regions, the farmland value was increased by five to 14 percent, four to six percent, and two to five percent, respectively. The Conservation Reserve Program was also

found to have an impact on developed land values; however, the percentage increases in value were less.

Additionally, Secchi (2007) performed research on the impact of high crop prices on environmental quality, specifically related to the Conservation Reserve Program. Secchi evaluated sensitive land retired from the Conservation Reserve Program. To analyze this scenario a Conservation Reserve Program land supply curve for various corn prices, was estimated by an estimate of the environmental impact of producing crops on Conservation Reserve Program land using the Environmental Policy Integrated Climate model (EPIC). The EPIC model illustrates the edge-of-field estimates of nutrient loss, carbon sequestration, and soil erosion. The study found that there were increases in impacts of higher corn prices and land enrolled in the Conservation Reserve Program being brought back into production.

Finally, through a research study of American farmers Osborn et. al. (1990) examined a national-level economic analysis of the Conservation Reserve Program participation. The decision to enroll in the Conservation Reserve Program is a discrete choice problem. The farmer will elect to sign up, if the anticipated utility of participating is greater than the expected utility of not participating. This team of researchers modeled the Conservation Reserve Program as a discrete choice problem and the model is estimated using data from the entire United States. Farm size, age of the farmer, land value, erosion rate, and expected net returns both with and without participation were used. The results of this study are useful to determine how and when a farmer should elect to enroll in the Conservation Reserve Program.

As a result, Osborn (1990) noted that growers are more responsive to the variable prices in crop production than they are to the variable prices in the Conservation Reserve Program. The results of the research study recommend that the government should increase the Conservation Reserve Program bid levels to keep pace with the increasing returns of crop production.

2.4 Conclusion

The literature review in this chapter discussed the conservation, economic return, and environmental benefits of the Conservation Reserve Program needed to make a decision on enrollment in the Conservation Reserve Program. The most common subject within the literature review is that there are economic benefits from enrolling in the Conservation Reserve Program, along with environmental benefits. This research provides the foundation needed to evaluate the economic and environmental returns of the Conservation Reserve Program on Lauver Family Farms, where they are focused on conservation minded practices that turn a profit. The next chapter will examine the data, followed by methodology used to evaluate the Conservation Reserve Program on Lauver Family Farms.

CHAPTER III: DATA

The objective of this thesis is to determine how to best utilize farmland owned by Lauver Family Farms from a profitability standpoint. To do so, a net present value and analysis of cash-flow was used. To assess profitability, cost data was gathered to subtract direct expenses from gross income to determine total net profit per acre. The costs for inputs and other expenses were then placed into the decision tool to generate the net present value.

Data used in this thesis were collected from Lauver Family Farms budgets, the Iowa State University Ag Decision Maker website, and yield history. The total sales derived from the crop ground are determined by price and yield. Tables 3.1 and 3.2 summarize yield data for Lauver Family Farms. A strict corn and soybean rotation is utilized on Lauver Family Farms due to the climate, soils, and ease of grain transport to cooperatives. By analyzing trends in yields in Figures 3.1 and 3.2, Lauver Family Farms was better able to gain an understanding of the range in yields over time, which may be expected if re-enrollment in the Conservation Reserve Program is decided upon.

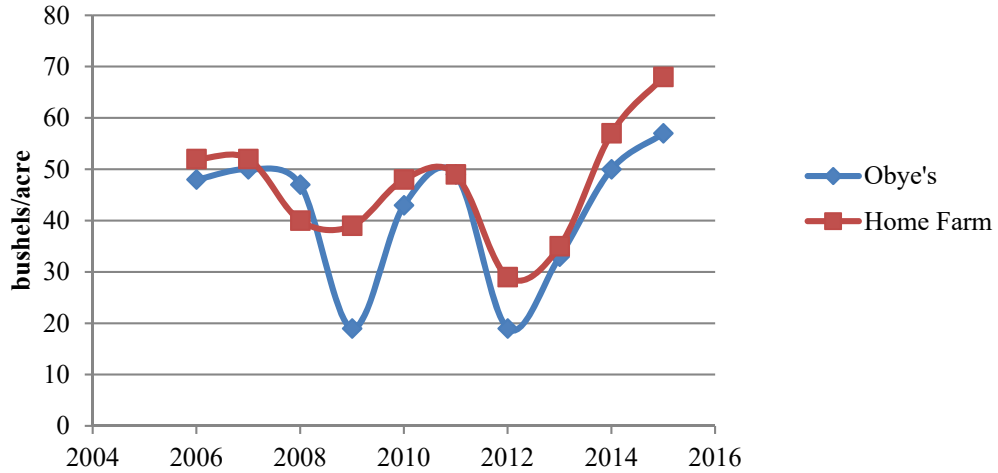
3.1 Crop Yields and Prices

Table 3.1 Summary Statistics for Selected Soybean Crop Yields on Lauver Family Farms (bushels/acre)

Soybean Yield	Parcel 1- Obye's	Parcel 2-Home Farm
Year Range:	2006-2015	2006-2015
Average	41.50	46.90
Min	19.00	29.00
Max	57.00	68.00
St Deviation	13.34	11.44
Range	38.00	39.00
Coefficient of variation	0.32	0.24

Source: Personal communication with Kevin Lauver, Lauver Family Farms

Figure 3.1 Average for Selected Soybean Crop Yields on Lauver Family Farms (bushels/acre)



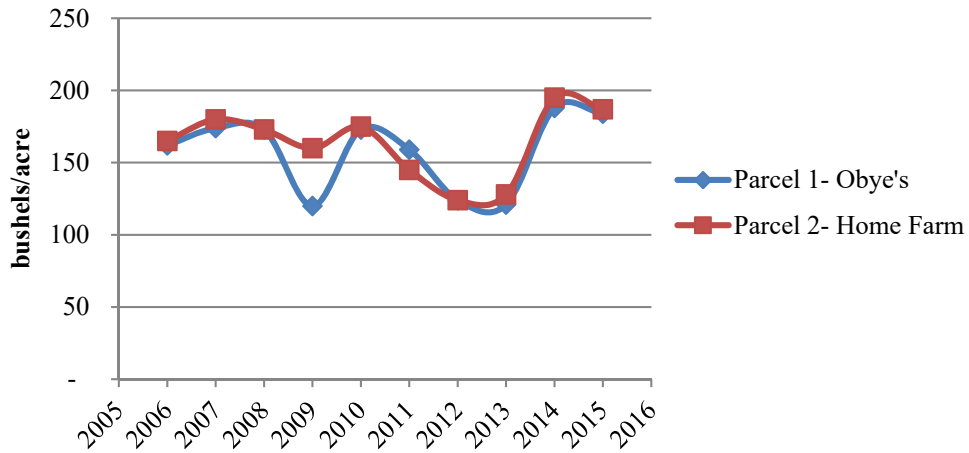
Source: Personal communication with Kevin Lauver, Lauver Family Farms

Table 3.2 Summary Statistics for Selected Corn Crop Yields on Lauver Family Farms (bushels/acre)

Corn Yield	Parcel 1- Obye's	Parcel 2-Home Farm
Year Range:	2006-2015	2006-2015
Avg	157.80	163.20
Min	120.00	124.00
Max	188.00	195.00
St Deviation	26.39	24.07
Range	68.00	71.00
Coefficient of variation	0.17	0.15

Source: Personal communication with Kevin Lauver, Lauver Family Farms

Figure 3.2 Average Selected Corn Crop Yields on Lauver Family Farms (bushels/acre)



Source: Personal communication with Kevin Lauver, Lauver Family Farms

To determine the gross income within the operation, Iowa cash corn and soybean prices were utilized from the Ag Decision Maker website. These were prices that are simple averages of monthly coefficients for the corn and soybean prices.

Table 3.3 Summary Statistics for Selected Corn Cash Crop Prices Received Data in Iowa (\$/bushel 2006-2015)

Corn	\$/bushel
Average	\$4.47
Standard Deviation	1.41
Maximum	\$6.67
Minimum	\$2.22
Range	\$4.45
Coefficient of variation	0.32

Source: Iowa State Ag Decision Maker

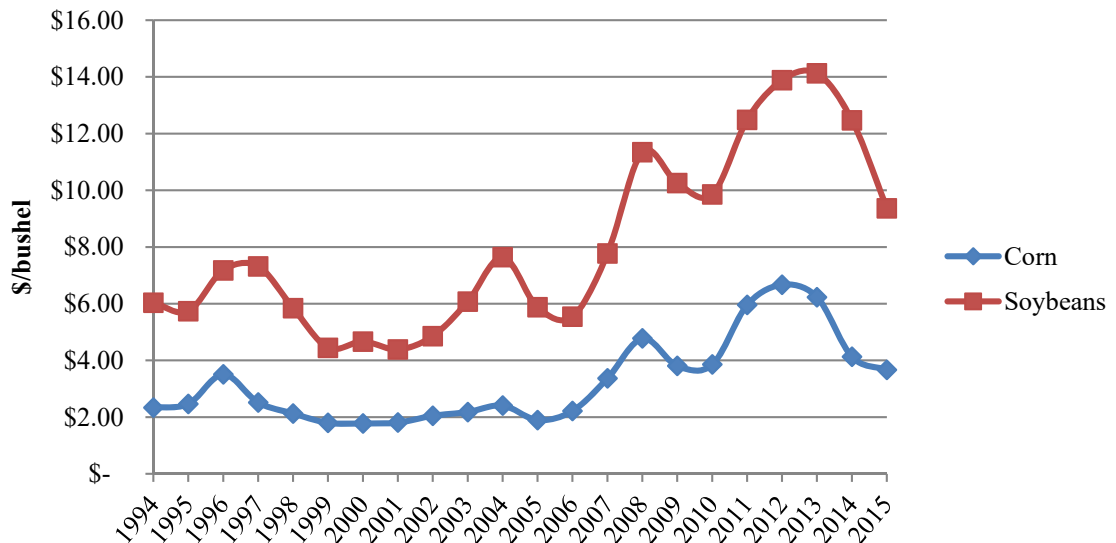
Table 3.4 Summary Statistics for Selected Soybean Cash Crop Prices Received Data in Iowa (\$/bushel 2006-2015)

Soybeans	\$/bushel
Average	\$10.72
Standard Deviation	2.71
Maximum	\$14.13
Minimum	\$5.55
Range	\$8.58
Coefficient of variation	0.25

Source: Iowa State Ag Decision Maker

The prices received data were used for this specific time period due to the enrollment of the land in the Conservation Reserve Program. Following an additional review of historical data, it appears that the prices experienced a higher range compared to the previous years, as shown in Figure 3.3. It is important to note this figure because it insinuates that agriculture is cyclical, and recently experienced an uptrend.

