

# Fertilizer Economics

February 4, 2023

Cumberland Gap Cattle Conference

Dr. S. Aaron Smith, Associate Professor and Extension Economist

Department of Agricultural and Resource Economics

University of Tennessee Institute of Agriculture

Email: [aaron.smith@utk.edu](mailto:aaron.smith@utk.edu)

Web Page: <https://cropeconomics.tennessee.edu>



# Overview



Macro Economic Conditions

Factors Affecting Fertilizer Prices

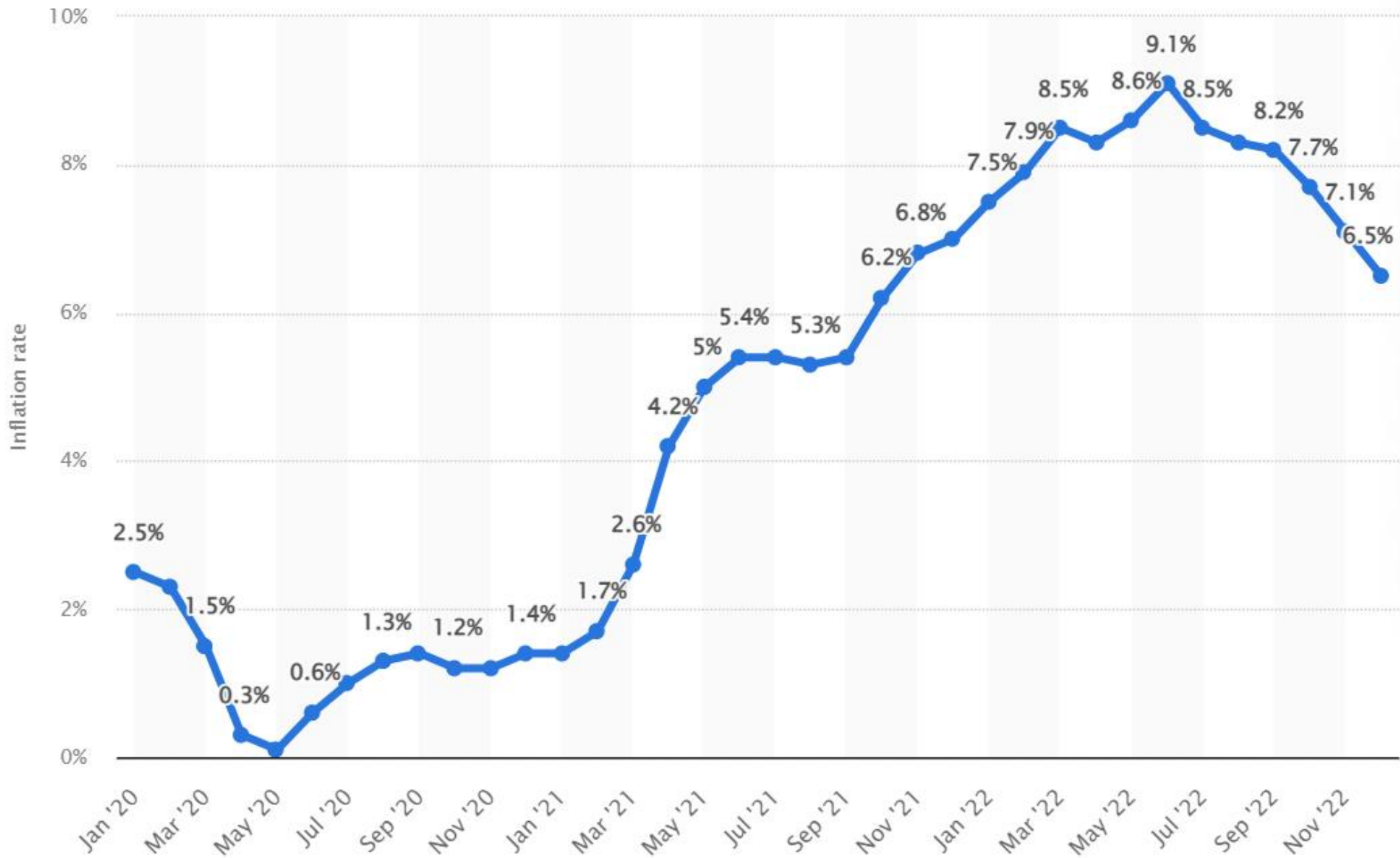
Poultry Litter and Alternative Nutrient Sources

Reducing Costs and 2023 Price Outlook

Inflation  
Interest Rates  
GDP Growth  
Government Spending  
Labor Force  
Exchange Rates



