ENHANCING GRAIN MARKETING DECISIONS: FARM BREAKEVEN ANALYSIS AND GRAIN SALES MANAGEMENT

by

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ABSTRACT

In recent years, the price volatility in agricultural commodity prices, as well as agricultural input costs, has drastically increased. Today's famer is faced with difficult decisions concerning when to market their crop, as well as when to secure various inputs. An increase in information availability, coupled with increasing price fluctuations, can make these decisions even more difficult for producers. Although seasonal trends, forecasts, and technical market analysis can be helpful, market efficiency prevents accurate prediction of agricultural prices. Because marketing decisions can be difficult to make, the easiest decision for a producer to make is to not make one at all. However, failure to make sound risk management decisions can be extremely costly to a producer.

There are two primary factors that impact a producer's bottom line: cost of production and grain marketing decisions. Each producer has their own unique cost of production that changes throughout the year. Variable input costs can be volatile within a single growing year, and often the need for certain inputs changes. Marketing decisions and timing can be an even bigger factor in a producer's gain or loss. Since price prediction is impossible, a producer's time may be better spent focusing on information they can control.

The purpose of this thesis was to test and evaluate a cost of production, crop insurance, and grain marketing calculator with a group of corn and soybean producers in Southeast Nebraska. It is hypothesized that providing customers with a multifaceted, integrated farm management and marketing decision making tool should help them be able to make more profitable risk management and marketing decisions. By knowing how factors as changing expenses impact cost of production and how grain sales impact

revenues and profitability per acre, it is hypothesized that users will make more profitable farm management and marketing decisions.

In October and November of 2014, twenty corn and soybean farmers were presented with the Grain Marketing Calculator. Grain sales in the 2014 and 2015 crop years were to be entered into the calculator by participating producers as they make their grain sales. Annual production history (APH), revenue protection insurance information, actual or expected yields, and total acres of each crop were entered into the calculator during the initial producer calculator rollout. Generalized costs were entered into the calculator prior to the producer rollouts. Participants were able to change the generalized costs to their actual costs if they chose to do so.

Data were gathered from the participants using the Grain Marketing Calculator in March of 2015. Participants weighted average futures sales, weighted average cash sales, percent of APH sold, and percent of total production sold were collected. In March of 2015, the same information from another group of producers who did not use the Grain Marketing Calculator was collected. The two groups average results were compared to each other and regression analyses were done to determine statistical significance of the impact on the test groups' results. At the end of the experiment, feedback was gathered from participants and improvements were suggested.

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CHAPTER I: INTRODUCTION

In the last decade, price volatility in agricultural commodity prices, as well as agricultural input costs, has drastically increased. Today's famer is faced with difficult decisions concerning when to market their crop, as well as when to secure various inputs. An increase in data availability, coupled with increasing price fluctuations, can make these decisions even more difficult and emotional for producers. Although seasonal trends, supply and demand forecasts, and technical market analysis can be helpful, it is impossible even with the use of these analytical tools to predict agricultural prices with great accuracy. The easiest decision for a producer to make is to not make one at all. However, failure to make sound risk management decisions can be extremely costly to a producer. A Grain Originator's goal is to help producers manage their risks and make marketing decisions using a variety of marketing tools based on their business needs. In doing this, the most current market information available should be used, while attempting to help producers make grain marketing decisions by trying to keep producers' personal emotions separate from their individual grain marketing decisions.

It is difficult if not impossible to put a dollar amount on the loss or gain that a producer may have due to either poor or sound marketing or input purchasing decisions due to price fluctuation. However there are two primary factors that impact a producer's bottom line. The first is cost of production. Each producer has their own unique cost of production that changes throughout the year. Variable input costs can be volatile within a single growing year, and often the need for certain inputs changes from year to year. For example, in 2012 irrigation costs were extremely high in the midst of the drought. However, grain drying costs were very low, also due to the drought. Moving away from input costs, grain marketing decisions and timing can be an even bigger factor in a producer’s gain or loss. The last three years are a prime example of that. In August of 2012, corn reached an all-time high of $8.40 on the Chicago Board of Trade. Just two years later, corn futures dropped to $3.20. In 2014, grain producers who had been proactive and hedged into future crop years during the 2012 period ultimately enjoyed great success in marketing their grain. However, producers who did not do so marketed their 2014 grain at much lower prices. While grain price volatility has not been as large in a nominal sense in past years, price risk has always been and is likely to remain a constant threat that producers must manage.

1.1 Price Risk Management

The concept of managing price risk is nothing new. The Chicago Mercantile Exchange Group (CME Group) has offered risk management tools for decades through futures and option contracts. Grain producers can open accounts with brokers or clearing houses to utilize these marketing tools. Independent and private companies also offer price risk management tools through the use of over the counter derivatives tied to CBOT products. Both independent grain companies and cooperatives offer basic price risk management tools such as cash contracts, basis contracts, minimum price contracts, and hedge to arrive contracts. Each one of these tools has its place in a producer’s risk management portfolio. It is important that producers understand how these tools work before they use them in their operations.

While using these tools is important, the decision of whether to use them and then determining how to manage them after they are selected is even more important for multiple reasons. The first factor to consider is whether the marketing approach taken by an agricultural producer is consistent with their crop insurance coverage selection. Crop insurance is a risk management tool for today’s farmer, and individual grain marketing decisions should be made to complement their crop insurance coverage. Another aspect of managing sales is managing the volume of sales through time, or having current knowledge of the percent of insurance guarantee sold as well as the percent of expected production sold. This is important because a producer can become oversold, which leads to a whole new type of risk for producers. The last and most important reason grain sales and input costs need to be managed and monitored by grain producers is profitability. Producers' profitability is directly affected by how effective they are in purchasing inputs and making grain sales. Failure to manage and monitor costs and to make grain sales at profitable levels can hurt the financial performance and standing of a farm business, and if severe enough it can ultimately lead to failure of farm business operations.

1.2 Purpose of thesis

The purpose of this thesis is to test and evaluate a cost of production, crop insurance, and grain marketing calculator with a group of corn and soybean producers in Southeast Nebraska. The motivating idea behind this work is that providing customers with a multifaceted, integrated farm management and marketing decision making tool should help them be able to make more profitable risk management and marketing decisions. By knowing how factors as changing land, equipment, and crop input expenses impact cost of production per acre and how new grain sales impact revenues and ultimately net profitability per acre, it is hypothesized that users of this program will make more profitable farm management and market decisions.

1.3 Product Rollout

In October and November of 2014, twenty customers of Farmers Cooperative were presented with the Grain Marketing calculator. Grain sales in the 2014 and 2015 crop years were to be entered into the Sales Tracker and Marketing Dashboard of this program by participating producers as they make their grain sales. Annual production history (APH), revenue protection insurance level (RP %), actual or expected yield, and total acres of each crop were entered into the RP Insurance Calculator during the initial producer calculator presentations. Generalized numbers were entered in the Cost of Land, Cost of Living and Variable Cost Calculators prior to the producer rollouts. Participating producers were left to change or use the fixed and variable cost portions of the calculators at their discretion.

