

# **IRRIGATED CROP PRODUCTION AND PROFITABILITY UNDER LEMA ALLOCATIONS**

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## **INTRODUCTION**

A district-wide Local Enhanced Management Area (LEMA) across Groundwater Management District No. 4 (GMD 4) in Northwest Kansas is under consideration. This proposed LEMA management plan covers all or portions of Cheyenne, Decatur, Rawlins, Gove, Graham, Logan, Sheridan, Sherman, Thomas and Wallace counties in the Northwest part of the state. An official record of this process of LEMA adoption in GMD 4 is available at [gmd4.org](http://gmd4.org) and at the following website through the Kansas Department of Agriculture, Division of Water Resources:

<http://agriculture.ks.gov/divisions-programs/dwr/managing-kansas-water-resources/local-enhanced-management-areas/lists/lemas/gmd4-district-wide-lemma>

A LEMA has already successfully operated within GMD4. In January 2013, a 99-mile area of Sheridan and a small part of Thomas counties formed its own five-year LEMA to extend the life of the aquifer in their area, known as the "Sheridan 6". The Sheridan 6 LEMA was the first to be established in the state of Kansas, but was set to expire at the end of 2017. However, irrigators in the Sheridan 6 LEMA renewed the groundwater management and conservation tool for another five years. (See Hutchinson Daily News article by Amy Bickell, August 7, 2017)

In the initial Sheridan 6 LEMA, irrigators agreed to pump an average 20 percent less from groundwater supplies – limiting themselves to a total of 55 inches of irrigated water application over five years of the plan – to an average of 11 inches a year. This LEMA also offered some flexibility, allowing groundwater users to move water to different wells inside the LEMA.

According to the Kansas Geological Survey, irrigators in the Sheridan 6 LEMA have reduced their irrigation use by 35 percent over the first four years of the program (Hutchinson Daily News, August 7, 2017). Water saving strategies used by Sheridan 6 LEMA irrigators have included a) adoption of more water-saving crop enterprises to conserve water use, and b) increased use of water saving technology such as low-flow nozzles and soil-moisture probes for efficient water usage. The purpose of this paper is to examine the water use, production and profitability prospects of the primary irrigated crops available to irrigators in the proposed GMD 4 LEMA in Northwest Kansas.

## IRRIGATED CROPS, WATER USE AND RETURNS OVER FULL COST

This analysis uses irrigated crop production budgets with alternative water use and production scenarios for Northwest Kansas corn, grain sorghum, soybeans, wheat, oil-type sunflowers and confection sunflowers. These 2018 Kansas Farm Management Guides (KFMGs) are developed by the Kansas State University Departments of Agricultural Economics, Agronomy, and Biological and Agricultural Engineering, with additional best management practice information from the Departments of Entomology, and Plant Pathology. These KFMG budgets are available on the [www.AgManager.info](http://www.AgManager.info) website through the KSU Department of Agricultural Economics.

The following KFMG Irrigated Crop Production Budgets with “Low-Average-High” water application rates and yield levels are using in this analysis. Listed with each scenario are a) the amount of irrigation water applied, b) the yield per acre, c) full economic cost breakeven price (BEP\$), and d) projected net returns over all costs per acre using harvest-time forward contract prices from the Colby area on Monday, January 29, 2018.

- **Table 1.** 2018 Center-pivot Irrigated Corn Budget for Northwest KS with a \$3.46 /bu forward contract price at 2018 harvest:
  - Full irrigation: 17.0 inches applied, 265 bu/ac yield, \$3.43 /bu BEP\$, +\$6.65 /ac profit
  - Limit irrigation: 14.5 inches applied, 240 bu/ac yield, \$3.54 /bu BEP\$, -\$20.13 /ac loss
  - More limited: 11.0 inches applied, 210 bu/ac yield, \$3.70 /bu BEP\$, -\$50.39 /ac loss
- **Table 2.** 2018 Center-pivot Irrigated Grain Sorghum Budget for Northwest KS with a \$3.27 /bu forward contract price at 2018 harvest:
  - Full irrigation: 13.0 inches applied, 170 bu/ac yield, \$4.02 /bu BEP\$, -\$126.73 /ac loss
  - Limit irrigation: 11.0 inches applied, 154 bu/ac yield, \$4.17 /bu BEP\$, -\$139.22 /ac loss
  - More limited: 9.0 inches applied, 130 bu/ac yield, \$4.51 /bu BEP\$, -\$161.81 /ac loss
- **Table 3.** 2018 Center-pivot Irrigated Soybean Budget for Northwest KS with a \$8.77 /bu forward contract price at 2018 harvest:
  - Full irrigation: 13.0 inches applied, 75 bu/ac yield, \$8.71 /bu BEP\$, +\$4.43 /ac profit
  - Limit irrigation: 11.0 inches applied, 65 bu/ac yield, \$9.28 /bu BEP\$, -\$32.91 /ac loss
  - More limited: 9.0 inches applied, 55 bu/ac yield, \$10.05 /bu BEP\$, -\$70.44 /ac loss
- **Table 4.** 2018 Center-pivot Irrigated Wheat Budget for Northwest KS with a \$4.11 /bu forward contract price at 2018 harvest:
  - Full irrigation: 10.0 inches applied, 75.0 bu/ac yield, \$7.44 /bu BEP\$, -\$249.70 /ac loss
  - Limit irrigation: 8.0 inches applied, 67.5 bu/ac yield, \$7.69 /bu BEP\$, -\$241.47 /ac loss
  - More limited: 6.0 inches applied, 60.0 bu/ac yield, \$8.13 /bu BEP\$, -\$241.26 /ac loss