# MACRO ECONOMIC CONDITIONS




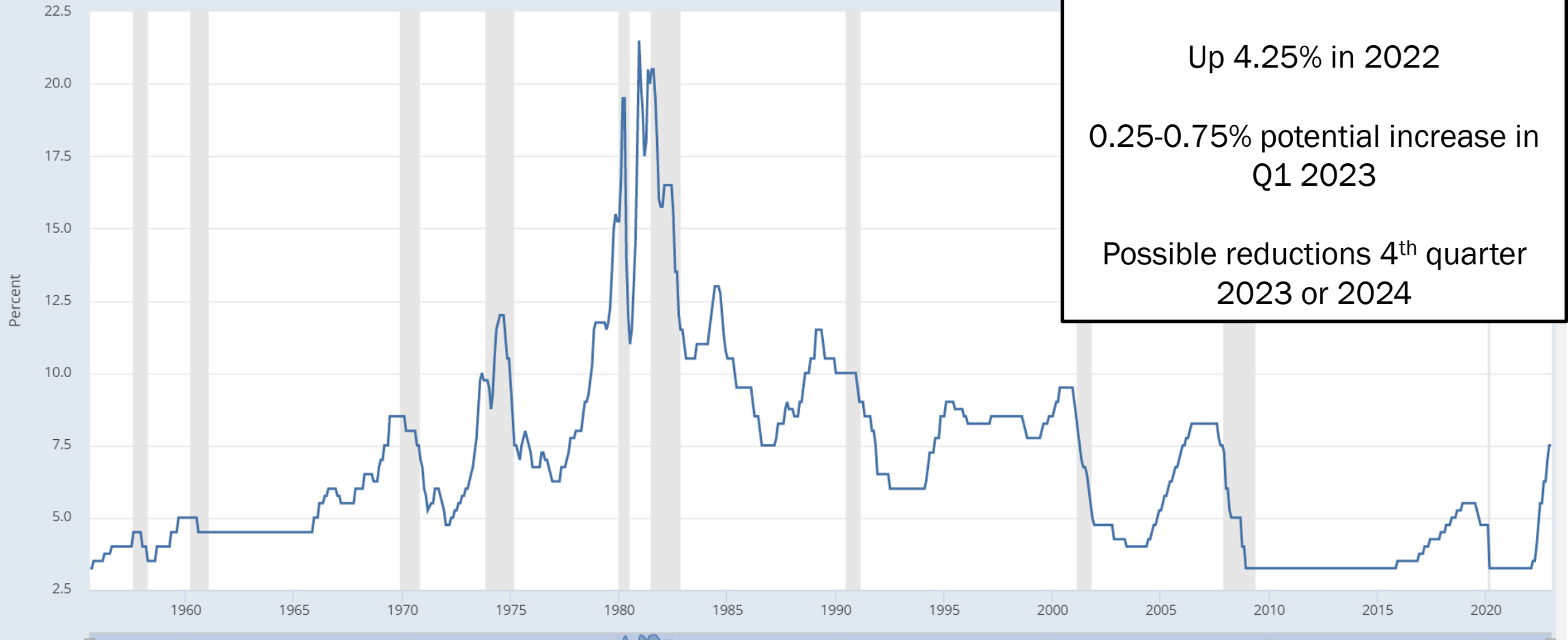
# Monthly Inflation Rate 2020-2022

Source: <https://www.statista.com/statistics>

Real. Life. Solutions.