Figure 3.3 Average Corn and Soybean Prices Received, Iowa, 1994-2015 (\$/bushel)



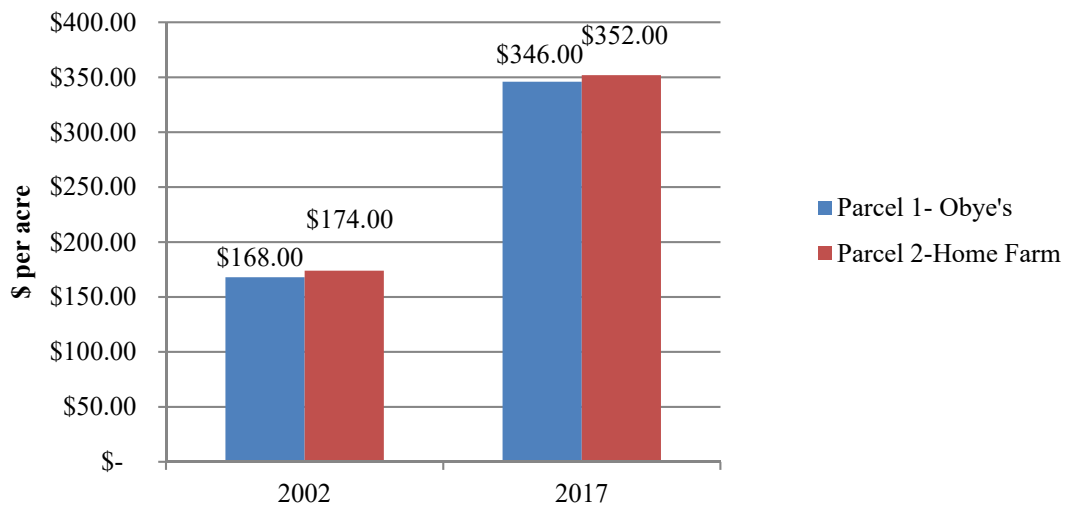
Source: Iowa State University Ag Decision Maker

To determine the payment rates proposed for re-enrollment on Lauver Family Farms, the Farm Service Agency was contacted in Calhoun County, Iowa. These payments

are an extremely important variable in the decision making process to re-enroll. The higher the payment, the more likely land will remain in the Conservation Reserve Program.

According to the Farm Service Agency in Calhoun County, the acreage payments are based off rental rates from two years ago. Since this is the case, the payments are trending with historical commodity prices from two years ago. The specific payment rates to be made to Lauver Family Farm for the next ten to fifteen years are illustrated in Figure 3.4.

Figure 3.4 Conservation Reserve Program Payments to Lauver Family Farms 2002 & 2017



Source: Iowa State University Ag Decision Maker

Whether or not these payments will continue to increase is to be determined. The current trend of rental rates in the state of Iowa is trending downward, so the projected payment is expected to trend downward as well. It is important to note that these are fixed payments to be made over 10 to 15 year periods.

3.3 Direct Input Costs

Sections 3.1 and 3.2 focus specifically on the income generated by Lauver Family Farms. Now in Section 3.3, the focus turns to the costs incurred during the production and cultivation of corn and soybeans. The purpose of this analysis is to understand the gross income generated by corn and soybean production, minus the costs, compared to the revenue generated by the Conservation Reserve Program. The components assessed in this cost analysis include, but are not limited to labor, land, seed, chemicals, fertilizer, and machinery for growing and harvesting. These are expenses within the operation that affect the profitability of the farmer, and are also costs that the farmer has the ability to control. The costs illustrated in the following sections are from Iowa State University Extension and outreach Ag Decision Maker website.

3.3.1 Labor

When considering crop production costs on Lauver Family Farms, labor is factored in as a primary contributor to annual costs. Although a family operation, labor costs must still be factored into the corn and soybean production. Table 3.5 and Figure 3.5 illustrate the historical and predicted labor costs through a trend line for corn and soybean production in Iowa, looking ahead ten years. These summary statistics are used to determine future costs to be incurred through corn and soybean production. When looking at Figure 3.5, it should be noted that the cost of labor has been increasing over the past ten years, so it can be anticipated that the cost of labor will continue to increase as well. A linear trend line was also placed within Figure 3.5 to view the trend of the cost of labor associated with cultivating the land in Iowa. The trend line results for corn were $y=0.8079x-1593.7$ and $R^2=0.925$. In this case, when X (year) increases by one, Y will increase by 0.8079. When X is zero, Y will be -1593.7. The R-squared values are a measure of how much of the variability

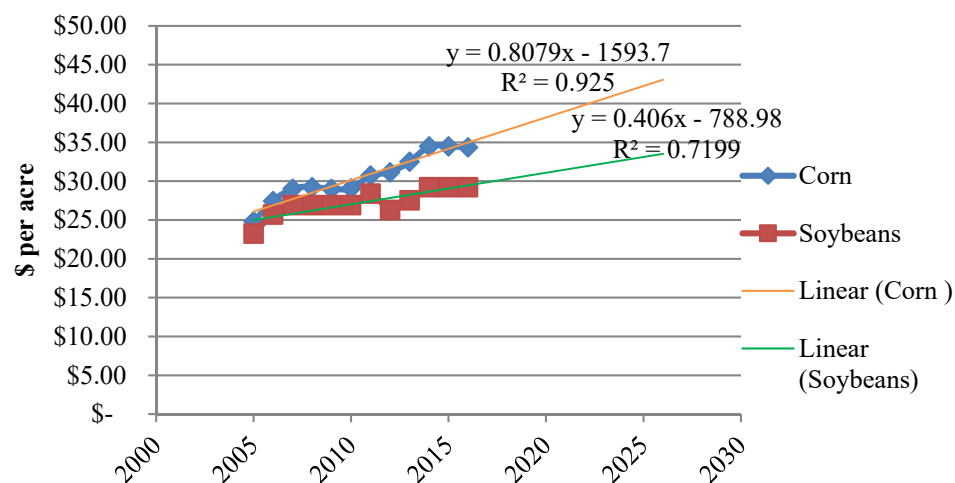
in Y is explained by X. For soybeans, the trend line was $y=0.406x-788.98$ and $R^2=0.7199$. When X (year) increases by one, Y will increase by 0.406, and when X is zero, Y will be -788.98. A linear trend line was used to project future labor expenses and is fitting in this example as it continually trends higher year over year. Contributing factors to this linear increase include minimum wage increases and the need for competitive wages and skilled labor in rural areas.

Table 3.5 Summary Statistics for Corn and Soybean Production Labor Costs in Iowa, 2005-2016 (\$/acre)

\$ per acre	Corn	Soybeans
Average	\$30.54	\$27.24
Minimum	\$24.84	\$23.28
Maximum	\$34.51	\$29.25
Standard Deviation	3.02	1.72
Range	\$9.67	\$5.97
Coefficient of variation	0.10	0.06

Source: Iowa State University Ag Decision Maker

Figure 3.5 Average and Estimated Cost of Labor for Corn and Soybean Production in Iowa



Source: Iowa State University Ag Decision Maker

3.3.2 Land

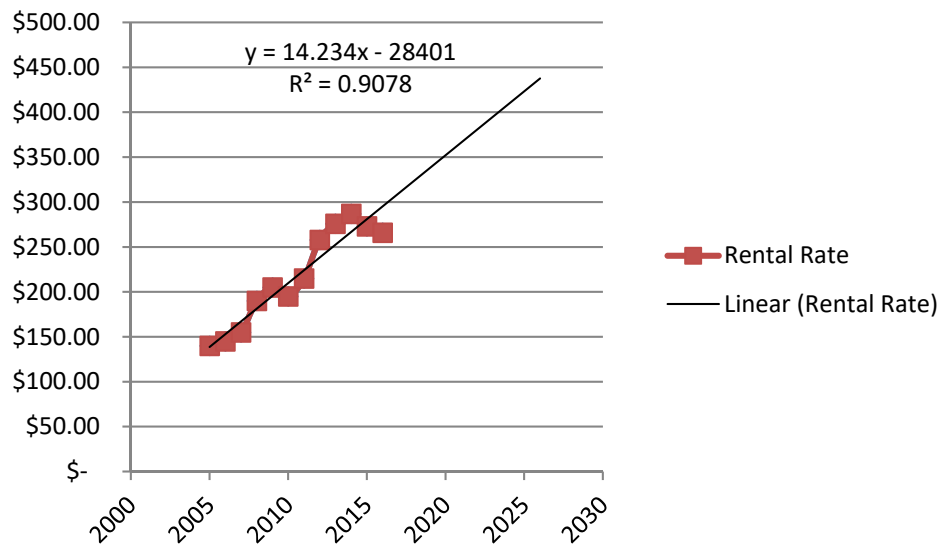
Land as a cost, is observed in this case as the cost to rent the land. Lauver Family Farms is the owner of the land, but it should be noted that they are looking at all possibilities when seeking the greatest profitability. For example, they could rent the land out to receive cash payments on the land. Even so, these rental payments would be variable, whereas the Conservation Reserve Program payments are constant over a ten to fifteen year period. In Figure 3.6, the summary statistics illustrate the range in land rents over the past ten years. When evaluating the trend line, it is clear that the rent for land for corn and soybean production is variable, but largely increasing over time. This is important because if Lauver Family Farms is to re-enroll in the Conservation Reserve Program, they will want to do so when bids for Conservation Reserve Program acres are high, meaning land rental rates are high. If land rental rates decline, then the Conservation Reserve program bids will decline as well. These land rental rate numbers are directly from Iowa State University's Ag Decision Maker. The trend line results for crop production was $y=14.234x-28,201$ and $R^2=0.9078$. When X (year) increases by one, Y will increase by 14.234. When X is zero, Y will be -28401. The R-squared value of 0.9078 is a measure of how much of the variability in rent is explained by the year variable. In the case of this trendline, a linear trend line was used, which is representative of historical data. However, in the future rental rates are beginning to decline. Since this is the case, utilizing a polynomial trend line may be beneficial in future years. Contributing factors to this linear trend include the rise in commodity prices and agricultural inputs over the past decade. As these prices decline, a polynomial trend line will be more representative of future growth.

Table 3.6 Summary Statistics for Corn and Soybean Production Land Rents in Iowa, 2005-2016 \$ per acre

\$ per acre	Corn	Soybeans
Average	\$217.08	\$217.08
Minimum	\$140.00	\$140.00
Maximum	\$287.00	\$287.00
Standard Deviation	53.86	53.86
Range	\$147.00	\$147.00
Coefficient of variation	0.25	0.25

Source: Iowa State University Ag Decision Maker

Figure 3.6 Average and Estimated Land Rental Rate for Crop Production in Iowa



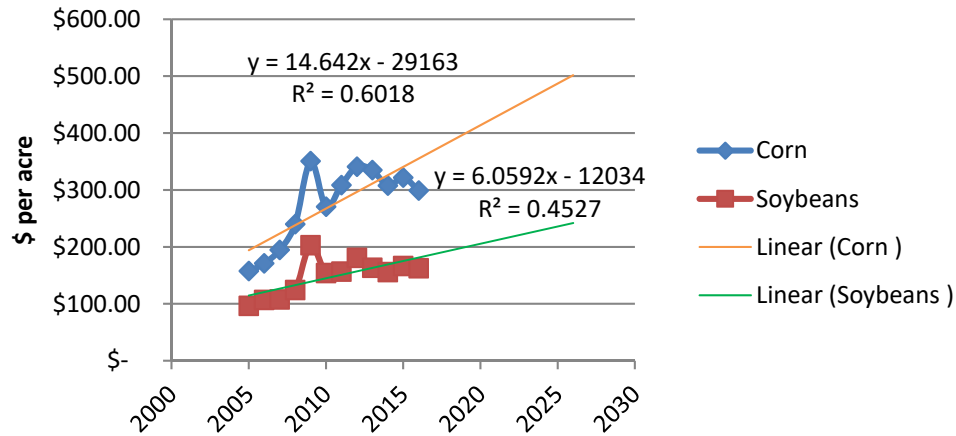
Source: Iowa State University Ag Decision Maker

3.3.3 Seed, Chemicals, and Fertilizer

Seed, chemicals, and fertilizer are inputs required for corn and soybean production.

