

# The Crude Truth About Diesel: An Analysis of Farm Fuel Costs

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## Abstract

Oil prices on March 7, 2026, are \$90 per barrel, up \$25 from just over a week ago before the U.S. bombed Iran. This \$25 increase impacts both consumers and farmers. Kansas grain farmers could see production costs rise by nearly \$22,000 from a \$25 oil shock. Diesel prices rise \$0.42 for every \$10 increase in oil, adding about \$10,000 in diesel costs. Fertilizer prices also track oil: a \$10 oil hike raises anhydrous ammonia by \$30/ton, costing Kansas farmers nearly \$12,000 more. Figure 5 generalizes the extra cost of production for various oil price shocks

## Introduction<sup>1</sup>

Geopolitical shocks in global oil markets, like U.S. and Israeli airstrikes on Iran, affect farm economics. This analysis spans 10 years (522 weeks) of federal petroleum pricing data from March 2016 to March 2026. Crude oil prices explain 80.6% of the variation in U.S. retail diesel prices over the decade. The remaining 19.4% reflects the effects of geopolitics, refinery economics, and inventory dynamics, all of which can drive volatile prices. Farmers rely on diesel to run machinery like tractors and combines, so any oil price change directly affects production costs.

## Analysis

The relationship between crude oil and diesel prices is nearly linear. This means that as crude oil prices (measured using West Texas Intermediate, or WTI Crude, in dollars per barrel) change, diesel prices (in dollars per gallon) change in a predictable way. This relationship has remained steady over a decade that included a global pandemic, a land war in Europe, and a commodity price collapse (figure 1). Linear regression of 522 weekly price observations from the Energy Information Administration (EIA) yields:

$$\text{Diesel (\$/gal)} = 0.695 + 0.0419 \times \text{WTI Crude (\$/bbl)}$$
$$R^2 = 0.806$$

SE = 0.35

This model indicates that 80.6% of the variation in diesel prices is explained by crude oil prices, and a residual standard error of \$0.353 per gallon, reflecting the typical deviation from the predicted value (figure 2).

The regression slope (0.0419) shows every \$1 rise in oil increases diesel by \$0.0419/gal. So, a \$10 oil jump raises diesel \$0.42. The \$0.695/gal intercept represents fixed supply chain costs: federal/state taxes (about \$0.24/gal), refinery overhead, transmission, and retail margin. This cost floor holds regardless of crude price. Even in April 2020, when WTI futures briefly went negative, retail diesel prices never dropped to zero—because the intercept reflects structural, not speculative, costs.

An  $R^2$  of 0.806 is high for commodity economics. However, for practical decisions, the 19.4% of variance not explained by crude oil also matters. It influences the model's standard error. Residual analysis (figure 3) examines the weekly difference between regression predictions and actual consumer prices. The unexplained component, or residuals, usually stays within the  $\pm$  \$0.353 per gallon standard error band. This confirms that crude oil is a reliable predictor under normal conditions. Still, diesel can diverge from the prediction model more often than gasoline.

Consumers tracking gasoline and diesel prices have likely noticed the spread between gas and diesel fluctuates throughout the year. Much of this change is due to the U.S. refinery situation (figure 4). As the figure shows, refinery capacity has decreased since covid, and the remaining capacity is almost fully used. Any deviations from normal can impact the residual diesel price. During Covid, refinery capacity was cut because consumers were not driving. Yet, diesel demand stayed strong due to industry and farm use. This led to the residual spike in early 2020. The start of the Russian/Ukraine war also spiked diesel prices as European nations looked for other diesel suppliers besides Russia.

The dual-axis time series of both price series over ten years (figure 1) shows the model's performance visually. When the two lines track together, such as from 2016 through early 2020 and again from late 2023 through 2025, the  $R^2$  of 0.806 is most effective. In 2022, the lines diverge significantly. Diesel's premium over crude-implied prices then reflects the residual variance the model cannot capture. This directly affects forecasting. Applying the regression equation to current conditions with WTI at \$90 per barrel (3/7/26) after a week of Iran bombing yields a baseline diesel expectation:  $0.695 + 0.0419 \times 90 = \$4.47$  per gallon.

