

# U.S. Fuel Outlook

## The fit for biodiesel and renewable diesel

*Risk and Profit Conference*

August 15 and 16, 2024



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## Biodiesel and Renewable diesel

- Similarities
  - Both help to conserve petroleum fuels
    - Petroleum fuels sometimes called “fossil” fuels
  - Both fuels are derived from biological sources
  - Both can help the environment by lowering greenhouse gases with a lower carbon footprint than using diesel refined from oil
  - Both can help relieve capacity pressure in oil refineries
  
- Differences
  - There are significant differences between the products

# Biodiesel

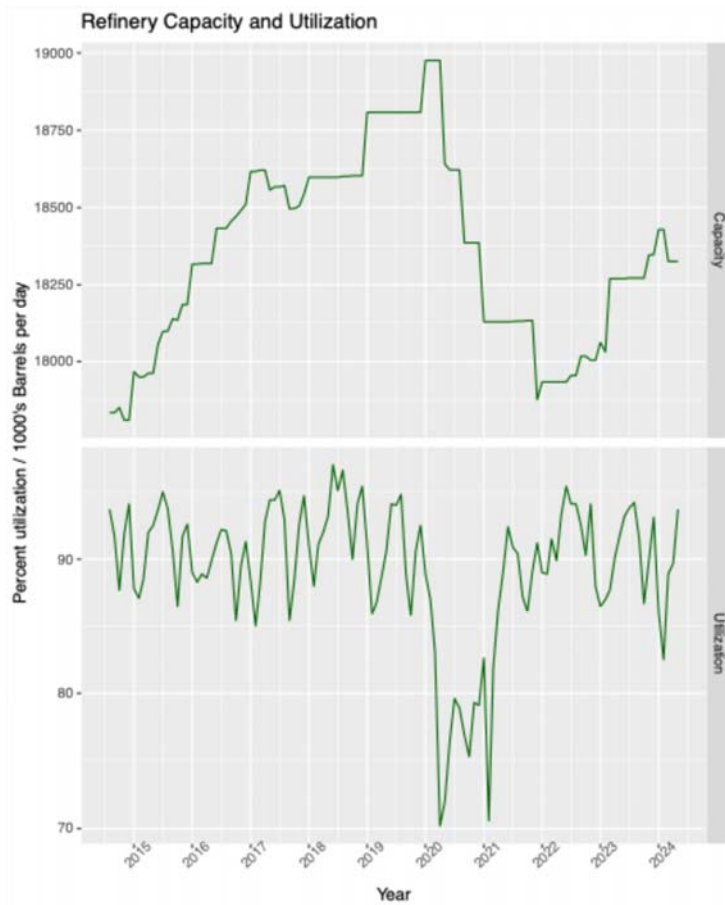
- Produced through a chemical process known as transesterification
  - Glycerin is separated from fat or vegetable oil.
  - Process involves reacting lipids, typically vegetable oils, animal fats, or recycled greases, with an alcohol (usually methanol) in the presence of a catalyst to produce biodiesel (fatty acid methyl esters) and glycerol as a by-product.
- Biodiesel can be used in its pure form (B100) or blended with petroleum diesel at any concentration in most diesel engines.
  - Biodiesel is often used in blends with petroleum diesel; common blends include B20 (20% biodiesel, 80% petroleum diesel) and B5 (5% biodiesel), due to its compatibility with diesel engines without significant modifications.
  - However, higher concentrations of biodiesel can require engine and infrastructure adjustments to avoid issues related to fuel viscosity and cold weather performance.
- Biodiesel blends are denoted by the letter "B" followed by a number that represents the percentage of biodiesel in the blend. The rest of the blend typically consists of petroleum diesel.

# Renewable diesel

- Produced through a different set of processes, such as hydrotreating, gasification, and pyrolysis, which involve more complex chemical reactions and higher pressures and temperatures.
  - The most common process, hydrotreating, involves removing oxygen from the triglycerides in fats or vegetable oils, resulting in a hydrocarbon similar to petroleum diesel.
  - This process not only produces renewable diesel but also yields propane and naphtha as by-products.
- Renewable diesel is a pure hydrocarbon and is chemically similar to petroleum diesel
  - **can be used in existing diesel engines without modifications**
  - does not have the same issues with NOx emissions or compatibility.
- Renewable diesel is better than biodiesel
  - Renewable diesel has a higher cetane number than biodiesel which leads to better combustion efficiency and engine performance.
  - Also has a lower cloud point, making it more suitable for use in colder climates compared to biodiesel.
  - Also better environmentally

# Challenges with both green diesel products

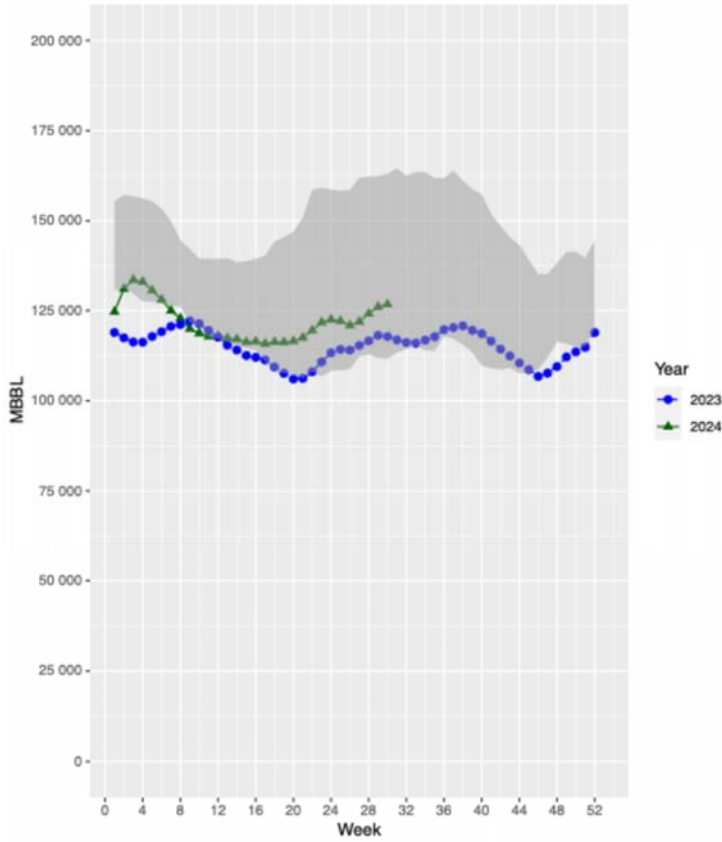
- Feedstock available
  - Similar to ethanol competing for corn
  - Renewable diesel has major advantage here
- Production costs
  - Currently biodiesel has an advantage
  - Renewable diesel is expected to erase any cost advantage of biodiesel
- Infrastructure compatibility
  - Biodiesel is not 100% compatible especially in B100 form
    - Requires blending in most cases
  - Renewable diesel is nearly identical to petroleum diesel so not really an issue.