1.4 Product Evaluation and Participant Requirements

Data were gathered from the participants using the Grain Marketing Calculator in March of 2015. The twenty participants weighted average futures sales, weighted average cash sales, percent of APH sold, and percent of total production sold were collected. In March of 2015, the same information from twenty other producers who did not use the Grain Marketing Calculator was collected. It is important to note that while the control group did not have access to the calculator, they were regular customers with Farmers Cooperative. All forty producers were over the age of 24 and under the age of 55, and all farmed over five hundred acres. Crop rotations, type of farming operation (dryland or irrigated), on farm storage, labor availability and trucking capacity are assumed to be similar for each operation. The two groups marketing performance for the 2014 crop year is compared to each other using multiple regression-based statistical analyses. Explanatory variables will include weighted average futures sale, weighted average cash sale, percent of APH sold, and percent of total production sold, with access to the calculator within the program being a dummy variable. Data on participants grain sales made between October of 2014 and March of 2015 is analyzed. All grain sales for the 2014 crop year are examined, including grain sales made prior to October of 2014. The cost side of the calculator will be evaluated on a usage base, but individual producers' costs of production and breakeven values will not be shared or collected.

A standardized survey was administered to the test group of producers that used the calculator, asking the following questions:

1. How many times did you use the grain marketing calculator?
2. Did you use the cost of land calculator?
3. How many times did you use the cost of land calculator?
4. Did you use the revenue protection insurance calculator?
5. How many times did you use the revenue protection insurance calculator?
6. Did you use the cost of living calculator?
7. How many times did you use the cost of living calculator?
8. Did you use the variable input and break even calculator?
9. How many times did you use the variable input and break even calculator?
10. Which of the four calculators did you find most useful?
11. Which of the four calculators did you find least useful?
12. What would you like to see added to the calculator?
13. Do you feel more comfortable or confident making marketing decisions with this calculator? What part as a whole was the most valuable?
14. If this calculator was linked to your Farmers Cooperative grain account and was updated daily, would you be inclined to do more grain business with Farmers Cooperative?

15. If this calculator was linked to your Farmers Cooperative fuel, chemical and fertilizer accounts and was updated daily, would you be more inclined to purchase these items at Farmers Cooperative?
16. Is this calculator a valuable enough tool that you would use it again next year?

These questions should provide more insight into what producers found valuable in the calculator, as well as gives them an opportunity to provide recommendations for its improvement. They also revealed whether producers would use this tool in the future.

It is important to recognize that this calculator is not a new and unique concept. Some producers have developed their own cost of production spreadsheets as well as sales tracking and managing methods. There are generic models that have been developed by universities, agricultural news and marketing companies, and independently owned grain companies and cooperatives. There are companies whose sole purpose is to track and manage producers' cost of production, insurance decisions, and grain sales. Along with the development of other "calculator-type" programs, previous research has evaluated whether the use of these programs benefits users in terms of their grain marketing performance. However, because it is directly tied to both companies' and producers' profitability and performance, the research is mostly proprietary.

CHAPTER II: INTRODUCTORY THEORY

2.1 Market Efficiency

As previously stated, price volatility in agricultural markets has increased significantly in the last ten years. Although volatility and fluctuations in price have changed in recent years, the way in which price is discovered and established has not. Futures markets and futures driven tools allow producers to sell their crops in the future, while allowing producers to shift their risk of lower prices to the marketplace, where there are many buyers and sellers. Because the marketplace has many buyers and sellers, the futures price of a commodity is deemed efficient since price can be agreed upon, with all information factored into the market. Hudson states

> "all available information about supply, demand, and so on, are reflected in current market prices. As such, today's price on the futures market is the best predictor of future prices and traders cannot earn above a normal rate of return from trading" (Hudson 2007).

Since the market is efficient, it is impossible to predict the market. Because agricultural commodities have entered into the global marketplace, more information and factors can influence the market. While the market has been and always will always be efficient, due to increased price volatility in a global marketplace, the amount of risk a farmer may face has changed.

2.2 Understanding Risk

To fully understand the marketing risks producers face, it is important that the concept of "risk" be defined. According to Harwood, "risk is uncertainty that affects an individual's welfare, and is often associated with adversity and loss" (Bodie and Merton). Risk is uncertainty that "matters," and may involve the probability of losing money, possible harm to human health, repercussions that affect resources (irrigation, credit), and other types of events that affect a person's welfare. Uncertainty (a situation in which a person does not know for sure what will happen) is necessary for risk to occur, but uncertainty need not lead to a risky situation" (Harwood, et al. 1999). Producers face several types of risk: price risk, yield risk, and contract risk.

2.3 Price Risk

Price risk in grain markets comes from two sources: futures and basis. Concerning futures price risk, the CME Group defines a futures contract as

> "a commitment to make or take delivery of a specific quantity and quality of a given commodity at a specific delivery location and time in the future. All terms of the contract are standardized except for the price, which is discovered via supply (offers) and the demand (bids). This price discovery process occurs through an exchange's electronic trading system or by open auction on the trading floor of a regulated commodity exchange" (The CME Group 2013).

Thus, the fluctuations in price through the process of price discovery, rather than the contract itself, are the risk producers' face with futures contracts. If a producer uses a futures contract to hedge their crop and the market moves against them, they are subject to margin calls. If a producer does not hedge and the market moves against them, they are subject to the loss in the cash market. Whether a producer chooses to hedge or not, their natural long position in the market (i.e., since they own the physical commodity) puts them at risk for loss if selling prices decline, which is why it is critical that producers manage their price risk. How they choose to manage that risk is up to them.

The second source of price risk a farmer faces is basis risk. Basis is the link between futures and a producer's local cash or spot market. According to The CME Group,

> "Basically, the local cash price for a commodity is the futures price adjusted for such variables as freight, handling, storage and quality, as well as the local supply and demand factors. The difference between the cash and futures prices may be slight or it may be substantial, and the two prices may not always vary by the same amount" (The CME Group 2013).

Even though in recent marketing years, futures risk has far exceeded basis risk, basis risk management is still important. According to Baldwin,

> "Farmers and grain handlers must understand basis and must record and use basis data to develop the perceived 'optimum' marketing strategy or to select the optimum combination of marketing alternatives for selling grain" (Baldwin n.d.).

In "timing" basis decisions, there can be some seasonal basis patterns that can help producers make basis pricing decisions. Baldwin states

> "Although basis will vary throughout the marketing year, the variation tends to be more predictable and less extreme than changes in the price of cash grain. Most basis patterns are predictable because of the carrying charge, arbitrage between the futures and cash markets, and transportation costs" (Baldwin n.d.).

Ultimately, producers need to make basis pricing decisions based on their knowledge and comprehension of the local basis market, their storage capabilities, their cash flow needs, and labor availability.

2.4 Other Risks

The last two risks producers face are yield risk and contract risk. Yield (or production) risk is the risk that a producer faces due to the impact of disasters weather, and human error on crop yields. Contract risk is the risk of forward contracts not being filled due to yield or production loss. Both of these risks can be controlled or mitigated with sufficient crop insurance coverage and by keeping forward contract pricing levels within producers' crop insurance actual proven history (APH) of yields.

CHAPTER III: LITERATURE REVIEW

As previously stated, there are many ways a producer can manage their risks. However, the type of risk management strategy they select may not be the most critical aspect of their decision. The most critical aspect may be acknowledging their risks and managing them in a way that best matches a producer's implicit individual risk tolerance. Pennings lists the multiple types of forward pricing tools and risk management strategies that a producer can choose. Pennings states that while there are a broad number of choices or decisions to be made, the biggest challenge for producers is a narrow bracket decision, meaning the more difficult decision is whether to actually use a risk management tool. Pennings also states that

> "we hypothesize that the choice of risk management tools on all three bracketing levels is influenced by farm characteristics, operator characteristics, external sources of information, and geographic heterogeneity" (Joost M.E. Pennings 2005).

Pennings includes farm size, livestock diversification, and the number of decision makers in farm characteristics. "The operator characteristics considered here are age, innovativeness, risk aversion, risk perception, and market orientation." (Joost M.E. Pennings 2005) In external sources of information, Pennings states that

> "university extension service, market advisory services, satellite delivery systems (such as DTN), USDA reports, local elevator, and the internet may affect producer use of risk management tools" (Joost M.E. Pennings 2005).