This is the crude-market component of today's diesel price: a \$1.05 premium since Iran bombing began. Actual pump prices, \$4.47 or higher, depend on the 19.4% of variance the model can't explain: refinery run rates, distillate inventory, Hormuz Strait insurance, and the conflict's course.

The other side of the price picture is demand. The earlier discussion assumes demand stays constant. This is often not true during uncertainty. Most consumers remember the toilet paper shortage during Covid. Panic buying fed more panic buying as people bought toilet paper simply because others were doing the same. A similar situation can occur with fuel. Consumers may top off their tanks because they expect prices to rise. This increased demand can temporarily push prices above model-predicted values.

## The Farm Situation

Fuel is not the largest cost for farms, but it is still a major expense. In 2024, the average Kansas Farm Management Association crop farm spent \$33,000 for diesel fuel, or almost \$18 per crop acre. A 30% rise in fuel prices means the typical grain farmer will spend an extra \$10,000 on fuel alone.

The indirect impact of an oil price increase is a rise in fertilizer prices. Fertilizer is the second largest farm expense after machinery, so higher prices can be difficult for farmers to absorb. Ibendahl (<https://agmanager.info/production-economics/prices-and-price-forecasts/fertilizer-price-outlook-2026>) found in February 2026 that anhydrous ammonia prices increase by \$3 per ton for every \$1 oil price rise. In February, the AA price was \$850. A \$25 increase in oil price would raise the AA price by \$75/ton, or nearly 9%. All fertilizers are highly correlated to AA, so it is likely all fertilizers could increase by 9%.

A typical Kansas grain farm spent almost \$130,000 for fertilizer in 2024, or about \$68 per crop acre. A 9% increase in fertilizer prices could mean an extra fertilizer cost of \$11,500 per farm. Together, higher diesel and fertilizer prices from \$90 oil could increase production costs by \$21,500. Other indirect effects, such as shipping for other inputs, would likely add to these costs.

Given the extreme volatility in oil prices at the moment, Figure 5 lists the extra cost of production for a Kansas grain farm at various oil prices.

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Methodology: Linear regression (a statistical technique for quantifying relationships between variables) of 522 weekly U.S. Energy Information Administration (EIA) price observations (using WTI crude spot price, code RWTC; and U.S. retail No. 2 diesel price, code EMD\_EPD2D\_PTE\_NUS\_DPG) from March 2016 to March 2026. The analysis used ordinary least squares (OLS, a common method for regression) estimation in

the R programming language. The final model had  $R^2$  (proportion of variance explained by the regression) = 0.806, adjusted  $R^2 = 0.806$ , residual standard error (average prediction error) = \$0.353 per gallon, and a slope coefficient p-value less than 0.0001 (indicating statistical significance).