## Current Oil and Diesel Situation

- Current refinery capacity is below pre-covid
  - Likely will never reach the 2020 capacity level
- Utilization is near maximum
- Biodiesel and renewable diesel can help

U.S. Diesel Stocks by Week for 2023 and 2024  
Plus/minus one Std Dev of previous 5 years in gray

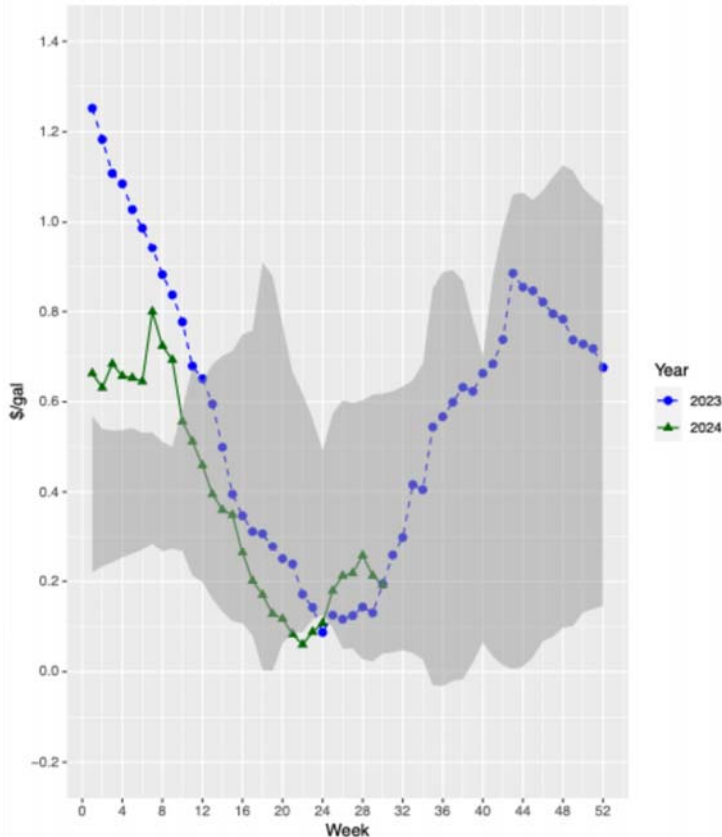


## Lack of refinery capacity has led to low diesel stocks

- We are still trying to build up stocks after shutting down for covid
- Situation in 2024 is better than 2023
- Slow process
  - It may take several more years to be more "normal"
- One problem away from a price disaster

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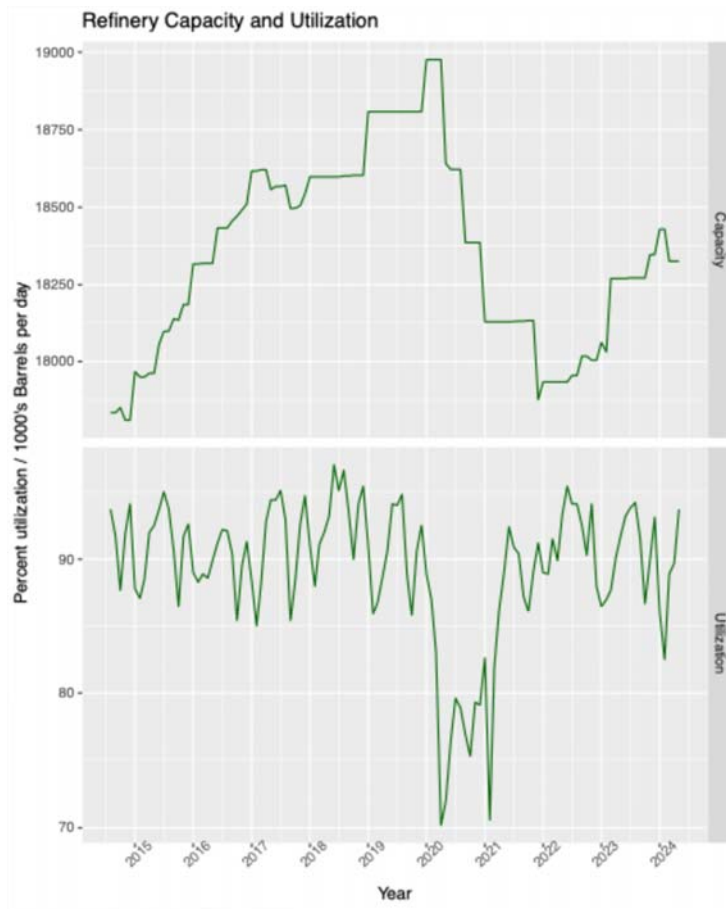
U.S. Diesel Price Premium by Week for 2023 and 2024  
Plus/minus one Std Dev of previous 5 years in gray



## Low diesel stocks are why we have price premium

- Typical range is now in the \$0.40 range
  - It hasn't always been this way
- 2023 and 2024 have been following an unusual trend

