Ostmeyer Family Farms: Economic feasibility of replacing Summer fallow with Spring canola in Northwest Kansas

by

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ABSTRACT

This thesis was completed to study the economic feasibility of replacing summer fallow with spring canola in Northwest Kansas, particularly Ostmeyer Family Farms. Ostmeyer Family Farms comprises irrigated and dryland farm grounds in Thomas and Sheridan County, Kansas. The farm has been in no-till production for the past 25 years. To help improve overall profitability and combat increased chemical-resistant weeds, Ostmeyer Family Farms needs to look for an alternative management approach. This thesis outlines one alternative to summer fallow.

Research was completed regarding the ability to grow and market spring canola in northwest Kansas. This research showed that the climate was particularly suited to increasing spring canola in northwest Kansas. The spring canola market is an emerging market in northwest Kansas and is feasible to ship by truck.

Analysis was completed on each of the following enterprises: i) wheat after fallow, ii) wheat after spring canola, iii) chemical fallow, iv) corn, and v) spring canola. Each enterprise budget established a rotation budget of fallow wheat corn and yellow-seeded canola-wheat corn. The fallow-wheat-corn rotational budget resulted in a net loss of $48.66 per acre, while the spring canola-wheat-corn rotation budget resulted in a net loss of $52.27.

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CHAPTER I: INTRODUCTION

Ostmeyer Family Farms is a small farm in northwest Kansas, specifically in southeast Thomas County and southwest Sheridan County, Kansas. The farm consists of irrigated and dry land farm ground. Ostmeyer Family Farms has three major decision-makers: Chris Ostmeyer, Chase Ostmeyer, and Jay Ostmeyer. The brothers have been operating the farm since 2008. Each decision-maker has a specific skill that is utilized in operating the farm. Chris, a farm manager by trade and manages the day-to-day operations. Chase, an agricultural banker, focuses on financials and capital purchases. Jay, an agricultural chemical business representative, provides agronomic guidance. All three brothers share equally in the labor requirements. Ostmeyer Family Farms operates to maximize profit per acre. They have practiced no-till farming since 1998. Being a no-till farming operation, chemical fallow has been essential to dry land farming.

Since 2012, the brothers have noticed an increase in chemical-resistant weeds. Multiple chemicals with different modes of action and active ingredients are used to combat chemical resistance. This has increased the cost of chemicals and the frequency of applications needed, resulting in an overall increase in the cost of chemical fallow. In 2018, Chase began working on his thesis on the economic feasibility of replacing summer follow with field peas. In 2019 Ostmeyer Family Farms added field peas into their rotation. With minimal success, Ostmeyer Family Farms has yet to fully accept the adoption of field peas as a replacement for chemical fallow. Ostmeyer Family Farms has yet to give up on replacing chemical fallow with a cash crop. Spring Canola was brought into the conversation as another possible alternative when Scoular purchased the ADM crush facility and announced an investment in a dual oilseed in March 2023.

1.1 Research Problem

Ostmeyer Family Farms would like an analysis completed on the feasibility of replacing summer fallow with spring canola, especially yellow-seeded canola. Adding spring canola to the rotation should improve overall profit per acre, provide ground cover and reduce chemical costs.

The researcher will complete an economic analysis of the standard rotation of fallow-wheat-corn and examine this rotation with spring canola replacing the fallow option. The research will use enterprise budgeting to show the net profit per acre for fallow-wheat-corn and yellow seeded canola-wheat-corn. Crop budgets will be completed for each enterprise, including chemical fallow, wheat after fallow, wheat after spring canola, corn, and spring canola.

Spring canola was selected as an alternative to fallow for its perceived economic and agronomic benefits. Spring canola is planted in mid-April and is harvested in late July. This would allow a 45 to 60-day fallow period before wheat drilling in September. Since spring canola is planted in mid-April, the canola should provide good ground shading to help prevent chemical-tolerant weeds from germinating as spring canola is a broadleaf crop. This would allow for biodiversity and use different modes of action unavailable in an all-grass rotation of wheat and corn. A disadvantage to adding spring canola to the rotation would be the use of accumulated soil moisture, which has historically been used for wheat production, which could result in low yield for the following wheat crop.

The researcher will investigate agronomic practices for fallow, wheat, corn, and spring canola regarding overall production and marketing. Wheat and corn are commonly used, but spring canola would be a new enterprise for Ostmeyer Family Farms and the area.

The researcher gathered the area's wheat, corn, and spring canola yield data to complete the enterprise budgets. Local markets were identified to establish the crop-price delivery locations. Variable costs were researched regarding production costs (fertilizer, chemical, land, storage, and equipment costs information for wheat and corn) derived from local input suppliers and grain elevators in the immediate area. Spring canola production requires additional research to establish the market and inputs, mainly seeds. The researcher knows only one emerging market in the area, Scoular. Cash prices and no contracts are available at this current time due to being an emerging market.

CHAPTER II: LITERATURE REVIEW

Continuous cropping systems in semiarid regions replace fallow with crops, providing protective cover, green manure or producing cereal, oilseed, legume grain, or forage, substituting crop transpiration for a fraction of the evaporative loss associated with fallow. Fallow replacement cover crops, however, can reduce the soil water available to a subsequent wheat crop (Aiken, et al. 2013). Since the adoption of Roundup, farmers, including Ostmeyer Family Farms, have used chemically assisted summer fallow practices to conserve water. However, in the past 25 years, herbicide-resistant weeds have prevented farmers from controlling the weeds during summer fallow. Lack of control has conservation effects due to excessive soil water extraction from herbicide-resistant weeds.

Ostmeyer Family Farms has requested an analysis on introducing yellow-seeded canola into the rotation, citing the loss of soil moisture, increased herbicide-resistant weeds, and overall cost of no-till summer fallow.

2.1 Yellow Seeded Canola Agronomics

Yellow-seeded canola, or Brassica napus, is a cross of edible rapeseed plants with thinner seed coats than other black-seeded varieties—the slimmer seed coat produces lower meal fire content and increased oil and protein content. Canola plants are relatively tall, reaching 4 to 5 feet. They have long, slender taproots and branched plant stems, with each branch terminating in an elongated spike. Canola is an indeterminate plant that will continue to flower and develop seeds until stress terminates this process. They have a taproot root structure often compared to an inverted cone that can reach depths of 46 to 65 inches (Washington State University Extension 2011). The resulting seed is small and round, approximately 100,000 to 150,000 seeds/lb. Seed germination occurs at 34 degrees

Fahrenheit, while the canola grows best when temperatures are between 54 and 86 degrees, with the optimal temperature for maximum growth and development being 68 degrees. The preferred growing conditions include well-drained, cool, and moist soil. Best growth has been shown to occur in a soil PH of 6.0 to 7.0. Canola is less tolerant to soil acidity than winter wheat (Kansas State University Agricultural Experiment Station and Cooperative Extension Service 2018). Ostmeyer Family Farm's farm ground has been grid soil tested since 2012 with a consistent PH between 6.5 and 7.5. This would be ideal for spring canola production.

Spring canola typically takes 80 to 100 days from planting to harvest to reach full maturity. Spring canola is overly sensitive to heat stress at flowering. If spring canola flowers during intolerable heat, it will reduce pod count and overall yield. Spring canola has been reported to have root depths as deep as 65 inches; however, it is said they can penetrate deeper often due to limited water (Washington State University Extension 2011). The root system continues to develop, with secondary roots growing outward and downward from the taproot. However, the root mass distribution varies depending on many factors, including soil type, moisture, and nutrient availability. Depending on the variety, flowering is typically 40 to 50 days after planting. Ideally, spring canola should be drilled in mid-April with an air seeder capable of uniform depth. Row spacing should be between 6 and 15 inches and drilled ¾ to 1 ½ inch depth for no-till seeding with ½ inch moisture above the seed. Canola production in 30-inch rows has gained some interest from growers who want to seed into heavy residue. However, research shows that 30-inch spacing may reduce yield by 5 to 15 percent, while other studies have shown no significant difference between narrow and 30-inch row widths because of self-thinning (Kansas State University

Agricultural Experiment Station and Cooperative Extension Service 2018). Plant density should be between 300,000 to 500,000 seeds per acre. Canola is a board-leaf plant. As a broadleaf crop, canola introduces diversity and allows different herbicides to be used. Weed control is critical to canola production and profitability. Of the requirements for high-yield potential, weed management is more important than fertilizer and genetics. Weeds are highly competitive and can use resources – moisture, nutrients, access to sunlight – otherwise available to the crop. Yield loss from weed competition can be significant (Canola Council of Canada 2023). Applying a pre-emerge herbicide before planting spring canola is encouraged (North Dakota State University Extension 2019).

BASF completed a study on how yield is affected due to seeding rates and depth to get an idea of the planting population. The study showed that yield was optimized at a planting population of 420,000 to 570,000 seeds per acre using factors that affect survivability, crop residue, soil moisture, soil temperature, seeding depth and speed of planting, fertilizer placement, seeding, crop disease, insects and weeds. The researcher deemed average survivability of 50 to 70 percent will help achieve a target plant population of 217,800 to 304,920 plants per acre (BASF 2019). Seed depth studies were also compiled, showing that seeding depth should be ½ inch to 1 ½ inches with optimal moisture. Seeding depth beyond 1 ½ inches will increase exposure to seeding diseases, and the longer time to emergence will reduce the protection period for flea beetle seed treatments. The energy required to emerge from that depth could also reduce seedling vigor (Canola Council 2018).