## WTI Crude Oil vs. U.S. Retail Diesel Prices (Weekly)

Last 10 years | Source: EIA

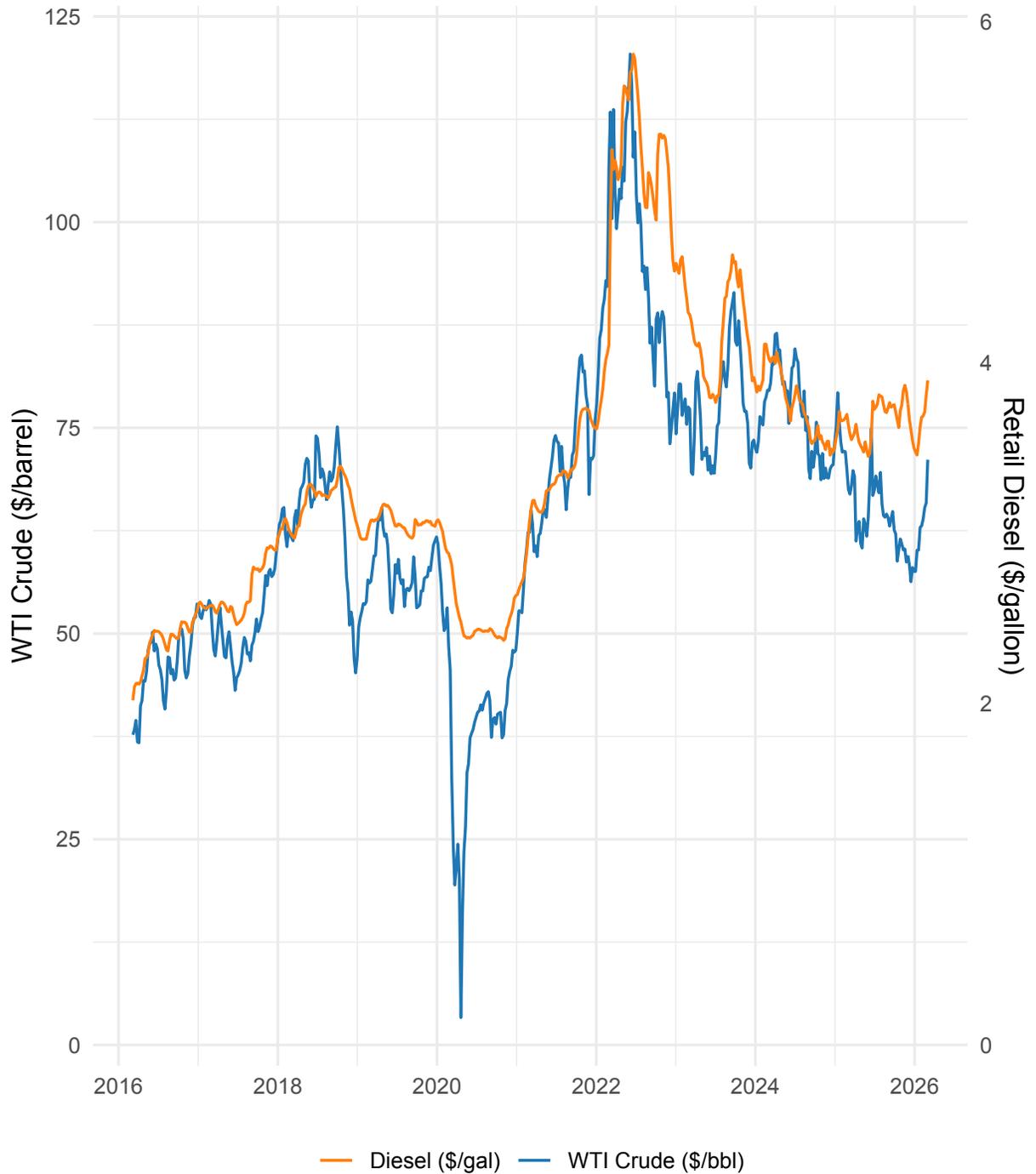
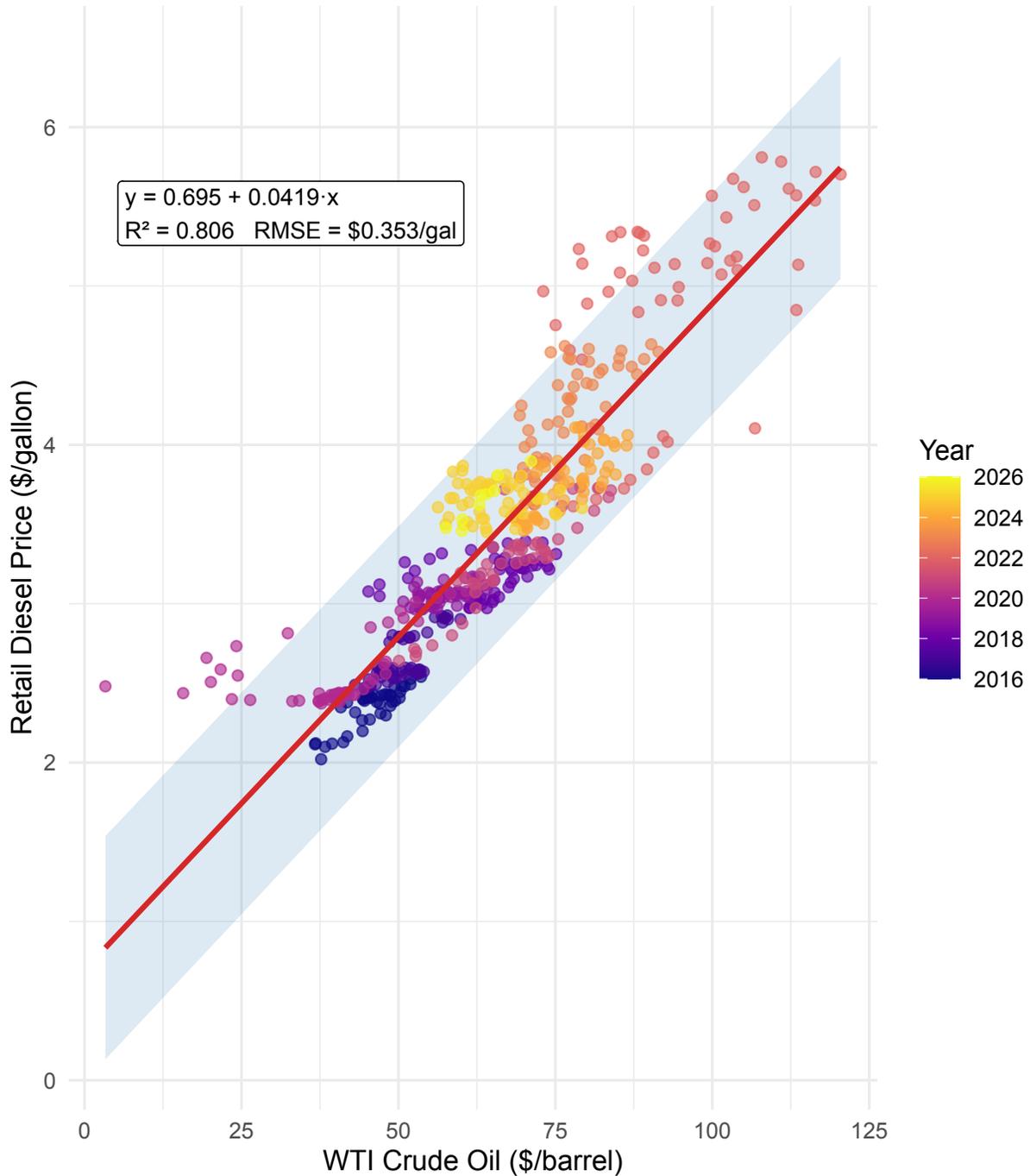