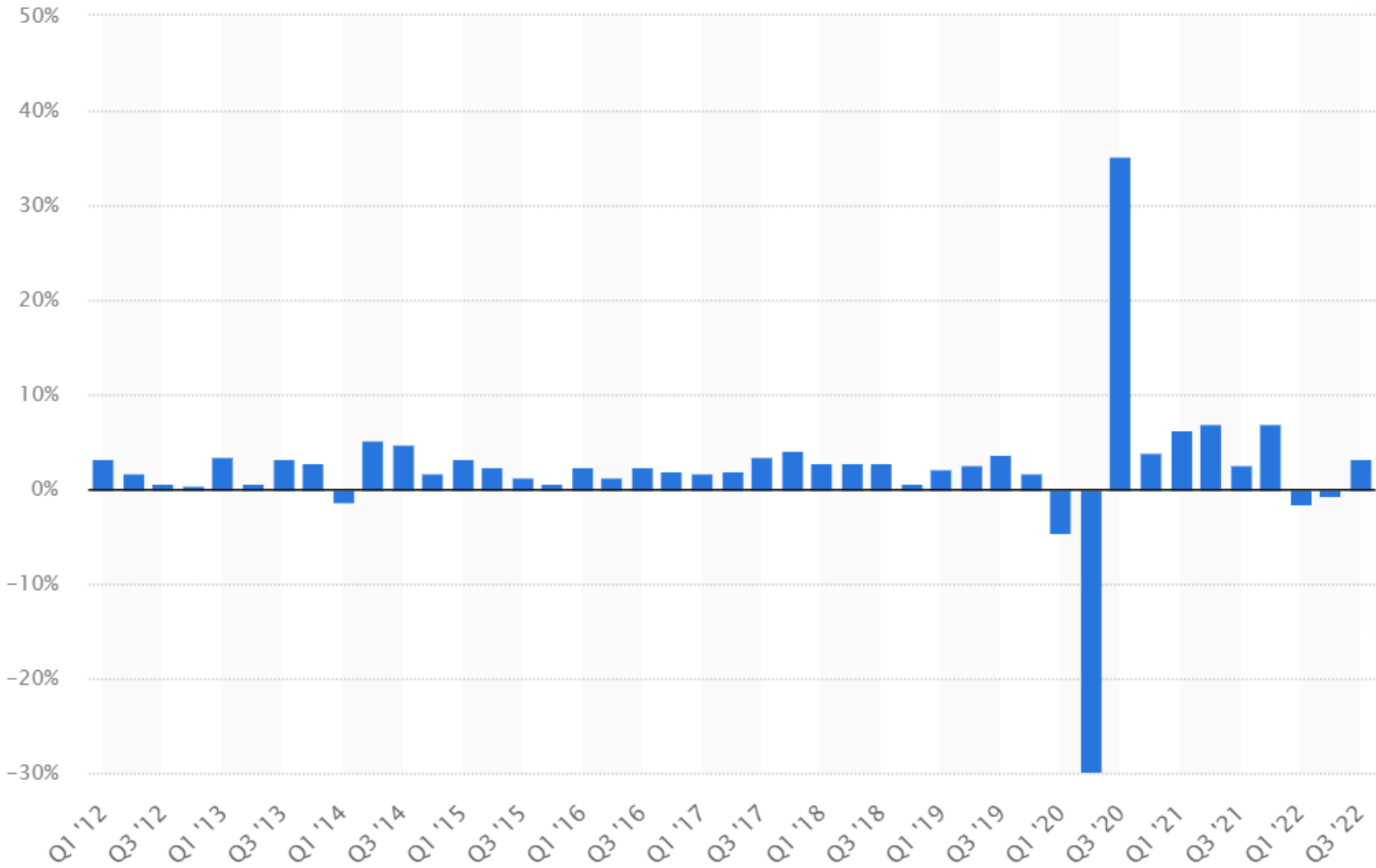
# Bank Prime Loan Rate

FRED  — Bank Prime Loan Rate



Source: <https://fred.stlouisfed.org/series/DPRIME>

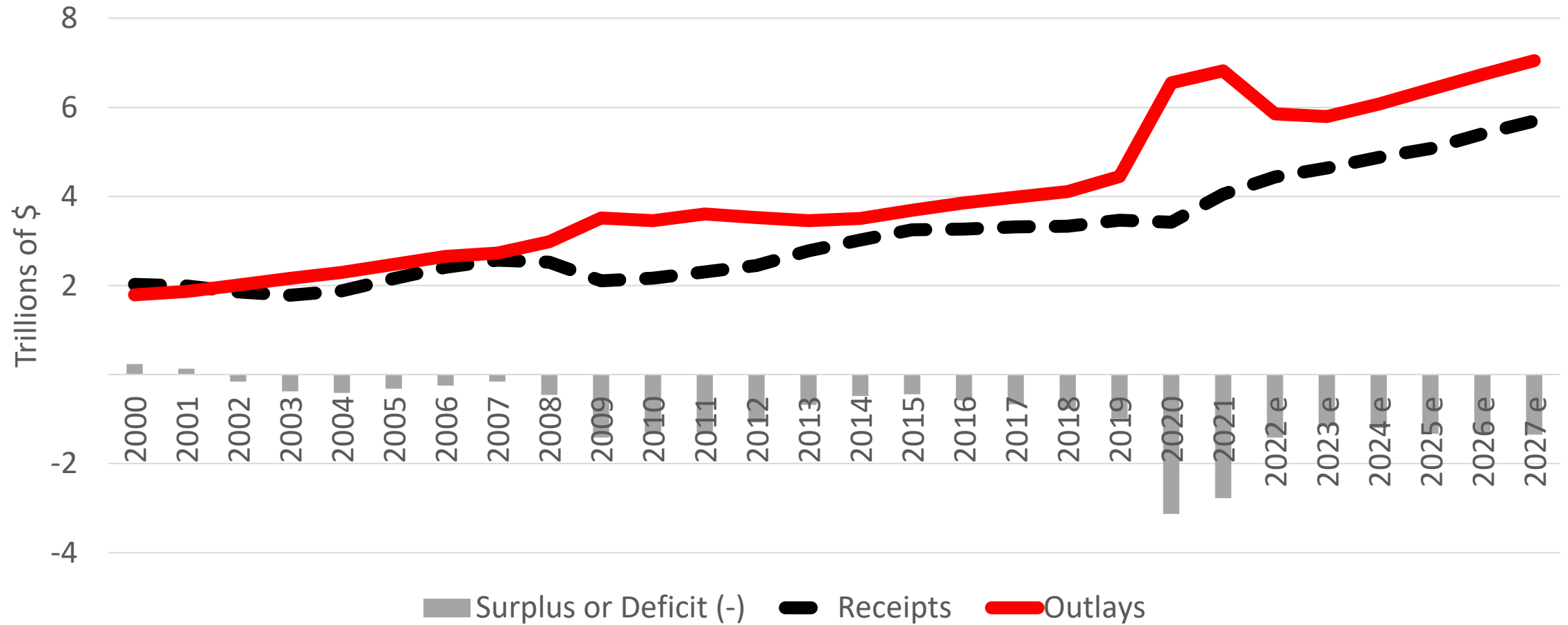
Percent change from preceding period



Source: <https://www.statista.com/statistics>

# U.S. GDP Growth by Quarter, 2012-2022

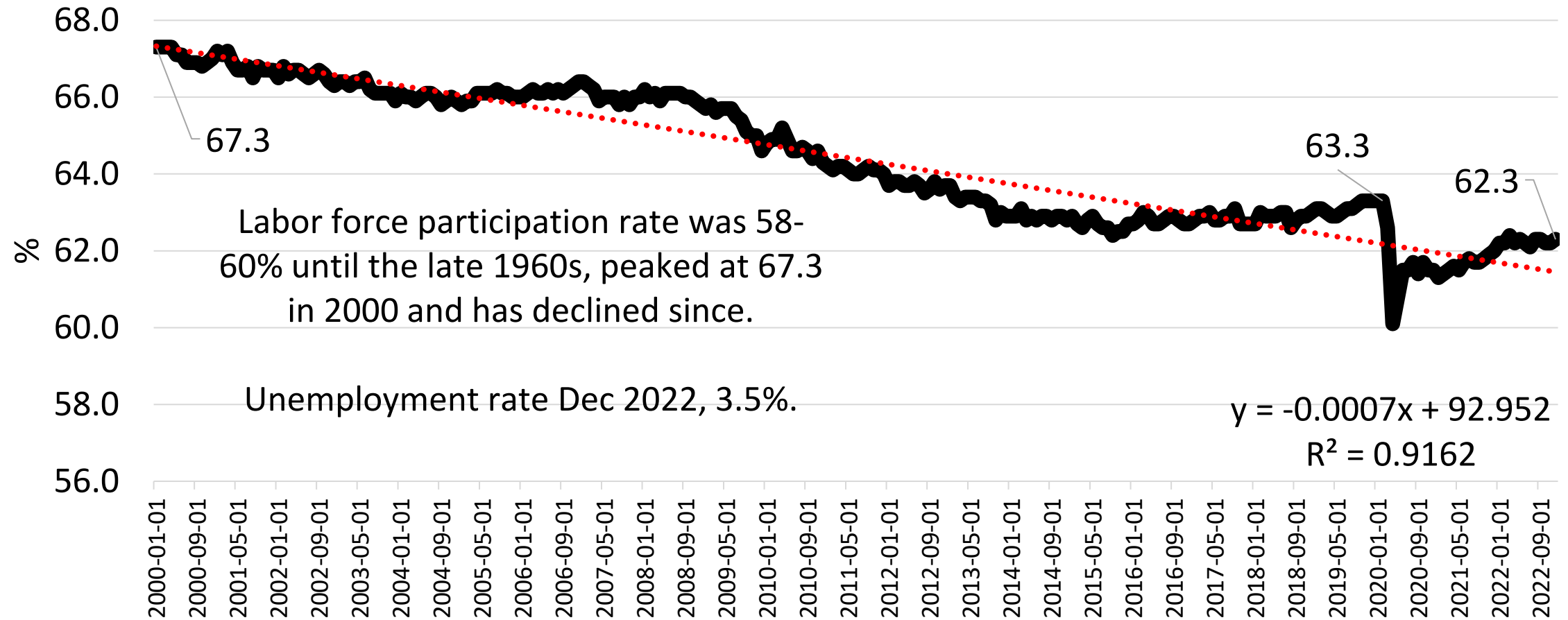
# Government Receipts, Outlays, and Deficit, 2000-2027e



Source:  
<https://www.whitehouse.gov/omb/budget/historical-tables/>

Real. Life. Solutions.

# U.S. Labor Force Participation Rate, 2000-2022



Source: <https://fred.stlouisfed.org/series/CIVPART>

Real. Life. Solutions.



# U.S. dollar-euro exchange rate



Source: Bloomberg; RSM US

# Macro Economic Takeaways

- Recession in 2023 or 2024?
- Impact of higher interest rates on operating expenses and capital purchases.
- USD direction and attendant impact on export and import purchasing power.
- Government spending on ad hoc versus Farm Bill.

Commodity Prices  
Natural Gas and Energy Prices  
Russia-Ukraine  
Shipping Rates



# FACTORS AFFECTING FERTILIZER AVAILABILITY AND COST

# Factors Affecting Fertilizer Prices

- Natural gas prices are down from the peak.
  - Natural gas accounts for 70-90% of variable production costs for nitrogen fertilizer.
  - Texas A&M estimated an increased value in natural gas only accounted for about 15% of the increase in nitrogen fertilizer cost.
- Other factors are influencing fertilizer prices.
  - Domestic production (hurricanes and other disruptions).
  - Constrained foreign production (China/COVID-19 shutdowns).
  - Tariffs (Morocco and Russia).
  - Supply chain logistical issues.
  - Increased global demand.
  - Russia-Ukraine and geopolitical stability .
- Lower natural gas prices should help with lowering nitrogen costs but there are a lot of other of other moving parts in fertilizer prices.

# Price of Corn

Corn (ZCH23)