2.2 Spring Canola Market

Spring canola is a spring-planted, cool-season crop that can be grown as an alternative to summer fallow. The agronomic and rotational benefits have been seen by producers across the Great Plains; however, a lack of market opportunities has presented a unique challenge in the past. In 2022, approximately 11,000 canola acres were planted across Kansas, up from 2021's 7,000 acres, with all of those acres being winter canola in south-central Kansas (Morning AgClips 2022). This increase is partially attributed to new markets that are available to sell canola.

Scoular is one of these new markets. Scoular invested in a Kansas oilseed crush facility in Goodland, Kansas, in 2021. Because of its high oil content, canola is highly valued in the renewable fuels sector. In March 2020, the U.S. Canola Association petitioned the EPA to approve canola oil as a feedstock for renewable diesel. In April 2022, the EPA issued a notice of proposed rulemaking that renewable diesel, jet fuel, naphtha, liquified petroleum gas, and heating oil produced from canola oil can reduce GHG emissions by at least 50%. Due to these events, the renewable diesel and sustainable aviation fuel markets will grow to over five billion gallons by 2025. Scoular's Goodland facility will process eleven million bushels of oil seeds a year, toggling between canola and soybeans as availability dictates (Scoular 2023). Scoular will target crushing canola nine to twelve months out of the year, with a preference to crush canola year-round. They will offer only cash prices and no contracts at this time. Scoular will target a price of $12 to $13 per bushel with a price no lower than $10 per bushel. They are still looking into several receiving points besides Goodland, Oakley being one of them. However, growers will likely have to store their canola on-farm until markets are fully developed (K-State Research and Extension 2023).

Canola is an oilseed crop widely grown in Canada, the northern United States, and other parts of the world. It has many edible and non-edible uses for humans and livestock, making it a versatile and valuable plant. Oil is canola's primary use. This oil extracted from the seed of the canola plant is one of the most popular cooking oils, as it has a neutral flavor, a high smoke point, and a low amount of saturated fat. It also contains omega-2 fatty acids and vitamin E, which are beneficial for health. Canola oil can be used for baking, frying, sautéing, marinating, and salad dressings. It can also be used for non-edible purposes, such as biodiesel, renewable diesel, aquaculture, bioplastics, cosmetics, toothpaste, sunscreen, and industrial lubricates. Canola meal, a by-product of canola oil extraction, is a high-protein feed ingredient for livestock such as cows, pigs, chickens, and fish. It can increase milk production in dairy cows and improve the quality of meat and eggs. Canola meal can also be used as a fertilizer for crops (Myers 2018).

2.3 Crop Rotational Effects

Substituting a short-season crop, spring-planted for fallow when soil moisture is adequate, might reduce soil degradation without significantly increasing the risk of failure to the following crop (Felter 2006).

Spring canola might be a viable option to replace summer fallow. This may reduce herbicide applications, provide rotational benefits, and provide additional profit. A study was completed for eliminating summer fallow (Lyon, et al. 2004). The study aimed to quantify the production and economic consequences of replacing summer fallow with spring-planted crops on the subsequent winter wheat crop. It was completed over three years (1999, 2000, and 2001) near Sidney, NE, in a randomized complete block design with five replications. The study concluded spring canola was the lowest returning treatment, with a reduction in annualized net return of $36.39 per acre, less than the summer fallow treatment. However, spring canola cultivation was not well adapted to the region. Warm temperatures in March resulted in rapid germination and growth, followed by subfreezing temperatures in April that killed seedling plants and necessitated replanting. Replanting caused the canola to flower during July's heat, resulting in poor yields. A lack of a local market also requires some development in the region.

A consideration in whether to add spring canola to the rotation is how spring canola will perform in different rotations and how water efficiencies change. Research conducted in Colorado indicates fewer pods and seeds with water stress during reproductive development and lower seed weight with stress during grain filling. Most canola water use comes from the top 47 inches of soil depth. Water can be removed from a depth of up to 65 inches. The following yield formula was generated to explain canola water use: Yield (lbs. per acre) = 175.2 lbs. per acre per in. × [water use (in.) – 6.0] (Kansas State University Agricultural Experiment Station and Cooperative Extension Service 2018). As seen in Table 2.3, the average normal precipitation from October to June is 12.65 inches. Ostmeyer Family Farms land does have the ability to hold this precipitation in the soil profile as long as the ground isn't frozen.

Table 2.1: Average Monthly Precipitation for Colby, KS, in inches

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total
Average	1.58	0.72	0.48	0.41	0.48	1.12	2.03	3.29	2.54	12.65

Source: U.S. Climate Data

Ostmeyer Family Farms believes crop rotations are critical, but will adding spring canola improve or reduce wheat yield? Research was completed to investigate the effect of winter wheat production after the introduction of canola into the crop rotation in Alberta, Canada. Alberta Agriculture, Food and Rural Development research and crop insurance indicate that wheat yield after canola increases 10 to 20 percent (Western Winter Wheat Initative 2017). This research directly conflicts with the wheat following pea research in Thomas County by other researchers, including Haag 2017. However, it should be noted that research completed in Canada was in a continuous canola cropping system, not fallow or wheat following canola.

2.4 Conclusion

The literature review in this chapter gave a firm foundation on the production methods for growing spring canola, spring canola yields, water use, and benefits associated with adding spring canola to a rotation. This knowledge will be used to make an accurate enterprise budget for spring canola in northwest Kansas. The economic benefits of adding spring canola to the rotation can then be analyzed.

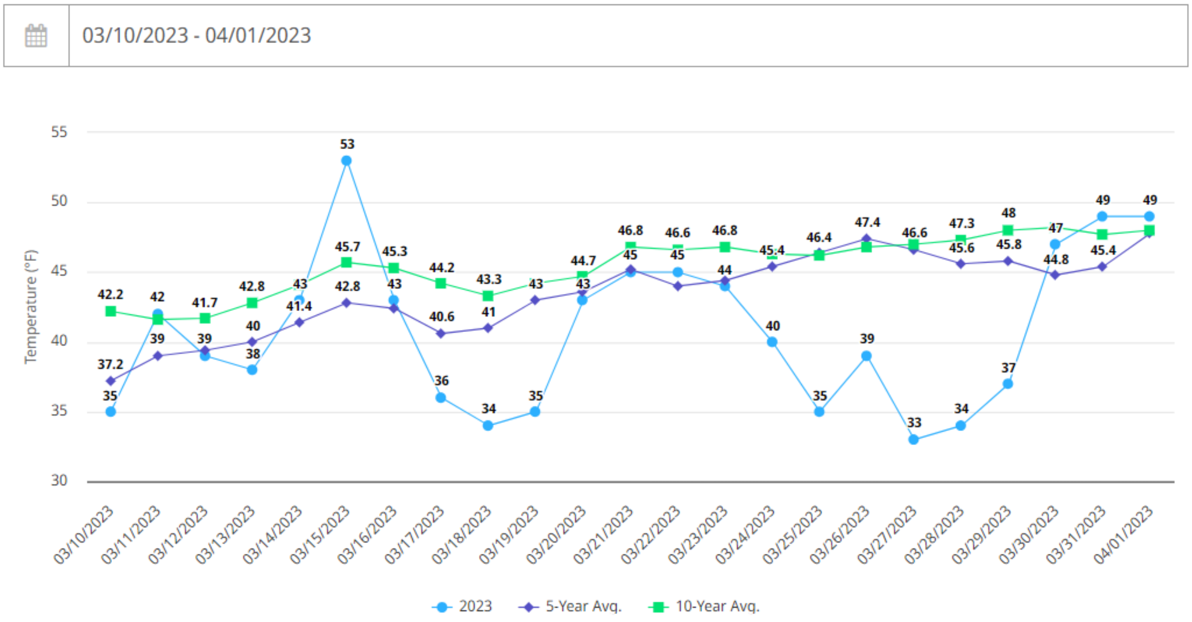
CHAPTER III: METHODS AND CONCEPTUAL MODEL

To analyze the economic feasibility of replacing summer fallow with spring canola in northwest Kansas, several methods include agronomic analysis of spring canola, enterprise budgets, and multi-year cash flow projections. The study will focus on two rotation choices: fallow-wheat-corn and yellow seeded canola-wheat-corn. Enterprise budgets will be completed on a per-acre basis for each cropping enterprise, including fallow, spring canola, wheat after canola, wheat after fallow, and corn. The cropping enterprises will then be averaged for the respective rotation. Although the enterprise budgets will only give a snapshot of each cropping enterprise, the researcher focuses on each rotation as a single unit. Furthermore, each rotation will be based on the enterprise budgets to derive a net income per acre. For example, if in a fallow-wheat-corn rotation, the net income is -$75:75:100 respectively, then the net income per acre would be an average of $33.33 per acre. This information will help the researcher decide which rotation maximizes profit per acre.

3.1 Agronomic Analysis of Spring Canola

Agronomic analysis was performed by researching spring canola from an agronomic standpoint for suitability for growth in northwest Kansas. Spring canola is typically planted in mid-April in North Dakota and requires a soil temperature of 34 degrees to germinate (Canola Council of Canada 2023). As seen below in Figure 3.1, the soil temperature at 2 inches is well above the required 34 degrees to achieve germination on March 15th in Colby, KS.