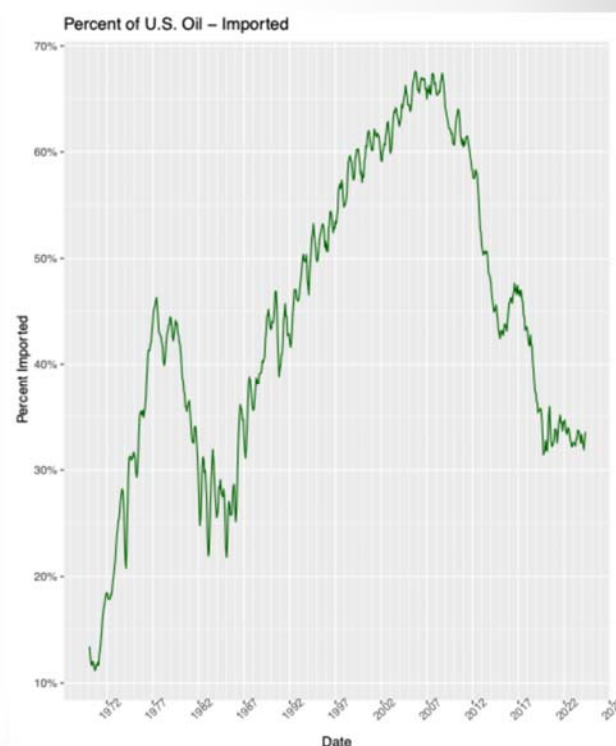
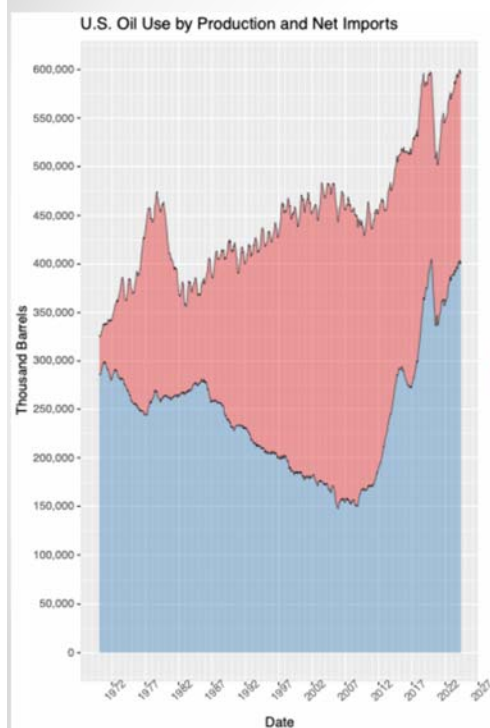
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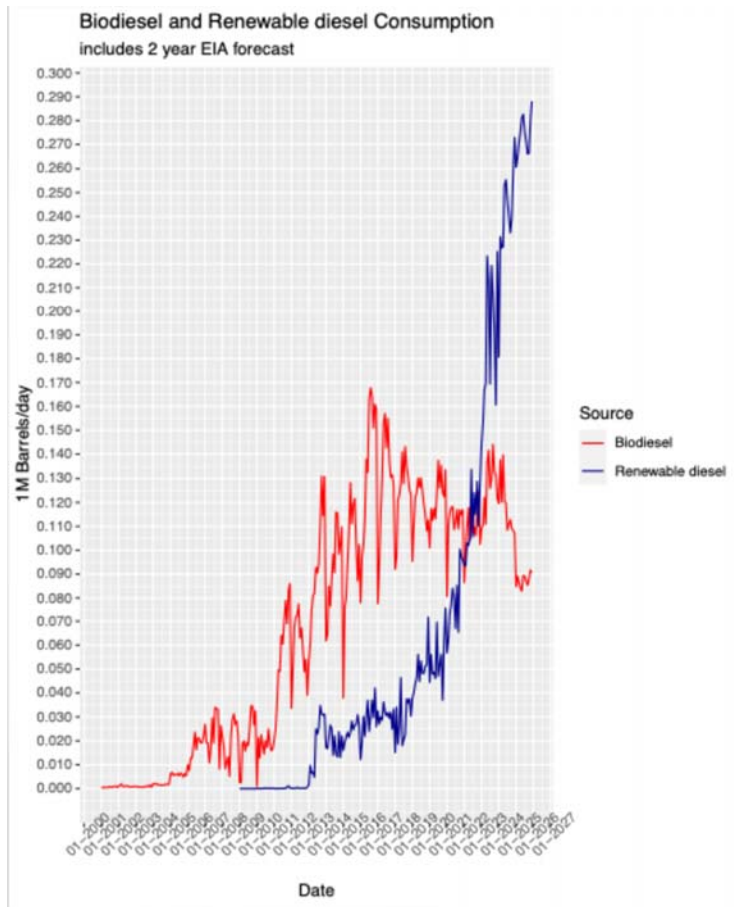
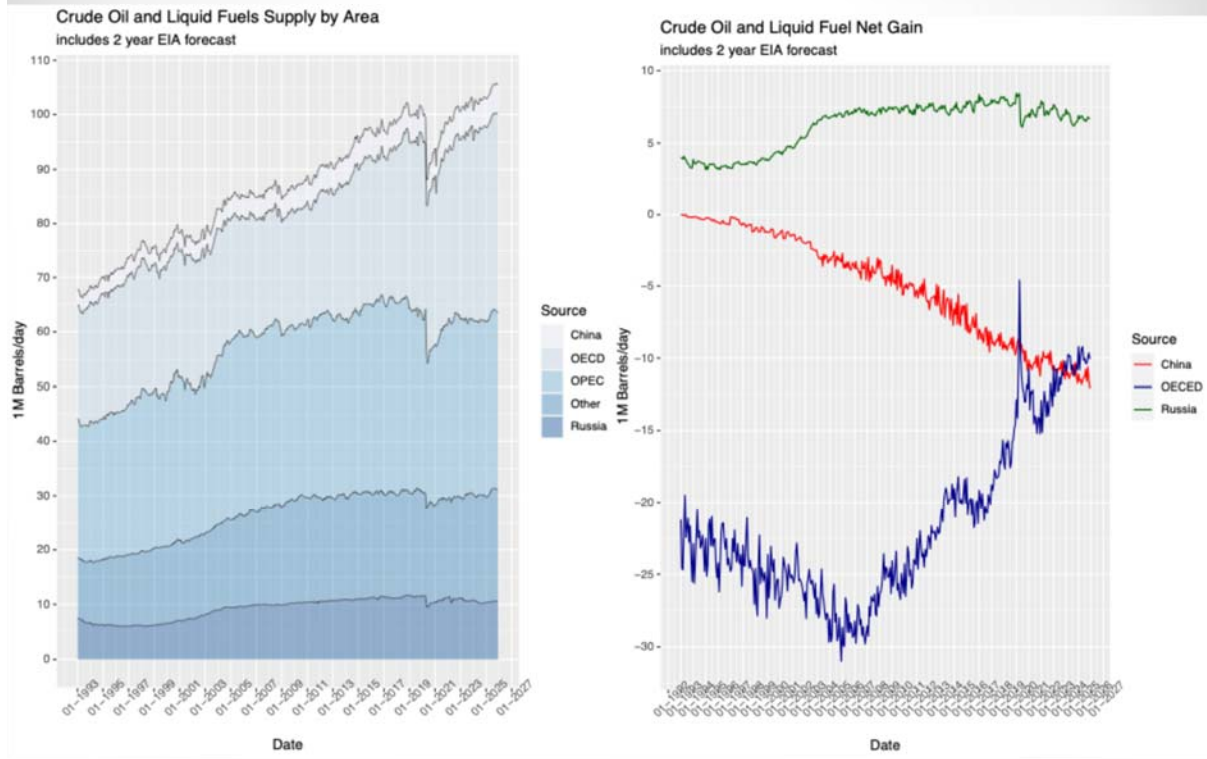
## Current Oil and Diesel Situation

- Current refinery capacity is below pre-covid
  - Likely will never reach the 2020 capacity level
- Utilization is near maximum
- Biodiesel and renewable diesel can help

## Our dependence on foreign oil

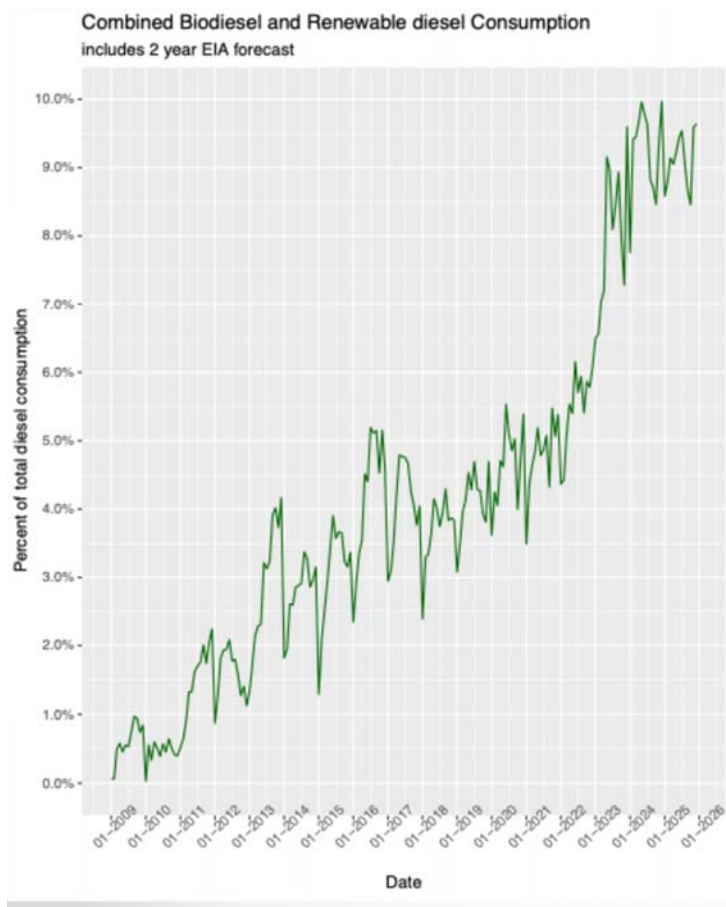


# World oil supply and demand



## Biodiesel and renewable diesel consumption

- Biodiesel is likely on its way out
  - Many advantages to renewable diesel
- The future is renewable diesel



## Is green diesel fuels making a difference?

- Yes
  - EIA is forecasting up to 10% of diesel consumption will be biodiesel and renewable diesel
- What is the limit of renewable diesel?
  - What is the supply potential of feedstocks?