Figure 1. 10-Year History of Oil and Diesel Prices

## U.S. Weekly Retail Diesel Price vs. WTI Crude Oil

Last 10 years (2016-03-07 – 2026-03-02) | n = 522 weekly observations

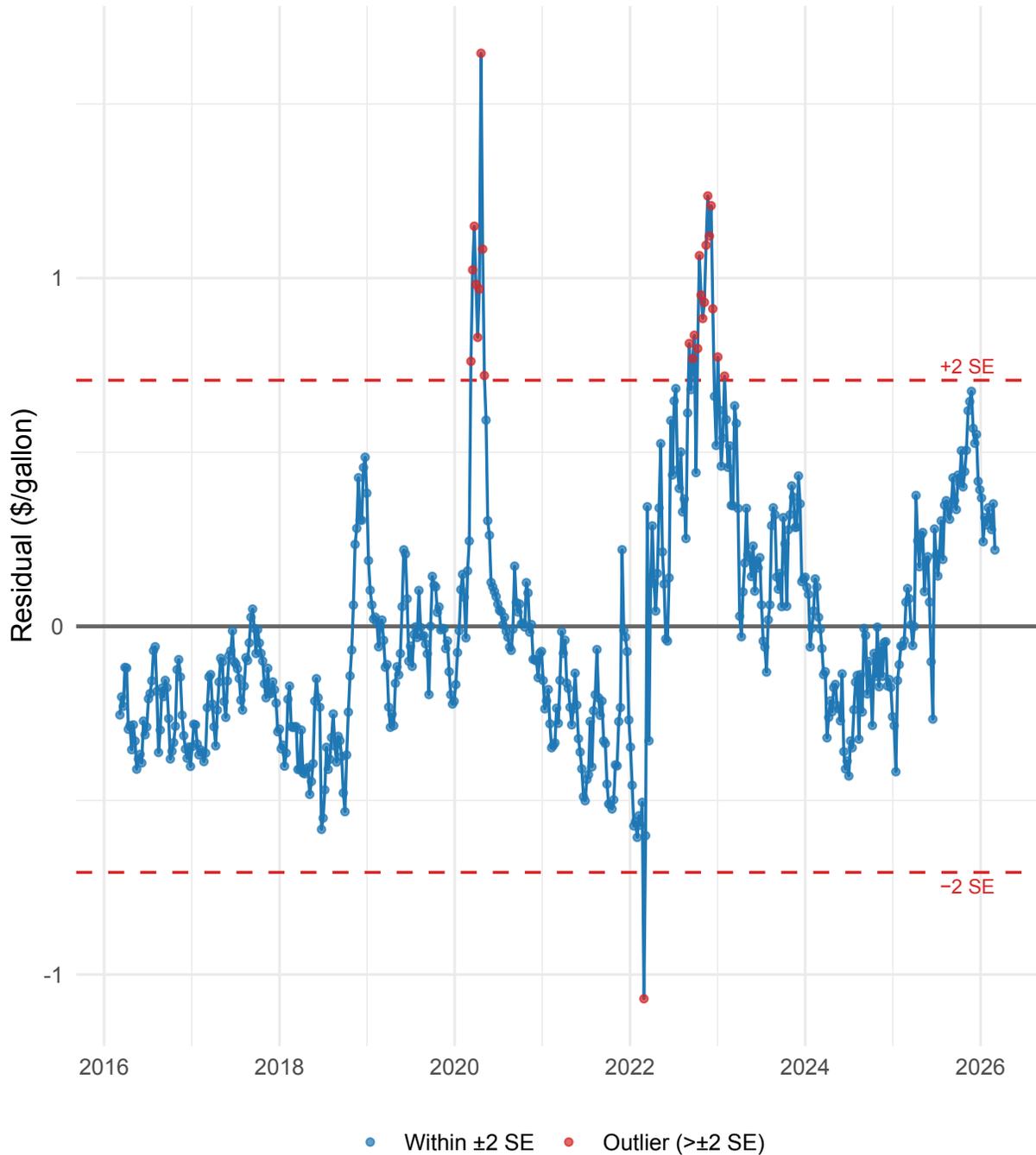


Source: EIA | Shaded band = 95% prediction interval

Figure 2. Scatterplot of Diesel vs Oil Prices