Penning's last factor influencing risk management choice, geographic heterogeneity is simply a producer's geographic location, "which is associated with particular crops and natural hedge conditions" (Joost M.E. Pennings 2005).

Regardless of how a producer would be classified by Pennings, one factor remains constant for all producers: making risk management decisions involves personal emotions and biases. Xu et al took the relationship between emotions, marketing decisions, and tendencies of producers further. Xu et al argues that personality traits, specifically Myers-Briggs personality types, have an effect on producers marketing tendencies and risk tolerance preferences. Xu et al surveyed farmers on risk tolerance and management styles through a series of questions to gain a risk tolerance rating. He also categorized producers similar to Pennings using operator characteristics and characteristics of the farm operation.

> "There were positive and statistically significant correlations of producers' risk attitudes in various areas of the farm business. However, there are also some differences in producers' willingness to (accept) risk, especially in the finance area. Although a number of variables were statistically significant, characteristics of the farm operation and risk attitudes of the farm operator had little effect on measures of behavior thought to involve risk/return trade-offs. The Myers-Briggs personality types were used in an analysis of marketing behavior that focused on marketing tools other than the spot (cash) market. Although some of the personality types had significant effects, there were often differences between the marketing behavior associated with corn and soybeans." (Xu, et al. 2005)

"Farmers' personality types had only limited influences on their pre-harvest marketing decisions for corn and soybeans. Although some personality types were significant for some marketing tools, there was not a consistent pattern of effects." (Xu, et al. 2005) Xu et al admits that his findings may not have been accurate in or relevant to the current market situation since the data were ten years old at the time. However, risk management attitudes and personality types would not have changed significantly.

While attitudes towards risk may not change, the type and amount of risk can change, and it has drastically over the last thirty years. In the 1970s and 1980s, the macro agricultural economy struggled amid high interest rates and falling land values that lead to high levels of agricultural loan defaults. With the recent rise in farmland values combined with record low interest rates and new government farm programs, it would appear that default risk may not be as high as the last farm crisis. Featherstone states:

> "It can be argued that the agricultural economy may be better insulated from those issues than in the late 1970s due to the use of fixed interest rate debt and crop insurance that may provide a revenue floor." (Featherstone, Is This Farm Boom Different? A Sympsium Sponsored by the Federal Reserve Bank of Kansas City 2012)

However, Featherstone points out several factors that may outweigh low interest rates and crop insurance programs. First is debt repayment ability.

> "A significant drop over two years in the ability to repay debt lead to the financial crisis and the drop in land values in the 1980s. Similar percentage changes in the value of farm production and interest payments coupled with an elimination of direct farm payments can result in similar drop in repayment capacity. Revenue insurance or farm programs will likely not cushion that size of drop across years. The use of fixed rate loan products will mitigate some of the cash flow issues but would not affect nor prevent a fall in farmland values. Revenue drops will more likely lead to a fall in land prices than an increase in interest rates but they tend to occur together." (Featherstone, Is This Farm Boom Different? A Sympsium Sponsored by the Federal Reserve Bank of Kansas City 2012)

Lower commodity prices over the past two years led to lower crop insurance revenue protection guarantee levels. This could be problematic if producers continue to raise large crops as both commodity prices and safety net levels continue to fall lower. With the future uncertain and risk ever present, the ability of grain producers to make informed purchasing and marketing decisions becomes even more important. If used correctly, this breakeven and grain marketing calculator may provide producers the information they need to make those effective management and marketing decisions.

CHAPTER IV: CALCULATOR DEVELOPMENT: LAND, INSURANCE, COST OF LIVING AND INPUTS

When building the calculator, fixed and variable input costs were separated from sales and revenue. While these separate sections of the calculator are integrated, it is possible for a producer to use the sales tracker in this program without entering fixed and variable costs. The following sections describe how the variable and fixed input cost calculators were designed.

4.1 Building the Calculator: Cost of Land

Since no two operations are the same, it is difficult to develop a calculator that matches all individual producers' needs. Many individual operations themselves have variability from one field location to another that can lead to even more data research and input by the producer. This research focuses on multiple core characteristics that operations have, specifically cost of land, insurance, input costs, and grain sales.

Cash rent and land payments vary for producers as well as for individual farms. The calculator (Table 4.1) allows the farmer to enter the farm name, total farm acres, the cash rent rate or the land payment amount. An amortization calculator was provided in a separate tab so a producer could determine their yearly land payment if they did not know it already. Total acres and weighted average cost are calculated at the bottom and are recorded into the cost of production dashboard and breakeven dashboard (Table 4.5).

Table 4.1: Average Cost of Land Calculator

				Insert Data in Blue Cells	
	Cash Rent / Land Payment Calculator			Yellow Cells are Protected	
	Farm Name	Acres	Rent/Own	Cost/Acre	Total
1	Home Place	160	Own	$ 300.00	$ 48,000.00
2	West 1/4	160	Own	$ 357.00	$ 57,120.00
3	Johnson Trust	80	Rent	$ 275.00	$ 22,000.00
4	Turkey Farm	120	Own	$ 403.00	$ 48,360.00
5	Buffalo Ranch	160	Rent	$ 250.00	$ 40,000.00
6	Dad's Place	320	Own	$ 210.00	$ 67,200.00
7	Dad's West 80	80	Own	$ 210.00	$ 16,800.00
8	Hoffman Trust	160	Rent	$ 300.00	$ 48,000.00
9	Williams Trust	200	Rent	$ 325.00	$ 65,000.00
10	Clay County Farm	160	Own	$ 475.00	$ 76,000.00
11		0		$ -	$ -
12		0		$ -	$ -
	Totals	1600			$ 488,480.00
	Weighted Average Cost / Acre	$ 305.30			

4.2 Building the Calculator: Crop Insurance

Similar to inputs, crop insurance is an area where producers' coverage and program selection can vary significantly. Revenue protection, hail, wind and multi-peril are some of the common insurance programs used by producers. Hail, wind and multi-peril all have a wide variety of coverage dates, deductions, and percentage options. Again, rather than focus in on the many details of crop insurance programs, this tool allows producers to analyze and use the most common form of crop insurance now being used, i.e., revenue protection (RP). In this calculator (Table 4.2), producers enter basic information about their insurance five year APH, their estimated or expected yield, the spring and fall insurance price discovery period averages, and finally the RP% (i.e., the percentage of APH yield coverage level) that they select, that ranges anywhere from 60% to 85%. Allowing producers to change their RP%, as well as APH and expected yield not only calculates an insurance payment in the event of a drought or adverse weather, but also helps them to determine the most appropriate level of coverage for their operation. For example, if a producer enters a hypothetical expected yield below APH, he can determine his insurance payment at multiple levels of coverage. If an insurance payment is made, the payment carries over into the cost of production and breakeven dashboard (Table 4.5), that gives them their net cost per acre before and after the insurance payment.