Figure 3.1: Average Soil Temperature on March 15th in Colby, KS



Source: https://www.greencastonline.com/tools/soil-temperature

One of the most critical times for spring canola is during flowering. Heat stress will cause the plant to abort flowers, thus limiting pod growth or no seed. Spring canola flowers between 40-50 days from germination and prefer a temperature range between 54 and 86 degrees, with the optimal temperature for maximum growth and development being 68 degrees (Washington State University Extension 2011). Assuming a March 15th plant date, flowering would occur in late April to early May. As shown below in Table 3.1, the average temperature during this time would be between 64 and 74 degrees. This is almost the ideal temperature for flowering.

Table 3.1: Average Monthly Temperature for Colby, KS, in Degrees Fahrenheit

	February	**March**	**April**	**May**	**June**
Average High	45	54	64	74	85
Average Low	18	26	35	47	57

Source: https://www.usclimatedata.com/climate/colby/kansas/united-states/usks0120

As mentioned in the Literature Review, spring canola has a developing market and will continue to increase in acres across Colorado, Nebraska, and Kansas. This increase in acres in a developing market, along with the above data, would indicate that the area is suitable for cultivating spring canola.

3.2 Enterprise Budgets

A farm operation comprises many different enterprises, including crops and livestock. An enterprise budget narrows down the income and expenses specific to each enterprise. This type of budgeting allows the researcher to understand better each enterprise and how each variable affects the net income per unit. As a result, the researcher can understand break-even analysis and how yield, price, and cost affect net income. Enterprise budgets can be helpful when deciding on which crops to plant. The enterprise budgets were created for Ostmeyer Family Farms on a per-acre basis and included the assumptions for custom application rates in figure 3.2, fertilizer prices in figure 3.3, nutrient requirements per bushel in figure 3.4, and chemical prices in figure 3.5.

Table 3.2: 2022 Custom Application Rates for Northwest Kansas

Fertilizing	
Anhydrous Application	$ 24.25
Liquid Application	$ 11.35
Planting/Drilling with Fertilizer Application	
Wheat	17.17
Corn	18.54
Spring Canola (Wheat)	17.17
Herbicide/Insecticide Application	
Ground Rig	$ 5.70
Aerial	$ 7.56
Grain Harvesting	
Wheat	$ 24.53
Corn	$ 28.33
Spring Canola (Wheat)	$ 24.53
Grain Hauling (Per bushel to nearest elevator/farm)	
Wheat	$ 0.24
Corn	$ 0.23
Spring Canola (Wheat)	$ 0.24
Crop Consulting	
Dryland	$ 7.50

Source: https://www.agmanager.info/machinery/papers/custom-rates-survey

Table 3.3: 2023 Fertilizer Prices for Northwest Kansas

Product	$/Ton	$/Actual lb
82-0-0	$ 805.00	$ 0.48
32-0-0	$ 335.00	$ 0.52
10-34-0	$ 480.00	$ 0.71

Source: CHS

Table 3.4: Nutrient Requirements Per Bushel Produced

Commodity	N/Bu.	P/Bu.
Wheat	1.16	0.48
Corn	0.67	0.35
Canola	1.75	0.94

Source: https://agphd.com/resources/nutrient-removal-charts/

Table 3.5: 2023 Chemical Prices

Chemical	Cost/Gal	Cost/Oz
2-4D Ester	$ 29.00	$ 0.23
Accuron	$ 75.00	$ 0.59
Authority MTZ	Dry	$ 0.75
Acedeclor	$ 33.00	$ 0.26
Ally	Dry	$ 2.90
Amazon Pro	$ 150.29	$ 1.17
Atrazine	$ 16.00	$ 0.13
Corvus	$ 384.00	$ 3.00
FullTime	$ 29.50	$ 0.23
Dicamba	$ 35.50	$ 0.28
Pendimethalin	$ 50.00	$ 0.39
Clethodim	$ 45.00	$ 0.35
Valor	$ 26.75	$ 0.21
Paraquat	$ 19.95	$ 0.16
Laudis	$ 505.60	$ 3.95
Mestrione 4SC	$ 95.00	$ 0.74
Prowl H20	$ 65.00	$ 0.51
Rave	Dry	$ 1.72
S-metolachor	$ 58.50	$ 0.46
Spartan 4F	$ 135.00	$ 1.05
Status	Dry	$ 4.15
Liberty	$ 44.00	$ 0.34
Roundup 6 lb	$ 14.50	$ 0.11

Source: CHS

Using the above chemical prices (Figure 3.5), three chemical plans were created with input from Ostmeyer Family Farm members and their agronomists. The cheapest herbicide plan for each was used in each enterprise budget.

Table 3.6: Corn Herbicide Plans

Spraying	**Plan 1**	oz/Acre	Cost/Acre	**Plan 2**	oz/Acre	Cost/Acre	**Plan 3**	oz/Acre	Cost/Acre
1	2-4D Ester	8.00	$ 1.81	2-4D Ester	8.00	$ 1.81	2-4D Ester	8.00	$ 1.81
	Atrazine	16.00	$ 2.00	Atrazine	16.00	$ 2.00	Atrazine	16.00	$ 2.00
	Corvus	4.00	$ 12.00	Corvus	4.00	$ 12.00	Corvus	4.00	$ 12.00
	Dicamba	12.00	$ 3.33	Dicamba	12.00	$ 3.33	Dicamba	12.00	$ 3.33
	Valor	2.00	$ 0.42	Valor	2.00	$ 0.42	Valor	2.00	$ 0.42
2	Ladius	3.00	$ 11.85	Fulltime	43.00	$ 9.91	Amazon Pro	20.00	$ 23.48
	Atrazine	32.00	$ 4.00	Dicamba	16.00	$ 4.44	Atrazine	32.00	$ 4.00
	Dicamba	16.00	$ 4.44	Mestrione 4SC	3.30	$ 1.68	Roundup	22.00	$ 2.49
	Roundup	22.00	$ 2.49	Roundup	22.00	$ 2.49			
3	Roundup	22.00	$ 2.49	Fulltime	43.00	$ 9.91			
	Status	5.00	$ 20.75	Dicamba	16.00	$ 4.44			
				mestrione 4SC	3.30	$ 1.68			
				Roundup	22.00	$ 2.49			
Total Cost/Acre			**$ 65.58**			**$ 56.59**			**$ 49.53**

Source: Ostmeyer Family Farms Agronomist

Table 3.7: Wheat Herbicide Plans

Spraying	**Plan 1**	oz/Acre	Cost/Acre	**Plan 2**	oz/Acre	Cost/Acre	**Plan 3**	oz/Acre	Cost/Acre
1	Ally	0.20	$ 0.58	Rave	4.00	$ 1.72	Dicamba	4.00	$ 1.11
	Dicamba	4.00	$ 1.11						
2	Paraquat	32.00	$ 4.99	Paraquat	32.00	$ 4.99	Paraquat	32.00	$ 4.99
	2-4D Ester	16.00	$ 3.63	2-4D Ester	16.00	$ 3.63	2-4D Ester	16.00	$ 3.63
3	Paraquat	32.00	$ 4.99	Paraquat	32.00	$ 4.99	Paraquat	32.00	$ 4.99
	Atrazine	16.00	$ 2.00	Atrazine	16.00	$ 2.00	Atrazine	16.00	$ 2.00
							2-4D Ester	12.00	$ 2.72
Total Cost/Acre			**$ 17.29**			**$ 17.32**			**$ 19.43**

Source: Ostmeyer Family Farms Agronomist

Table 3.8: Spring Canola Herbicide Plans

Spraying	**Plan 1**	oz/Acre	Cost/Acre	**Plan 2**	oz/Acre	Cost/Acre	**Plan 3**	oz/Acre	Cost/Acre
1	Dicamba	16.00	$ 4.44	Paraquat	32.00	$ 4.99	Valor(fall)	1.00	$ 0.21
				Dicamba	4.00	$ 1.11			
2	Paraquat	32.00	$ 4.99	Liberty	32.00	$ 11.00	Paraquat	32.00	$ 4.99
				Roundup	22.00	$ 2.49			
3	Liberty	43.00	$ 14.78	Liberty	43.00	$ 14.78	Liberty	43.00	$ 14.78
	Clethodim	5.00	$ 1.76	Clethodim	5.00	$ 1.76	Clethodim	5.00	$ 1.76
4	Liberty	43.00	$ 14.78	Liberty	43.00	$ 14.78	Liberty	43.00	$ 14.78
Total Cost/Acre			**$ 40.75**			**$ 50.91**			**$ 36.52**

Source: Ostmeyer Family Farms Agronomist

Table 3.9: Chemical Fallow Herbicide Plans

Spraying	**Plan 1**	oz/Acre	Cost/Acre	**Plan 2**	oz/Acre	Cost/Acre	**Plan 3**	oz/Acre	Cost/Acre
1	Corvus	5.00	$ 15.00	Valor	4.00	$ 0.84	Authority MTZ	16.00	$ 11.95
	Atrazine	16.00	$ 2.00	Dicamba	16.00	$ 4.44	Dicamba	16.00	$ 4.44
	Dicamba	16.00	$ 4.44	2-4D Ester	16.00	$ 3.63			
	2-4D Ester	16.00	$ 3.63						
	Roundup	22.00	$ 2.49						
2	Paraquat	32.00	$ 4.99	Roundup	22.00	$ 2.49	Roundup	22.00	$ 2.49
	2-4D Ester	16.00	$ 3.63	Dicamba	16.00	$ 4.44	Dicamba	16.00	$ 4.44
				2-4D Ester	16.00	$ 3.63	2-4D Ester	16.00	$ 3.63
3	Paraquat	32.00	$ 4.99	Paraquat	32.00	$ 4.99	Paraquat	32.00	$ 4.99
	2-4D Ester	16.00	$ 3.63	2-4D Ester	16.00	$ 3.63	2-4D Ester	16.00	$ 3.63
4	Paraquat	32.00	$ 4.99	Paraquat	32.00	$ 4.99	Paraquat	32.00	$ 4.99
	2-4D Ester	16.00	$ 3.63	2-4D Ester	16.00	$ 3.63	2-4D Ester	16.00	$ 3.63
5	Paraquat	32.00	$ 4.99	Paraquat	32.00	$ 4.99	Paraquat	32.00	$ 4.99
	2-4D Ester	16.00	$ 3.63	2-4D Ester	16.00	$ 3.63	2-4D Ester	16.00	$ 3.63
Total Cost/Acre			**$ 62.00**			**$ 45.29**			**$ 52.78**

Source: Ostmeyer Family Farms Agronomist

3.2.1 Corn Enterprise Budget

The corn enterprise budget is calculated according to the following equation.