Figure 3.7 provides greater insight into profitability and costs associated with cultivating corn and soybeans.

Figure 3.7 Average and Estimated Seed, Chemicals, Fertilizer, etc. Costs for Corn and Soybean Production in Iowa



Source: Iowa State University Ag Decision Maker

This analysis is most concerned with profitability and cash flow per acre, so these variables are extremely important. These direct input costs are under the direct control of the farmer, but they are costs that are likely to be incurred each year going forward within the Lauver Family Farms operation. The data were gathered from the Iowa State University Ag Decision Maker since it relates closely with Lauver Family Farms production practices and is comprehensive over ten years as well summary data are illustrated in Table 3.7 and Figure 3.7. These direct costs are volatile as was noted in the analysis. Even so, the trend line does indicate that the costs of input prices in general are rising with inflation and commodity prices. The trend line results for corn were $y=14.642x-29163$ and $R^2=0.6018$. Since this is the case, when X (year) increases by one, Y will increase by 14.642, and when X is zero, Y will be 29163. For soybeans, the trend line was $y=6.0592x-12034$ and $R^2=0.4527$. Moreover, when X (year) increases by one for soybeans, Y will increase by 6.0592. When X is zero, Y will be 12034. The R-squared values are a measure of how much of the variability in costs is explained by the year. A linear trend line was used for a future projection of costs. When analyzing input costs, they have predominately been linear,

but a polynomial trend line could also be used to illustrate future trends in this case. This trend line responds in many cases to the fluctuations in corn and soybean commodity prices, along with on-farm profitability. Therefore, a polynomial trend line would be most representative in the long term. Nevertheless, seed remains linear in its continual price increase in price year over year.

Table 3.7 Summary Statistics for Corn and Soybean Production Seed, Chemicals, Fertilizer, etc. Costs in Iowa, 2005-2016 \$ per acre

\$ per acre	Corn	Soybeans
Average	\$274.90	\$148.12
Minimum	\$157.72	\$96.53
Maximum	\$350.76	\$202.85
Standard Deviation	68.05	32.46
Range	\$193.04	\$106.32
Coefficient of variation	0.25	0.22

Source: Iowa State University Ag Decision Maker

3.3.4 Machinery Costs for Growing and Harvesting

Machinery costs for growing and harvesting are fixed costs within the operation related to corn and soybean production. Depreciation is associated with these fixed costs. Lauver Family Farms does all of the planting and harvesting within their operation. In the past, customer harvesting has been contracted, when needed. The rates charged were based upon the Iowa State University Ag Decision Maker recommendations. The machinery costs for harvesting and growing are also from the Iowa State University Ag Decision Maker, illustrated in Table 3.8 and Figure 3.8. It can be expected that inflation and increased costs of machinery will continue to drive this cost up over the next ten years as well, when evaluating the linear trend line estimated. The R-squared values are a measure of how much of the variability in costs is explained by the year. Furthermore, trend line

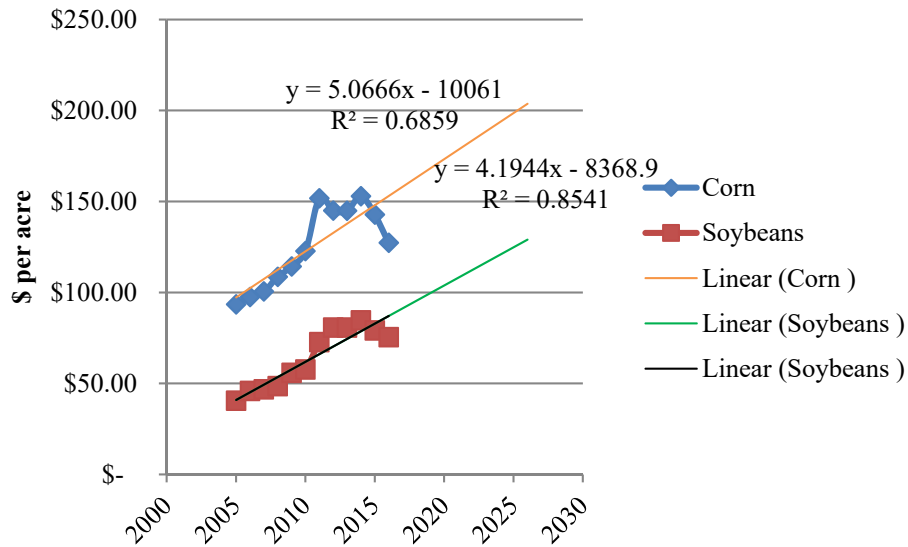
results for corn were $y=5.0666x-10061$ and $R^2=0.6859$. In this case, when X (year) increases by one, Y will increase by 5.0666, and when X is zero, Y will be -10061. For soybeans, the trend line was $y=4.1944x-8368.9$ and $R^2=0.8541$. Specifically, when X (year) increases by one, Y will increase by 4.1944, and when X is zero, Y will be -8368.9. The trend line used was linear as machinery prices have increased over the past ten years. Nevertheless, a polynomial trend line could also be used to illustrate the trends in machinery prices. These machinery costs are subject to the variability of on-farm profitability. This on-farm profitability leads to the supply and demand for new and used machinery. When on farm profitability is low, the demand for machinery is low as well and is represented by a polynomial trendline. However, when profitability is high, a linear trendline is most representative.

Table 3.8 Summary Statistics for Corn and Soybean Production Machinery Costs for Growing and Harvesting in Iowa, 2005-2016 \$ per acre

\$ per acre	Corn	Soybeans
Average	\$125.16	\$64.05
Minimum	\$93.43	\$40.53
Maximum	\$152.93	\$84.70
Standard Deviation	22.05	16.36
Range	\$59.50	\$44.17
Coefficient of variation	0.18	0.26

Source: Iowa State University Ag Decision Maker

Figure 3.8 Average and Estimated Machinery Costs for Corn and Soybean Growing and Harvesting in Iowa



Source: Iowa State University Ag Decision Maker

3.3.5 Total Cost Per Bushel and Price Per Bushel

A historical look at the cost to produce each bushel and the price received for each bushel was evaluated over the past ten years as well. By studying the past ten years prices and costs of production, Lauver Family Farms is able to gain greater insight into where profitability may be in the future. Overall, there was a significant change in the range of costs, but the profitability saw ever greater ranges over the past ten years of production. Lauver Family Farms will use this data as they make decisions to improve long-term profitability, while reviewing prices received. By gaining an understanding of past history, future trends and prices can be estimated. The ranges in historical prices are significant, when comparing against the flat payment received from the Conservation Reserve Program.

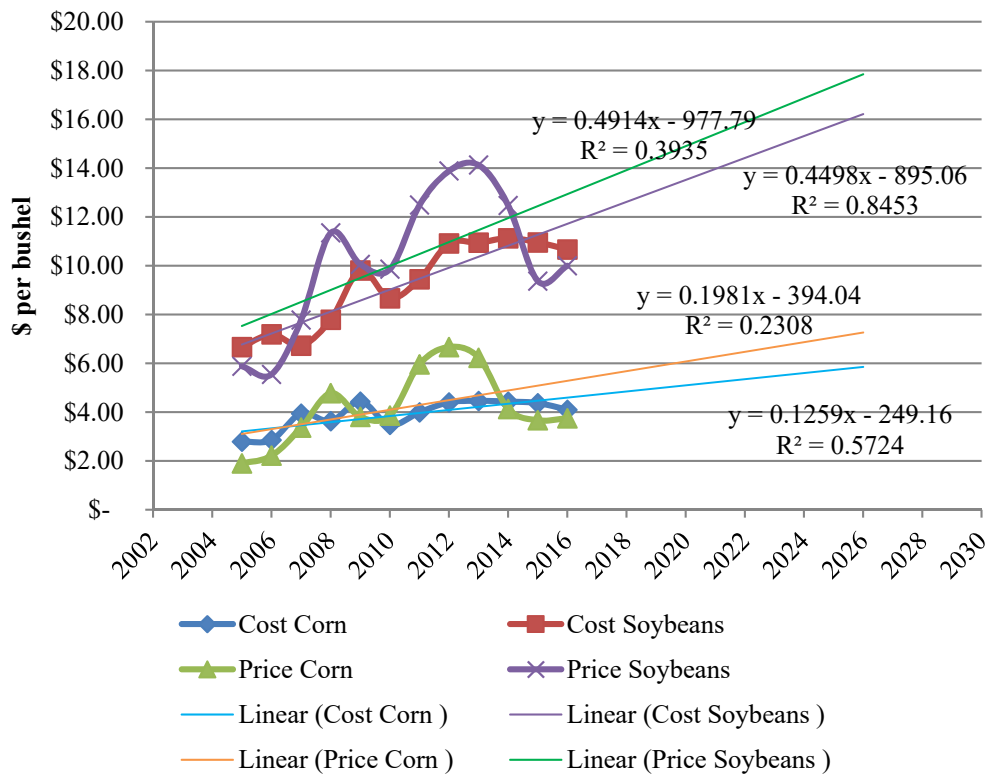
Summary statistics are presented in Table 3.9 and Figure 3.9. The results in Figure 3.9 illustrate the volatility in the corn and soybean markets for prices received, and how the cost of production tends to follow the price per bushel. The trend line results for corn cost of production were $y=0.1259x-249.16$ and $R^2=0.5724$. When evaluating the cost of corn production trend line, when X (year) increases by one, Y will increase by 0.1259. When X is zero, Y will be -249.16. For soybean cost of production, the trend line was $y=0.4498x-895.06$ and $R^2=0.8453$. For soybean cost, when X (year) increases by one, Y will increase by 0.4498. When X is zero, Y will be -895.06. The trend line results for corn price per bushel were $y=0.1981x-394.04$ and $R^2=0.2308$. When X (year) increases by one, Y will increase by 0.1981, and when X is zero, Y will be -394.04. For soybean price per bushel, the trend line was $y=0.4914x-977.79$ and $R^2=0.3935$. Since this is the case, when X (year) increases by one, Y will increase by 0.4914. When X is zero, Y will be -977.79. The R-squared values are a measure of how much of the variability in costs and prices is explained by the year. The R-Squared values are also relatively high throughout this analysis. Since this is the case, the higher the R-squared, the better the model fits the data. R-squared ranges from 0 at its lowest to 1.00 at its highest. An increase in commodity prices and the cost of producing them resulted in the use of a linear trend line. However, a polynomial trend line would also be fitting for this data as well. This fluctuation in the price per bushel and cost per bushel is related to the supply and demand shifts in commodity prices influenced by, but not limited to world demand and domestic consumption of corn and soybean commodities.