## Summary

- Real concerns with world oil supply
  - Russia/Ukraine war could affect Russia's ability to contribute to world oil supply
  - Similar situation in the middle east
- Despite the US producing more of our oil use, we remain a net importer
- Refinery constraints limit the amount of diesel we can produce even if oil supply wasn't a concern
- Renewable diesel future is bright
  - Environmentally friendly
  - Reduces the issues of world oil supply and refinery capacity

# U.S. Ethanol <sup>Corn</sup> & Biodiesel <sup>Soybeans</sup>

## Trends in Market Prices & Profitability

KSU [www.AgManager.info](http://www.AgManager.info) & WILL Radio (Illinois)

August 7, 2024



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# Ethanol & DDGS Markets



KANSAS STATE UNIVERSITY

Department of Agricultural Economics

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## Ethanol Prices – Weekly, through August 7, 2024; \$/gallon

Source: Trading Economics, <https://tradingeconomics.com/commodity/ethanol>



# Retail Diesel & Gasoline Prices

Weekly Continuous Chart: April 5, 1993 through July 15, 2024



<https://www.eia.gov/todayinenergy/prices.php>

## Wholesale Spot Petroleum Prices **8/06/24 Close**

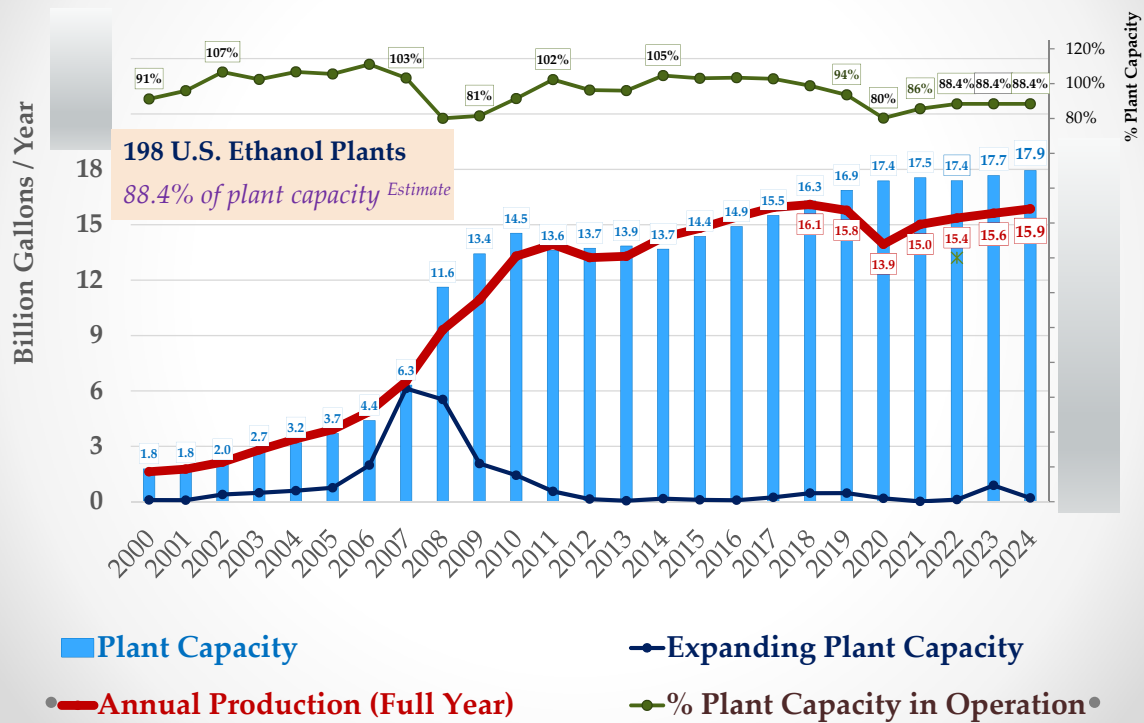
Product	Area	Price	Percent Change*
Crude Oil (\$/barrel)	WTI	74.60	+0.2 ↑
	Brent	76.62	-1.1 ↓
	Louisiana Light	76.40	+0.1 ↑
Gasoline (RBOB) (\$/gallon)	NY Harbor	2.36	-1.7 ↓
	Gulf Coast	2.30	-2.7 ↓
	Los Angeles	2.26	-1.3 ↓
Heating Oil (\$/gallon)	NY Harbor	2.17	-1.2 ↓
	Gulf Coast	2.08	-1.3 ↓
3:2:1 Crack Spread (\$/barrel)	Gulf Coast (LLS)	18.81	-10.3 ↓
Low-Sulfur Diesel (\$/gallon)	NY Harbor	2.25	-1.1 ↓
	Gulf Coast	2.20	-1.1 ↓
	Los Angeles	2.17	-1.2 ↓
Propane (\$/gallon)	Mont Belvieu, TX	NA	NA
<b>Retail Petroleum Prices (AAA), 8/06/24 (\$/gallon)</b>			
Regular Gasoline	U.S. Average	3.46	-0.1 ↓
Diesel	U.S. Average	3.79	0.0

## Select Spot Prices for Delivery Today

Region	Natural Gas (\$/million Btu)		Electricity (\$/MWh)		Spark Spread (\$/MWh)
	Price	Percent Change*	Price	Percent Change*	
New England	1.43	-4.6 ↓	29.22	-10.9 ↓	19.20
New York City	1.37	-2.8 ↓	31.39	-30.6 ↓	21.80
Mid-Atlantic	1.36	-0.9 ↓	36.32	-37.1 ↓	26.78
Midwest	1.73	+0.4 ↑	26.11	-8.0 ↓	14.03
Louisiana	1.83	+0.2 ↑	28.75	+9.5 ↑	15.95
Houston	1.79	+2.5 ↑	76.00	-40.9 ↓	63.47
Southwest	1.73	+15.6 ↑	80.00	-2.7 ↓	67.91
Southern CA	2.47	-8.6 ↓	48.30	-40.0 ↓	30.98
Northern CA	3.28	+0.9 ↑	50.19	-36.8 ↓	27.23
Northwest	1.13	+16.4 ↑	79.00	+12.1 ↑	71.10