- **Table 5.** 2018 Center-pivot Irrigated Oil Sunflower Budget for Northwest KS with a \$17.00 /cwt forward contract price at 2018 harvest:
  - Full irrigation: 12.0 inches applied, 3,000 lb/ac yield, \$23.74 /cwt BEP\$, –\$202.30 /ac loss
  - Limit irrigation: 10.0 inches applied, 2,400 lb/ac yield, \$26.99 /cwt BEP\$, –\$239.71 /ac loss
  - More limited: 8.0 inches applied, 1,800 lb/ac yield, \$32.41 /cwt BEP\$, –\$277.32 /ac loss
- **Table 6.** 2018 Center-pivot Irrigated Confection Sunflower Budget for Northwest KS with a \$21.50 /cwt average large/small seed forward contract price at 2018 harvest:
  - Full irrigation: 12.0 inches applied, 2,600 lb/ac yield, \$25.55 /cwt BEP\$, –\$105.21 /ac loss
  - Limit irrigation: 10.0 inches applied, 2,200 lb/ac yield, \$28.04 /cwt BEP\$, –\$143.93 /ac loss
  - More limited: 8.0 inches applied, 1,700 lb/ac yield, \$32.95 /cwt BEP\$, –\$194.66 /ac loss

Note that these costs and returns are calculated for full costs. Returns to land and irrigation equipment for these crops and their respective irrigation and production scenarios will be presented at the Central Plains Irrigation Conference on February 20-21, 2018.

## COMPARING YIELD, REVENUE, REVENUE / INCH, AND NET RETURNS

### Irrigated Yields by Water Application

**Figure 1** illustrates the relationship between irrigated yields and water application amounts for the crops in Tables 1-6. Especially notable are the higher projected yields for irrigated corn (210 bu/ac) at 11.0 inches of irrigation applied annually than for grain sorghum (154.0 bu/ac). At 11.0 inches applied soybeans are projected to yield 65.0 bu/ac, while at 10.0 inches of water applied irrigated wheat is projected to yield 75 bu/ac.

Irrigated oil sunflower and confection sunflower are not included in this chart. At 10 inches per acre irrigated oil sunflower is projected to yield 2,400 pounds per acre, while confections are projected to yield 2,200 pounds.

These crop yield estimates in the 10-11 inches of water applied per year range are particularly relevant given that the average allowable application rate in the Sheridan 6 LEMA was 11.0 inches per year (i.e., 55 inches total over a 5 year period – averaging 11.0 per year applied).

### Irrigated Revenue by Water Application Amounts

**Figure 2** shows projected crop revenue following from the irrigated yields and water application amounts in **Figure 1**. Irrigated corn has higher revenue levels than other crops at all water application x yield levels. Revenues for irrigated grain sorghum, soybeans, and wheat are comparable, while projected revenues for irrigated wheat lag behind other crops.

### Irrigated Revenue per Inch of Irrigation Water Applied

**Figure 3** shows projected crop revenue per inch of irrigation water applied. These results illustrate the economic principle of “declining marginal returns” for irrigation water applications to corn,

grain sorghum, soybeans and wheat. The largest marginal impact in terms of revenue for an inch of water applied is for the lowest amount of water (11.0 inches per acre) applied to irrigated corn, i.e., \$66 per inch, followed the second highest amount again for corn (i.e., \$57 per acre for 14.5 inches applied). Corn is followed by soybeans in terms of revenue per inch of water applied, with confection sunflower and grain sorghum nearly equal, with irrigated wheat following last.

### **Irrigated Net Returns by Crop and Irrigation Water Application**

**Figure 4** illustrates projected net returns per acre for the various crops and their alternative water application / yield scenarios. Of these crops examined for Northwest Kansas, only irrigated corn and irrigated soybeans show profitable or near profitable scenarios. Irrigated grain sorghum and confection sunflower show similar net returns, with irrigated wheat lags behind.

## **CONCLUSIONS**

These reinforce the predominant position of irrigated corn in on irrigated cropland in Northwest Kansas. However, under limited irrigation water use policies and regulations such as the region-wide LEMA in GMD 4, it is worthwhile to consider how to best use limited irrigation water allocations (i.e., such as 55 inches over 5 years, for an average of 11.0 inches per year) in the most profitable manner over time.

Given current new crop forward contract prices for major irrigated cropping options in Northwest Kansas, it seems likely that farmers will continue to plant crops with the best prospects for net returns, and will economize irrigated groundwater use to a least a moderate degree in the early years of the coming multi-year regulatory period. However, given the uncertainty associated with rainfall supplies in Northwest Kansas, with both higher and lower than normal annual rainfall possible, farmers will likely choose their strategy in the early 1-2 years based on their degree of true risk aversion.

In other words, are Northwest Kansas farmers likely to severely constrain or limit their irrigation water use in the early years of a 5 year LEMA plan to be sure in their thinking to have water available to use legally through the later years of the 5 year LEMA plan? OR are they likely to go ahead and use their regular amounts of irrigation water in early years and hope for 1-2 years of “good rainfall” during the 5-year period. These potential “good years” with better than average rainfall would “bale them out” from having to cut back their usage in years 4-5 of the LEMA plan. The strategy chosen will be indicative of their approach to “making decisions under risk”.