Table 3.9 Summary Statistics for Corn and Soybean Production Total Cost per Bushel and Price per Bushel in Iowa, 2005-2016 \$ per bushel

\$ per bushel	Corn Cost	Soybean Cost	Corn Price	Soybean Price
Average	\$3.91	\$9.25	\$ 4.20	\$10.24
Minimum	\$2.79	\$6.67	\$1.90	\$5.55
Maximum	\$4.46	\$11.13	\$ 6.67	\$14.13
Standard Deviation	0.59	1.76	1.48	2.82
Range	\$1.67	\$4.46	\$4.77	\$8.58
Coefficient of variation	0.15	0.19	0.35	0.28

Source: Iowa State University Ag Decision Maker

Figure 3.9 Average and Estimated Corn and Soybean Production, Total Cost Per Bushel and Price Per Bushel in Iowa, 2002-2030



Source: Iowa State University Ag Decision Maker

3.3.6 Total Cost Per Acre Corn and Soybean Production

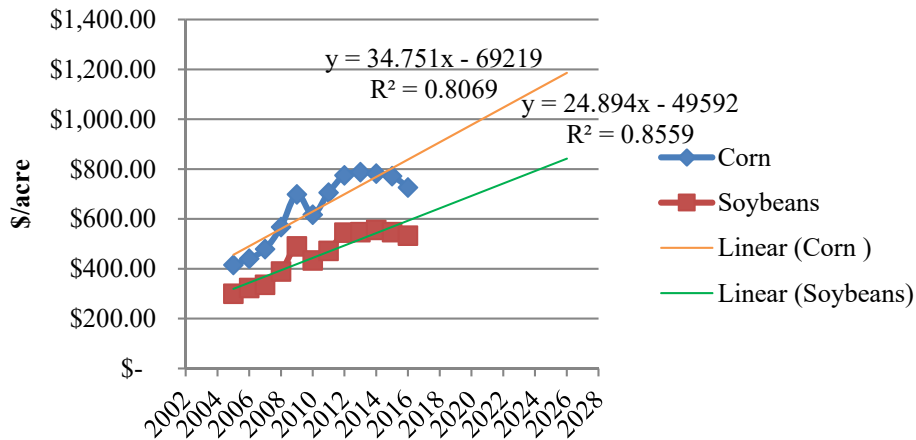
The total cost per acre for corn and soybean production data was derived from the Iowa State University Ag Decision Maker. This data is important due to its comprehensive ability to illustrate the total cost per acre to produce corn and soybeans in the state of Iowa. Over the past ten years, there has been a significant range in the costs per acre to produce a corn and soybean crop. For example, seed, fertilizer, labor, land and machinery all contribute to the total cost per bushel to cultivate and harvest corn and soybeans. It is these ranges and costs in dollars per acre that are factored in, when making a decision on Conservation Reserve Program enrollment. Table 3.10 and Figure 3.10 illustrate the total costs per acre for corn and soybean production on an Iowa Farm. The trend line results for corn were $y=34.751x-69219$ and $R^2=0.8069$. When X (year) increases by one, Y will increase by 34.751, and when X is zero, Y will be 69219. For soybeans, the trend line was $y=24.894x-49592$ and $R^2=0.8559$. In this case, when X (year) increases by one, Y will increase by 24.894. When X is zero, Y will be -49592. The R-squared values are a measure of how much of the variability in Y is explained by year. The R-squared values in this case are relatively high, therefore indicating the model fits the data. The total cost of producing corn and soybeans per acre has been largely linear, so a trend line was used. However, the data could also be analyzed with a polynomial trend line. This total cost per acre is dependent upon the input prices such as seed costs, fertilizer costs, land costs, labor costs, and herbicide costs, just to name a few. As these input prices increase or decline, the trend line will appear linear at times, but can also appear polynomial in nature.

Table 3.10 Summary Statistics for Corn and Soybean Production Total Cost per Acre in Iowa, 2005-2016 \$ per acre

\$ per acre	Corn	Soybeans
Average	\$647.69	\$456.49
Minimum	\$415.99	\$300.34
Maximum	\$788.53	\$556.60
Standard Deviation	139.48	97.01
Range	\$372.54	\$256.26
Coefficient of variation	0.22	0.21

Source: Iowa State University Ag Decision Maker

Figure 3.10 Average and Estimated Corn and Soybean Production Total Cost per Acre in Iowa



3.3.7 Total Land Rental Rates in Calhoun County Iowa

Moreover, from a data standpoint, the total land rental rates were evaluated in Calhoun County Iowa over the past ten years using data from the Iowa State Ag Decision Maker by county. It can be noted that the total cost to rent land per acre has experienced a significant rise over the past ten years, followed by a slight decline as commodity prices have decreased, as shown in Figure 3.11. It is important to observe these land rental prices for Iowa, since it is possible for Don or Kevin Lauer to rent the farm to Andrew or Jacob Lauer as next generation producers, if they desired to do so. That being said, the bid for the Conservation Reserve Program for the next ten years, is significantly higher than the average, or even the maximum price received in Iowa for land rental over the past ten

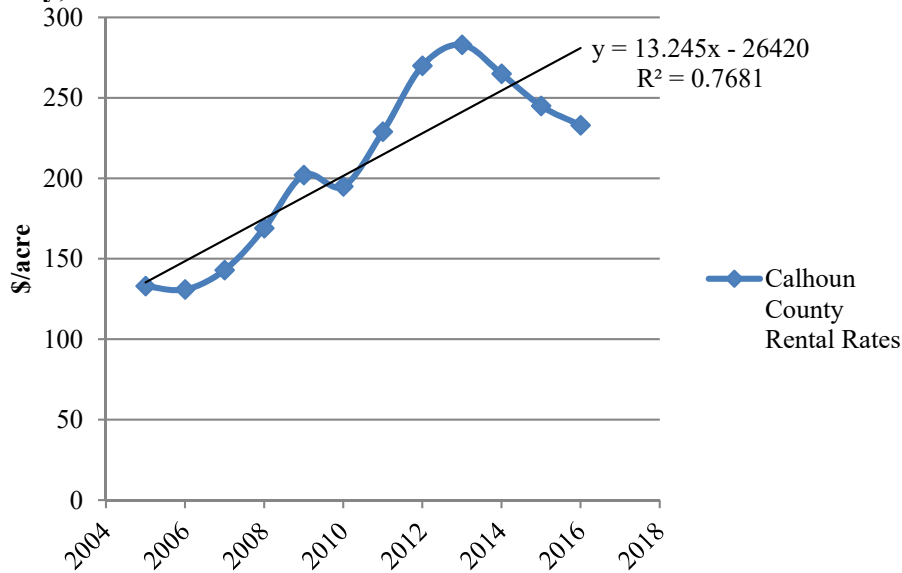
years. It is important to consider these points, since the value of the land will fluctuate in the years to come, and it will need to be reevaluated at future enrollment decision points. As primary succession planning options, Kevin and Don may either rent the land out to the next generation in Andrew and Jacob, or enroll the land in the conservation reserve program, if it is paying a higher rate. The R-squared value of 0.7681 is a measure of how much of the variability in rental rates is explained by the year. The trend line results for the Iowa land rental rates were $y=13.245x-26420$ and $R^2=0.7681$. When X (year) increases by one, Y will increase by 13.245. When X is zero, Y will be 26420. Table 3.11 and Figure 3.11 provide these data and results. A linear trend line was used in this case, but the trend line used could also be analyzed with a polynomial trend line. The land rental rates fluctuate based upon on-farm profitability. When profitability is low, growers request tenants to lower rent. Contributing factors to the variation in land rental rates include both increases and decreases in commodity prices, increases and decreases in input prices, and increases in the actual sale value of farmland. All of these factors contribute to the linear trendline in recent years, and the recent decline in land rental rates indicates a trend line that is polynomial in nature.

Table 3.11 Summary Statistics for Iowa Land Rental Rates, 2005-2016, Calhoun County, Iowa

\$ per acre	Land Rental
Average	\$208.17
Minimum	\$131.00
Maximum	\$283.00
Standard Deviation	54.48
Range	152
Coefficient of Variation	0.261749

Source: Iowa State University Ag Decision Maker

Figure 3.11 Summary Statistics for Iowa Land Rental Rates, 2005-2016, Calhoun County, Iowa



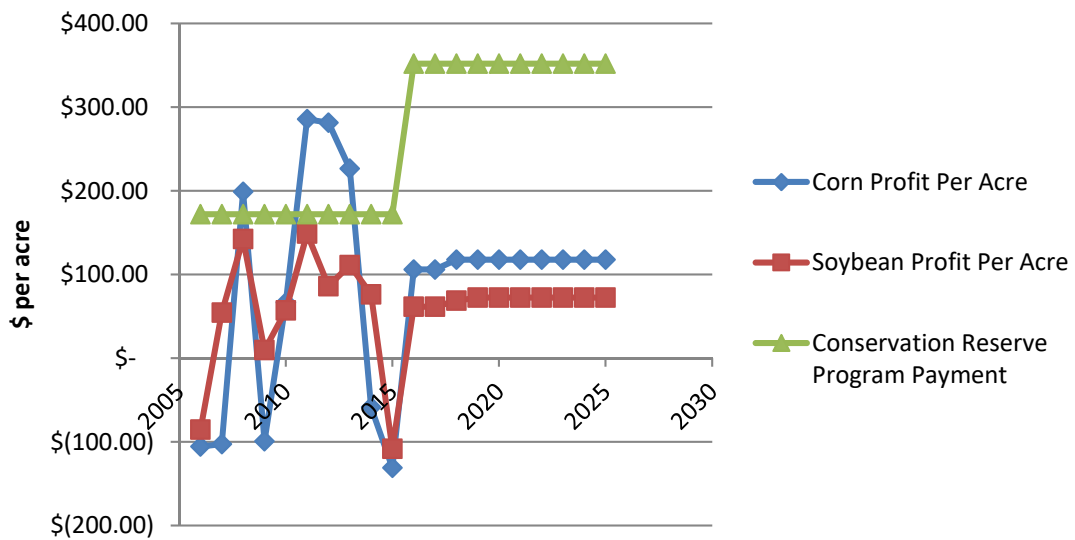
Source: Iowa State University Ag Decision Maker, Historical County Cropland Rental Rates, July 2016

3.3.8 Corn and Soybean Production Profit versus Conservation Reserve Program Bids

Finally, an analysis of profitability was performed to examine historic profits and anticipated profits in the future related to corn and soybean production and Conservation Reserve Program payments. Corn production was more profitable than the Conservation Reserve Program four of the years the acres were enrolled due to the high commodity prices and lower production prices. The Conservation Reserve Program bids used are the actual values provided for the last 15 years and the bid offered for the next 10-15 years of enrollment. This analysis will be used to gain a greater understanding of historical profitability on the acres on the Obye Farm and Home Farm to make an informed enrollment decision. Finally, it is assumed that crop production profitability will remain constant over the next ten years for the purposes of a comparison against the Conservation Reserve Program bid. The crop budgeting values are derived from actual Lauver Family