Table 4.2: Revenue Protection Insurance Calculator

	Corn		
	Enter Data in Blue Cells		
Actual Production History	210		
Estimated Actual Yield	240	% above APH	12.50%
Spring Price	$ 4.62		
Harvest Price	$ 3.30		
% Insured	75%		
Greater of Spring/Fall Price	$ 4.62		
Revenue Guarantee	$ 727.65		
Acutal Yield	240		
Greater of Spring/Fall Price	$ 4.62		
Actual Revenue	$ 1,108.80		
% Insured	75%		
Claim Per Acre	$ (381.15)	If Payment Negative	-

4.3 Building the Calculator: Cost of Living

An area often overlooked when building farm budgets or analyzing cost of production is the cost of living. The cost of living should be included especially if a producer is relying on the operation to provide for financial well-being. Just like cost of land and crop inputs, every producer's cost of living is unique to that specific operation. To determine this cost in the calculator, monthly living costs are broken down into fifteen cost categories. Since there could be many different categories to cost of living, the spreadsheet allows the user to change the category's name. Monthly expenses in each field are then converted into yearly expenses. Acreage information in the cost of living section is pulled from total acres farmed in the cost of land calculator, and an average cost of living per acre is determined (Table 4.3). This cost is then added into the cost of production and breakeven dashboard (Table 4.5).

Table 4.3: Cost of Living Calculator

Expense	Month	Year
Food	$ 713.00	$ 8,556.00
House Payment	$ 675.00	$ 8,100.00
Electric Bill	$ 250.00	$ 3,000.00
Other Utilities	$ 250.00	$ 3,000.00
Healthcare	$ 380.00	$ 4,560.00
Childcare Services	$ 550.00	$ 6,600.00
Phone/Cable/Internet	$ 200.00	$ 2,400.00
Auto Insurance	$ 150.00	$ 1,800.00
Travel Expense	$ 150.00	$ 1,800.00
Student Tuition	$ 150.00	$ 1,800.00
Other Debt Payment	$ 300.00	$ 3,600.00
Retirement Savings	$ 200.00	$ 2,400.00
Charity	$ 150.00	$ 1,800.00
Entertainment	$ 100.00	$ 1,200.00
Other	$ 100.00	$ 1,200.00
Taxes	$ 2,600.00	$ 31,200.00
Total	$ 3,605.00	$ 43,260.00
Total Acreage in Production		1600
Cost of Living Per Year Per Acre		$ 27.04

4.4 Building the Calculator: Variable Input Costs

The input calculator was built using "standardized" variable cost categories, leaving the item, cost, and rate up to producers. From these standardized categories an average cost per acre is calculated, and then totaled to determine a total average cost of production per acre. For example, for corn, each crop year has a section for various input activities, products, prices, rates, and amounts. Each producer can change these so it matches their individual farm operation. This both creates and eliminates assumptions about producers in that if a category is listed, a producer can choose to use or eliminate that product and cost by not entering information into that category.

As illustrated in the calculator (Table 4.4), a producer could elect to skip dry fertilizer and starter fertilizer and fungicide, and factor in an “applied price” of chemical with custom application, rather than separating application costs from the chemical price. A producer is also able to insert their own cost of seed, plant population, fuel cost, irrigation cost, and tax cost. While some assumptions were made based on what fixed and variable costs are included, a producer can still control whether or not these costs actually factor into their bottom line.

Table 4.4: Variable and fixed rate input costs before land payment

2014 Corn Budget	Date					
Variable & Fixed Costs Before Land Payment						
Activity	Product	Price	By	Rate	Amount	Cost/Acre
Preplant Nitrogen	NH3	$630	Ton	200	Lbs/Acre	$76.83
Nitrogen Application	Fuel	$3.00	Gallon	1.75	$/Acre	$ 5.25
Dry Fertilizer	11-52-0	$580	Ton	125	Lbs/Acre	$36.25
Dry Application	Fuel	$3	Acre	1.4	$/Acre	$4
Starter Fertilizer	10-34-0	$30	Ton	5	Gal/Acre	$0.88
Burndown Herbicide	2,4-D	$28.00	Gallon	1	Pt/Acre	$3.50
Burndown Herbicide	Roundup	$0.18	Ounce	32	Fl Oz/Acre	$5.76
Burndown Herbicide	Lumax	$40.00	Gallon	2	Qt/Acre	$20.00
Burndown Application	Fuel	$3.00	Gallon	1.4	$/Acre	$4.20
Seed Cost	P1498	$250	Bag	32	1000/Acre	$100.00
Planting Cost	Fuel/Service	$3.00	Acre	1	$/Acre	$3.00
Post Emerge Herbicide	Status	$0.30	Ounce	2.5	Fl Oz/Acre	$0.75
Post Emerge Herbicide	Roundup	$0.18	Ounce	32	Fl Oz/Acre	$ 5.76
Post Emerge Additive	Amonium Sulfate	$0.25	Pound	1.7	Lbs/Acre	$ 0.43
Post Emerge Application	Fuel/Service	$3.00	Acre	1	$/Acre	$ 3.00
Fungicide at Tassle	Stratego	$15	Ounce	1	Fl Oz/Acre	$ 15.00
Fungicide Application	Fuel	$3.00	Acre	1	$/Acre	$ 3.00
Irrigation Cost	Fuel	$3.00	Gallon	12	Per Pass	$ 36.00
Harvest Cost	Fuel	$3.00	Acre	3	$/Acre	$ 9.00
Crop Drying	Propane	$1.30	Gallon	0.05	$/Bushel	$15.60
Machinery Repairs	Service	$20	Acre	1	$/Acre	$20
Crop Insurance	Service	$36	Acre	1	$/Acre	$36
Crop Service	Service	$12	Acre	1	$/Acre	$12
Machinery Depreciation	Depreciation	$50	Acre	1	$/Acre	$50
Taxes	Tax	$80	Acre	1	$/Acre	$80

4.5 Building the Calculator: Total Cost Dashboard and Breakeven Price

Once a producer has entered all the fixed and variable costs, the calculator gives the producer a “cost dashboard” that lists all of their average costs per acre (Table 4.5). The dashboard factors in any insurance payment received if a producer's expected or actual yield fell below their APH and RP% policy. Lastly, the dashboard lists two mission critical figures: breakeven price needed at APH yield and breakeven price needed at expected yield. These two figures are likely to directly affect producers’ decisions when using the next part of the calculator, the sales tracker and marketing dashboard.

Table 4.5: Cost of production and breakeven dashboard

Total Cost Before Note & Land Payment							$546.40
Operating Note	Time In Years		1	Rate	5%		$24.59
Total Cost After Note							$570.99
Total Cost After Average Land Cost							$ 876.29
Add Insurance Gain if Yield Loss							$ 876.29
Add Cost of Living Expense Per Acre							$ 903.33
Breakeven Price Needed at APH							$ 4.30
Breakeven Price Needed at Expected Yield							$ 3.76

CHAPTER V: CALCULATOR DEVELOPMENT: SALES TRACKER AND MARKETING DASHBOARD

The final piece of the calculator is the "Sales Tracker and Dashboard" (Table 5.1). This is where a producer enters total acreage of the commodity planted and their sales information. All other information is pulled from the previous parts of the calculator. For example, insurance APH and expected yield are transferred from the insurance and yield section that is used to calculate total bushel production based on insurance guarantee, as well as total expected production. The dashboard also provides the producer with information on percent of insurance guarantee sold and percent of expected bushels sold.

When entering sales information, the producer starts with date of sale and the location of sale. The calculator recognizes four types of sales: cash sales through the sponsoring company or grain merchandiser, futures only sales, sales through the use of put options, and seed corn sales. The dashboard then tracks and totals the amount sold for each period. For example, if a producer makes two 5,000 bushel sales for the harvest time frame, the dashboard will total the two for 10,000 bushels for that time frame. The dashboard recognizes the time frames of harvest, December and each month through July, as well as a "to be determined" (TBD) section. The TBD section gives the total futures only sales that do not have a basis value or delivery point established. The TBD section also recognizes any open long put option positions.