**Table 1. 2018 Center-pivot Irrigated Corn Budget for Northwest Kansas**  
(Low-Average-High Yields & Water Applications), KSU Farm Mgmt Guide Budgets

Kansas Farm Management Guide Cost-Return Budget				
2018 Irrigated Corn – Center Pivot Systems in Northwest Kansas				
Department of Agricultural Economics, Kansas State University				
Authors: Daniel O'Brien, Monte Vandevveer, Gregg Ibendahl, Lucas Haag, John Holman, A. J. Foster				
INCOME PER ACRE	Yield Level, bu/ac			Your Farm
	210	240	265	
A. Yield per acre				
B. Price per bushel (Colby, KS New Crop FC, 1/29/2018)	\$3.46	\$3.46	\$3.46	
C. Crop insurance indemnity payments	\$0.00	\$0.00	\$0.00	
D. Other crop income	\$0.00	\$0.00	\$0.00	
E. Total Returns/acre ((A x B) + C + D)	<b>\$726.60</b>	<b>\$830.40</b>	<b>\$916.90</b>	
COSTS PER ACRE				
1. Seed	\$99.68	\$113.92	\$125.79	
2. Fertilizer	\$78.15	\$89.29	\$98.53	
DAP (18-46-0) with planter	\$34.21	\$39.06	\$43.14	
Urea	\$43.94	\$50.23	\$55.39	
Other fertilizer	\$0.00	\$0.00	\$0.00	
3. Herbicide	\$48.95	\$48.95	\$48.95	
Preplant burndown	\$8.37	\$8.37	\$8.37	
Pre-emergence	\$38.98	\$38.98	\$38.98	
Post-emergence	\$1.60	\$1.60	\$1.60	
4. Insecticide	\$7.28	\$7.28	\$7.28	
5. Fungicide	\$6.31	\$6.31	\$6.31	
6. Crop consulting	\$6.50	\$6.50	\$6.50	
7. Crop insurance	\$28.38	\$32.43	\$35.81	
8. Labor (beyond custom field operations)	\$27.00	\$27.00	\$27.00	
9. Miscellaneous Expenses	\$10.00	\$10.00	\$10.00	
10. Custom Field Operations	\$148.07	\$160.04	\$170.03	
Tillage	\$18.65	\$18.65	\$18.65	
Spraying	\$18.54	\$18.54	\$18.54	
Planting	\$17.20	\$17.20	\$17.20	
Fertilizing	\$0.00	\$0.00	\$0.00	
Harvesting	\$57.54	\$64.35	\$70.03	
Hauling	\$36.14	\$41.30	\$45.61	
Drying	\$0.00	\$0.00	\$0.00	
Other	\$0.00	\$0.00	\$0.00	
11. Irrigation Costs (inches applied per acre)	<b>11.0</b>	<b>14.5</b>	<b>17.0</b>	
Irrigation energy costs	\$35.30	\$46.54	\$54.56	
Irrigation system capital depreciation	\$76.67	\$76.67	\$76.67	
Irrigation system 6% interest on equipment	\$59.22	\$59.22	\$59.22	
Irrigation system repair & maintenance	\$3.63	\$4.79	\$5.61	
12. Farmland Charge / Cash Rent	\$126.88	\$145.00	\$160.10	
SUBTOTAL	\$762.01	\$833.94	\$892.36	
13. Interest on 1/2 Subtotal (less land & irrig. System)	\$14.98	\$16.59	\$17.89	
F. TOTAL COST	\$776.99	\$850.53	\$910.25	
G. TOTAL COSTS/BUSHEL (F ÷ A)	\$3.70	\$3.54	\$3.43	
H. RETURNS OVER COSTS per acre (E – F)	<b>(\$50.39)</b>	<b>(\$20.13)</b>	\$6.65	
I. % RETURN OVER TOTAL COST ((F ÷ G) - 1)	-6.5%	-2.4%	0.7%	

**Table 2. 2018 Center-pivot Irrigated Grain Sorghum Budget for NW Kansas**  
(Low-Average-High Yields & Water Applications), KSU Farm Mgmt Guide Budgets

<b>Kansas Farm Management Guide Cost-Return Budget</b>				
<b>2018 Irrigated Grain Sorghum – Center Pivot Systems in Northwest KS</b>				
Department of Agricultural Economics, Kansas State University				
Authors: Daniel O'Brien, Monte Vandevveer, Gregg Ibendahl, Lucas Haag, John Holman, A. J. Foster				
INCOME PER ACRE	Yield Level, bu/ac			Your Farm
	130	154	170	
A. Yield per acre				
B. Price per bushel (Colby, KS New Crop FC, 1/29/2018)	\$3.27	\$3.27	\$3.27	
C. Crop insurance indemnity payments	\$0.00	\$0.00	\$0.00	
D. Other crop income	\$0.00	\$0.00	\$0.00	
E. Total Returns/acre ((A x B) + C + D)	<b>\$425.10</b>	<b>\$503.58</b>	<b>\$555.90</b>	
COSTS PER ACRE				
1. Seed	\$12.59	\$14.92	\$16.47	
2. Fertilizer	\$49.55	\$58.59	\$64.76	
DAP (18-46-0) with planter	\$23.16	\$27.41	\$30.39	
Urea	\$26.39	\$31.18	\$34.37	
Other fertilizer	\$0.00	\$0.00	\$0.00	
3. Herbicide	\$41.25	\$41.25	\$41.25	
Preplant burndown	\$8.37	\$8.37	\$8.37	
Pre-emergence	\$32.88	\$32.88	\$32.88	
Post-emergence	\$0.00	\$0.00	\$0.00	
4. Insecticide	\$0.00	\$0.00	\$0.00	
5. Fungicide	\$0.00	\$0.00	\$0.00	
6. Crop consulting	\$6.25	\$6.25	\$6.25	
7. Crop insurance	\$31.24	\$37.01	\$40.86	
8. Labor (beyond custom field operations)	\$25.20	\$25.20	\$25.20	
9. Miscellaneous Expenses	\$10.00	\$10.00	\$10.00	
10. Custom Field Operations	\$124.21	\$134.75	\$141.77	
Tillage	\$18.65	\$18.65	\$18.65	
Spraying	\$11.21	\$11.21	\$11.21	
Planting	\$17.53	\$17.53	\$17.53	
Fertilizing	\$5.75	\$5.75	\$5.75	
Harvesting	\$42.87	\$48.21	\$51.76	
Hauling	\$28.20	\$33.40	\$36.87	
Drying	\$0.00	\$0.00	\$0.00	
Other	\$0.00	\$0.00	\$0.00	
11. Irrigation Costs (inches applied per acre)	<b>9.0</b>	<b>11.0</b>	<b>13.0</b>	
Irrigation energy costs	\$28.89	\$35.30	\$41.72	
Irrigation system capital depreciation	\$76.67	\$76.67	\$76.67	
Irrigation system 6% interest on equipment	\$59.22	\$59.22	\$59.22	
Irrigation system repair & maintenance	\$2.97	\$3.63	\$4.29	
12. Farmland Charge / Cash Rent	\$108.90	\$129.00	\$142.40	
SUBTOTAL	\$576.94	\$631.79	\$670.86	
13. Interest on 1/2 Subtotal (less land & irrig. System)	\$9.96	\$11.01	\$11.78	
F. TOTAL COST	\$586.91	\$642.80	\$682.63	
G. TOTAL COSTS/BUSHEL (F ÷ A)	\$4.51	\$4.17	\$4.02	
H. RETURNS OVER COSTS per acre (E – F)	<b>(\$161.81)</b>	<b>(\$139.22)</b>	<b>(\$126.73)</b>	
I. % RETURN OVER TOTAL COST ((F ÷ G) - 1)	-27.6%	-21.7%	-18.6%	