Corn Enterprise Budget Model

$$\mathbf{C_{EB} = (C_P*C_Y) - (C_{FE} + C_{WCE} + C_{CIE} + C_{LE} + C_{CFOE} + C_{IE} + C_{RE})}$$

C_{EB} = Corn Enterprise Profit/Loss
C_P = Corn Price
C_Y = Corn Yield
C_{FE} = Corn Fertilizer Expense
C_{WCE} = Corn Weed Control Expense
C_{SE} = Corn Seed Expense
C_{CIE} = Corn Crop Insurance Expense
C_{LE} = Corn Crop Labor Expense
C_{CFOE} = Corn Custom Field Operation Expense
C_{IE} = Corn Operating Interest Expense
C_{RE} = Cash Rent Expense

Table 3.10: Dryland Corn Yield for Ostmeyer Family Farms

	N	Mean	Std Dev	Minimum	Maximum
Yield	10	101.10	28.80	55.00	142.00

Production for the corn enterprise budget is based on Ostmeyer Family Farms' average dryland corn yield since 2013, shown above in Table 3.2. The average corn yield of 101 bushels/ac was multiplied by the USDA's long-term projection model for a corn price of $4.30, resulting in a revenue per acre of $434.30.

Expenses are divided into eight categories: fertilizer, weed control, seed, crop insurance, labor, custom field operations, interest on operating capital, and cash rent. The fertilizer expense is based on AgPHD's estimated nutrients per bushel of corn or 0.67 actual lbs. of nitrogen and 0.35 actual lbs. phosphorus (Figure 3.4) (AgPhD 2023). Each recommended rate is multiplied by the current cost of actual pounds of 82-0-0 (%N-P2O5-

K2O) and 10-34-0 fertilizers (Figure 3.3). Weed control was discussed in depth with Ostmeyer Family Farms' agronomist. Three separate chemical plans were created, and the cheapest plan was used in this enterprise budget (Figure 3.6). Seed cost is from the 2024 actual average seed cost per bag of corn or $285/bag. Corn is projected to be planted at 16,500 seeds per acre, as Ostmeyer Family Farms' agronomist recommended. Crop insurance expense is based on the 2023 actual cost per acre for 70% Revenue Protection (RP) insurance coverage. Labor costs are for crop consulting fees per acre for dryland farm ground, which are charged to Ostmeyer Family Farms for the 2023 crop year. Miscellaneous labor is derived from Kansas State University (KSU) enterprise budgets. Custom field operations are based on the 2022 custom rates survey completed by KSU (Figure 3.2). Interest on operating capital is figured as 50% of the expenses times the operating rate currently charged to Ostmeyer Family Farms, which is 7.5%. 50% assumes the funds will be borrowed from planting to harvest for half of the year. Cash rent was equal to the NASS survey for cash rent in Thomas County, Kansas, or $55.50 per acre. This is in line with Ostmeyer Family Farms cash rent. The dryland corn enterprise budget estimates a per-acre net income of $60.53 (Figure 3.10).

Table 3.11: Ostmeyer Family Farms Corn Enterprise Budget

		Unit	Price	Quantity	Amount	Sub-total	Total
Income		bu	$ 4.30	101.00	$ 434.30	$ 434.30	
Corn- Ostmeyer							
Total Income						$ 434.30	
Expenses							
Fertilizer							
Nitrogen (82-0-0)		lb	0.48	35.35	$ 16.97		
Phosphorus (10-34-0)		lb	0.71	67.67	$ 48.05	**$ 65.01**	
Weed Control							
Herbicide Plan 2							
	Herbicide						
Spray #1	2-4D Ester	oz	0.23	8.00	$ 1.81		
	Atrazine	oz	0.13	16.00	$ 2.00		
	Corvus	oz	3.00	4.00	$ 12.00		
	Dicamba	oz	0.28	12.00	$ 3.33		
	Valor	oz	0.21	2.00	$ 0.42		
Spray #2	Amazon Pro	oz	1.17	20.00	$ 23.40		
	Atrazine	oz	0.13	32.00	$ 4.00		
	Roundup	oz	0.11	22.00	$ 2.49	**$ 49.45**	
Seed							
Corn-Roundup Ready BT		1k seeds	3.56	16.50	$ 58.78	**$ 58.78**	
Crop Insurance							
Corn Dryland Ostmeyer		acre	13.75	1.00	$ 13.75	**$ 13.75**	
Labor							
Crop Consulting		acre	7.00	1.00	$ 7.00		
Miscellaneous (beyond custom field operations)		hour	15.00	0.50	$ 7.50	**$ 14.50**	
Custom Field Operations							
Fertilizer Application (NH3)		acre	24.25	1.00	$ 24.25		
Plant-Corn		acre	18.54	1.00	$ 18.54		
Spray Ground Rig		acre	5.70	2.00	$ 11.40		
Harvest-Corn		acre	28.33	1.00	$ 28.33		
Haul-Corn		bu	0.23	101.00	$ 23.23	**$ 105.75**	
Interest on Operating Capital			7.5%	$ 153.62	$ 11.52	**$ 11.52**	
Cash Rent							
		acre	$ 55.00	1.00	$ 55.00	**$ 55.00**	
Total Expenses						**$ 373.77**	
Net Income Per Acre							**$ 60.53**

3.2.2 Wheat After Fallow Enterprise Budget

The wheat after-fallow enterprise budget is calculated according to the following equation.

Wheat After Fallow Enterprise Budget Model

$$\mathbf{WF_{EB} = (W_{P}*W_{Y}) – (W_{FE} + W_{FCE} + W_{WCE} + W_{SE} + WF_{CIE} + W_{LE} + W_{CROE} + W_{IE} + CRE)}$$

WF_{EB} = Wheat Enterprise Profit/Loss
W_{P} = Wheat Price
W_{Y} = Wheat Yield
W_{FE} = Wheat Fertilizer Expense
W_{FCE} = Wheat Fungicide Expense
W_{WCE} = Wheat Weed Control Expense
W_{SE} = Wheat Seed Expense
WF_{CIE} = Wheat After Fallow Crop Insurance Expense
W_{LE} = Wheat Labor Expense
W_{CFOE} = Wheat Custom Field Operation Expense
W_{IE} = Wheat Operating Interest Expense
CRE = Cash Rent Expense

Table 3:12: Dryland Wheat After Fallow Yield for Ostmeyer Family Farms

	N	Mean	Std Dev	Minimum	Maximum
Yield	10	35.30	24.22	2.00	84.00

Production for the wheat after the fallow enterprise budget is based on Ostmeyer Family Farms' average dryland wheat since 2013, shown above in Table 3.3. The average fallowed wheat yield of 35 bushels was multiplied by the USDA's long-term projection model for wheat price or $5.70, resulting in an income per acre of $199.50.

Expenses are divided into nine categories: fertilizer, fungicide, weed control, seed, crop insurance, labor, custom field operations, interest on operating capital, and cash rent.

The fertilizer expense is based on AgPHD's estimated nutrients per bushel of wheat or 1.16 actual lbs. of nitrogen and 0.48 actual lbs. phosphorus (Figure 3.4) (AgPhD 2023). Each recommended rate is multiplied by the current cost of actual pounds of 32-0-0 (%N-P2O5-K2O) and 10-34-0 fertilizers (Figure 3.3). Weed control was discussed in depth with Ostmeyer Family Farms' agronomist. Three separate chemical plans were created, and the cheapest plan was used in this enterprise budget (Figure 3.6). Seed cost is from the 2024 actual average seed cost per acre for certified seed. Wheat is projected to be drilled at 1 bushel per acre as Ostmeyer Family Farms' agronomist recommended. Crop insurance expense is based on the 2023 actual cost per acre for 70% Revenue Protection (RP) insurance coverage. Labor costs are for crop consulting fees per acre for dryland farm ground, which are charged to Ostmeyer Family Farms for the 2023 crop year. Miscellaneous labor is derived from Kansas State University (KSU) enterprise budgets. Custom field operations are based on the 2022 custom rates survey completed by KSU (Figure 3.2). Interest on operating capital is figured as 50% of the expenses times the operating rate currently charged to Ostmeyer Family Farms, which is 7.5%. 50% assumes the funds will be borrowed from planting to harvest for half of the year. Cash rent was equal to the NASS survey for cash rent in Thomas County, Kansas, or $55.50 per acre. This is in line with Ostmeyer Family Farms cash rent. The wheat after chemical fallow enterprise budget estimates a per-acre net loss of $ 72.94 (Figure 3.11).