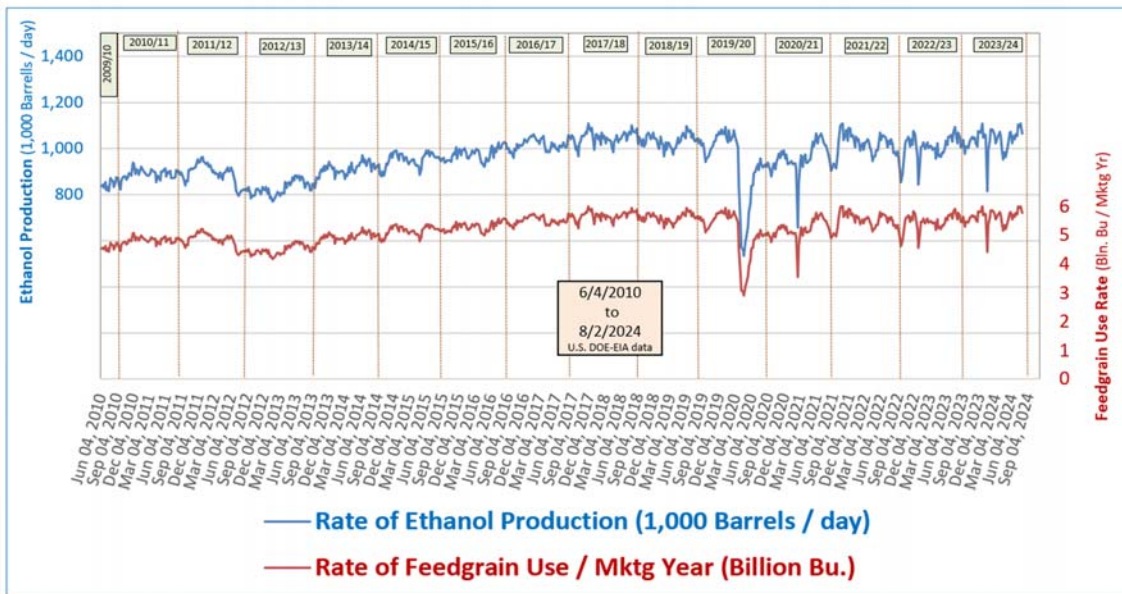
# U.S. Ethanol Capacity & Production

Source: USDA ERS Biofuel Statistics – As of July 22, 2024



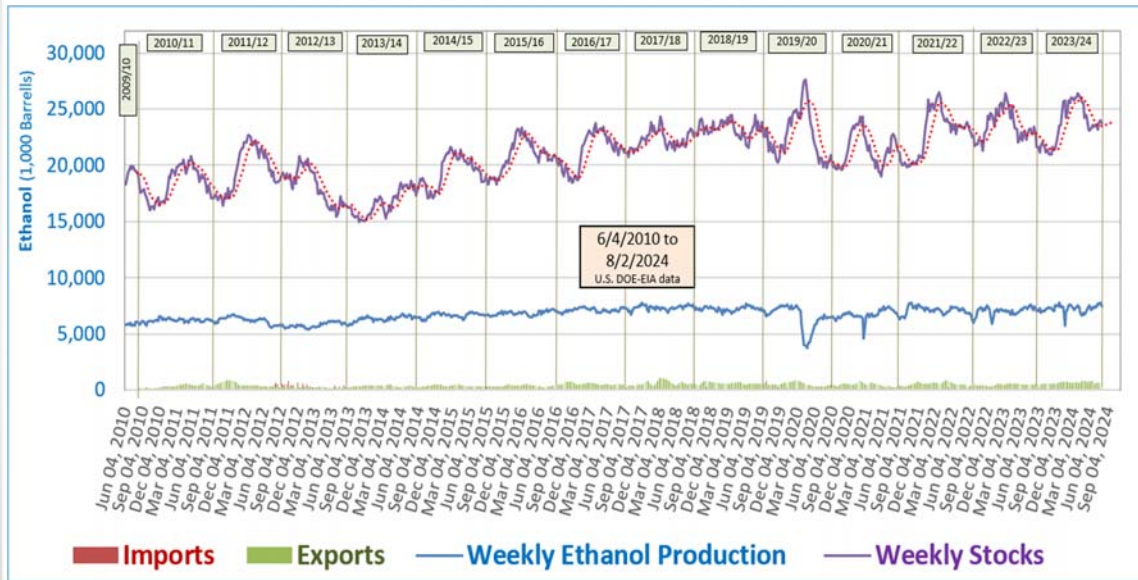
# U.S. Ethanol Production & Corn Use *Weekly*

Based on DOE-EIA data on U.S. Ethanol Industry Trends as of August 2, 2024



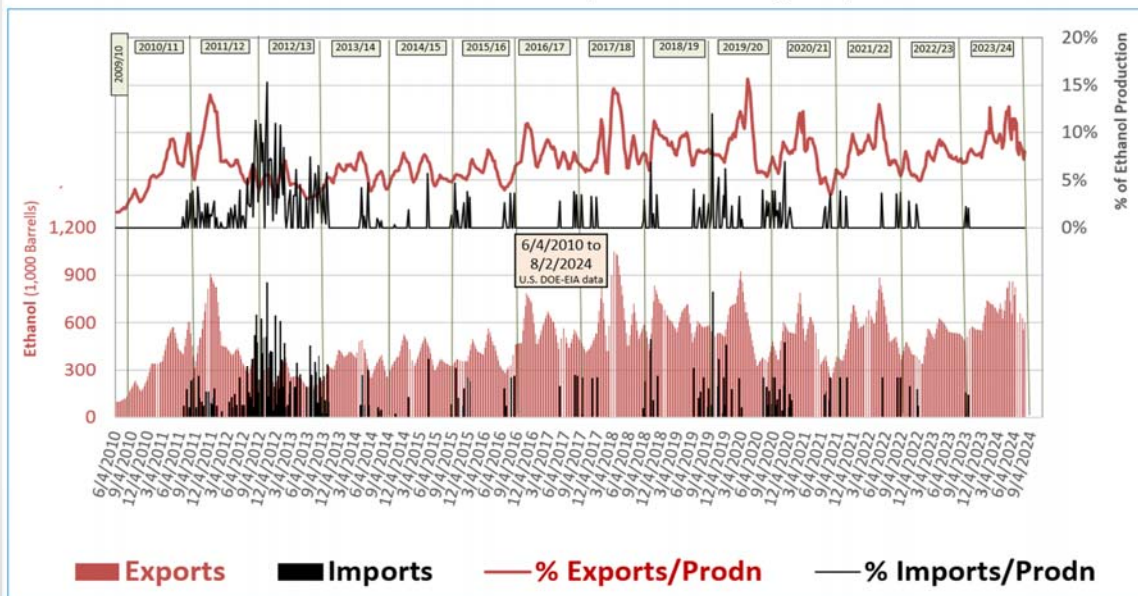
# U.S. Ethanol Production & Stocks *Weekly*