**Table 3. 2018 Center-pivot Irrigated Soybean Budget for Northwest Kansas**  
(Low-Average-High Yields & Water Applications), KSU Farm Mgmt Guide Budgets

<b>Kansas Farm Management Guide Cost-Return Budget</b>				
<b>2018 Irrigated Soybeans – Center Pivot Systems in Northwest Kansas</b>				
Department of Agricultural Economics, Kansas State University				
Authors: Daniel O'Brien, Monte Vandever, Gregg Ibendahl, Lucas Haag, John Holman, A. J. Foster				
INCOME PER ACRE	Yield Level, bu/ac			Your Farm
A. Yield per acre	55	65	75	
B. Price per bushel (Colby, KS New Crop FC, 1/29/2018)	\$8.77	\$8.77	\$8.77	
C. Crop insurance indemnity payments	\$0.00	\$0.00	\$0.00	
D. Other crop income	\$0.00	\$0.00	\$0.00	
E. Total Returns/acre ((A x B) + C + D)	<b>\$482.35</b>	<b>\$570.05</b>	<b>\$657.75</b>	
COSTS PER ACRE				
1. Seed	\$46.96	\$55.50	\$64.04	
2. Fertilizer	\$17.08	\$20.06	\$23.21	
MAP (11-52-0) with planter	\$17.08	\$20.06	\$23.21	
Other fertilizer	\$0.00	\$0.00	\$0.00	
Other fertilizer	\$0.00	\$0.00	\$0.00	
3. Herbicide	\$34.94	\$34.94	\$34.94	
Preplant burndown	\$3.20	\$3.20	\$3.20	
Pre-emergence	\$28.54	\$28.54	\$28.54	
Post-emergence	\$3.20	\$3.20	\$3.20	
4. Insecticide	\$0.00	\$0.00	\$0.00	
5. Fungicide	\$0.00	\$0.00	\$0.00	
6. Crop consulting	\$6.25	\$6.25	\$6.25	
7. Crop insurance	\$20.31	\$24.00	\$27.69	
8. Labor (beyond custom field operations)	\$24.60	\$24.60	\$24.60	
9. Miscellaneous Expenses	\$10.00	\$10.00	\$10.00	
10. Custom Field Operations	\$93.64	\$98.41	\$103.18	
Tillage	\$12.60	\$12.60	\$12.60	
Spraying	\$16.82	\$16.82	\$16.82	
Planting	\$17.64	\$17.64	\$17.64	
Fertilizing	\$0.00	\$0.00	\$0.00	
Harvesting	\$34.15	\$36.66	\$39.17	
Hauling	\$12.43	\$14.69	\$16.95	
Drying	\$0.00	\$0.00	\$0.00	
Other	\$0.00	\$0.00	\$0.00	
11. Irrigation Costs (inches applied per acre)	<b>9.0</b>	<b>11.0</b>	<b>13.0</b>	
Irrigation energy costs	\$28.89	\$35.30	\$41.72	
Irrigation system capital depreciation	\$76.67	\$76.67	\$76.67	
Irrigation system 6% interest on equipment	\$59.22	\$59.22	\$59.22	
Irrigation system repair & maintenance	\$2.97	\$3.63	\$4.29	
12. Farmland Charge / Cash Rent	\$122.69	\$145.00	\$167.31	
SUBTOTAL	\$544.22	\$593.58	\$643.12	
13. Interest on 1/2 Subtotal (less land & irrig. System)	\$8.57	\$9.38	\$10.20	
F. TOTAL COST	\$552.79	\$602.96	\$653.32	
G. TOTAL COSTS/BUSHEL (F ÷ A)	\$10.05	\$9.28	\$8.71	
H. RETURNS OVER COSTS per acre (E – F)	(\$70.44)	(\$32.91)	\$4.43	
I. % RETURN OVER TOTAL COST ((F ÷ G) - 1)	-12.7%	-5.5%	0.7%	

**Table 4. 2018 Center-pivot Irrigated Wheat Budget for Northwest Kansas**  
(Low-Average-High Yields & Water Applications), KSU Farm Mgmt Guide Budgets