677-4s +2-2 (+0.33%) 02/03/23 [CBOT] DELAYED

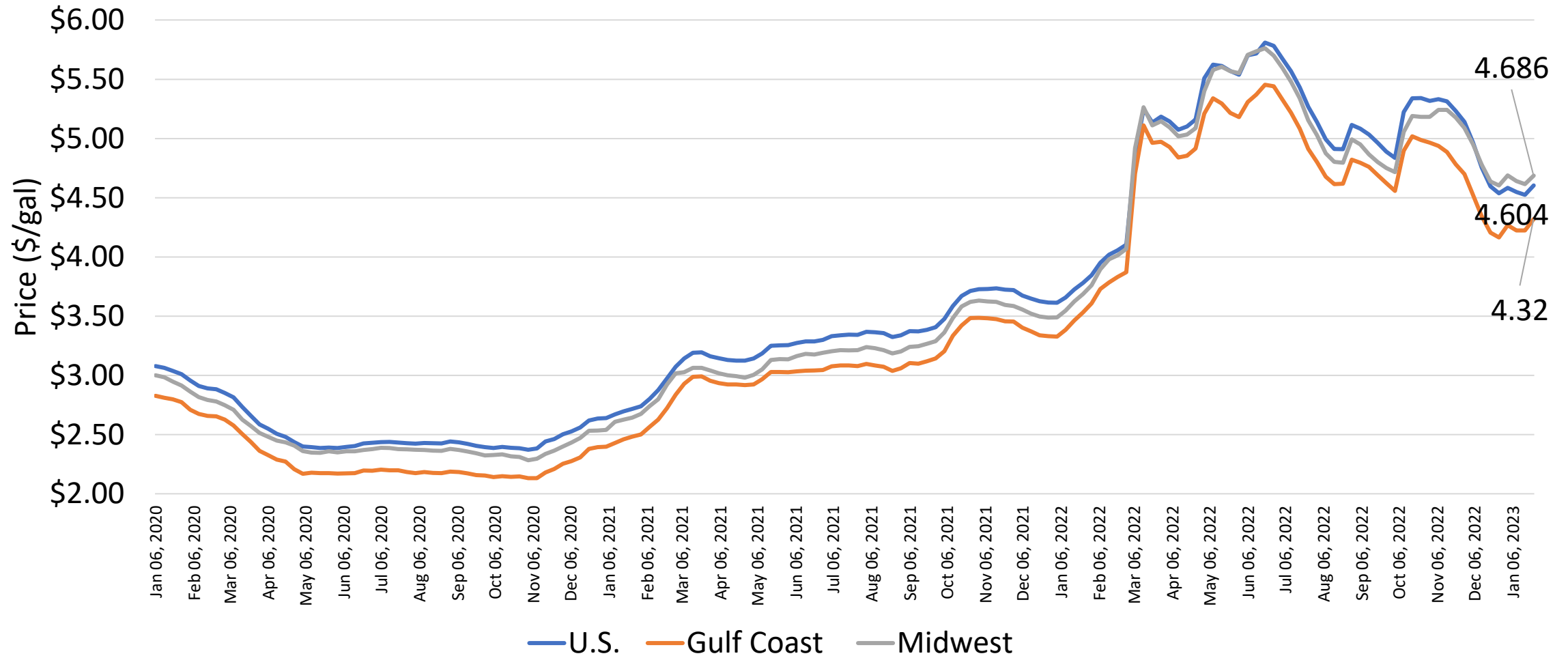
ZCH23 [Filter] 1D 5D 1M 3M 6M 9M 1Y 2Y 3Y 5Y 10Y 20Y MAX Weekly Nearby 5Y +Study Tools Settings Compare f(x) Grid Mode Templates Clear



# Weekly Nearby Natural Gas Closing Price, 2010-2022



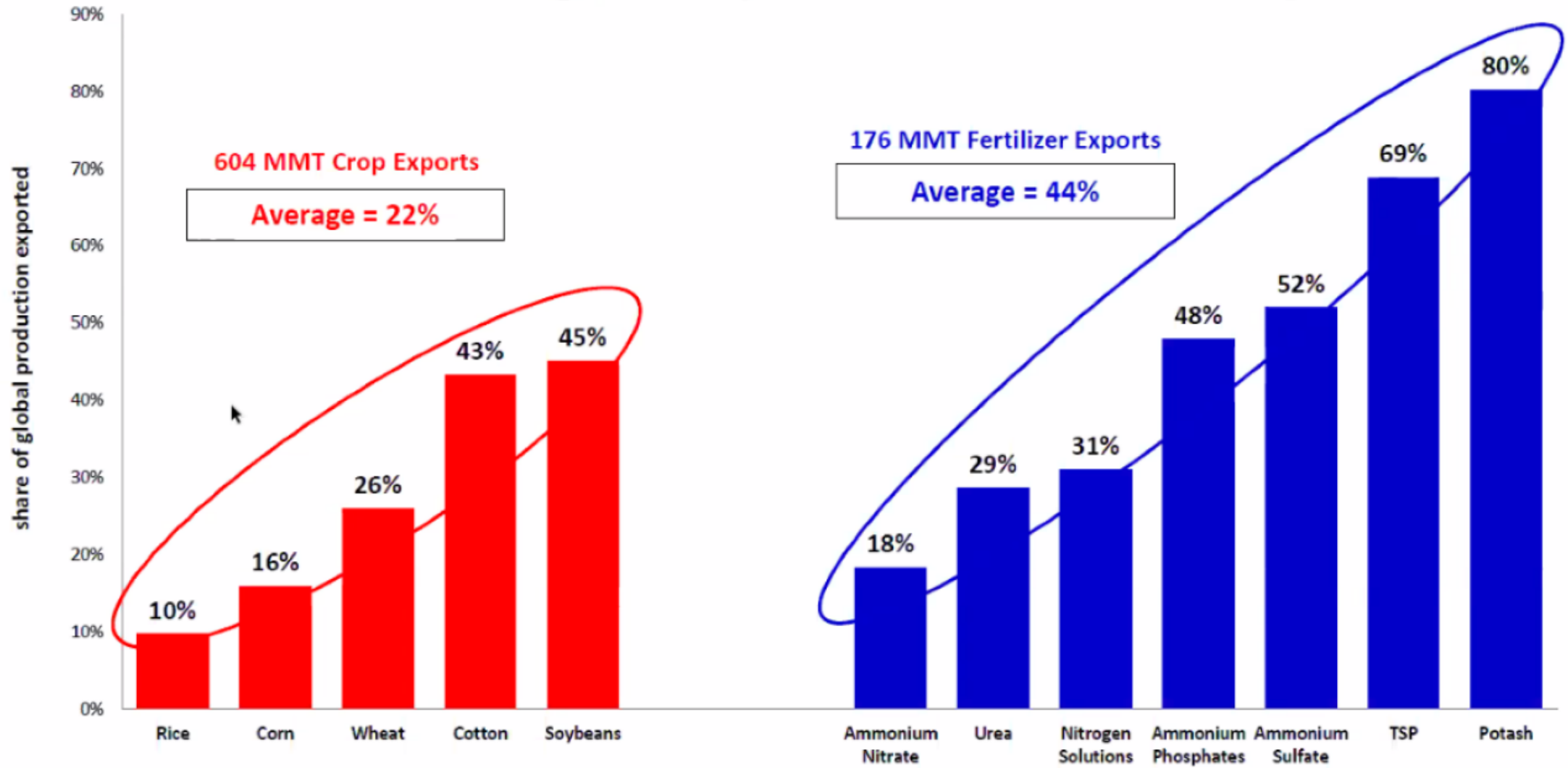
# Weekly Retail No 2 Diesel Prices (\$/gal), 2020-2023