The "basis set", "futures" and "basis" help producers manage sales they make throughout the year. The "basis set" section tells the producer if basis has been priced on each specific sale. The dashboard totals bushels with unpriced basis in the "Total Open HTA/Put" section. The futures section is the futures level of the sale, and basis is the basis level the producer received. The calculator breaks down each sale into a cash sale value, percent of insurance guarantee, percent of expected production, and total revenue. The dashboard calculates a weighted average cash sale, weighted average futures only sale, total bushels sold and total revenue per acre. It is important to note that because total revenue per acre and weighted average cash sale are based on cash values, they are not accurate representations at all times if a producer is using sales methods other than cash sales. For those producers, they need to stay focused on weighted average futures sales until basis is set on additional sales.

Table 5.1: Sales tracker and marketing dashboard

Insert Data in BlueCells	
Yellow Cells are Protected	
Total Acres	1440
Insurance APH	210
Expected bu/acre	240
RP % chosen	75%
Total Production:	
Insurance Guarantee	226,800
Total Expected Production	345,600

Totals Sold For	
Harvest	106197
December	35000
January	20000
February	50000
March	20000
April	0
May	15000
June	0
July	0
TBD	0

Total bu Sold thru:	
Terminal	126197
Mill	40000
Futures	0
Puts	35000
Seed	45000

Futures Only Sales	
Total	0

Total Bu Sold	246196.82
% Ins. Guarentee Sold	95.32%
% Expected Bu Sold	63%
Weighted Ave. Cash	$ 4.12
Weighted Ave. Futures	$ 4.329
Total Rev/Acre	$ 704

							Cash Sales			
Date Sold	Location	Time	Bu Amount	Basis Se	Futures	Basis	Cash Sales	% of Ins.	% of Exp.	Total Rev.
9/19/2013	Puts	December	25000	Y	$ 4.37	$(0.25)	$ 4.12	11.0%	7.2%	$103,000.00
11/6/2013	Terminal	Harvest	10000	Y	$ 4.65	$(0.40)	$ 4.25	4.4%	2.9%	$ 42,500.00
12/20/2013	Puts	December	10000	Y	$ 4.16	$(0.20)	$ 3.96	4.4%	2.9%	$ 39,575.00
2/19/2014	Terminal	Harvest	10000	Y	$ 4.65	$(0.40)	$ 4.25	4.4%	2.9%	$ 42,500.00
2/28/2014	Terminal	Harvest	10000	Y	$ 4.70	$(0.40)	$ 4.30	4.4%	2.9%	$ 43,000.00
3/3/2014	Terminal	Harvest	10000	Y	$ 4.80	$(0.40)	$ 4.40	4.4%	2.9%	$ 44,000.00
3/28/2014	Seed	Harvest	20000	Y	$ 4.91	$ 0.10	$ 5.01	8.8%	5.8%	$100,200.00
3/28/2014	Terminal	May	15000	Y	$ 4.37	$(0.18)	$ 4.19	6.6%	4.3%	$ 62,850.00
3/31/2014	Seed	Harvest	25000	Y	$ 4.95	$ 0.10	$ 5.05	11.0%	7.2%	$126,250.00
9/11/2014	Terminal	Harvest	1196.82	Y	$ 3.42	$(0.27)	$ 3.15	0.5%	0.3%	$ 3,769.98
12/1/2014	Terminal	Harvest	20000	Y	$ 3.76	$(0.38)	$ 3.38	8.8%	5.8%	$ 67,600.00
12/10/2014	Mill	January	20000	Y	$ 3.95	$(0.15)	$ 3.80	8.8%	5.8%	$ 76,000.00
12/11/2014	Mill	February	20000	Y	$ 4.03	$(0.10)	$ 3.93	8.8%	5.8%	$ 78,600.00
1/5/2015	Terminal	February	20000	Y	$ 4.05	$(0.36)	$ 3.69	8.8%	5.8%	$ 73,800.00
1/12/2015	Terminal	March	20000	Y	$ 4.02	$(0.31)	$ 3.71	8.8%	5.8%	$ 74,200.00
2/9/2015	Terminal	February	10000	Y	$ 3.91	$(0.31)	$ 3.60	4.4%	2.9%	$ 36,000.00
							$ -	0.0%	0.0%	$ -
							$ -	0.0%	0.0%	$ -

CHAPTER VI: MARKETING RESULTS

6.1 Data Collection & Summary Marketing Results

Data were collected from producers in the beginning of April of 2015. Out of the 20 producers that this calculator was provided to, 12 used the Grain Marketing Calculator (GMC). The eight producers that did not use the grain marketing calculator were not included in these results. Since the primary focus was the GMC, frequency of use of the other calculators was collected but did not disqualify producers marketing results. The 12 test group participants were compared against 12 control group volunteers that agreed to share sales values and production information. All of the same information on sales volumes and levels as well as APH and total expected production was gathered from the control group. The same age and acreage parameters were applied to both the control and the test groups.

Table 6.1: 2014 Corn Weighted Averages Test vs. Control

Test	Futures	Cash	Basis	% APH Sold	% Total Production Sold
Average	$ 4.08	$ 3.68	$ (0.40)	111%	84%
Standard Deviation	$ 0.22	$ 0.28	$ 0.11	22%	17%
Median	$ 4.08	$ 3.67	$ (0.42)	113%	87%
Control					
Average	$ 3.97	$ 3.65	$ (0.32)	105%	81%
Standard Deviation	$ 1.46	$ 1.34	$ 0.13	43%	34%
Median	$ 4.00	$ 3.60	$ (0.33)	109%	89%

According to the results for 2014 corn production (Table 6.1), on average, the test group outperformed the control group on weighted average futures sales by eleven cents, while only by three cents in the cash category. In the percent of APH sold and total production sold category, the test group sold more in both categories, with APH being 6% more and total production at 3% more. Both the sales level and percent sold may be attributed to the test group knowing their weighted average sale, as well as their percentage sold given the market conditions in the fall of 2014 with early October harvest lows and a moderate post-harvest price recovery until Spring of 2015. In the basis category, the control group actually outperformed the test group by eight cents. This could possibly be due to appreciating basis values on sales made later at a lower futures market than by the control group, or early sales made at higher future values when basis values were wider for the test group.

Table 6.2: 2014 Soybeans Weighted Averages Test vs. Control

Test	**Futures**	**Cash**	**Basis**	**% APH Sold**	**% Total Production Sold**
Average	$ 10.11	$ 9.59	$ (0.53)	128%	100%
Standard Deviation	$ 0.55	$ 0.56	$ 0.15	10%	0%
Median	$ 10.08	$ 9.55	$ (0.58)	125%	100%
Control					
Average	$ 9.88	$ 9.23	$ (0.65)	111%	88%
Standard Deviation	$ 3.60	$ 3.37	$ 0.19	47%	37%
Median	$ 9.91	$ 9.22	$ (0.66)	121%	100%

For 2014 soybeans (Table 6.2), the test group outperformed the control by $0.23 in futures, and $0.36 in cash. These results where similar to 2014 corn production where the test group outperformed the control, which may be attributed to sales made prior to harvest lows in the market in 2014. Results for soybeans differed from corn in that the test group outperformed the control group in basis by twelve cents. This could be attributed to the test group delivering more soybeans to end user markets with premium basis values. The test group beat the control group by 17% in the percent of APH sold and 12% in percent of total production sold. Again, this could be attributed to the test group having more information about their operations and breakeven requirements.

6.2 2015 Crop Year Data

Data were collected on 2015 corn and soybean sales, percent of APH sold, and percent of total expected production sold. Summary statistics were compiled and test group versus control group results were analyzed. Due to lack of observations and lack of statistical significance, 2015 results were omitted from the research findings.