<b>Kansas Farm Management Guide Cost-Return Budget</b>				
<b>2018 Irrigated Wheat – Center Pivot Systems in Western Kansas</b>				
Department of Agricultural Economics, Kansas State University				
Authors: Daniel O'Brien, Monte Vandevveer, Gregg Ibendahl, Lucas Haag, John Holman, A. J. Foster				
INCOME PER ACRE	Yield Level, bu/ac			Your Farm
	60	67.5	75	
A. Yield per acre				
B. Price per bushel (Scott City, KS New Crop FC, 1/29/2018)	\$4.11	\$4.11	\$4.11	
C. Crop insurance indemnity payments	\$0.00	\$0.00	\$0.00	
D. Other crop income	\$0.00	\$0.00	\$0.00	
E. Total Returns/acre ((A x B) + C + D)	\$246.60	\$277.43	\$308.25	
COSTS PER ACRE				
1. Seed	\$16.00	\$18.00	\$20.00	
2. Fertilizer	\$35.80	\$40.40	\$44.64	
DAP (18-46-0) with planter	\$13.18	\$14.88	\$16.36	
Urea	\$22.62	\$25.52	\$28.28	
Other fertilizer	\$0.00	\$0.00	\$0.00	
3. Herbicide	\$6.31	\$6.31	\$6.31	
Preplant burndown	\$0.00	\$0.00	\$0.00	
Pre-emergence	\$6.31	\$6.31	\$6.31	
Post-emergence	\$0.00	\$0.00	\$0.00	
4. Insecticide	\$0.00	\$0.00	\$0.00	
5. Fungicide	\$8.79	\$8.79	\$8.79	
6. Crop consulting	\$6.00	\$6.00	\$6.00	
7. Crop insurance	\$26.33	\$29.62	\$32.91	
8. Labor (beyond custom field operations)	\$22.80	\$22.80	\$22.80	
9. Miscellaneous Expenses	\$10.00	\$10.00	\$10.00	
10. Custom Field Operations	\$77.12	\$76.37	\$83.76	
Tillage	\$0.00	\$0.00	\$0.00	
Spraying	\$11.26	\$11.26	\$11.26	
Planting	\$16.37	\$16.37	\$16.37	
Fertilizing	\$5.29	\$5.29	\$5.29	
Harvesting	\$31.23	\$32.93	\$34.62	
Hauling	\$12.97	\$10.52	\$16.22	
Drying	\$0.00	\$0.00	\$0.00	
Other	\$0.00	\$0.00	\$0.00	
11. Irrigation Costs (inches applied per acre)	6.0	8.0	10.0	
Irrigation energy costs	\$19.26	\$25.68	\$32.10	
Irrigation system capital depreciation	\$76.67	\$76.67	\$76.67	
Irrigation system 6% interest on equipment	\$59.22	\$59.22	\$59.22	
Irrigation system repair & maintenance	\$1.98	\$2.64	\$3.30	
12. Farmland Charge / Cash Rent	\$114.67	\$129.00	\$143.33	
SUBTOTAL	\$480.95	\$511.50	\$549.83	
13. Interest on 1/2 Subtotal (less land & irrig. system)	\$6.91	\$7.40	\$8.12	
F. TOTAL COST	\$487.86	\$518.90	\$557.95	
G. TOTAL COSTS/BUSHEL (F ÷ A)	\$8.13	\$7.69	\$7.44	
H. RETURNS OVER COSTS per acre (E – F)	(\$241.26)	(\$241.47)	(\$249.70)	
I. % RETURN OVER TOTAL COST ((F ÷ G) - 1)	-49.5%	-46.5%	-44.8%	



**Table 5. 2018 Center-pivot Irrigated Oil-Sunflower Budget for NW Kansas**  
(Low-Average-High Yields & Water Applications), KSU Farm Mgmt Guide Budgets