Table 3.13: Ostmeyer Family Farms Wheat After Chemical Fallow Enterprise Budget

		Unit	Price	Quantity	Amount	Sub-total	Total
Income		bu	$ 5.70	35.00	$ 199.50	$ 199.50	
Wheat- Ostmeyer							
Total Income						**$ 199.50**	
Expenses							
Fertilizer							
Nitrogen (32-0-0)		lb	1.16	40.60	$ 47.10		
Phosphorus (10-34-0)		lb	0.48	16.80	$ 8.06	**$ 55.16**	
Weed Control							
Herbicide Plan 1							
	Herbicide						
Spray #1	Ally	oz	2.90	0.20	$ 0.58		
	Dicamba	oz	0.28	4.00	$ 1.11		
					$ -		
Spray #2	Paraquat	oz	0.16	32.00	$ 4.99		
	2-4D Ester	oz	0.23	16.00	$ 3.63		
Spray #3	Paraquat	oz	0.16	32.00	$ 4.99		
	Atrazine	oz	0.13	16.00	$ 2.00	**$ 17.30**	
Fungicide							
Wheat-Fungicide	Nexicor	oz	1.80	9.00	$ 16.20	**$ 16.20**	
Seed							
Wheat-		bu	15.00	1.00	$ 15.00	**$ 15.00**	
Crop Insurance							
Corn Dryland Ostmeyer		acre	5.31	1.00	$ 5.31	**$ 5.31**	
Labor							
Crop Consulting		acre	7.00	1.00	$ 7.00		
Miscellaneous (beyond custom field operations)		hour	15.00	0.50	$ 7.50	**$ 14.50**	
Custom Field Operations							
Fertilizer Application (Liquid)		acre	11.35	1.00	$ 11.35		
Drill-Wheat		acre	17.17	1.00	$ 17.17		
Spray-Aerial Fungicide		acre	7.56	1.00	$ 7.56		
Spray Ground Rig		acre	5.70	3.00	$ 17.10		
Harvest-Wheat		acre	24.53	1.00	$ 24.53		
Haul-Wheat		bu	0.24	35.00	$ 8.40	**$ 86.11**	
Interest on Operating Capital			7.5%	$ 104.79	$ 7.86	**$ 7.86**	
Cash Rent							
		acre	$ 55.00	1.00	$ 55.00	**$ 55.00**	
Total Expenses						**$ 272.44**	
Net Income Per Acre							**$ (72.94)**

3.2.3 Wheat After Spring Canola Enterprise Budget

The wheat after Spring Canola enterprise budget is calculated using the following equation:

Wheat After Spring Canola Enterprise Budget Model

$$\mathbf{WSC_{EB} = (W_{P}*(W_{Y} + SC_{YB})) - (W_{FE} + W_{FCE} + W_{WCE} + W_{SE} + W_{FCCIE} + W_{LE} + W_{CROE} + W_{IE} + CRE)}$$

WSC_{EB} = Wheat After Spring Canola Enterprise Profit/Loss
W_{P} = Wheat Price
W_{Y} = Wheat Yield
SC_{YB} = Spring Canola Yield Bump
WSC_{FE} = Wheat Fertilizer Expense
W_{FCE} = Wheat Fungicide Expense
W_{WCE} = Wheat Weed Control Expense
W_{SE} = Wheat Seed Expense
W_{FCCIE} = Wheat Continuous Crop Insurance Expense
W_{LE} = Wheat Labor Expense
W_{CFOE} = Wheat Custom Field Operation Expense
W_{IE} = Wheat Operating Interest Expense
CRE = Cash Rent Expense

Production for wheat after the spring canola enterprise budget is based on Ostmeyer Family Farms' average dryland wheat since 2013, shown in Table 3.3. An adjustment was completed to decrease the projected yield by 10% bushels per acre. This yield bump in wheat projection following spring canola is based on the research completed in Canada (Western Winter Wheat Initative 2017). The average wheat yield of 35 times a 10%-bushel yield bump, resulting in 38.5 bushels per acre, was multiplied by the USDA's long-term projection model for wheat price or $5.70, resulting in an income per acre of $219.45.

With two exceptions, expenses are the same as the enterprise budget for wheat after fallow. The fertilizer expenses were adjusted for higher yield projections. Crop insurance expenses increased from $5.31 to $12.54 per acre. This increase is attributed to spring canola added to the rotation, requiring continuous wheat insurance rates instead of fallow rates. The dryland wheat after-spring canola enterprise budget estimates a per-acre net loss of $67.08. Refer to below Figure 3.12.

Table 3.14: Ostmeyer Family Farms Wheat After Spring Canola Enterprise Budget

		Unit	Price	Quantity	Amount	Sub-total	Total
Income		bu	$ 5.70	38.50	$ 219.45	$ 219.45	
Wheat- Ostmeyer							
Total Income						**$ 219.45**	
Expenses							
Fertilizer							
Nitrogen (32-0-0)		lb	1.16	44.66	$ 51.81		
Phosphorus (10-34-0)		lb	0.48	18.48	$ 8.87	**$ 60.68**	
Weed Control							
Herbicide Plan 1							
	Herbicide						
Spray #1	Ally	oz	2.90	0.20	$ 0.58		
	Dicamba	oz	0.28	4.00	$ 1.11		
					$ -		
Spray #2	Paraquat	oz	0.16	32.00	$ 4.99		
	2-4D Ester	oz	0.23	16.00	$ 3.63		
Spray #3	Paraquat	oz	0.16	32.00	$ 4.99		
	Atrazine	oz	0.13	16.00	$ 2.00	**$ 17.30**	
Fungicide							
Wheat-Fungicide	Nexicor	oz	1.80	9.00	$ 16.20	**$ 16.20**	
Seed							
Wheat-		bu	15.00	1.00	$ 15.00	**$ 15.00**	
Crop Insurance							
Corn Dryland Ostmeyer		acre	12.54	1.00	$ 12.54	**$ 12.54**	
Labor							
Crop Consulting		acre	7.00	1.00	$ 7.00		
Miscellaneous (beyond custom field operations)		hour	15.00	0.50	$ 7.50	**$ 14.50**	
Custom Field Operations							
Fertilizer Application (Liquid)		acre	11.35	1.00	$ 11.35		
Drill-Wheat		acre	17.17	1.00	$ 17.17		
Spray-Aerial Fungicide		acre	7.56	1.00	$ 7.56		
Spray Ground Rig		acre	5.70	3.00	$ 17.10		
Harvest-Wheat		acre	24.53	1.00	$ 24.53		
Haul-Wheat		bu	0.24	38.50	$ 9.24	**$ 86.95**	
Interest on Operating Capital			7.5%	$ 111.58	$ 8.37	**$ 8.37**	
Cash Rent							
		acre	$ 55.00	1.00	$ 55.00	**$ 55.00**	
Total Expenses						**$ 286.53**	
Net Income Per Acre							**$ (67.08)**

3.2.4 Spring Canola Enterprise Budget

The spring canola enterprise budget is calculated using the following equation:

Spring Canola Enterprise Budget Model

$$\mathbf{SC_{EB} = (SC_{P} * SC_{Y}) - (SC_{FE} + SC_{FC} + SC_{WCE} + SC_{SE} + SC_{CIE} + SC_{LE} + SC_{CFOE} + SC_{IE} + CRE)}$$

SC_{EB} = Spring Canola Enterprise Profit/Loss
SC_{P} = Spring Canola Price
SC_{Y} = Spring Canola Yield
SC_{FE} = Spring Canola Fertilizer Expense
SC_{WCE} = Spring Canola Weed Control Expense
SC_{SE} = Spring Canola Seed Expense
SC_{CIE} = Spring Canola Crop Insurance Expense
SC_{LE} = Spring Canola Labor Expense
SC_{CFOE} = Spring Canola Custom Field Operation Expense
SC_{IE} = Spring Canola Operating Interest Expense
CRE = Cash Rent Expense

Production for the spring canola enterprise budget is based on a combination of research compiled by K-state Research and Extension and a simulation of the production potential of dryland spring canola by D.C. Nielsen. The average rounded spring canola yield of 20 bushels per acre was multiplied by $12.00 per bushel, which is the expected price for Scoular in Goodland, Kansas. This results in revenue of $240.00 per acre.