6.3 2014 Crop Regressions

This analysis focuses on several key explanatory or dependent and independent variables, including access to the grain marketing calculator, futures price, cash price, and percentage of APH sold. Since cash sales directly reflect basis values, basis was excluded in the analysis of 2014 data. On the percentage sold, focus was placed on percent of APH sold rather than percentage of total sold, because ultimately these factors communicate the same information. However, in some instances results were statistically significance for both percent of APH sold and percent of total production sold, as well as cash sales and basis sales. Throughout the analysis, explanatory dummy variables used were either access to the GMC or percentage of APH sold.

6.4 2014 Corn Regressions

2014 corn futures and cash selling prices were analyzed to determine if the GMC impacted the test group (Table 6.5). The dummy variable GMC used represents the use of the Grain Market Calculator (GMC). t-Statistics and P-values were provided with the coefficient to determine statistical significance.

Table 6.3: 2014 Corn Futures and Cash Models

Futures				
R Square	0.0646			
Number of Observations	24			
	Coefficients	**Standard Error**	**t Stat**	**P-value**
Intercept	3.9700	0.0655	60.6357	0.0000
Dummy Variable GMC Used	0.1142	0.0926	1.2330	0.2306
Cash				
R Square	0.0054			
Number of Observations	24			
	Coefficients	**Standard Error**	**t Stat**	**P-value**
Intercept	3.6458	0.0764	47.7079	0.0000
Dummy Variable GMC Used	0.0375	0.1081	0.3470	0.7319

Analysis of the impact of using the GMC on producers' 2014 corn cash and futures selling prices (Table 6.5) shows a positive marginal impact of $0.1142 per bushel on futures selling prices, and a positive marginal impact of $0.0375 per bushel impact on cash sales prices, meaning the test group of producers using the GMC outperformed the control group in both of these price categories. However, these regressions were not statistically significant at a 10%. It is possible that the lack of statistical significance may be due to the low number of observations and degrees of freedom in the analysis.

Percent of APH sold were analyzed to determine if the GMC impacted corn sales volumes of the test group (Table 6.6). The dummy variable used in the regression was participants' use of the GMC. t-Statistics and P-values were provided with the coefficient to determine statistical significance.

Table 6.4: 2014 Corn Percent of APH Sold

R Square	0.0165			
Number of Observations	24			

	Coefficients	Standard Error	t Stat	P-value
Intercept	1.0525	0.0631	16.6882	0.0000
Dummy Variable GMC Used	0.0542	0.0892	0.6073	0.5499

In analyzing whether the 2014 percentage of APH sold for corn were impacted by use of the GMC (Table 6.6), no statistically significant impact was found. While the coefficient of the use of the GMC is positive, there is not a sizable difference in percent of APH sold between the test group using the GMC and the control group that did not. The small differential may be caused by the lack of observations and market conditions with harvest lows at the time data were collected.

6.5 2014 Soybean Regressions

2014 soybeans were analyzed to determine if the GMC impacted test group prices (Table 6.7). Use of the GMC is the dummy variable in these regressions. t-Statistics and P-values were provided with the coefficient to determine statistical significance.

Table 6.5: 2014 Soybeans Futures and Cash Models

Futures				
R Square	0.0639			
Number of Observations	24			
	Coefficients	**Standard Error**	**t Stat**	**P-value**
Intercept	9.8775	0.1352	73.0817	0.0000
Dummy Variable GMC Used	0.2342	0.1911	1.2251	0.2335
Cash				
R Square	0.1251			
Number of Observations	24			
	Coefficients	**Standard Error**	**t Stat**	**P-value**
Intercept	9.2292	0.1422	64.9193	0.0000
Dummy Variable GMC Used	0.3567	0.2010	1.7740	0.0899

Analysis of the impact of using the GMC on 2014 soybeans sales were similar to those for 2014 corn, in that there were positive coefficients for both futures and cash regressions. (Table 6.7) Soybean futures selling prices were positively impacted by use of the GMC ($0.2342 per bushel), but were not statistically significant at the 10% level. Soybean cash selling price was also positively impacted by the use of the GMC (+$0.3567 per bushel), and were statistically significant at the 10% level with a t-Statistic of 1.77 and a P-value of 0.089. The positive impact on cash price using the GMC may be caused by test group participants forward sales or use of end user markets. These positive impacts were viewed as economically important given tight profit margins and soybean cost structure in this region.

Percent of APH sold were analyzed to determine the GMC's impact on soybean sales volumes of the test group (Table 6.8). The dummy variable used in the regression was participants' use of the GMC. t-Statistics and P-values were provided with the coefficient to determine statistical significance.

Table 6.6: 2014 Soybeans Percent of APH Sold

R Square	0.1570			
Number of Observations	24			
	Coefficients	**Standard Error**	**t Stat**	**P-value**
Intercept	1.1117	0.0574	19.3822	0.0000
Dummy Variable GMC Used	0.1642	0.0811	2.0239	0.0553

In analyzing whether 2014 soybean sales percent of APH were positively affected by GMC use, it was found that there was a 16.42% increase in percent soybean APH sold (Table 6.8). These results were statistically significant at the 5.53% level with a t-Statistic of 2.023. These results differ from those for corn in which no statistically significant positive impact was found. The positive impact may be caused by participants lack of access to on farm storage and use of the GMC factored with cost of commercial storage. Similarly, results of GMC use on percentage of total production sold were analyzed to determine if similar results are obtained. Analysis of total production sold used the same dummy variable and statistical tests as the percent of APH analysis.

Table 6.7: 2014 Soybeans Total Production Sold

R Square	0.1638			
Number of Observations	24			
	Coefficients	**Standard Error**	**t Stat**	**P-value**
Intercept	0.8817	0.0403	21.8723	0.0000
Dummy Variable GMC Used	0.1183	0.0570	2.0758	0.0498

In terms of total production sold, there was an 11.83% increase in sales for those using the GMC with the results statistically significant at the 5% level with a t-Statistic of 2.07 and a P-Value of 0.0498. (Table 6.9) This supports the results of the previous percent APH sold analysis. It implies that those with access to the GMC were moderately more aggressive on grain sales, even though it was by a relatively small proportion.

6.6 2014 Futures Sales and Percent of APH Sold

All producer grain sales, especially sales within the current crop year, should be correlated with percentage sold. One would assume that percent of APH sold and weighted average futures price would both be highly correlated for those who used the grain marketing calculator in that both percent sold and weighted average price should be higher. To determine the correlation, an analysis of the impact of percent of APH sold on 2014 corn and soybeans futures selling prices were performed (Table 6.10 and Table 6.11). Dummy variables were use of the GMC and percent of APH sold. t-Statistics and P-values were provided with coefficients to determine statistical significance of impacts to the test group.

Table 6.8: 2014 Corn Futures Sales vs. Percent of APH Sold

R Square	0.0913			
Number of Observations	24			
	Coefficients	**Standard Error**	**t Stat**	**P-value**
Intercept	4.1546	0.2441	17.0191	0.0000
Dummy Variable GMC Used	0.1237	0.0942	1.3129	0.2034
Dummy Variable % of APH Sold	(0.1753)	0.2233	(0.7853)	0.4410

Table 6.9: 2014 Soybeans Futures Sales vs. Percent of APH Sold

R Square	0.0774			
Number of Observations	24			
	Coefficients	**Standard Error**	**t Stat**	**P-value**
Intercept	9.5622	0.5839	16.3771	0.0000
Dummy Variable GMC Used	0.1876	0.2115	0.8869	0.3852
Dummy Variable % of APH Sold	0.2836	0.5105	0.5556	0.5843

2014 corn analysis indicated when both use of the GMC and the percentage of APH sales were included in a multiple regression analysis; the GMC has a positive impact while the APH sales percentage had a negative impact (Table 6.10). However, neither explanatory variable was statistically significant. The impact of the use of the GMC did not change appreciably from earlier analysis in which the use of the GMC was analyzed alone. These results indicate that percent of APH sold did not impact cash or futures sales price.