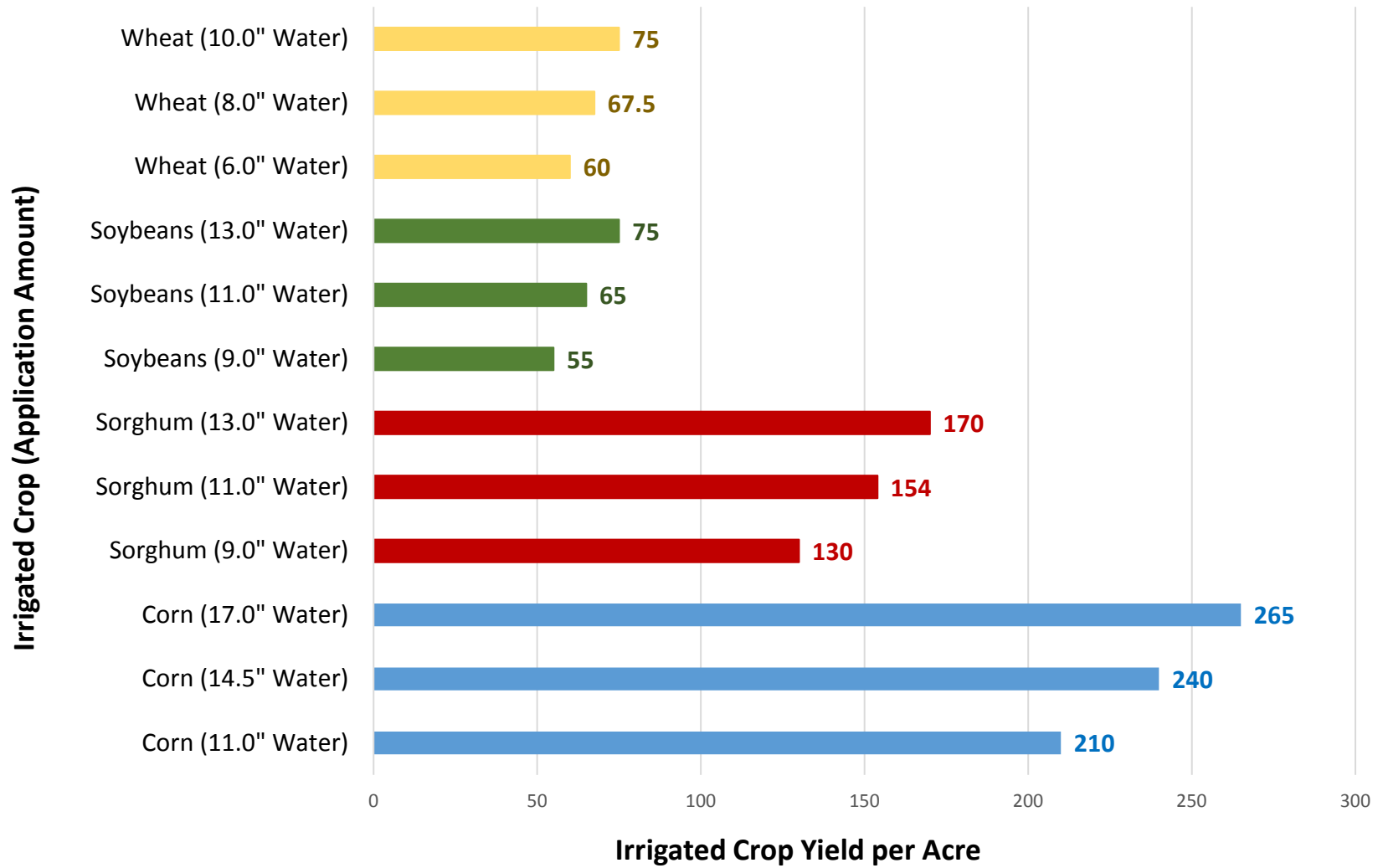
<b>Kansas Farm Management Guide Cost-Return Budget</b>				
<b>2018 Irrigated Oil-Type Sunflower – CP Systems in Western Kansas</b>				
Department of Agricultural Economics, Kansas State University				
Authors: Daniel O'Brien, Monte Vandever, Gregg Ibendahl, Lucas Haag, John Holman, A. J. Foster				
INCOME PER ACRE	Yield Level, bu/ac			Your Farm
	1,800	2,400	3,000	
A. Yield (pounds per acre)				
B. Price per bushel (Goodland, KS New Crop FC, 1/29/2018)	\$17.00	\$17.00	\$17.00	
C. Crop insurance indemnity payments	\$0.00	\$0.00	\$0.00	
D. Other crop income	\$0.00	\$0.00	\$0.00	
E. Total Returns/acre ((A x B) + C + D)	<b>\$306.00</b>	<b>\$408.00</b>	<b>\$510.00</b>	
COSTS PER ACRE				
1. Seed	\$26.33	\$35.10	\$43.88	
2. Fertilizer	\$19.26	\$25.54	\$32.03	
MAP (11-52-0) with planter	\$8.08	\$10.63	\$13.39	
Anhydrous Ammonia (82-0-0)	\$11.18	\$14.91	\$18.64	
Other fertilizer	\$0.00	\$0.00	\$0.00	
3. Herbicide	\$49.94	\$49.94	\$49.94	
Preplant burndown	\$0.00	\$0.00	\$0.00	
Pre-emergence	\$31.42	\$31.42	\$31.42	
Post-emergence	\$18.52	\$18.52	\$18.52	
4. Insecticide	\$14.65	\$14.65	\$14.65	
5. Fungicide	\$0.00	\$0.00	\$0.00	
6. Crop consulting	\$6.50	\$6.50	\$6.50	
7. Crop insurance	\$19.64	\$26.18	\$32.73	
8. Labor (beyond custom field operations)	\$24.00	\$24.00	\$24.00	
9. Miscellaneous Expenses	\$10.00	\$10.00	\$10.00	
10. Custom Field Operations	\$141.84	\$144.36	\$146.88	
Tillage	\$37.67	\$37.67	\$37.67	
Spraying	\$22.51	\$22.51	\$22.51	
Planting	\$18.77	\$18.77	\$18.77	
Fertilizing	\$14.83	\$14.83	\$14.83	
Harvesting	\$40.51	\$40.51	\$40.51	
Hauling	\$7.55	\$10.07	\$12.59	
Drying	\$0.00	\$0.00	\$0.00	
Other	\$0.00	\$0.00	\$0.00	
11. Irrigation Costs (inches applied per acre)	<b>8.0</b>	<b>10.0</b>	<b>12.0</b>	
Irrigation energy costs	\$25.68	\$32.10	\$38.51	
Irrigation system capital depreciation	\$76.67	\$76.67	\$76.67	
Irrigation system 6% interest on equipment	\$59.22	\$59.22	\$59.22	
Irrigation system repair & maintenance	\$2.64	\$3.30	\$3.96	
12. Farmland Charge / Cash Rent (\$/acre)	\$96.75	\$129.00	\$161.25	
SUBTOTAL	\$573.11	\$636.56	\$700.21	
13. Interest on 1/2 Subtotal (less land & irrig. System)	\$10.21	\$11.15	\$12.09	
F. TOTAL COST	\$583.32	\$647.71	\$712.30	
G. TOTAL COSTS/BUSHEL (F ÷ A) (\$/cwt)	\$32.41	\$26.99	\$23.74	
H. RETURNS OVER COSTS per acre (E – F)	<b>(\$277.32)</b>	<b>(\$239.71)</b>	<b>(\$202.30)</b>	
I. % RETURN OVER TOTAL COST ((F ÷ G) - 1)	<b>-47.5%</b>	<b>-37.0%</b>	<b>-28.4%</b>	

**Table 6. 2018 Center-pivot Confection Sunflower Budget for NW Kansas**  
(Low-Average-High Yields & Water Applications), KSU Farm Mgmt Guide Budgets