Based on U.S. DOE – EIA on U.S. Ethanol Industry Trends as of August 2, 2024



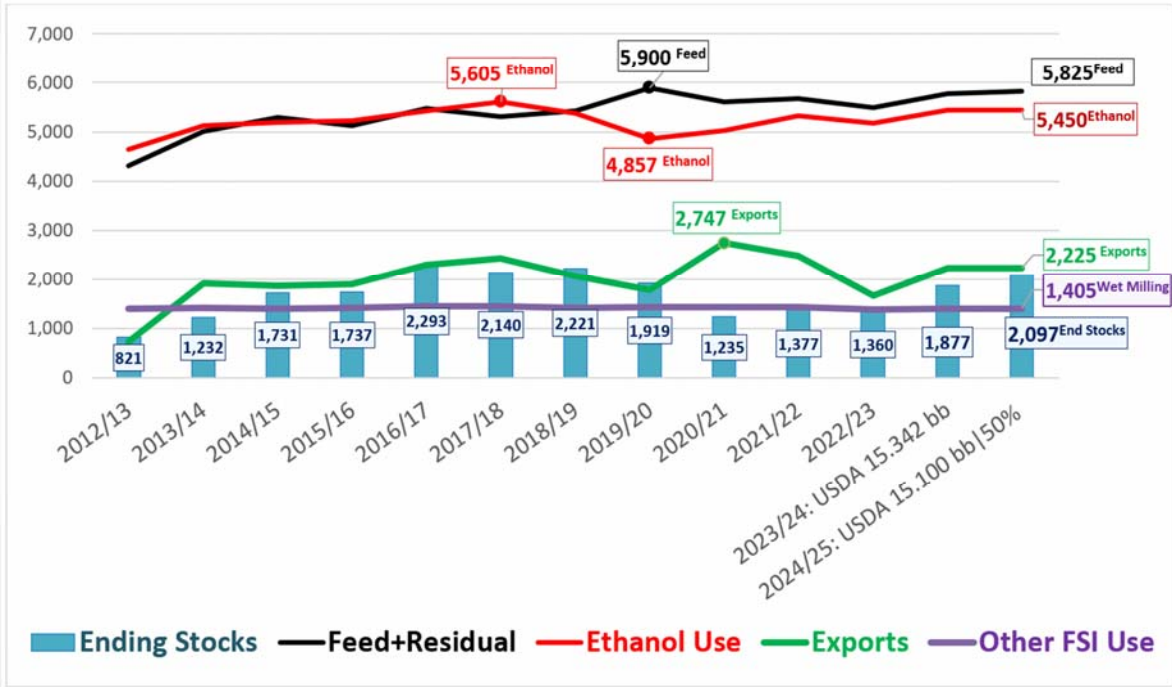
# U.S. Ethanol Foreign Trade *Weekly*

Based on U.S. DOE – EIA on U.S. Ethanol Industry Trends as of August 2, 2024



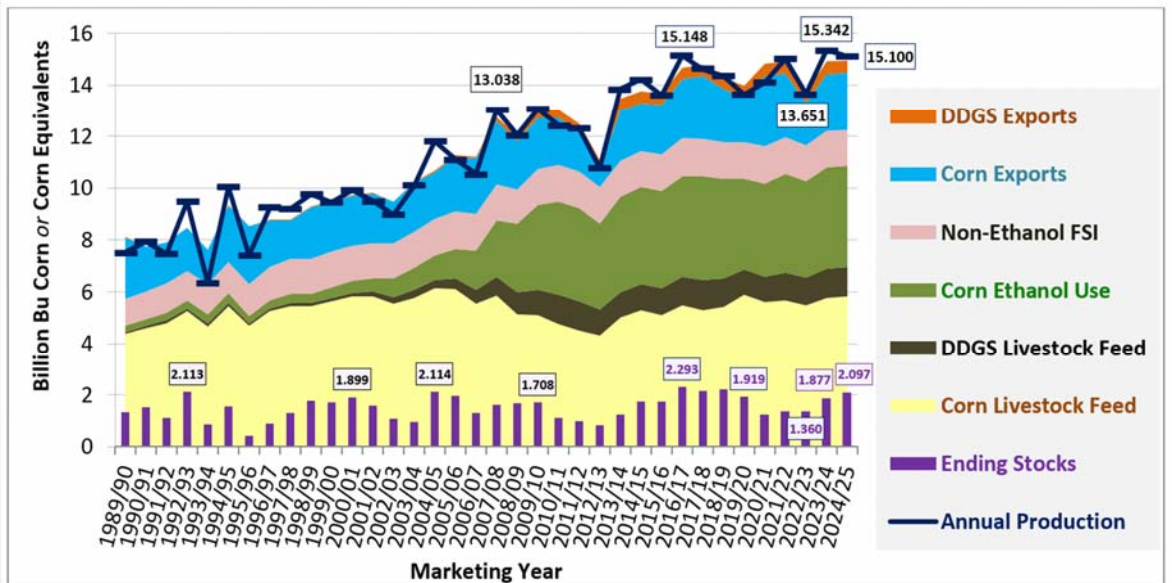
# U.S. Corn Use & Ending Stocks

MY 2012/13 thru "New Crop" MY 2024/25 as of the 7/12/2024 WASDE Report + KSU estimates



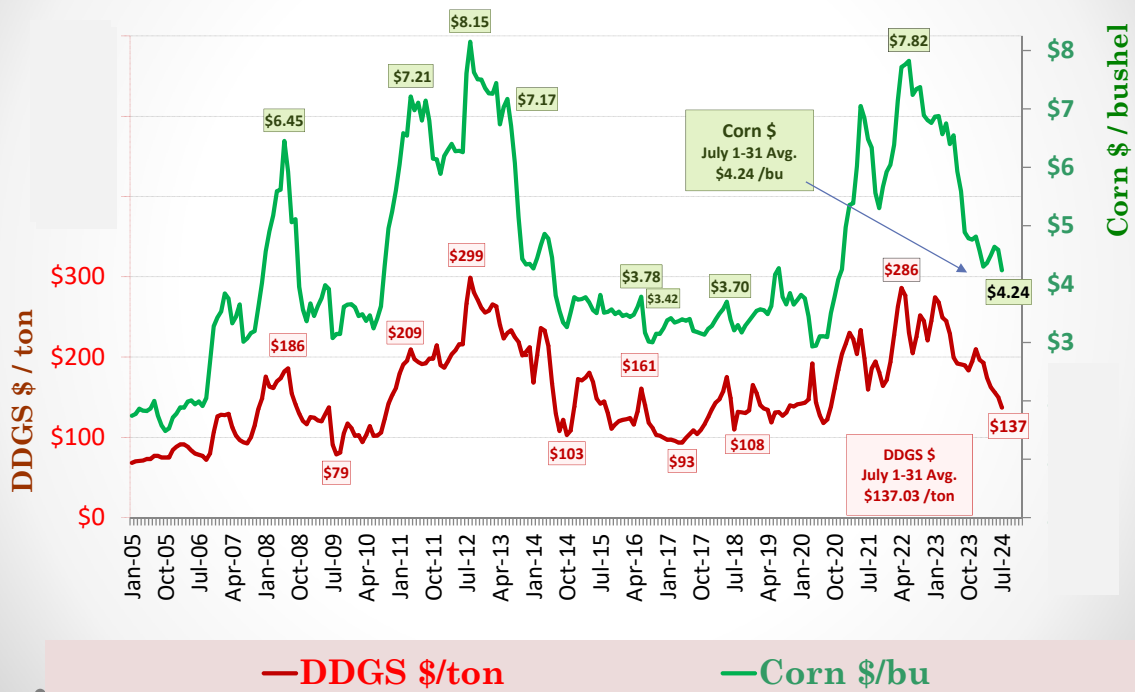
# U.S. Corn Supply-Demand w. DDGS *Adj.*

MY 2012/13 thru "New Crop" MY 2024/25 as of the 7/12/2024 WASDE Report + KSU estimates