Expenses are divided into nine categories: fertilizer, weed control, seed, crop insurance, labor, custom field operations, interest on operating capital, and cash rent. The fertilizer expense is based on AgPHD's estimated nutrients per bushel of canola or 1.75 actual lbs. of nitrogen and 0.94 actual lbs. phosphorus (Figure 3.4) (AgPhD 2023). Each recommended rate is multiplied by the current cost of actual pounds of 32-0-0 (%N-P2O5-K2O) and 10-34-0 fertilizers (Figure 3.3). Weed control was discussed in depth with

Ostmeyer Family Farms' agronomist. Three separate chemical plans were created, and the cheapest plan was used in this enterprise budget (Figure 3.8). Chemical prices were derived from the local chemical dealer. Seed cost is from the 2024 actual average seed cost per acre. Spring Canola is projected to be drilled at one bag per ten acres, as Ostmeyer Family Farms' agronomist recommended. Crop insurance is based on a written agreement that would need to be completed for spring canola with RCIS (Rural Community Insurance Services), resulting in a crop insurance cost of $12.54/acre. Labor costs are for crop consulting fees per acre for dryland farm ground, which are charged to Ostmeyer Family Farms for the 2023 crop year. Miscellaneous labor is derived from Kansas State University (KSU) enterprise budgets. Custom field operations are based on the 2022 custom rates survey completed by KSU (Figure 3.2). Interest on operating capital is figured as 50% of the expenses times the operating rate currently charged to Ostmeyer Family Farms, which is 7.5%. 50% assumes the funds will be borrowed from planting to harvest for half of the year. Cash rent was equal to the NASS survey for cash rent in Thomas County, Kansas, or $55.50 per acre. This is in line with Ostmeyer Family Farms cash rent. The dryland spring canola enterprise budget estimates a per-acre net loss of $ 150.25 (Figure 3.13).

Table 3.15: Ostmeyer Family Farms Spring Canola Enterprise Budget

		Unit	Price	Quantity	Amount	Sub-total	Total
Income		bu	$ 12.00	20.00	$ 240.00	$ 240.00	
Wheat- Ostmeyer							
Total Income						**$ 240.00**	
Expenses							
Fertilizer							
Nitrogen (32-0-0)		lb	1.75	35.00	$ 61.25		
Phosphorus (10-34-0)		lb	0.94	18.80	$ 17.67	**$ 78.92**	
Weed Control							
Herbicide Plan 1							
	Herbicide						
Spray #1	Valor	oz	0.21	1.00	$ 0.21		
					$ -		
Spray #2	Paraquat	oz	19.96	32.00	$ 4.99		
Spray #3	Liberty	oz	32.00	43.00	$ 14.78		
	Clethodim	oz	45.00	1.76	$ 1.76		
Spray # 4	Liberty	oz	32.00	43.00	$ 14.78	**$ 36.52**	
Seed							
Spring Canola- Liberty Link		acre	1,000.00	0.10	$ 100.00	**$ 100.00**	
Crop Insurance							
Canola Dryland Ostmeyer		acre	12.54	1.00	$ 12.54	**$ 12.54**	
Labor							
Crop Consulting		acre	7.00	1.00	$ 7.00		
Miscellaneous (beyond custom field operations)		hour	15.00	0.50	$ 7.50	**$ 14.50**	
Custom Field Operations							
Fertilizer Application (Liquid)		acre	11.35	1.00	$ 11.35		
Drill-Wheat		acre	17.17	1.00	$ 17.17		
Spray Ground Rig		acre	5.70	4.00	$ 22.80		
Harvest-Wheat		acre	24.53	1.00	$ 24.53		
Haul-Wheat		bu	0.24	20.00	$ 4.80	**$ 80.65**	
Interest on Operating Capital			7.5%	$ 161.57	$ 12.12	**$ 12.12**	
Cash Rent							
		acre	$ 55.00	1.00	$ 55.00	**$ 55.00**	
Total Expenses						**$ 390.25**	
Net Income Per Acre							**$ (150.25)**

3.2.5 Chemical Fallow Enterprise Budget

The chemical fallow enterprise budget is calculated according to the following equation.

Chemical Fallow Enterprise Budget Model

$$\mathbf{CF_{EB} = (CF_{FE} + CF_{WCE} + CF_{LE} + CF_{CFOE} + CF_{IE} + CRE)}$$

CF_{EB} = Chemical Fallow Enterprise Loss
CF_{WCE} = Chemical Fallow Weed Control Expense
CF_{LE} = Chemical Fallow Labor Expense
CF_{CFOE} = Chemical Fallow Custom Field Operation Expense
CF_{IE} = Chemical Fallow Operating Interest Expense
CRE = Cash Rent Expense

The income for the chemical fallow enterprise budget is \$0. No crop was taken off the chemical fallow during the year.

Weed control was discussed in depth with the Ostmeyer Family Farms' agronomist. Three separate chemical plans were completed, and the cheapest plan was used in this enterprise budget (Figure 3.9). Chemical prices were derived from the local chemical dealer. Miscellaneous labor is derived from Kansas State University (KSU) enterprise budgets. Custom field operations are based on the 2022 custom rates survey completed by KSU (Figure 3.2). Interest on operating capital is figured by multiplying 50 percent of the expenses times the current operating interest rate charged to Ostmeyer Family Farms, which is 7.5%. Fifty percent is used with the assumption that the funds will be borrowed for half of the year. The chemical fallow enterprise budget estimates a per-acre net loss of \$133.56 (Figure 3.14).

Table 3.16: Ostmeyer Family Farms Chemical Fallow Enterprise Budget

		Unit	Price	Quantity	Amount	Sub-total	Total
Income					$ -	$ -	
Total Income							**$ -**
Expenses							
Weed Control							
Herbicide Plan 2							
	Herbicide						
Spray #1	Valor	oz	0.21	4.00	$ 0.84		
	Dicamba	oz	0.28	16.00	$ 4.44		
	2-4D Ester	oz	0.23	16.00	$ 3.63		
Spray #2	Roundup	oz	22.00	0.11	$ 2.49		
	Dicamba	oz	0.28	16.00	$ 4.44		
	2-4D Ester	oz	0.23	16.00	$ 3.63		
Spray #3	Paraquat	oz	32.00	0.16	$ 4.99		
	2-4D Ester	oz	0.23	16.00	$ 1.76		
Spray # 4	Paraquat	oz	32.00	0.16	$ 4.99		
	2-4D Ester	oz	0.23	16.00	$ 1.76		
Spray # 5	Paraquat	oz	32.00	0.16	$ 4.99		
	2-4D Ester	oz	0.23	16.00	$ 1.76	**$ 39.72**	
Labor							
Miscellaneous (beyond custom field operations)		hour	15.00	0.50	$ 7.50	**$ 7.50**	
Custom Field Operations							
Spray Ground Rig		acre	5.70	5.00	$ 28.50	**$ 28.50**	
Interest on Operating Capital			7.5%	$ 37.86	$ 2.84	**$ 2.84**	
Cash Rent							
		acre	$ 55.00	1.00	$ 55.00	**$ 55.00**	
Total Expenses						**$ 133.56**	
Net Income Per Acre							**$ (133.56)**

3.3 Rotation Budgets

At first glance, the Chemical Fallow Enterprise Budget shows a net loss of (\$133.56) per acre, and the Spring Canola Enterprise Budget shows a net loss of (\$150.25). This would indicate that it is better to use chemical fallow instead of planting spring canola with a net savings of \$16.69 per acre. Enterprise budgets are an excellent tool to help producers decide between various crops, but this can be flawed. An entire rotation budget should be utilized when one enterprise directly affects the next, like wheat after spring canola.

3.4 Rotation Budget Model:

$$\frac{\sum(EB)}{N}$$

EB= Enterprise Budget

N= Number of Enterprise Budgets

3.4.1 Fallow-Wheat-Corn-Corn Budget Model

The Fallow-Wheat-Corn Rotation Budget is calculated according to the following equation.

Net Income Per Acre= $$\frac{CF_{EB} + WF_{EB} + C_{EB}}{3}$$

CF_{EB}= Chemical Fallow Enterprise Loss

WF_{EB}= Wheat After Fallow Enterprise Profit/Loss
C_{EB}= Corn Enterprise Profit/Loss

3.4.2 Spring Canola-Wheat-Corn-Corn Budget Model

The Spring Canola-Wheat-Corn Rotation Budget is calculated according to the following equation.

Net Income Per Acre= $$\frac{SC_{EB} + WF_{EB} + C_{EB}}{3}$$

SC_{EB}= Spring Canola Enterprise Profit/Loss
WF_{EB}= Wheat After Fallow Enterprise Profit/Loss
C_{EB}= Corn Enterprise Profit/Loss

CHAPTER IV: RESULTS

A net income per rotation can be realized using the above Rotation Budget Models in conjunction with the individual Enterprise Budgets.

Fallow-Wheat-Corn Rotation Model results:

$$\frac{(\$133.56)+(\$72.94)+\$60.53}{3}$$

= Net Loss of ($48.66)

Spring Canola-Wheat-Corn Rotation Model results:

$$\frac{(\$150.25)+(\$67.08)+\$60.53}{3}$$

= Net Loss of ($52.27)

The fallow-wheat-corn and Spring Canola-Wheat-Corn rotation budgets have similar net losses per acre. With a $3.61 per acre loss difference, small changes in price and yield in wheat or spring canola would change the results. The net loss from the spring canola enterprise outweighs the potential gains in wheat production by adding spring canola to the rotation.

For the Spring Canola-Wheat-Corn rotation to equal the Fallow-Wheat-Corn rotation, the spring canola price needs to increase by $0.54 per bushel; yield would need to increase by 1.41 bushel per acre or a combination of the two.

4.1 Decision Tool

The researcher created an Excel spreadsheet for future rotational analysis between fallow-wheat-corn and spring canola-wheat-corn rotation. Ostmeyer Family Farms can use this decision tool to adjust commodity prices, yield, and expenses to get an accurate net income per rotation. Refer to Figure 4.1: Ostmeyer Family Farms Excel Rotation Decision Tool.