### Residuals Over Time: Diesel Price Unexplained by Crude Oil

Positive = diesel more expensive than crude predicts | Negative = cheaper



Residual SE = \$0.353/gallon | Dashed =  $\pm 2$  SE bounds

Figure 3. Residuals from Diesel Price Regression

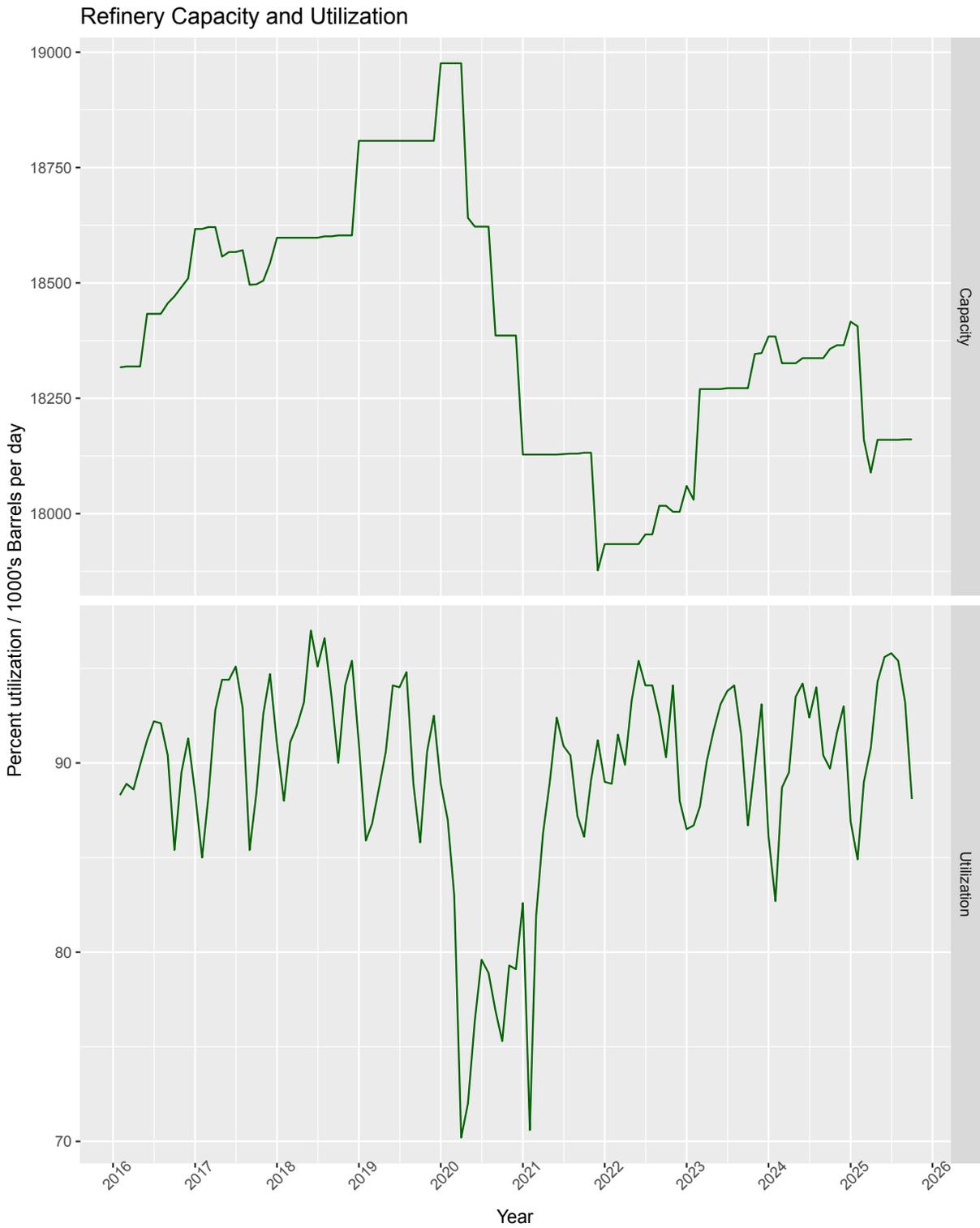