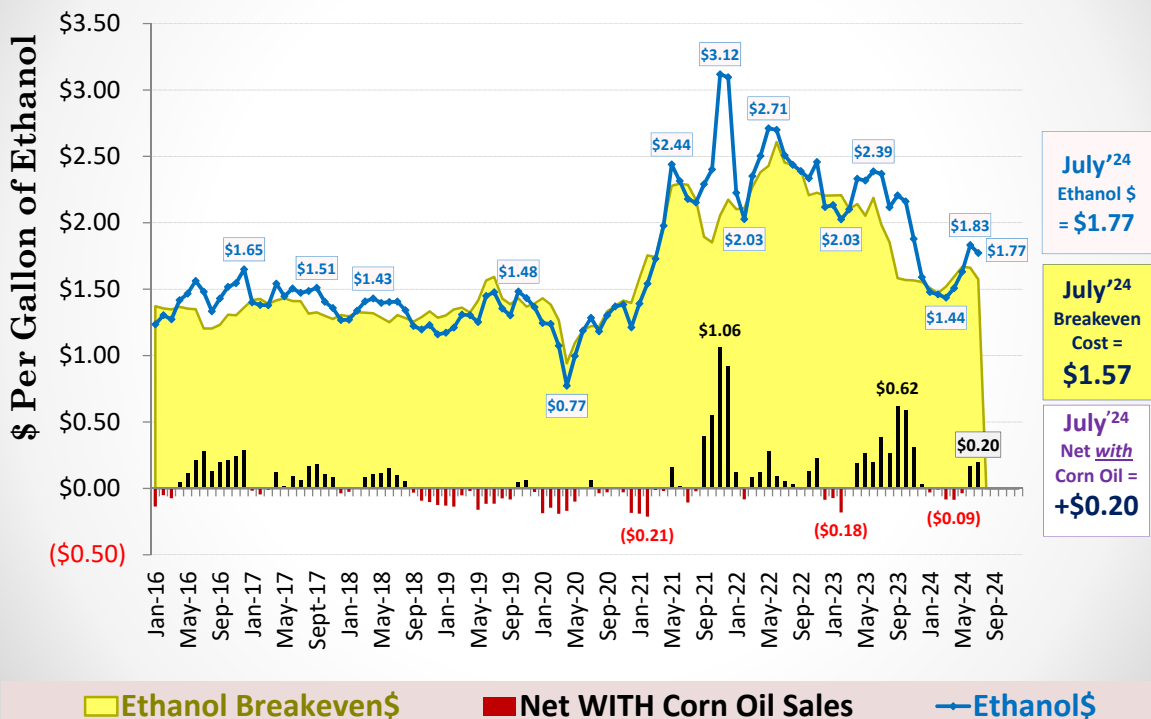
# Ethanol DDGS & Corn Input Prices

ISU Ethanol Plant Model (January 2005 – July 31, 2024)



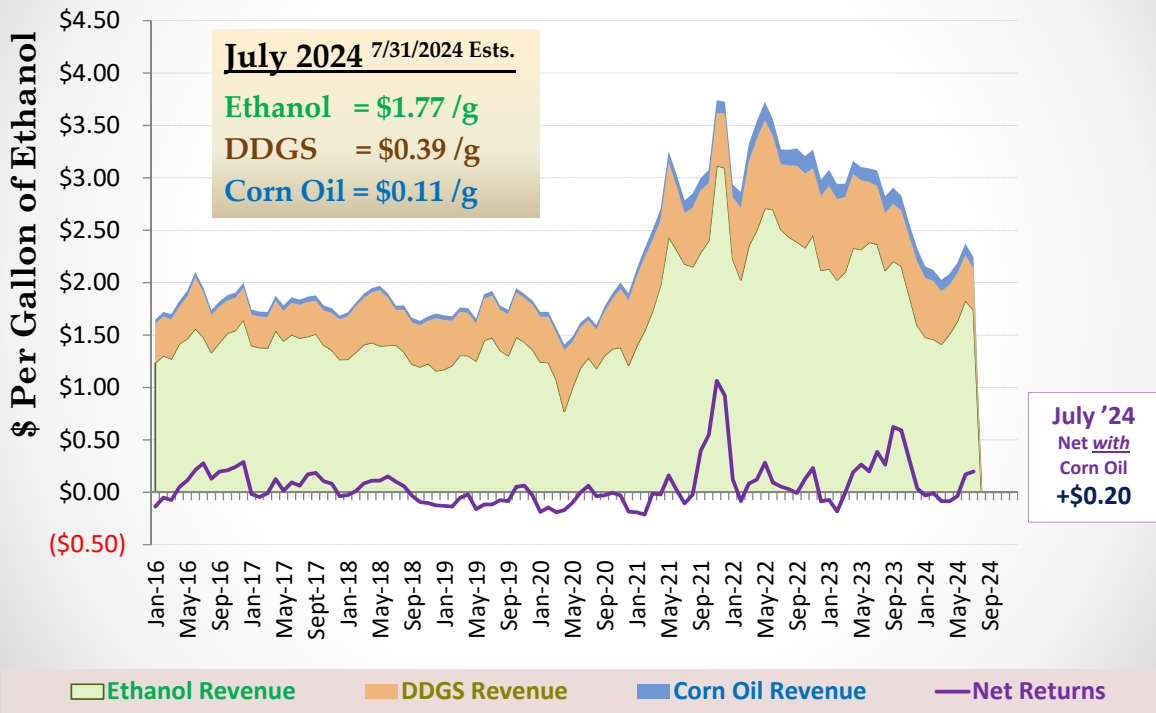
# Ethanol Price, Cost & Profit/Loss

ISU Ethanol Plant Model (January 2007 – July 31, 2024)



# Ethanol Revenues & Net Returns

ISU Ethanol Plant Model (January 2007 – July 31, 2024)



# Ethanol Profitability Calculations Iowa #s, 7/31/2024

USDA AMS Bioenergy Report:  
National Weekly Grain Co-Products Report  
USDA Slug: 3618  
Calculated on August 7, 2024

Week / Date	Monthly Estimates											Break Even \$	Profit \$	
	Iowa Ethanol Plant \$	Iowa DDGS \$	Iowa Corn Oil \$	Corn x Ethanol Conversion	Corn x DDGS Conversion	Iowa Corn Input \$	EPV (Processing Value <sup>SM</sup> )	Corn EPV Calculated	Ethanol \$/gallon	DDGS \$/gallon	Corn Oil \$/gallon			Total Revenue \$/gallon
Sep-22	\$2.39	\$251.84	\$0.73	2.85	16.50	\$7.37		\$9.62	\$2.39	\$0.72	\$0.17	\$3.28	\$2.3969	(\$0.0075)
Oct-22	\$2.33	\$245.08	\$0.73	2.85	16.50	\$6.89		\$9.41	\$2.33	\$0.71	\$0.17	\$3.21	\$2.2071	\$0.1277
Nov-22	\$2.46	\$220.80	\$0.78	2.85	16.50	\$6.81		\$9.60	\$2.46	\$0.64	\$0.18	\$3.27	\$2.2260	\$0.2314
Dec-22	\$2.12	\$244.79	\$0.69	2.85	16.50	\$6.76		\$8.74	\$2.12	\$0.70	\$0.16	\$2.98	\$2.2043	(\$0.0859)
Jan-23	\$2.13	\$274.33	\$0.68	2.85	16.50	\$6.87		\$9.02	\$2.13	\$0.79	\$0.16	\$3.08	\$2.2059	(\$0.0728)
Feb-23	\$2.03	\$268.04	\$0.63	2.85	16.50	\$6.88		\$8.62	\$2.03	\$0.77	\$0.14	\$2.94	\$2.2073	(\$0.1818)
Mar-23	\$2.10	\$249.23	\$0.56	2.85	16.50	\$6.57	\$8.37	\$8.60	\$2.10	\$0.72	\$0.13	\$2.94	\$2.1044	(\$0.0040)
Apr-23	\$2.33	\$245.10	\$0.54	2.85	16.50	\$6.75	\$9.05	\$9.21	\$2.33	\$0.71	\$0.12	\$3.16	\$2.1407	\$0.1910
May-23	\$2.32	\$229.10	\$0.55	2.85	16.50	\$6.40	\$9.05	\$9.05	\$2.32	\$0.66	\$0.13	\$3.10	\$2.0532	\$0.2643
Jun-23	\$2.39	\$199.55	\$0.57	2.85	16.50	\$6.55	\$9.05	\$9.02	\$2.39	\$0.57	\$0.13	\$3.09	\$2.1875	\$0.1991
Jul-23	\$2.37	\$191.93	\$0.65	2.85	16.50	\$5.93	\$8.73	\$8.98	\$2.37	\$0.55	\$0.15	\$3.07	\$1.9836	\$0.3849
Aug-23	\$2.12	\$190.86	\$0.68	2.85	16.50	\$5.59		\$8.29	\$2.12	\$0.55	\$0.16	\$2.82	\$1.8529	\$0.2641
Sep-23	\$2.21	\$189.81	\$0.60	2.85	16.50	\$4.89	\$8.25	\$8.53	\$2.21	\$0.55	\$0.15	\$2.91	\$1.5627	\$0.6232
Oct-23	\$2.16	\$183.35	\$0.62	2.85	16.50	\$4.78	\$7.91	\$8.29	\$2.16	\$0.53	\$0.14	\$2.83	\$1.5692	\$0.5912
Nov-23	\$1.88	\$194.30	\$0.55	2.85	16.50	\$4.76	\$7.28	\$7.51	\$1.88	\$0.56	\$0.13	\$2.56	\$1.5658	\$0.3125
Dec-23	\$1.59	\$209.67	\$0.53	2.85	16.50	\$4.81	\$6.58	\$6.79	\$1.59	\$0.61	\$0.13	\$2.33	\$1.5548	\$0.0354
Jan-24	\$1.48	\$196.51	\$0.49	2.85	16.50	\$4.57		\$6.32	\$1.48	\$0.57	\$0.11	\$2.16	\$1.5095	(\$0.0309)
Feb-24	\$1.46	\$193.06	\$0.45	2.85	16.50	\$4.30		\$6.21	\$1.46	\$0.56	\$0.10	\$2.12	\$1.4696	(\$0.0087)
Mar-24	\$1.44	\$174.04	\$0.44	2.85	16.50	\$4.36	\$5.87	\$5.74	\$1.41	\$0.50	\$0.11	\$2.03	\$1.5200	(\$0.0841)
Apr-24	\$1.51	\$162.51	\$0.43	2.85	16.50	\$4.49	\$5.90	\$5.92	\$1.51	\$0.47	\$0.11	\$2.09	\$1.5936	(\$0.0862)
May-24	\$1.63	\$156.41	\$0.41	2.85	16.50	\$4.64	\$6.18	\$6.21	\$1.63	\$0.45	\$0.10	\$2.19	\$1.6683	(\$0.0369)
Jun-24	\$1.83	\$150.03	\$0.44	2.85	16.50	\$4.59	\$6.72	\$6.73	\$1.83	\$0.43	\$0.11	\$2.37	\$1.6618	\$0.1702
Jul-24	\$1.77	\$137.03	\$0.45	2.85	16.50	\$4.24	\$6.35	\$6.36	\$1.74	\$0.39	\$0.11	\$2.24	\$1.5746	\$0.1973