Data Source: <https://www.eia.gov/petroleum/gasdiesel/>

Real. Life. Solutions.

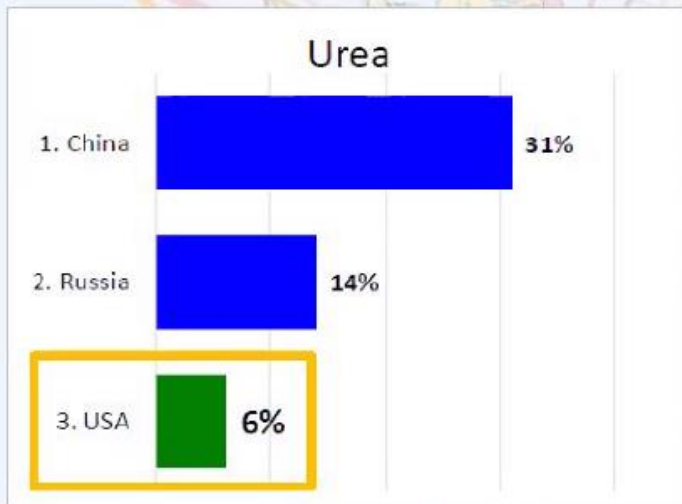
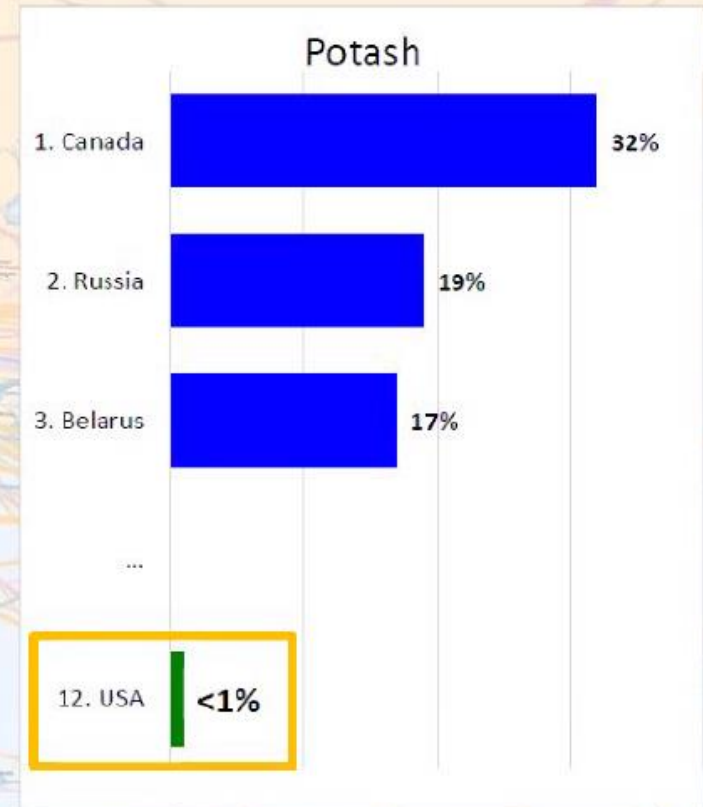
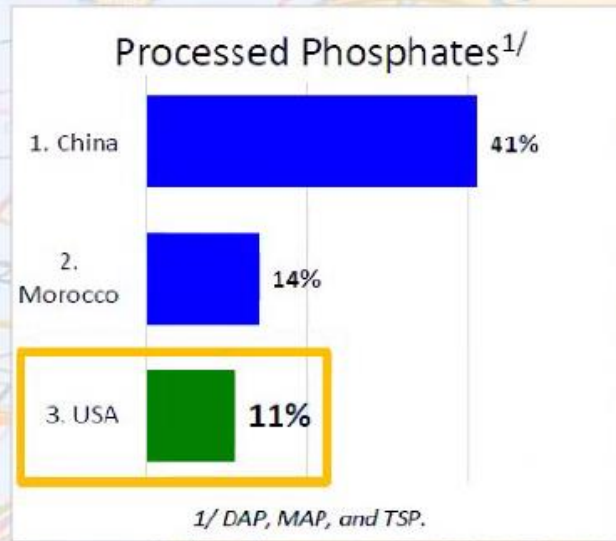
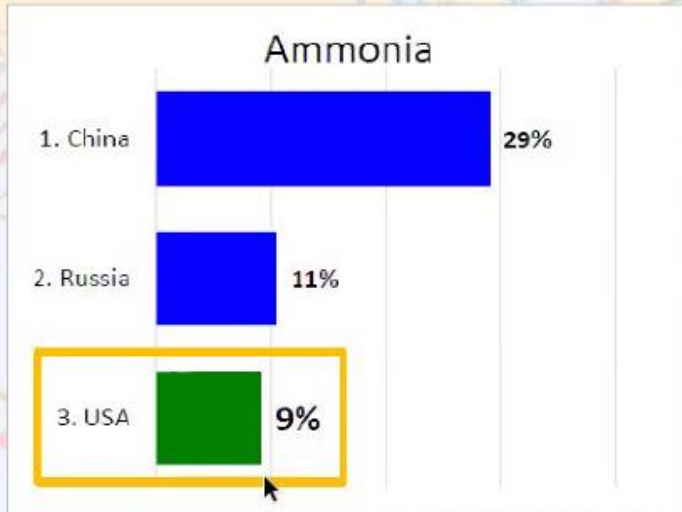
# Share of World Crop (2020/21) and Fertilizer Products (2020) Traded