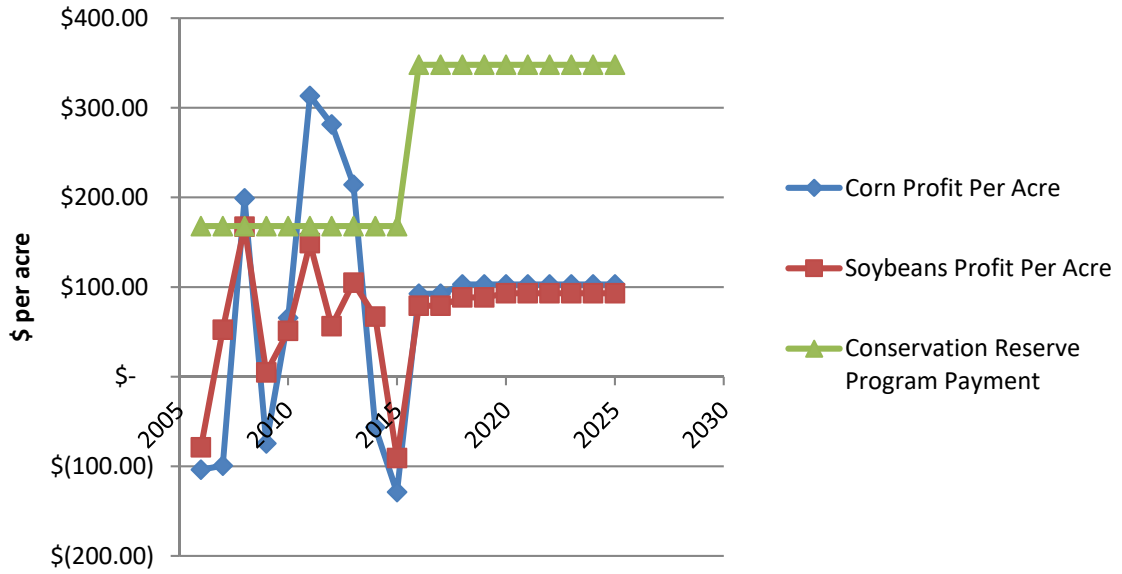
Farm crop budgets including expenses and an estimate of the next ten years of crop production with the corn price at \$3.50 and soybean price at \$9.25 on both farms. A discounted yield has been factored in on the first three years of crop production on each farm. These values have been set at a 15% yield reduction in the first year, a 10% yield reduction in the second year, and 5% yield reduction in the third year. The reason for this is due to the agronomic challenges associated with returning the acres back to crop production after 15 years of grassland vegetation as a result of acreage enrollment in the Conservation Reserve Program. Figure 3.12 and Figure 3.13 provide these data and results.

Figure 3.12 Home Farm Corn and Soybean Profit Versus Conservation Reserve Program Bids



Source: Iowa State University Ag Decision Maker and Lauver Family Farms

Figure 3.13 Obye Farm Corn and Soybean Profit Versus Conservation Reserve Program Bids



Source: Iowa State University Ag Decision Maker and Lauver Family Farms

CHAPTER IV: CONCEPTUAL MODEL AND METHODS

4.1 Conceptual Model Introduction

The conceptual model provides information to support and aid in the decision making process for enrolling in the Conservation Reserve Program or land conversion to grain production for Lauver Family Farms. As noted in the literature review, the decision to enroll in the Conservation Reserve Program is a discrete choice problem. The farmer will elect to sign up, if the anticipated utility of participating is greater than the expected utility of not participating (Osborn et. al. 1990).

The benefits to Lauver Family Farms of enrolling in the Conservation Reserve Program include conservation, improved soil health, water quality, and profitability. The conceptual model will include, but not be limited to, the relationship between long-term profits from crop production, soil productivity, land conversion, opportunity cost of the Conservation Reserve Program and Conservation Reserve Program payments over the period of enrollment. It is expected that the highest yields will lead to converting Conservation Reserve Program land into crop production. Moreover, it is estimated that the most productive soil will generate the highest yields, the cost of land conservation will impact profitability by generating costs, and Conservation Reserve Program payments will be significant.

First, the long-term profitability of crop production is considered on Lauver Family Farms. If the yield history on Lauver Family Farms indicates high yielding crop production, it is likely that the land values will be high as well. This will determine the productivity, yield averages, and provide an indication of the Conservation Reserve

Program payments to make an informed decision regarding the enrollment of the acres into the Conservation Reserve Program.

Soil productivity is a factor as it has a direct correlation to the land value and yield production histories. The greater productivity the soil type has, the greater the potential for yield. If the soil type is more productive, it is less likely that the land will be retired into the Conservation Reserve Program, since it will promote the potential of high yielding crops. Soil types were analyzed from the United States Department of Agriculture's soil maps and classifications. If the soils indicate they have the ability to drain on their own, then it will favor crop production.

However, if there is a high risk of higher saturation and water holding capacity, the soils will likely favor being retired into the Conservation Reserve Program. The result of higher saturated soils would indicate greater probability of reduced yields over the course of time and an increase in profit margin from enrollment in the Conservation Reserve Program that would result in an effective risk management tool. Finally, when discussing the Conservation Reserve Program payments with Kevin Lauver, it was noted that the bids are provided by the United States Department of Agriculture Farm Service Agency, are based off of the soil types present in each parcel to be enrolled (personal communication, August 22, 2016).

Land conversion is another variable that must be considered. If and when the conversion takes place, the cost of fuel, equipment, and labor must be analyzed. Each of these inputs and production costs has risen over the past decade, and future inflation is inevitable and must be assessed as a long-term enrollment decision is made. If the land conversion costs are significantly high, it is unlikely Lauver Family Farms will till the

ground to plant corn or soybeans the following year. Inflation is captured by inserting a 2.9% and 3.5% discount rate in the net present value analysis, while yields are decreased in a corn and soybean rotation by 15%, 10%, and 5% to address land conversation. The discount rate is used to calculate the net-present value of future cash flows from rotating corn and soybeans, or receiving the Conservation Reserve Program Payments. The discount rate is a combination of debt costs and equity capital. Since the farm has no debt, the discount rate is valued at the return rate of off-farm investments. The rates were discussed with Kevin Lauver via personal communication.

For example, Kevin's most recent operating note loan was charged an interest rate of d (5.75%). He also has a savings account earning an interest of e (.002%). The following equation can be used to determine the discount rate: $d \times (\text{debt}/\text{asset}) + e \times (\text{equity}/\text{asset}) = \text{discount rate}$, or $5.75\% \times (0.5/1) + .002\% \times (0.5/1) = 2.9\%$ discount rate. A second discount rate was also used, to analyze the effect of future increases in interest rates. $7\% \times (0.5/1) + .002\% \times (0.5/1) = 3.5\%$ discount rate. Kevin indicated the operating note loan interest rate is based on Federal Bank interest, which fluctuates across growing seasons. The data for this equation was derived from personal communication with Kevin Lauver (Personal communication, September 18, 2016). The equation for the discount rate was derived from a University of Illinois (FAST) Farm Analysis Solution tools worksheet.

The payments the Conservation Reserve Program allows for the specific farms to enroll are an extremely important variable within the decision tool created. The higher the payment, the more likely land will remain in Conservation Reserve Program.

The model includes an easy to use decision tool encompassing rotation scenarios to determine possible outcomes using a sensitivity analysis and net present value. These

scenarios provide Lauver Family Farms to use the tool annually across any of the acres within their operation to determine the best path forward in regard to grain production or Conservation Reserve Program enrollment. It is important to note that all input costs are assumed to be constant in the sensitivity analysis.

4.2 Conservation Reserve Program Opportunity Cost and Net Present Value

To expand the decision tool beyond a rotated acres profitability analysis, a present value analysis was conducted to determine the value of the payments to the landowner, if enrolled in the Conservation Reserve Program. The present value analysis illustrates the current worth of a future sum of the cash that will be returned. As a result, the future cash flows of the present value analysis will be discounted at the discount rate. If the discount rate is higher, then the present value rate of the cash flows will be lower. Furthermore, revenues and costs for each scenario of crop production, Conservation Reserve Program enrollment, and land conversion will be analyzed.

The Lauver Family Farms tracts of land enrolled in the Conservation Reserve Program is driven by comparing the present value of government payments over time, and is defined as the following equation:

Equation 4.1 Present Value of Conservation Reserve Program Payments

$$V_0^C = \sum_{t=1}^k C_t / (1 + r_t)^t$$

Where, V_0^C is the value of the land at the culmination of period 0; C_t is the rent derived from the conservation reserve program at the end of the period, which is

represented by t , followed by k being equal to 10 or 15 years. This is dependent upon the contract length agreed to between Lauver Family Farms and the federal government; r_t is the constant real discount rate for year t . Moreover, the present value of farming the land is represented in Equation 4.2.

Equation 4.2 Present Value of Corn and Soybean Production

$$V_0^F = \sum_{t=1}^k F_t / (1 + r_t)^t$$

Where, V_0^F is the monetary value of the land at the end of period 0; F_t is the net income derived annually from the parcel being farmed, while all other variables are defined previously. In this case, if the present value of returns from the Conservation Reserve Program, V_0^C , presents a greater numerical value than the present value of the net income received from farming the land V_0^F , over the same time period, Lauver Family Farms will prefer the Conservation Reserve Program contract. In this case, the opportunity cost is defined as.

Equation 4.3 Opportunity Cost

$$V_0^C - V_0^F$$

Furthermore, Lauver Family farms must look at values outside of strictly the monetary returns. For example, sons Andrew and Jacob Lauver do enjoy hunting pheasants on the Conservation Reserve Program land, so that would be defined as a benefit to enrolling in the program. Additionally, the conservation reserve program provides decreased soil erosion and leaching of nitrates as well, aligning closely with the conservation minded approach of Lauver Family Farms. These are benefits that are not

illustrated within the model, but are attractive to those involved within the farming operation.

Finally, strategic risk management is extremely important within Lauver Family Farms when it comes to analyzing the outcome of this decision. This is the behavior of each family member's response to the uncertainties and opportunities involved. A clear understanding of the strategy as a family, the risks in adopting it such a strategy, and the risks in executing it, are each of importance.

When assessing the personalities and ages of the decision makers within the operation, there are vast differences presented when approaching risk. Don, 83, owns a majority of the land, is primarily retired outside of harvest and planting, and is conservative when it comes to his risk tolerance. For example, Don does not forward contract grain deliveries, but rather waits to market his grain after harvest. Kevin, 57, is the primary decision maker within the operation and owns a portion of the land. He is reaching retirement age and is conservative as well, but is more aggressive in his grain marketing approach by forward contracting. Both Kevin and Don are not seeking significant risk at this point in their careers.

Meanwhile, Andrew and Jacob Lauver are becoming more actively engaged in the family farm at 26 and 22 years of age. They are more tolerant of risk, and aggressive in their approach to profitability, if there is the potential for a greater return in the short term, versus the long-term. Furthermore, Jacob intends to make farming his career, while Andrew plans to invest and grow the business, never more than one step away from the farm. Kevin has encouraged both Andrew and Jacob to invest and save in order to purchase a parcel of land near the Home Farm, if land does come up for sale in the coming years.

This is of importance due to the fact that income is expected to be derived for years to come, with the hope of passing the family farm on to the next generation.