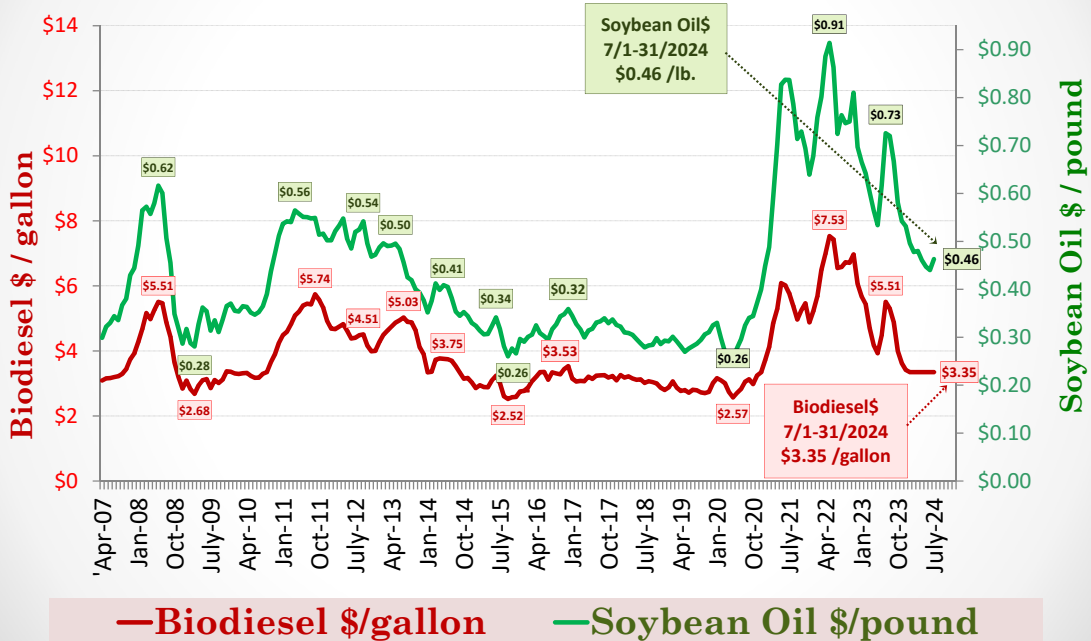
# CBOT Soybean Oil Futures

Weekly Continuous Chart: August 2019 thru August 7, 2024



# Biodiesel & Soybean Oil Prices

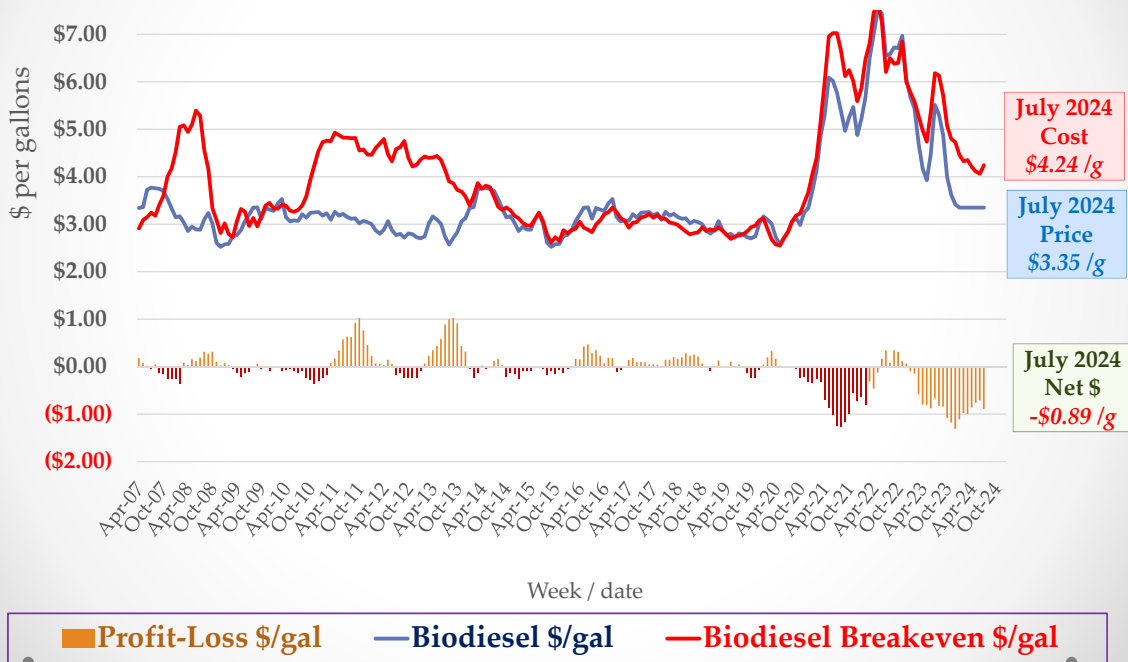
ISU Conventional Biodiesel Plant Model (April 2007 – July 2024)





# Biodiesel \$, Costs & Profits

ISU Conventional Biodiesel Plant Model (April 2007 – July 2024)



## Questions?



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