Figure 4. Refinery Capacity and Utilization

## Extra Farm Input Costs vs. WTI Crude Oil Price

Incremental fuel and fertilizer costs above the \$65/barrel baseline

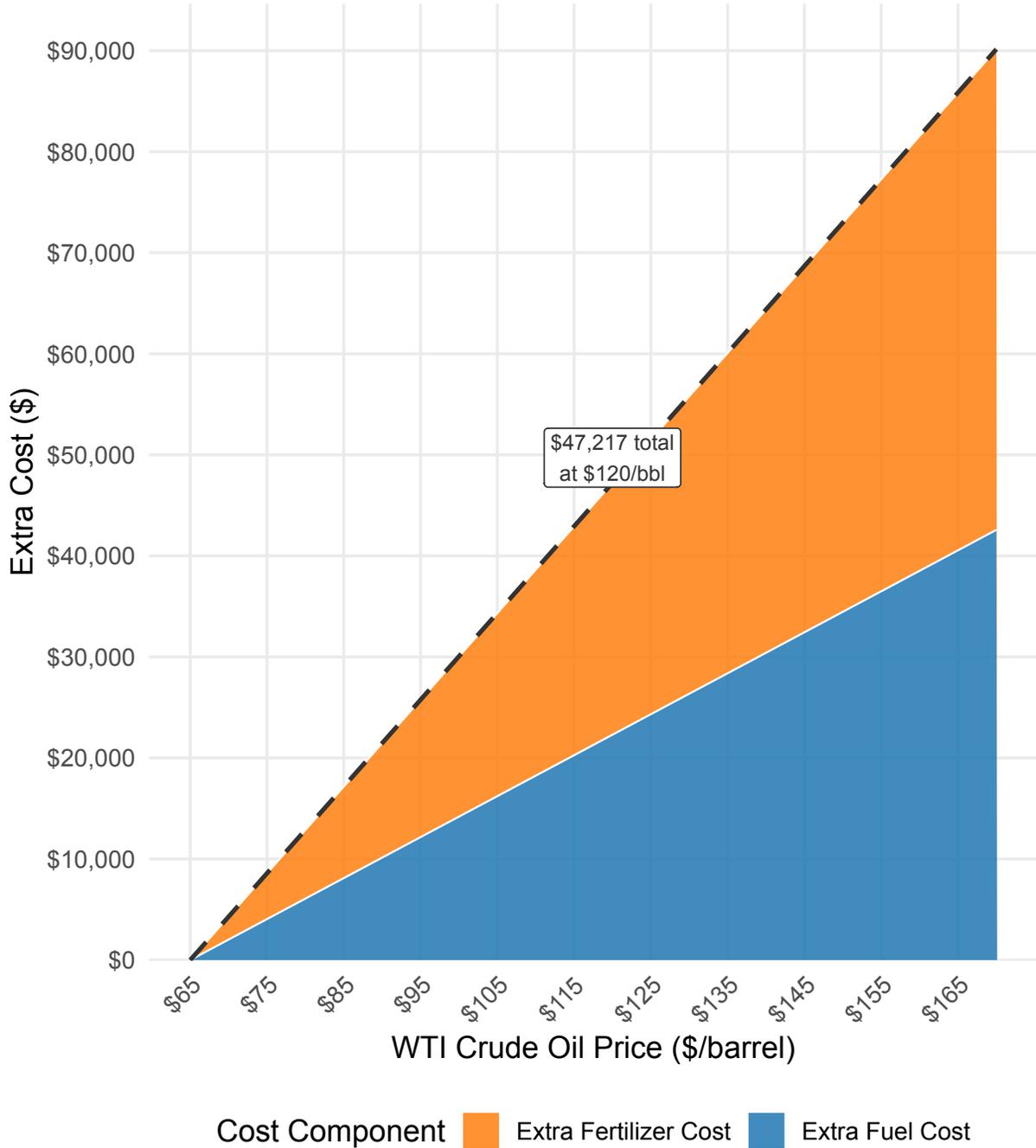


Figure 5 - Change in Kansas Grain Farm Cost of Production

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