<b>Kansas Farm Management Guide Cost-Return Budget</b>				
<b>2018 Irrigated Confection Sunflower – CP Systems in Western Kansas</b>				
Department of Agricultural Economics, Kansas State University				
Authors: Daniel O'Brien, Monte Vandever, Gregg Ibendahl, Lucas Haag, John Holman, A. J. Foster				
INCOME PER ACRE	Yield Level, bu/ac			Your Farm
	1,700	2,200	2,600	
A. Yield (pounds per acre)				
B. Price per bushel (Goodland, KS New Crop FC, 1/29/2018)	\$21.50	\$21.50	\$21.50	
C. Crop insurance indemnity payments	\$0.00	\$0.00	\$0.00	
D. Other crop income	\$0.00	\$0.00	\$0.00	
E. Total Returns/acre ((A x B) + C + D)	<b>\$365.50</b>	<b>\$473.00</b>	<b>\$559.00</b>	
COSTS PER ACRE				
1. Seed	\$23.12	\$29.92	\$35.36	
2. Fertilizer	\$18.30	\$23.45	\$27.63	
MAP (11-52-0) with planter	\$7.65	\$9.78	\$11.48	
Anhydrous Ammonia (82-0-0)	\$10.65	\$13.67	\$16.15	
Other fertilizer	\$0.00	\$0.00	\$0.00	
3. Herbicide	\$32.65	\$32.65	\$32.65	
Preplant burndown	\$0.00	\$0.00	\$0.00	
Pre-emergence	\$31.42	\$31.42	\$31.42	
Post-emergence	\$1.23	\$1.23	\$1.23	
4. Insecticide	\$14.65	\$14.65	\$14.65	
5. Fungicide	\$0.00	\$0.00	\$0.00	
6. Crop consulting	\$6.50	\$6.50	\$6.50	
7. Crop insurance	\$20.23	\$26.18	\$30.94	
8. Labor (beyond custom field operations)	\$24.00	\$24.00	\$24.00	
9. Miscellaneous Expenses	\$10.00	\$10.00	\$10.00	
10. Custom Field Operations	\$137.36	\$139.04	\$140.72	
Tillage	\$37.67	\$37.67	\$37.67	
Spraying	\$18.03	\$18.03	\$18.03	
Planting	\$18.77	\$18.77	\$18.77	
Fertilizing	\$14.83	\$14.83	\$14.83	
Harvesting	\$40.51	\$40.51	\$40.51	
Hauling	\$7.55	\$9.23	\$10.91	
Drying	\$0.00	\$0.00	\$0.00	
Other	\$0.00	\$0.00	\$0.00	
11. Irrigation Costs (inches applied per acre)	<b>8.0</b>	<b>10.0</b>	<b>12.0</b>	
Irrigation energy costs	\$25.68	\$32.10	\$38.51	
Irrigation system capital depreciation	\$76.67	\$76.67	\$76.67	
Irrigation system 6% interest on equipment	\$59.22	\$59.22	\$59.22	
Irrigation system repair & maintenance	\$2.64	\$3.30	\$3.96	
12. Farmland Charge / Cash Rent (\$/acre)	\$99.68	\$129.00	\$152.45	
SUBTOTAL	\$550.70	\$606.68	\$653.26	
13. Interest on 1/2 Subtotal (less land & irrig. system)	\$9.45	\$10.25	\$10.95	
F. TOTAL COST	\$560.16	\$616.93	\$664.21	
G. TOTAL COSTS/BUSHEL (F ÷ A) (\$/cwt)	\$32.95	\$28.04	\$25.55	
H. RETURNS OVER COSTS per acre (E – F)	<b>(\$194.66)</b>	<b>(\$143.93)</b>	<b>(\$105.21)</b>	
I. % RETURN OVER TOTAL COST ((F ÷ G) - 1)	-34.8%	-23.3%	-15.8%	

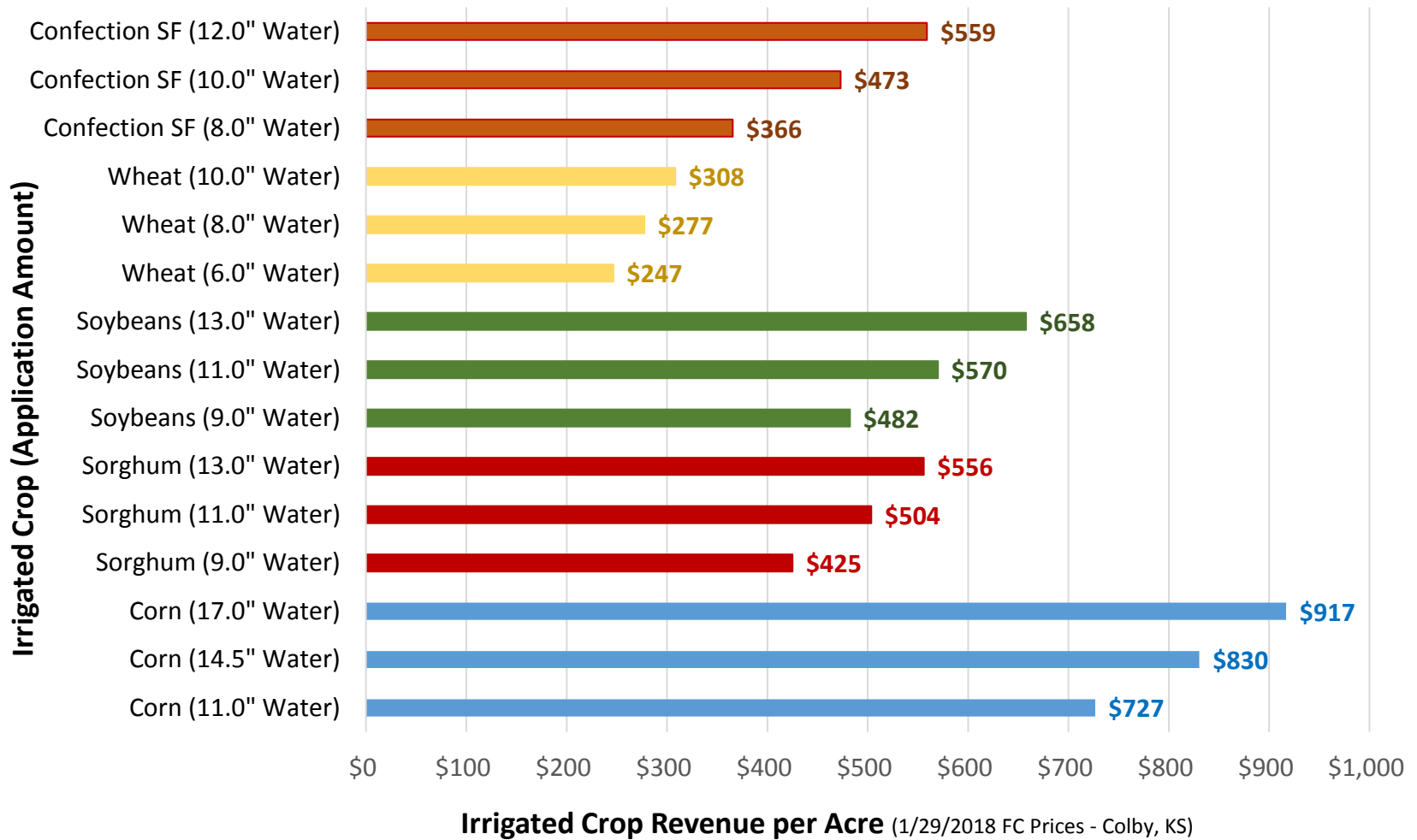
### Figure 1. Irrigated Yield by Water Application/acre in Northwest Kansas