CHAPTER V: PROCEDURES AND METHODS

Procedures and methods were established to meet the purpose of this thesis to determine which option was the most profitable long-term for the operation. The purpose includes evaluating the sources of data relevant to Lauver Family Farms decision.

First, the model includes an easy to use decision tool encompassing crop production budgets and conservation reserve program payments. This decision tool creates the ability to easily change values within cells annually to make informed long and short term decisions. By changing the data within cells through scenarios, it is possible to determine whether to enroll in the Conservation Reserve Program, or convert land to corn and soybean production.

Data were collected from Lauver Family Farms production records, such as yield history. Furthermore, input costs, such as seed, fertilizer, and herbicide application costs were incorporated. Finally, data were acquired and validated through an interview with the owners and operators of Lauver Family Farms, Don and Kevin Lauver. The interview was conducted in person, and historical, present, and future perspectives on grain production and the Conservation Reserve Program were discussed.

Moreover, further discussion with the owners of Lauver Family Farms focused on each scenario presented related to grain production, or enrollment in the Conservation Reserve Program. By creating scenarios with production costs, Lauver Family Farms can use the tool annually, when enrollment decisions need to be made.

Data for production costs were extracted from in-person interviews, as well as the Iowa State University Ag Decision Maker website. Analysis of these production costs and budgets serves as a primary method to develop a forecasting decision tool for Lauver

Family Farms. Additionally, soil maps were used to determine productivity potential on each farm. By using crop budgets for corn and soybean production, along with the current bids for Conservation Reserve Program enrollment, years one through ten were forecasted for net return over total costs per acre by utilizing crop budgets. Fertilizer, seed, and crop protection, machinery, and crop insurance costs were all factored into this analysis.

The predicted costs of production costs and future outlook are important to the ultimate decision made by Lauver Family Farms and trend lines were incorporated as well. As a result, the analysis is used to evaluate a range of outcomes for the inputs provided, now and into the future. In the case of Lauver Family Farms, observations of historical prices for various inputs, outputs, and productivity are analyzed. Forecasting within the model is used to determine expense calculations such as seed costs, fertilizer costs, and crop protection costs. In addition, income calculations will also be made to illustrate the expected price received, expected yield, and expected payments made by the United States Department of Agriculture Farm Service Agency for the contracted payments made for enrolling acres in the Conservation Reserve Program.

To receive quoted prices per acre for enrollment in the Conservation Reserve Program, a meeting was scheduled with the local United States Department of Agriculture Farm Service Agency office that Lauver Family Farms works with to receive a quote on the current payments for the Conservation Reserve Program acres eligible for re-enrollment. The payment values provided by the local Farm Service Agency office provided information for the what/if analysis to be conducted and compared against grain production and land conversion.

During an interview with the Farm Service Agency, it was noted that penalties would be incurred, if Lauver Family Farms decided to enroll acres, and then un-enroll in future years (personal communication, August 29,2016) . These would be considered liquidated damages by the Farm Service Agency. To determine the amount when assessing liquidated damages, the number of Conservation Reserve Program acres being terminated must be multiplied times 25% of the annual rental rate. That being said, it is important for Lauver Family Farms to realize the implications of enrolling in the Conservation Reserve Program, and then deciding to terminate the agreement, would likely not be worth the cost.

One important aspect to note within the tool is the agronomic cost of producing corn or soybeans on the land for the first time the following year. From an agronomy standpoint, it is known that there may be a reduction in yield during the first year due to the inability to have ideal emergence and soil conditions after the first year being tilled, after fifteen years of enrollment in the Conservation Reserve Program. Furthermore, the land would have remained dormant over the past 15 years, meaning it has not been tilled, fertilized, or managed in over a decade. To arrive at a discounted yield percentage, an expert opinion was provided by Kevin Lauver. It was estimated that in the first year a 15% yield reduction would be experienced, followed by 10% the second year, and only 5% the third year. After the third year of production on the Conservation Reserve Program land, optimal yields in the growing environment would be expected.

Furthermore, an inquiry was made to a local contractor who does tiling work. The purpose of the inquiry was to determine the cost per acre to tile the land currently in the Conservation Reserve Program. If un-enrolled, the land would need to be tilled in order to increase the yield. Kevin Lauver indicated that the cost for the tile would be \$500/acre, or

\$50 per year on each acre over 10 years, which presents a significant upfront capital investment from Lauver Family Farms to improve the land (personal communication August 22, 2016). When discussing this investment with Lauver Family Farms, it was agreed upon that the debt would be amortized over ten years, resulting in the \$50 per acre cost added to production.

The use of crop budgets and forecasting aided Lauver Family Farms decision making due to the ability to examine future outcomes using numerous values for various inputs. For example, over the past 15 years, prices have ranged from \$1.77 to \$7.06 per bushel for corn and \$4.44 to \$16.80 per bushel for soybeans according to the Iowa State University Ag Decision Makers webpage. This difference in prices makes a long-term decision to retire acres to the Conservation Reserve Program a risky one, if higher prices occur. Alternatively, if acres are locked in at a high payment per acre in the Conservation Reserve Program, simulation can be used to illustrate the advantages of using the Conservation Reserve Program as a risk management tool on Lauver Family Farms. Excel was used to create this decision tool, factoring in future corn and soybean commodity prices. Excel assigns values to the returns after commodity prices, yield, and input costs to generate an expected profit or loss per acre being analyzed. These values are used in the net present value tool.

Net present value is primarily used to aid in the decision making process long-term, and is the difference between the present value of cash inflows and the present value of cash outflows. If we have a positive net present value, then the cash inflows indicate that the production practices are profitable and exceed the costs. Alternatively, if we have a negative net present value, we can expect a net loss in production.

Moreover, a sensitivity analysis was conducted to view how the price per bushel of corn and soybeans affected the decision to enroll in the conservation reserve program. Specifically, a sensitivity analysis studies how the uncertainty in the output of a mathematical model or system can be apportioned to different sources of uncertainty in its inputs. In this case, we analyze the costs of production for corn and soybeans, price, and bids made by the Conservation Reserve Program. Again, it is important to note that costs are assumed to remain constant throughout the sensitivity analysis.

Collectively, the economic trends, projected corn and soybean prices, and land values are important to this analysis. By including data and utilizing a decision tool, Lauver Family Farms is able to analyze the benefits of using the Conservation Reserve Program as a risk management tool.

CHAPTER VI: RESULTS

The thesis results were gathered through the procedures and methods as outlined in the previous chapter.

6.1 Results

First, the net return over total costs is a significant indicator of the future profitability of a corn and soybean rotation, versus remaining enrolled in the Conservation Reserve Program. Figure 6.1 illustrates that it is evident that in this case the expected net return over costs will be higher, if the acres are enrolled in the Conservation Reserve Program. These are projected net returns based off the previous ten years of yield history and current corn and soybean commodity prices. The payment rates for the Conservation Reserve Program are directly from the Farm Service Agency and are based upon rental rates from two years ago, and specifically related to the soil types on the Home Farm and Obye Farm.

Figure 6.1 Net Return over Total Costs (\$/acre)

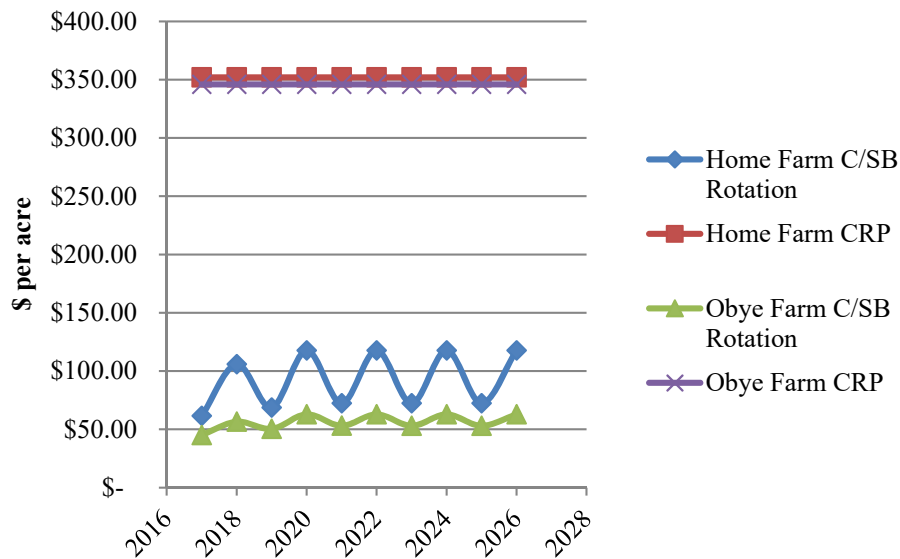
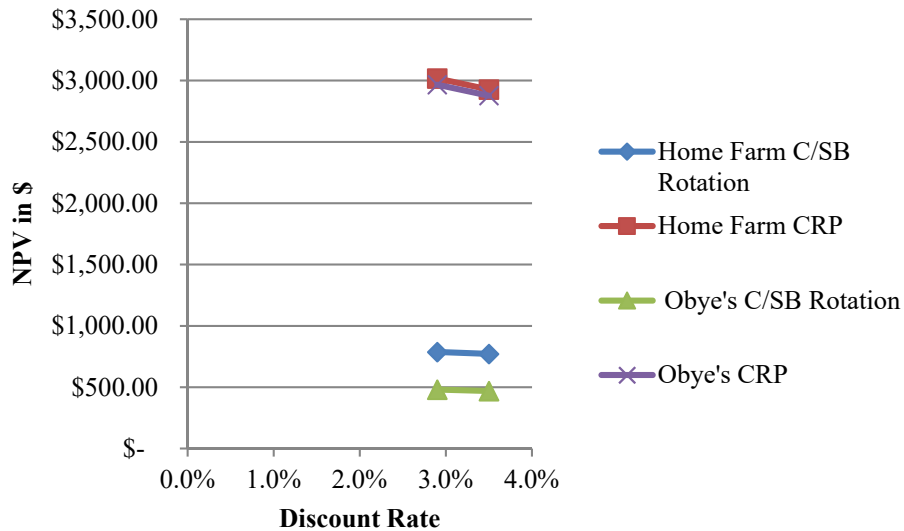


Figure 6.2 provides the net present value determined in this analysis for both farm parcels and Conservation Reserve Program acres.

Figure 6.2 Net Present Values of Crop and Conservation Reserve Program Acres



The decision tool calculates net present value per acre on the Home Farm to be \$787.38 when discounted at 2.9% and planted in a corn and soybean rotation for the next ten years. Moreover, if the discount rate is raised to 3.5%, then the net present value decreases to \$771.48.

When considering enrolling the marginal acres in the Conservation Reserve Program, the net present value of the land on the Home Farm is at \$3,018.01 at a 2.9% discount rate and \$2,927.45 at an 3.5% discount rate. The corn price was set at \$3.50 and the soybean price was set at \$9.25 during this time period. The expected corn yield on this farm following soybeans is 163 bushels per acre, and the expected soybean yield on this farm is 47 bushels per acre over 10 years. Each of these yields is derived from a ten year

average on the farm, collected directly from Kevin Lauver’s production records (personal communication, August 22, 2016). Table 6.1 and Figure 6.1 provide these results and data.