Table 4.1 Ostmeyer Family Farms Excel Rotation Decision Tool

Crop Enterprise	Yield Goal	Actual Yield	Projected Price/Bushel	Gross Income/Acre	Gross Expenses/Acre	Net Income/Acre
Corn	101.00	101.00	$ 4.30	$ 434.30	$ 373.77	$ 60.53
Wheat (after Spring Canola)	38.50	38.50	$ 5.70	$ 219.45	$ 286.53	$ (67.08)
Wheat (after Chemical Fallow)	35.00	35.00	$ 5.70	$ 199.50	$ 272.44	$ (72.94)
Spring Canola	20.00	20.00	$ 12.00	$ 240.00	$ 390.25	$ (150.25)
Chemical Fallow				$ -	$ 103.99	$ (133.56)
				Insurance Guarantee		

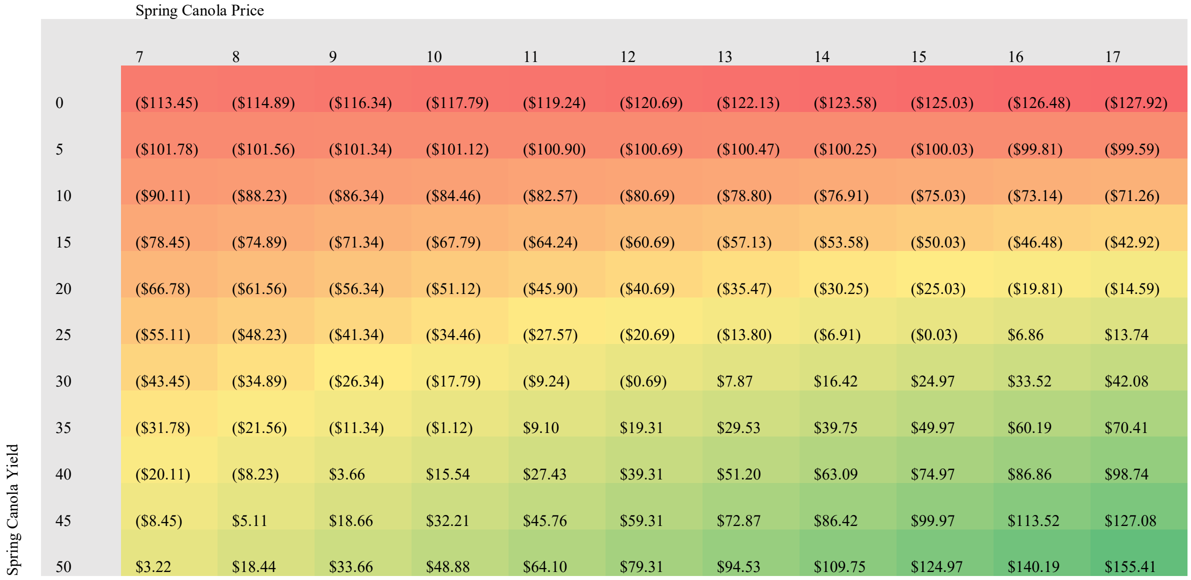
Comparison	
F-W-C	$ (48.66)
SC-W-C	$ (52.27)

4.2 Sensitivity Analysis

Sensitivity analysis used spring canola price and yield to show the net income for spring canola-wheat-corn rotation (Figure 4.2). Keeping all else constant, a $1 increase in spring canola price to $13 would increase the rotation's net income loss of ($52.27) to a net income loss of ($45.60). This scenario would increase the net income by $6.67. On the contrary, a five-bushel spring canola yield increase would decrease the net loss of ($52.27) to a net loss of ($39.51). This scenario would increase the rotation net income by $12.76.

Furthermore, an additional sensitivity was completed on the wheat yield penalty/bump after spring canola. Figure 4.3 shows the difference between the spring canola-wheat-corn and fallow-wheat-corn rotation at different wheat yield penalties and bumps. A positive yield response results in a higher net income per acre for the spring canola rotation, and a negative yield response results in a higher net income per acre for the fallow rotation. Holding everything else constant, a wheat yield increase of more than 2.85 bushels per acre would result in a higher net income for the spring canola-wheat-corn rotation.

Figure 4.1: Spring Canola-Wheat-Corn Rotation Sensitivity (Net Income/Acre)

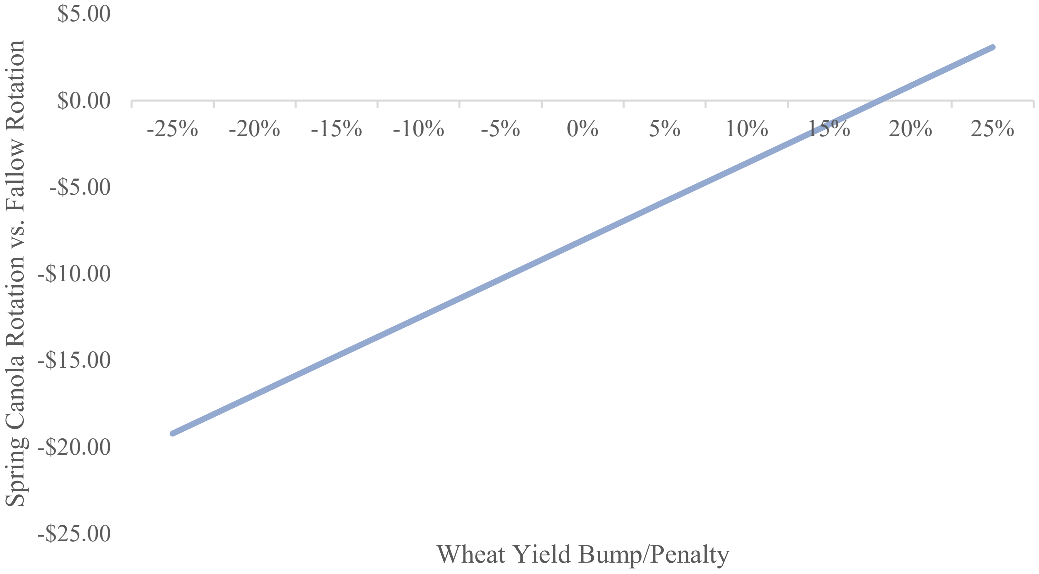


Spring Canola Price

Spring Canola Yield

	7	8	9	10	11	12	13	14	15	16	17
0	($113.45)	($114.89)	($116.34)	($117.79)	($119.24)	($120.69)	($122.13)	($123.58)	($125.03)	($126.48)	($127.92)
5	($101.78)	($101.56)	($101.34)	($101.12)	($100.90)	($100.69)	($100.47)	($100.25)	($100.03)	($99.81)	($99.59)
10	($90.11)	($88.23)	($86.34)	($84.46)	($82.57)	($80.69)	($78.80)	($76.91)	($75.03)	($73.14)	($71.26)
15	($78.45)	($74.89)	($71.34)	($67.79)	($64.24)	($60.69)	($57.13)	($53.58)	($50.03)	($46.48)	($42.92)
20	($66.78)	($61.56)	($56.34)	($51.12)	($45.90)	($40.69)	($35.47)	($30.25)	($25.03)	($19.81)	($14.59)
25	($55.11)	($48.23)	($41.34)	($34.46)	($27.57)	($20.69)	($13.80)	($6.91)	($0.03)	$6.86	$13.74
30	($43.45)	($34.89)	($26.34)	($17.79)	($9.24)	($0.69)	$7.87	$16.42	$24.97	$33.52	$42.08
35	($31.78)	($21.56)	($11.34)	($1.12)	$9.10	$19.31	$29.53	$39.75	$49.97	$60.19	$70.41
40	($20.11)	($8.23)	$3.66	$15.54	$27.43	$39.31	$51.20	$63.09	$74.97	$86.86	$98.74
45	($8.45)	$5.11	$18.66	$32.21	$45.76	$59.31	$72.87	$86.42	$99.97	$113.52	$127.08
50	$3.22	$18.44	$33.66	$48.88	$64.10	$79.31	$94.53	$109.75	$124.97	$140.19	$155.41

Figure 4.2: Wheat After Spring Canola Yield Sensitivity



4.3 Breakeven Analysis

A breakeven analysis was completed to show what spring canola price or yield would be needed to net the spring canola-wheat-corn rotation to equal the fallow-wheat-corn. Using goal seek in Excel with the decision tool created, the breakeven spring canola price is $12.54 at the current assumed yield, while the breakeven spring canola yield is 21.41 bushels per acre at the current assumed price. Refer to Figure 4.4 and Figure 4.5 below.

Table 4.2: Ostmeyer Family Farms Spring Canola Price Breakeven to Fallow Rotation

Crop Enterprise	Yield Goal	Actual Yield	Projected Price/Bushel	Gross Income/Acre	Gross Expenses/Acre	Net Income/Acre
Corn	101.00	101.00	$ 4.30	$ 434.30	$ 373.77	$ 60.53
Wheat (after Spring Canola)	38.50	38.50	$ 5.70	$ 219.45	$ 286.53	$ (67.08)
Wheat (after Chemical Fallow)	35.00	35.00	$ 5.70	$ 199.50	$ 272.44	$ (72.94)
Spring Canola	20.00	20.00	$ 12.54	$ 250.82	$ 390.25	$ (139.43)
Chemical Fallow				$ -	$ 133.56	$ (133.56)
				Insurance Guarantee		

Comparison	
F-W-C	$ (48.66)
SC-W-C	$ (48.66)

Table 4.3: Ostmeyer Family Farms Spring Canola Yield Breakeven to Fallow Rotation

Crop Enterprise	Yield Goal	Actual Yield	Projected Price/Bushel	Gross Income/Acre	Gross Expenses/Acre	Net Income/Acre
Corn	101.00	101.00	$ 4.30	$ 434.30	$ 373.77	$ 60.53
Wheat (after Spring Canola)	38.50	38.50	$ 5.70	$ 219.45	$ 286.53	$ (67.08)
Wheat (after Chemical Fallow)	35.00	35.00	$ 5.70	$ 199.50	$ 272.44	$ (72.94)
Spring Canola	21.41	21.41	$ 12.00	$ 256.96	$ 396.39	$ (139.43)
Chemical Fallow				$ -	$ 133.56	$ (133.56)
				Insurance Guarantee		

Comparison	
F-W-C	$ (48.66)
SC-W-C	$ (48.66)

4.4 Worst Case Scenario

A worst-case scenario was completed to see at what point the net income with each enterprise budget is at its lowest. This happens when the crop insurance guarantee is met, and expenses are the highest per enterprise unit.