Source: U.S. Department of Agriculture and International Fertilizer Industry Association. Averages computed as total exports (crop or fertilizer material) divided by total production.



# Global Producers - 2020



Source: International Fertilizer Association (IFA).

# China Curbs Exports

## Producers Face Fertilizer Price Squeeze

China Phosphate Fertilizer Export Freeze Adds to Global Supply Challenges

9/30/2021 | 4:45 PM CDT

## China customs to inspect fertilizer exports from 15 Oct

Published date: 13 October 2021

China's General Administration of Customs will start inspections on fertilizer exports from 15 October, according to an official notice published today.

Share:

COMMODITIES

## Chinese urea futures slide from record highs on new export measures

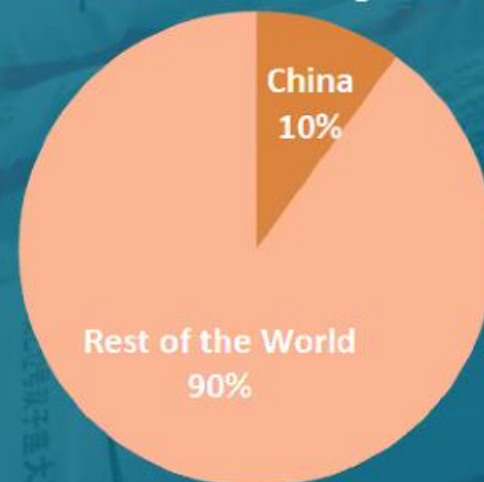
CONTRIBUTOR  
Emily Chow — Reuters

PUBLISHED  
OCT 14, 2021 5:56AM EDT