Table 6.1 Home Farm Net Present Value Table

Net Present Value-Home Farm	2.9%	3.5%
Corn and Soybean Rotation (2017-2026)	\$787.38	\$771.48
Conservation Reserve Program (2017-2026)	\$3,018.01	\$2,927.45

Figure 6.1 Home Farm Net Present Value Table in Excel Decision Tool

Compare Crop Rotations												Ten Year Average	
Enter the number (1.Corn-Corn, 2.Corn-Sb, 3.Sb-Corn, 4.Soybeans-C-C) for each crop from the above table to find rotation totals and average revenue.												Total	Revenue
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10			
Rotation 1:	2	3	2	3	2	3	2	3	2	3			
	Corn-Sb	Sb-Corn	Corn-Sb	Sb-Corn	Corn-Sb	Sb-Corn	Corn-Sb	Sb-Corn	Corn-Sb	Sb-Corn			
Percentage Adjustment	-15%	-10%	-3%										
Net Return over Total Costs	\$61.54	\$105.97	\$68.78	\$117.75	\$72.40	\$117.75	\$72.40	\$117.75	\$72.40	\$117.75	\$924.48	\$92.45	
Net Returns over Variable Costs	\$158.59	\$192.41	\$177.25	\$213.78	\$186.58	\$213.78	\$186.58	\$213.78	\$186.58	\$213.78	\$1,943.11	\$194.31	
Rotation 2:	5	5	5	5	5	5	5	5	5	5			
	CRP	CRP	CRP	CRP	CRP	CRP	CRP	CRP	CRP	CRP			
Percentage Adjustment													
Net Return over Total Costs	\$352.00	\$352.00	\$352.00	\$352.00	\$352.00	\$352.00	\$352.00	\$352.00	\$352.00	\$352.00	\$3,520.00	\$352.00	
Net Returns over Variable Costs	\$317.00	\$317.00	\$317.00	\$317.00	\$317.00	\$317.00	\$317.00	\$317.00	\$317.00	\$317.00	\$3,170.00	\$317.00	
Net Present Values- Home Farm	2.9%	3.5%											
Corn and Soybean Rotation	\$787.38	\$771.48											
Conservation Reserve Program	\$3,018.01	\$2,927.45											

Net Present Values- Home Farm	2.9%	3.5%
Corn and Soybean Rotation	\$787.38	\$771.48
Conservation Reserve Program	\$3,018.01	\$2,927.45

When analyzing the Obye Farm, the second farm to encompass current Conservation Reserve Program acres, the net present value in a corn and soybean rotation is calculated at \$480.65 when discounted at 2.9% and \$468.94 when the discount rate is raised to 3.5% (Table 6.2 and Figure 6.2).

Furthermore, when the land is re-enrolled in the Conservation Reserve Program, the net present value is raised to \$2,966.57 at a 2.9% discount rate and has a \$2,877.55 net present value when the discount rate is raised to 3.5% (Table 6.2 and Figure 6.2). The corn price was set at \$3.50 and the soybean price was set at \$9.25. The expected corn yield on this farm following soybeans is 157 bushels per acre, and the expected soybean yield on

this farm is 41 bushels per acre over 10 years. Each of these yields is derived from a ten year average on the farm, collected directly from Kevin Lauver’s production records (personal communication, August 22, 2016).

Table 6.2 Obye Farm Net Present Value Table

Net Present Value-Obye Farm	2.9%	3.5%
Corn and Soybean Rotation (2017-2026)	\$480.65	\$468.94
Conservation Reserve Program (2017-2026)	\$2,966.57	\$2,877.55

Figure 6.2 Obye Farm Net Present Value Table in Excel Decision Tool

Compare Crop Rotations												
Enter the number (1.Corn-Corn, 2.Corn-Sb, 3.Sb-Corn, 4.Soybeans-C) for each crop from the above table to find rotation totals and average revenue.												
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Ten Year	Average
Corn and Soybean Rotation	2	3	2	3	2	3	2	3	2	3	Total	Revenue
Percentage Adjustment	-15%	-10%	-5%									
Net Return over Total Costs	\$45.16	\$56.60	\$50.47	\$62.89	\$53.13	\$62.89	\$53.13	\$62.89	\$53.13	\$62.89	\$563.19	\$56.32
Net Returns over Variable Costs	\$141.65	\$142.71	\$158.31	\$158.56	\$166.65	\$158.56	\$166.65	\$158.56	\$166.65	\$158.56	\$1,576.86	\$157.69
Conservation Reserve Program	5	5	5	5	5	5	5	5	5	5	Total	Revenue
Percentage Adjustment												
Net Return over Total Costs	\$346.00	\$346.00	\$346.00	\$346.00	\$346.00	\$346.00	\$346.00	\$346.00	\$346.00	\$346.00	\$3,460.00	\$346.00
Net Returns over Variable Costs	\$346.00	\$346.00	\$346.00	\$346.00	\$346.00	\$346.00	\$346.00	\$346.00	\$346.00	\$346.00	\$3,460.00	\$346.00
Net Present Values-Obye Farm	2.9%	3.5%										
Corn and Soybean Rotation	\$480.65	\$468.94										
Conservation Reserve Program	\$2,966.57	\$2,877.55										

Net Present Values-Obye Farm	2.9%	3.5%
Corn and Soybean Rotation	\$480.65	\$468.94
Conservation Reserve Program	\$2,966.57	\$2,877.55

When analyzing the net present values in this case, it is clear that the sound decision for the next enrollment term will be to enroll the acres in the Conservation Reserve Program. The net present values in a corn and soybean rotation remain low, while the net present values for re-enrollment in the Conservation Reserve Program are significantly higher. It is important to remember that this has not always been the case, so the decision tool will be effective for re-evaluation when commodity prices increase, and the Conservation Reserve Program payment price is locked. For example, according to the Iowa State University Ag Decision Maker, in the late 2000’s corn was \$7.00 and it was

more profitable to raise corn on the acres, versus let it remain in the Conservation Reserve Program.

It should be noted that changes in the commodity and input prices will change the expected gross profits per acre which may significantly impact the net present value. Since this is the case, it will be important to continually refer back to the model from time to time to ensure the best decision was made for the operation from a conservation and profitability standpoint. This model calculates the net present value based upon the direct costs that are input, specifically related to Lauver Family Farms production practices. If the farming methods change over the years, the model could significantly change as well.

Finally, a sensitivity analysis was run on each farm to determine the point at which profitability would be higher in a corn and soybean rotation over ten years, versus taking the Conservation Reserve Program Payments. Yields were left unchanged, but the commodity prices were adjusted higher. In this case, the point at which profitability went higher was when corn after soybeans was \$6.25 per bushel and soybeans after corn were \$11.35 per bushel. Table 6.3 and Figure 6.3 provide these results.

Table 6.3 Home Farm Sensitivity Analysis Results

Net Present Values	2.9%	3.5%
Ten Year Corn and Soybean Rotation	\$3,058.31	\$2,942.74
Conservation Reserve Program	\$3,018.01	\$2,927.45

Figure 6.3 Home Farm Sensitivity Analysis Net Present Value

Compare Crop Rotations													
Enter the number (1.Corn-Corn, 2.Corn-Sb, 3.Sb-Corn, 4.Soybeans-C) for each crop from the above table to find rotation totals and average revenue.													
Rotation 1:	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Ten Year Total	Average Revenue	
	2	3	2	3	2	3	2	3	2	3			
	Corn-Sb	Sb-Corn	Corn-Sb	Sb-Corn	Corn-Sb	Sb-Corn	Corn-Sb	Sb-Corn	Corn-Sb	Sb-Corn			
Percentage Adjustment	-15%	-10%	-5%										
Net Return over Total Costs	\$442.55	\$194.80	\$494.62	\$216.45	\$520.65	\$216.45	\$520.65	\$216.45	\$520.65	\$216.45	\$3,509.71	\$359.97	
Net Returns over Variable Costs	\$539.60	\$281.24	\$603.09	\$312.48	\$634.83	\$312.48	\$634.83	\$312.48	\$634.83	\$312.48	\$4,578.34	\$457.83	
Rotation 2:	5	5	5	5	5	5	5	5	5	5			
	CRP	CRP	CRP	CRP	CRP	CRP	CRP	CRP	CRP	CRP	Ten Year Total	Average Revenue	
Percentage Adjustment													
Net Return over Total Costs	\$352.00	\$352.00	\$352.00	\$352.00	\$352.00	\$352.00	\$352.00	\$352.00	\$352.00	\$352.00	\$3,520.00	\$352.00	
Net Returns over Variable Costs	\$317.00	\$317.00	\$317.00	\$317.00	\$317.00	\$317.00	\$317.00	\$317.00	\$317.00	\$317.00	\$3,170.00	\$317.00	
Net Present Values- Home Farm	2.9%	3.5%											
Corn and Soybean Rotation	\$3,058.31	\$2,942.74											
Conservation Reserve Program	\$3,018.01	\$2,927.45											

Net Present Values- Home Farm	2.9%	3.5%
Corn and Soybean Rotation	\$3,058.31	\$2,942.74
Conservation Reserve Program	\$3,018.01	\$2,927.45

An additional sensitivity analysis was run on the Obye Farm to determine the point at which profitability would be higher in a corn and soybean rotation over ten years, versus taking the Conservation Reserve Program Payments. Again, yields were left unchanged, but the commodity prices were adjusted higher. In this case, the point at which profitability went higher was when corn after soybeans was \$6.68 per bushel and soybeans after corn were \$11.88 per bushel. Table 6.4 and Figure 6.4 provide these results.

Table 6.4 Obye Farm Sensitivity Analysis

Net Present Values	2.9%	3.5%
Ten Year Corn and Soybean Rotation	\$3,001.33	\$2,878.60
Conservation Reserve Program	\$2,966.57	\$2,877.55

Figure 6.4 Home Farm Sensitivity Analysis Net Present Value

Compare Crop Rotations													
Enter the number (1.Corn-Corn, 2.Corn-Sb, 3.Sb-Corn, 4.Soybeans C-C) for each crop from the above table to find rotation totals and average revenue.													
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Ten Year	Average
Corn and Soybean Rotation		2	3	2	3	2	3	2	3	2	3	Total	Revenue
		Corn-Sb	Sb-Corn	Corn-Sb	Sb-Corn	Corn-Sb	Sb-Corn	Corn-Sb	Sb-Corn	Corn-Sb	Sb-Corn		
Percentage Adjustment		-15%	-10%	-5%									
Net Return over Total Costs		\$469.53	\$153.65	\$524.77	\$170.72	\$552.39	\$170.72	\$552.39	\$170.72	\$552.39	\$170.72	\$3,488.00	\$348.80
Net Returns over Variable Costs		\$566.02	\$239.75	\$632.61	\$266.39	\$665.91	\$266.39	\$665.91	\$266.39	\$665.91	\$266.39	\$4,501.68	\$450.17
Conservation Reserve Program		5	5	5	5	5	5	5	5	5	5		
		CRP	CRP	CRP	CRP	CRP	CRP	CRP	CRP	CRP	CRP	Ten Year	Average
Percentage Adjustment													
Net Return over Total Costs		\$346.00	\$346.00	\$346.00	\$346.00	\$346.00	\$346.00	\$346.00	\$346.00	\$346.00	\$346.00	\$3,460.00	\$346.00
Net Returns over Variable Costs		\$346.00	\$346.00	\$346.00	\$346.00	\$346.00	\$346.00	\$346.00	\$346.00	\$346.00	\$346.00	\$3,460.00	\$346.00
Net Present Values-Obye Farm		2.9%	3.5%										
Corn and Soybean Rotation		\$3,001.33	\$2,878.60										
Conservation Reserve Program		\$2,966.57	\$2,877.55										

Net Present Values-Obye Farm		
	2.9%	3.5%
Corn and Soybean Rotation	\$3,001.33	\$2,878.60
Conservation Reserve Program	\$2,966.57	\$2,877.55

The ability to run a sensitivity analysis within the decision tool provides Lauer Family

Farms with analysis to input prices at any point during the ten years they have enrolled in the Conservation Reserve Program. Yes, it is possible that commodity prices will again rise above levels where a corn and soybean rotation may be more profitable than the Conservation Reserve Program payments.