In a similar analysis of the impact of using the GMC and of percent APH sales on 2014 soybeans futures sales, both the coefficients of both explanatory variables were positive, but neither were statistically significant. (Table 6.11) In results not shown here, the percent of APH sales showed no statistically significant impact on 2014 corn cash sales prices or 2014 corn cash basis levels. These results suggest that percentage of APH has little explanatory ability in these models.

Results for 2014 corn and soybean sales support the idea that use of the Grain Marketing Calculator helped producers improve their selling prices. Although there was not always statistical significance, positive coefficients, and greater summary statistics for the test group indicate that there was a financial advantage to those producers who had the calculator.

CHAPTER VII: SURVEY RESULTS

While the author's primary objective of this thesis was to test the entire program as a whole, it is important to note that due to time constraints or lack of input from the test group not all participants used every part of the program. Although the experiment required that participants at least use the Grain Marketing Calculator, use of all parts of the program were examined. Frequency of use and value of each calculator were acquired in the participant survey (Table 7.1). Frequencies of use of all calculators were important as the goal of the research were to gauge impact of participant results.

Table 7.1: Survey Results Summary Statistics

Calculator	GMC	Cost of Land	RP Insurance	Cost of Living	Variable Cost of Production
Number of Participants Used	12	7	9	1	10
Average Number of Times Used	6.3	1.1	1.7	0.1	3.8
Percent of Participants That Used	100%	58%	75%	8%	83%
Minimum Number of Times Used	3	0	0	0	0
Maximum Number of Times Used	12	3	4	1	12
Voted Most Useful	9	0	1	0	2

According to the survey results, the Grain Marketing Calculator (GMC) was the most highly used with all twelve participants using it on an average of 6.3 times. The GMC also ranked the highest in the "most useful" category receiving nine votes. These results are consistent with the GMC being the focal point of this research.

The Variable Cost of Production Calculator (VCPC) ranked second in terms of usage with ten participants using the calculator an average of 3.8 times, and also received the second highest number of votes for "most useful". While the VCPC tool provided participants with a large amount of information relevant to their individual farming operations, it was also the most tedious to use. Consequently, the finding that the VCPC tool was not ranked as high as the GMC by study participants is not surprising.

The RP Insurance Calculator (RPIC) ranked third with nine study participants using the calculator an average of 1.7 times, while only receiving one vote for being "most useful". Although the RPIC was used by 75% of participants, it had a relatively low number for average uses by participants. This could be attributed to information required by the RP Insurance calculator did not change much throughout the marketing decision period, especially given the time of year the calculator was in use. There were only two changes to the spring and fall prices in RP insurance guarantees – i.e., in March and October 2014.

The two remaining calculators (i.e., the cost of land calculator and the cost of living calculator) received no votes for being "most useful". However; it is noteworthy that over half of the participants used the cost of land calculator. This could be attributed to the high land prices and cash rent costs paired with relatively low commodity prices during the period of this study. It is also not surprising that the cost of living calculator had relatively low use since many of the variables in this calculator may not change from year to year, unless a participant was planning a drastic life change. Since only one participant used the cost of living calculator, a regression analysis was not run on that data.

Multiple regression analysis of the results were run using 2014 corn futures sales only. The 2014 corn futures prices were chosen as the benchmark for these analyses, because the current marketing year was the dominant concern of participants at the time of the experiment. Corn results were chose over soybeans since test group participants were located in a production area that is more heavily focused on corn-on-corn cropping systems. Throughout the analysis, the explanatory variables were the futures price, percentage of APH sold, the number of times a particular calculator was used, or whether a calculator was used at all. Futures price and percent of APH sold were regressed as well as frequency of use and outright use (or not) to provide a more complete and unbiased analysis of each variable. Cash sales price and percent of total production sold were regressed but not discussed in this work as analysis yielded the same result. 2014 corn futures sales were compared to the number of times the GMC were used (Table 7.2), the outright use of the cost of land calculator (Table 7.3), the outright use of the revenue protection calculator were used (Table 7.4), the number of times the revenue protection calculator were used (Table 7.5), and the number of times the variable cost of production calculator were used (Table 7.6). The dummy variable in these analyses were either frequency of use or outright use to determine impact on futures price of each calculator. It could be argued that percent of production sold may not have been impacted by calculators that were not related to participants' insurance guarantee. To eliminate the uncertainty, only percent of APH sold were compared to outright use of the revenue protection calculator (Table 7.7) with use of the calculator being the dummy variable to determine impact on percentage of APH sold.

Table 7.2: 2014 Corn Futures Sales and Frequency of Use of the Grain Marketing Calculator

R Square	0.0002			
Number of Observations	12			
	Coefficients	**Standard Error**	**t Stat**	**P-value**
Intercept	4.0774	0.1645	24.7842	0.0000
Dummy Variable Number of Times GMC Used	0.0011	0.0237	0.0451	0.9649

Table 7.3: 2014 Corn Futures Sales and Outright Use of the Cost of Land Calculator

R Square	0.0078			
Number of Observations	12			
	Coefficients	**Standard Error**	**t Stat**	**P-value**
Intercept	4.0620	0.1038	39.1200	0.0000
Dummy Variable Use of the Cost of Land Calculator	0.0380	0.1360	0.2795	0.7855

Table 7.4: 2014 Corn Futures Sales and Outright Use of Revenue Protection Calculator

R Square	0.0049			
Number of Observations	12			
	Coefficients	**Standard Error**	**t Stat**	**P-value**
Intercept	4.1100	0.1342	30.6165	0.0000
Dummy Variable Use of the Revenue Protection Calculator	(0.0344)	0.1550	(0.2222)	0.8286

In analyzing the impact of the amount of usage of the Grain Marketing Calculator (GMC) on 2014 corn futures sales price, use of the calculator shows a small positive but statistically insignificant amount. (Table 7.2) This could be attributed to either sporadic sales made by participants at harvest lows by study participants not using the GMC at the time of sale, or to a lack of respondent observations in the data set. Moving forward through the marketing year, it would have been interesting to see how an earlier or larger grain price rally after the 2014 harvest low would have impacted the results. Market conditions as well as harvest delays due to wet weather conditions may have altered the marketing-related perceptions and behavior of study participants, and therefore the results of the overall performance of the GMC for 2014 corn production.

Outright usage of the cost of land calculator also yielded a small positive differential in 2014 corn Futures sales prices, but was not statistically significant given as evidenced by a very low t-Statistic. (Table 7.3) While positive, the low significance could be attributed to the low number of observations, or low usage of the calculator, either out of a lack of interest by participants, or a lack of change in farmland values, unlike the GMC, where grain prices could change daily with additional grain sales.

The use of the revenue protection insurance calculator had a small negative impact on 2014 corn futures selling prices, but was not statistically significant (Table 7.4). This finding runs counter to pre-study intuition based on the assumption that proper use and understanding of crop insurance (particularly revenue-based crop insurance products) could help a participant make better marketing decisions. The negative coefficient could be explained by the timing of the experiment given that crop insurance coverage decisions had already been made for the 2014 crop year and may not have had an impact on participants' marketing decisions.