Revenue Guarantee = APH X Coverage %

This revenue provides a safety net for the enterprise budgets for corn, wheat after fallow, and continuous wheat. A written agreement can be obtained for spring canola; therefore, a safety net is also available (Figure 4.7: Crop Insurance Guarantee).

Table 4.4 Crop Insurance Guarantee

Commodity	Corn	Wheat	Wheat	Spring Canola
Practice	CNTCR	SUMFW	CNTCR	CNTCR
APH	91	39	27	17.4
Guarantee Price	$ 5.91	$ 7.34	$ 7.34	$ 12.98
Coverage %	70%	70%	70%	70%
Cost	$ 13.75	$ 5.31	$ 11.87	$ 12.54
Revenue Guarantee/Acre	$ 376.47	$ 200.38	$ 138.73	$ 158.10

Table 4.5: Worst Case Ostmeyer Family Farms Scenario

Crop Enterprise	Yield Goal	Actual Yield	Projected Price/Bushel	Gross Income/Acre	Gross Expenses/Acre	Net Income/Acre
Corn	101.00	87.55	$ 4.30	$ 376.47	$ 370.56	$ 5.91
Wheat (after Spring Canola)	38.50	24.34	$ 5.70	$ 138.73	$ 259.85	$ (121.12)
Wheat (after Chemical Fallow)	35.00	35.15	$ 5.70	$ 200.38	$ 272.73	$ (72.35)
Spring Canola	20.00	13.18	$ 12.00	$ 158.10	$ 360.61	$ (202.51)
Chemical Fallow				$ -	$ 133.56	$ (133.56)
				Insurance Guarantee		

Comparison	
F-W-C	$ (56.81)
SC-W-C	$ (105.91)

The worst-case scenario is reached when corn yield is 87.55 bushels per acre, wheat (after spring canola) yield is 24.34 bushels per acre, wheat (after chemical fallow) yield is

35.15 bushels per acre, and spring canola yield is 13.18 bushels per acre. This results in F-W-C rotation net income loss per acre of ($56.81) and SC-W-C rotation net income loss per acre of ($105.91) (Figure 4.7). This worst-case scenario would favor F-W-C rotation by $49.10 per acre. This difference is due to spring canola having a worst-case net loss of ($202.51) per acre compared to a fallow net loss of ($133.56) per acre.

4.5 Actual Machinery Cost Scenario

The researcher used custom rates for field operations to illustrate a conservative value for these expenses. However, Ostmeyer Family Farms does have a full line of equipment. Adding spring canola to the rotation would add equipment savings due to the economy of scale. Drilling and harvesting additional acres would allow Ostmeyer to spread the fixed equipment costs like insurance and cost of capital over additional acres. Thus, decreasing the cost per acre of field operations. Using Iowa State University Extension and Outreach (2023), the researcher estimated the actual cost per acre of each field operation based on Ostmeyer Family Farms' actual equipment values (Iowa State University Extension and Outreach 2023). These updated field operation costs were then analyzed using the Ostmeyer Family Farms decision tool (Figure 4.1). The results are below in Figure 4.9.

Table 4.6 Ostmeyer Family Farms Actual Machinery Cost Scenario

Crop Enterprise	Yield Goal	Actual Yield	Projected Price/Bushel	Gross Income/Acre	Gross Expenses/Acre	Net Income/Acre
Corn	101.00	101.00	$ 4.30	$ 434.30	$ 324.56	$ 109.74
Wheat (after Spring Canola)	38.50	38.50	$ 5.70	$ 219.45	$ 251.56	$ (32.11)
Wheat (after Chemical Fallow)	35.00	35.00	$ 5.70	$ 199.50	$ 237.47	$ (37.97)
Spring Canola	20.00	20.00	$ 12.00	$ 240.00	$ 351.44	$ (111.44)
Chemical Fallow				$ -	$ 114.37	$ (114.37)
				Insurance Guarantee		

Comparison	
F-W-C	$ (14.20)
SC-W-C	$ (11.27)

Based on Ostmeyer Family Farms' actual equipment cost, the spring canola-wheat-corn rotation has a lower net loss per acre of $2.93 than the fallow-wheat-corn rotation. This is lower than the custom rate approach of $3.61 per acre. The researcher elected to use custom rates for field operation expense to show a more conservative value.

4.6 Current Market Price Scenario

USDA projected prices were used to eliminate the day-to-day variances in corn and wheat prices. The current market scenario was used to show the difference between each rotation using current contract prices for corn and wheat on March 9, 2024 (Figure 4.10). Spring Canola price was changed to $11.00 per bushel, corn prices at harvest delivery were changed to $4.42 per bushel, and wheat was changed to $5.14 per bushel. This results in a fallow-wheat-corn rotation net loss of $44.62 and a spring canola-wheat-corn rotation net loss of $62.08. In this scenario, fallow-wheat-corn rotation is favored by $17.47 per acre. At these prices, wheat after chemical fallow has hit its crop insurance guarantee of $199.50 per acre.

Table 4.7: Ostmeyer Family Farms Current Market Price Scenario

Crop Enterprise	Yield Goal	Actual Yield	Projected Price/Bushel	Gross Income/Acre	Gross Expenses/Acre	Net Income/Acre
Corn	101.00	101.00	$ 4.30	$ 446.42	$ 373.77	$ 72.65
Wheat (after Spring Canola)	38.50	38.50	$ 5.14	$ 197.89	$ 286.53	$ (88.64)
Wheat (after Chemical Fallow)	35.00	35.00	$ 5.14	$ 199.50	$ 272.44	$ (72.94)
Spring Canola	20.00	20.00	$ 12.00	$ 220.00	$ 390.25	$ (170.25)
Chemical Fallow				$ -	$ 133.56	$ (133.56)

Insurance Guarantee

Comparison	
F-W-C	$ (44.62)
SC-W-C	$ (62.08)

CHAPTER V: CONCLUSION

This thesis evaluates the economic feasibility of replacing summer fallow with spring canola in northwest Kansas on Ostmeyer Family Farms. The literature review examined spring canola agronomics, the spring canola market, and crop rotational effects. This research showed that spring canola would grow well agronomically on Ostmeyer Family Farms' land, and the market would be available to sell grain.

Further analysis was completed to determine the economic effect of replacing fallow with spring canola in a normal rotation. This was measured by completing individual rotation budgets to determine the net income per acre per rotation. The rotation budgets' results illustrate a fallow-wheat-corn rotation net income loss per acre of $48.66. spring canola-wheat-corn rotation resulted in a net income loss of $52.27. This indicates that the fallow-wheat-corn rotation would outperform the spring canola-wheat-corn rotation by $3.61 based on the assumption in this research.

In the worst-case scenario, fallow-wheat-corn rotation net income loss per acre is $56.81, while spring canola-wheat-corn rotation net income loss per acre is $105.91. This analysis shows the spring canola-wheat-corn rotation would be riskier by $49.10 per acre. The breakeven analysis showed the yield and price needed to make the budget rotation net income $0; however, a better comparison would be to compare the spring canola-wheat-corn rotation to equal the fallow-wheat-corn rotation. The researcher found that the spring canola-wheat-corn rotation would be riskier but, overall, more profitable than the fallow-wheat-corn rotation in the Ostmeyer Family Farms case due to their actual machinery cost. Based on the above, the researcher would recommend that Ostmeyer Family Farms switch the farm from a fallow-wheat-corn rotation to a spring canola-wheat-corn rotation.

When more southern spring canola hybrids become available, Ostmeyer Family Farms would benefit from experimenting with spring canola-wheat-corn rotation on a small scale. This would allow them to observe the actual yield and yield penalty/bump on wheat following spring canola on their soils and using their farming practices. Doing this on a small acreage would limit the loss if the worst-case scenario were to occur.

The increase in weed resistance and the overall cost of the chemical fallow period are the underlying reasons for this project. When chemicals like glyphosate were initially introduced in the early 90's, three sprayings with glyphosate would be the fallow period cost. Now, with atrazine, bromoxynil, chlorsulfuron, fomesafen, glyphosate, imazamox, imazethapyr, lactofen, mesotrione, metribuzin, pyrasulfotole, tembotrione, thifensulfuron-methyl, five to six spraying with multiple modes of action is needed for the fallow period. Without introducing new active ingredient, the fallow cost will likely continue to rise, making spring canola-wheat-corn rotation even more beneficial. Ostmeyer Family Farms should continue to assess this with the decision tool provided with this research as grain and input prices change.

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