2018 KSU Farm Management Guide Budget Estimates



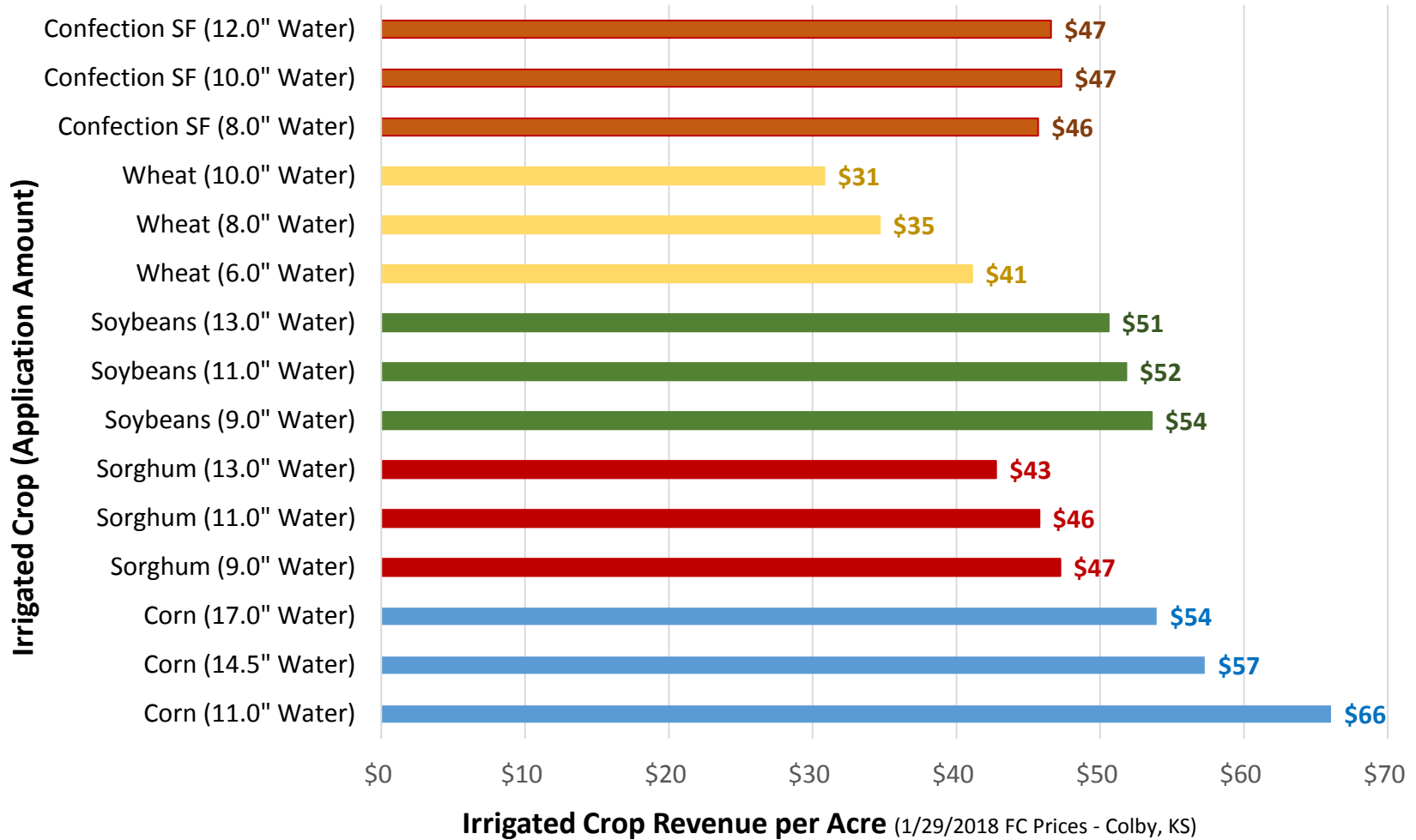
**Figure 2. Irrigated Total Revenue by Water Application/acre in NW KS**

2018 KSU Farm Management Guide Budget Estimates



**Figure 3. Irrigated Total Revenue per Inch of Water Applied/acre in NW KS**

2018 KSU Farm Management Guide Budget Estimates



**Figure 4. Irrigated Net Returns by Water Application/acre in NW KS**

2018 KSU Farm Management Guide Budget Estimates