Nonetheless, penalties would have to be paid to terminate the Conservation Reserve Program contract, which may outweigh the benefits of cultivating the land. Moreover, tile would need to be installed, which has been factored into the crop production budget of this sensitivity analysis.

CHAPTER VII: CONCLUSION

7.1 Conclusion

Within this thesis research, we have evaluated and discussed several areas that impact profitability within Lauver Family Farms related to the Conservation Reserve Program and a crop rotation. The purpose of this research is to put Lauver Family Farms in the best position possible from a profitability standpoint on acres that are marginal within the operation.

Furthermore, we reviewed past literature focusing on the Conservation Reserve Program and its effectiveness since initial implementation in the Farm Bill of 1985. Additional factors such as taking the land out of the Conservation Reserve Program, direct input costs with corn and soybean cultivation, and re-enrolling the land in the Conservation Reserve Program at a higher payment rate were discussed, all of which influence the net present value and profitability over a ten year period.

The net present value analysis does require a significant amount of assumptions regarding cash flow and inputs. We evaluated the past ten years of yield history directly from Lauver Family Farms to assess the past performance within the operation. Then, the expected cash flows within the operation based upon cropping rotation were used to generate the net present values for either a crop rotation, or ten year re-enrollment in the Conservation Reserve Program.

The sensitivity analysis conducted within this thesis incorporates perhaps the most important variable, which is the price received for grain per bushel in dollars. Lauver Family Farms is now aware that if corn prices are to exceed \$6.25 and soybeans are to exceed \$11.35, the profitability of their decision to enroll in the Conservation Reserve Program will be impacted.

Nevertheless, with the information collected and analyzed, it is clear that a re-enrollment in the Conservation Reserve Program would be significantly more profitable than a corn and soybean rotation on the acres. The resulting analysis discovered that the Conservation Reserve Program will be more profitable than cultivating the acres in a corn and soybean rotation for the next 10 or 15 years. This is a result that was then communicated back to Lauver Family Farms, and a re-enrollment decision of the 50 acres will be made for the next 15 years at \$346 per acre on Obye's and \$352 per acre the Home Farm, respectively through the year 2032. The contracts will pay a flat rate over the next 15 years (2017-2032). It is important to note this is a long-term agreement, and if Lauver Family Farms decides to terminate the contract, they must pay a penalty to exit the agreement.

Additionally, it is important to note from a management standpoint that the Conservation Reserve Program is *less* risky, and *more* profitable than crop production when analyzing the decision to re-enroll acres within the operation

Furthermore, if Lauver Family Farms decided not to enroll at this high price, it is likely that they would not be able to enter the Conservation Reserve Program again for several years, due to the competitiveness of the contracts and resource concerns from a contract payment standpoint in Calhoun County, Iowa. It is likely Lauver Family Farms would need to farm the land for several more years, and then seek a re-enrollment, at what would be an anticipated lower payment rate within the Conservation Reserve Program.

This is a fifteen year commitment, and the strategic risk management process is of even greater importance going forward as the decision process is re-evaluated when the next enrollment period comes to light, encompassing financial goals, behavioral differences and risk preferences. When assessing the personalities and ages of the decision makers within the operation, the behavioral differences and ages bring forth greater opportunities, but also differences in opinion.

Moreover, it is important to recall from the literature review that the 2014 Farm Bill the enrollment cap of Conservation Reserve Program acres from 32 million to 24 million acres by the year 2018 (Stubbs 2014). Lauer Family Farms has as opportunity to re-enroll acres, and if they decide to enroll five or ten years from now, the opportunities to enroll may continue to be minimized as they were in the most recent reauthorization of the Farm Bill.

Finally, the next enrollment period will come about in 2032, and Andrew and Jacob Lauer will be even more engaged in the day to day decision making process on the family farm. The net present value and sensitivity analysis performed in this thesis will be extremely useful as decisions are made in future years regarding conservation reserve program enrollment. In these particular circumstances, Lauer Family Farms is confident and pleased with their long-term commitment to conservation stewardship and production agriculture.

7.2 Future Research

This work could be repeated on other farms in the area that the Lauer Family Farms parcels of land are located, or in other states as well. The scenario analyzed of either

re-enrolling or cultivating crops is an issue that has been and will continue to be faced by agricultural producers across the nation. Indeed, Iowa State University and Kansas State University do have decision tools and budgets available, encouraging producers to make more informed decisions through such tools and extension support. It is this support, research, and continual interest from producers, farm managers, and absentee land owners, with unique management practices that will continue to drive long-term decision making processes with confidence and clarity.

REFERENCES

- Burke, Ingrid C. 1995. "Soil Organic Matter Recovery in Semiarid Grasslands: Implications for the Conservation Reserve Program." *Ecological Applications* 5 (3): 793-801. <http://onlinelibrary.wiley.com/doi/10.2307/19411987full>.
- Iowa State University Extension Ag Decision Maker. 2016. "Ag Decision Maker." Feb 1. Accessed May 4, 2016. <<https://www.extension.iastate.edu/agdm/crops/pdf/a2-11.pdf>>. .
- Iowa State University Extension. 2010. "Average Monthly Corn and Soybean Prices Received by Iowa Farmers." *Chartbook*. March 1. Accessed May 4, 2016. <http://www.2.econ.iastate.edu/outreach/agriculture/periodicals/chartbook/Chartbook2/Tables/Table11.pdf>.
- Isik, Murat. 2004. "An Analysis of the Effects of Uncertainty and Irreversibility on Farmer Participation in the Conservation Reserve Program." *Journal of Agricultural and Resource Economics* 29 (2): 242-59. http://www.jstor.org/stable/40987218?seq=1#page_scan_tab_contents.
- Johnson, Kris A., Brent J. Dalzell, Marie Doanhuec, Jesse Gourevitchc, Dennis L. Johnson, Greg S. Karlovitse, Bonnie Keelerc, and Jason T. Smith. 2016. "Conservation Reserve Program (Conservation Reserve Program) lands provide ecosystem service benefits that exceed land rental payment costs." *Ecosystem Services* 175-185.
- Konyar, Kazim. 1990. "ANational-Level Economic Analysis of Conservation Reserve Program Participation: A Discrete Choice Approach." *The Journal of Agricultural Economics Research* 42 (2). http://ageconresearch.umn.edu/bitstream139017/2/3Konyar_42_2.pdf.
- Lauver, Kevin, interview by Andrew Lauver. 2016. *Personal Communication* Lake City, IA, (September 18).
- Lauver, Kevin, interview by Andrew Lauver. 2016. *Personal Communication* Lake City, IA, (August 22).
- Osborn, C. Tim and Konyar, Kazim "A national-level economic analysis of conservation reserve program participation: a discrete choice approach." *The Journal of Agricultural Economics Research* 42, no. 2 (1990): 5-12.
- Parks, Peter J. 1997. "Sustaining Open Space Benefits in the Northeast: An Evaluation of the Conservation Reserve Program." *Journal of Environmental Economics and Management*. *Journal of Environmental Economics and Management* 32 (1): 85-94. <http://www.sciencedirect.com/science/article/pii/S0095069696909560>.

- Plastina, Alejandro. 2016. "Ag Decision Maker, Iowa State University." *Historical County Cropland Rental Rates*. July. Accessed August 22, 2016.
www.extension.iastate.edu/agdm/wholefarm/pdf/c2-11.pdf.
- Randall, G.W., D. R. Huggins, M. P. Russelle, D. J. Fuchs, W. W. Nelson, and J. L. Anderson. 1997. "Nitrate Losses through Subsurface Tile Drainage in Conservation Reserve Program, Alfalfa, and Row Crop Systems." *Journal of Environmental Quality* 26: 1240-1247. doi:10.2134/jeq1997.00472425002600050007x.
- Ribaudo, M.O. 1989. *Water-quality benefits of the Conservation Reserve Program*. Technical Report, Washington, D.C.: Economic Research Service, Washington, DC (USA). Resources and Technology Div.
- Roberts, Mary, interview by Andrew Lauver. 2016. *Personal Communication* Rockwell City, IA, (Aug 29).
- Secchi, Silvia. May 1 2007. *Impact of High Crop Prices on Environmental Quality: A Case of Iowa and the Conservation Reserve Program* Silvia Secchi, Iowa State University. Working Paper, Iowa State University, Digital Repository at Iowa State University. Accessed July 6, 2016.
http://lib.dr.iastate.edu/card_workingpapers/471/.
- Shapiro, C. A., D. L. Holshouser, W. L. Kranz, D. P. Shelton, J. F. Witowski, K. J. Jarvi, G. W. Echtenkamp, et al. 2001. "Tillage and Management Alternatives for Returning Conservation Reserve Program Land to Crops." *Agronomy Journal* 93: 850-862. doi:10.2134/agronj2001.964850x.
- Smith, Rodney B.W. 1995. "The Conservation Reserve Program as a Least-Cost Land Retirement Mechanism." *American Journal of Agricultural Economics* 77 (1): 93-105. <http://ajae.oxfordjournals.org/content/77/1/93.short>.
- Stubbs, Megan. "Conservation Reserve Program (CRP): Status and Issues." Congressional Research Service, nationalaglawcenter.org/wp-content/uploads/assets/crs/R42783.pdf. Accessed 20 Oct. 2016.
- Sullivan, Patrick, Daniel Hellerstein, LeRoy Hansen, Robert Johansson, Steven Koenig, Ruben N. Lubowski, William D. McBride, et al. 2004. *The Conservation Reserve Program: Economic Implications for Rural America*. Agricultural Economic Report No. 834, United States Department of Agriculture-ERS.
doi:<http://dx.doi.org/10.2139/ssrn.614511>.
- United States Department of Agriculture . 2010. *State Facts*. Accessed April 10, 2011.
<http://www.ers.United States Department of Agriculture.gov/StateFacts/>.

University of Illinois. 2016. "Fast Tools & Resources ." *Land Purchase Analysis*. Accessed Sept 18, 2016.
www.farmdoc.illinois.edu/fasttools/spreadsheets/ProgramDescriptions/LandPurchase.pdf.

Wu, JunJie. 2010. "The Effect of the Conservation Reserve Program on Land Values." *Land Economics* 86 (1): 1-21. <http://le.uwpress.org/content/86/1/1.short>.