Table 7.5: 2014 Corn Futures Sales and Outright Use of the Variable Cost of Production Calculator

	Coefficients	Standard Error	t Stat	P-value
R Square	0.2422			
Number of Observations	12			
Intercept	3.8500	0.1435	26.8343	0.0000
Dummy Variable Use of the Variable Cost of Production Calculator	0.2810	0.1572	1.7879	0.1041

Table 7.6: 2014 Corn Futures Sales and Frequency of Use of the Variable Cost of Production Calculator

	Coefficients	Standard Error	t Stat	P-value
R Square	0.0332			
Number of Observations	12			
Intercept	4.0469	0.0918	44.0758	0.0000
Dummy Variable Cost of Production Calculator Frequency Used	0.0099	0.0170	0.5858	0.5710

Table 7.7: 2014 Corn Percent of APH Sold and Outright Use of the Revenue Protection Calculator

	Coefficients	Standard Error	t Stat	P-value
R Square	0.0324			
Number of Observations	12			
Intercept	1.0400	0.1330	7.8224	0.0000
Dummy Variable Outright Usage of RP Insurance Calculator	0.0889	0.1535	0.5790	0.5754

Use of the Variable Cost of Production Calculator (VCPC) had a positive impact of \$0.281 per bushel on 2014 corn futures selling prices and was statistically significant with a P-value of .1041 and a t-Statistic of 1.7879. (Table 7.5) This finding is consistent with pre-study expectations in that participants who knew their cost of production could have made more informed marketing decisions, regardless of the time of year. It would have been informative to see the impact the calculator would have had with participants using it through a full production and marketing year before or during variable input selection.

Unlike the regression of outright usage of the VCPC against 2014 corn futures sales, frequency of use had a very small positive coefficient that was not statistically significant based on findings of a low t-Statistic (Table 7.6). This does not discredit the results of the previous analysis regarding the positive impact of outright usage of the VCPC as it could be argued that one initial use of the calculator was enough for participants to make more informed marketing decisions, and that additional usage of the calculator will not yield additional information that would be of increased benefit to users of the VCPC program.

Regressing 2014 corn percent of APH sold versus outright use of the Revenue Protection Insurance Calculator (RPIC) yielded a small positive coefficient that was not statistically significant. (Table 7.7) This is a counter-intuitive result since it was assumed prior to the study that the percent of grain production sold and the use and understanding of revenue protection crop insurance would be highly correlated. The lack of statistical significance could be attributed either to the limited sample size or due to the fact that most progressive forward marketers already carry and/or understand revenue protection insurance. Since all participants were identified as progressive forward sellers and grain futures users and were assumed to be similar in how their forward marketing actions respond to the use of RPIC, it causes the author to reevaluate the calculator and determine what changes could be made to add value to the users marketing program.

CHAPTER VIII: OTHER FEEDBACK

Participants in this study where asked for their feedback on using the Grain Marketing Calculator (GMC) program and its' various subparts. While all participants provided positive feedback, there were several recommendations for improvements and changes. The vast majority of participants stated that automating the calculator to more readily track cash and futures sales would be a great improvement. This is not surprising since sales tracking was one of the most time consuming parts of this calculator, especially as additional grain sales had to be recorded in the GMC program throughout the year.

The second biggest improvement requested was to add a current market value section so the user would know what the current value of their unsold production was. One participant suggested adding a current market value as well as a hypothetical sale function so users could select a percentage of their unsold production and key it as a "what if sale" to see what impact it would have on their financial "bottom line". Several participants suggested that it would be beneficial to show current market values of options strategies versus original purchase price of the option as well as futures price at the time the option was purchased. Other responses included adding additional features such as i) a share rent function so that acres, costs, and bushels shares would split according to the share rent agreement, ii) adding a cost of equipment and equipment depreciation calculator, and iii) adding a drop down function to the variable cost section so that inputs and rates could be selected from a dropdown list.

The biggest improvement to this calculator would be synchronization with the company's grain accounting system. Even though many of the participants in the test group took the time to enter grain sales on their own into the GMC program, instant synchronization would be more accurate and less time consuming. The second biggest improvement would be adding a current market value function. Even though participants could enter current market value of the commodity in with a hypothetical sale to see the impact on the bottom line, this could be time consuming for the user. The ease of access to information for the individual program user increases the likelihood that the GMC program will be actively and effectively used. The ease of access issue leads to the recommendation to make the program easily accessible to farmer-users on mobile devices. Allowing use of this tool and ready access to individual grain market information anywhere at any time could lead to a significant increase in use.

CHAPTER IX: CONCLUSIONS & RECOMMENDATION

8.1 Summary

Price volatility in agricultural commodity prices and input costs has drastically increased in recent years. Any price fluctuations throughout a marketing year make grain marketing and input purchasing decisions difficult for farmers. Although seasonal trends, forecasts, and technical analysis can be helpful, market efficiency makes it impossible to predict agricultural prices accurately. Farmers face several types of risks that can be mitigated to a degree with different insurance and contracting strategies and tools. For risk to be mitigated to the fullest extent, farmers need access to the information their farm business is providing them with. Without that information, farmers cannot make informed decisions.

This research provided a group of corn and soybean producers in Southeast Nebraska with a multifaceted, integrated farm management and marketing decision making tool to help them make more profitable risk management and marketing decisions. In October and November of 2014, twenty participants were given the Grain Marketing Calculator. Data were gathered in March of 2015 from twelve of the participants that actively used the calculator as well as twelve individuals who did not have access to the calculator to serve as a control group. Marketing results from the test group and control group were compared and analyzed as well as outright use and frequency of use of different parts of the calculator by test group to determine the impact the calculator had on sales values as well as amount of grain sold.

Results showed small positive impacts in sales prices as well as percent of production sold in both corn and soybeans. Regression analysis indicated that while impacts were positive, there was little statistical significance, confirming market efficiency theory. One area that provide statistically significant were 2014 soybeans percent of APH sold by the test group, which were positive and statistically significant at the 10% level of significance. The positive impact may be caused by participants' lack of access to on farm storage, use of end user markets, and use of the GMC factored with cost of commercial storage. Further analysis of percent of total production sold by the test group confirmed the findings, which was statistically significant at the 5% level.

Outright usage and frequency of use of the calculators by the test group were analyzed to determine impact on futures prices and percent of APH sold. Results yielded both positive and negative impacts. All impacts were small and none were statistically significant, confirming market efficiency theory.

Feedback on the calculator was obtained from test group participants. While various improvements were suggested, all participants stated that use of the calculator gave them more confidence making marketing decisions. Most participants stated that they would use the calculator again if no improvements were made, and all participants stated they would use the calculator again if improvements were made. Even though market efficiency prevents individuals from predicting the market, the added confidence in making marketing decisions by participants made this experiment a success.

8.2 Conclusion and Recommendation

While features of the calculator could be changed or improved upon in the future, the basic goal of conducting this experiment was a helpful. Many crop producers lack easy access to important management information about their operations in general and about costs of production in particular that they need to make informed grain marketing decisions. If a producer has easy access to the information the farm operation is already providing, then the producer can make more informed marketing and management decisions. The results of this study provided evidence that this Grain Market Calculator program helped grain marketers to be more informed and effective marketers of their grain. Even without additional improvements in the calculator, it still functions as a decision making tool for grain producers. Every marketing year will have price fluctuations and volatility that could skew the calculator's impact on marketing results. Since market efficiency makes it impossible to outguess the market, farmers should focus on managing the information they can access. Having access to this information in a multifaceted, integrated farm management and marketing decision making tool should help farmers be able to make more profitable risk management and marketing decisions.

The company's management team will decide whether this is a product and service that they want to provide to their customers. Assuming that the decision is made to move forward with this project, the Management Team will need to weigh the benefits to both the producer and the company against the cost required to either invest the capital needed to make this calculator more user-friendly, or to outsource the project of increasing the user friendliness of this program to an independent third party.

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