## Global Phosphate Exports

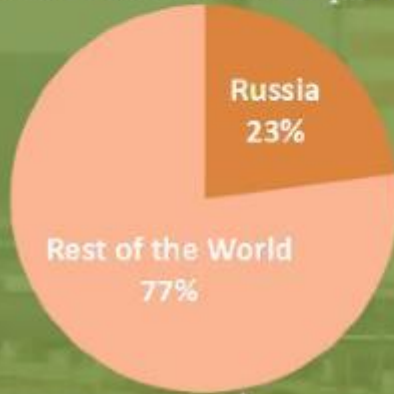


## Global Urea Exports



# Russia Restricts Exports

Global Ammonia Exports



Global Urea Exports



Global Phosphate Exports



Global Potash Exports



03 Nov 2021

**Russia to impose export quotas on nitrogen, complex fertilizers**

November 3, 2021

**Russia to Impose Nitrogen, Complex Export Quotas**

Russia halts nitrogen, phosphate fertilizer exports to support local farmers

Market

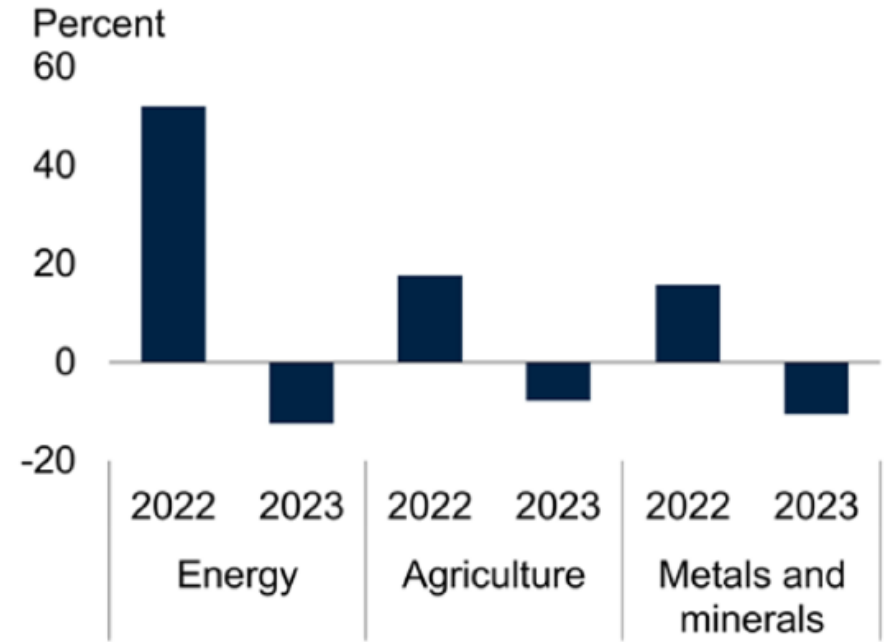
**Russia sets 6 month quotas for fertilizer exports from Dec. 1**

3 Nov 2021 | Masha Belikova

# A. Russia and Ukraine's share of commodity exports

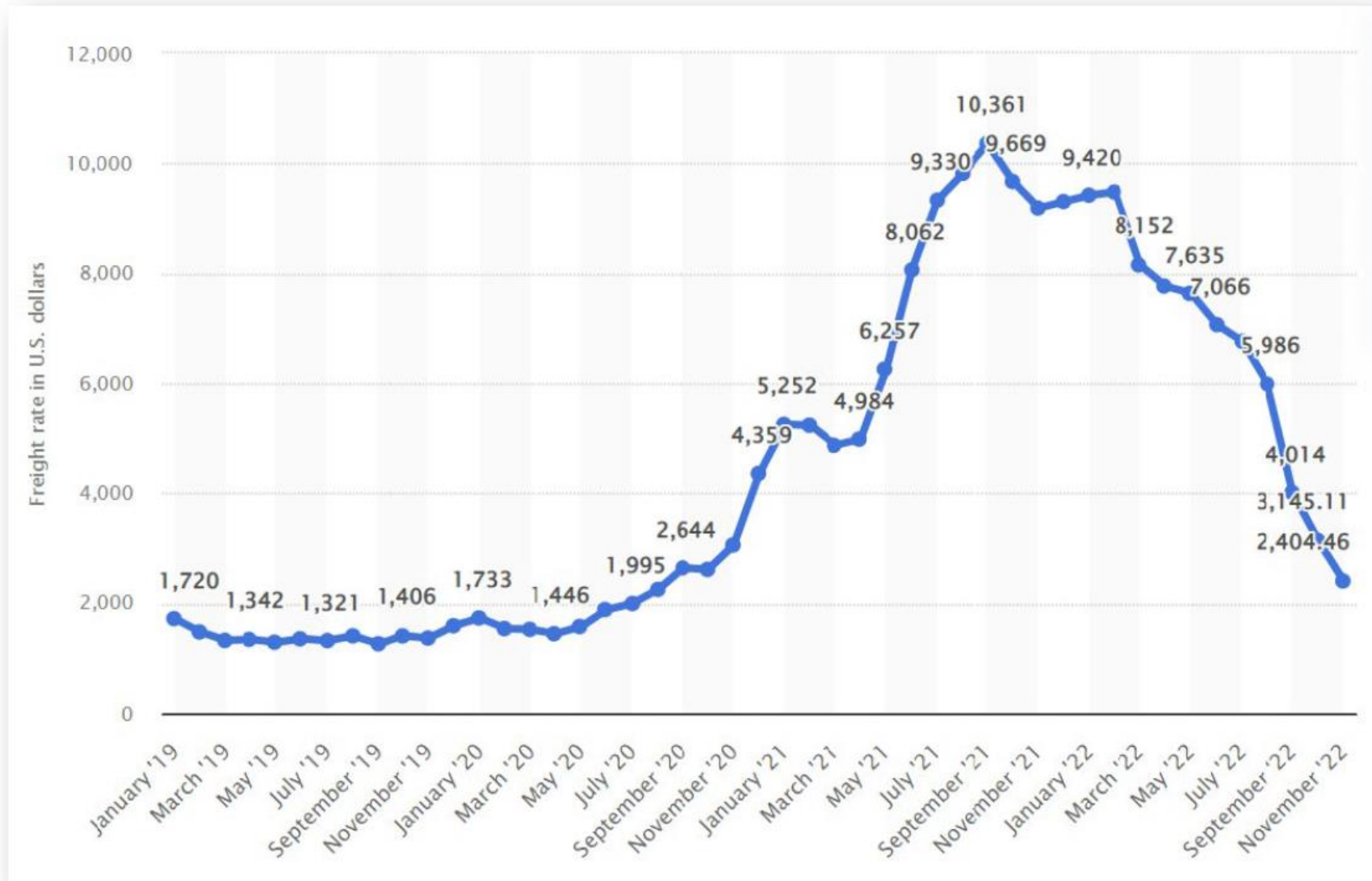


# B. Commodity price forecasts



Sources: Bloomberg; BP Statistical Review; Energy Information Administration; International Energy Agency; UN Comtrade; U.S. Department of Agriculture; World Bank.

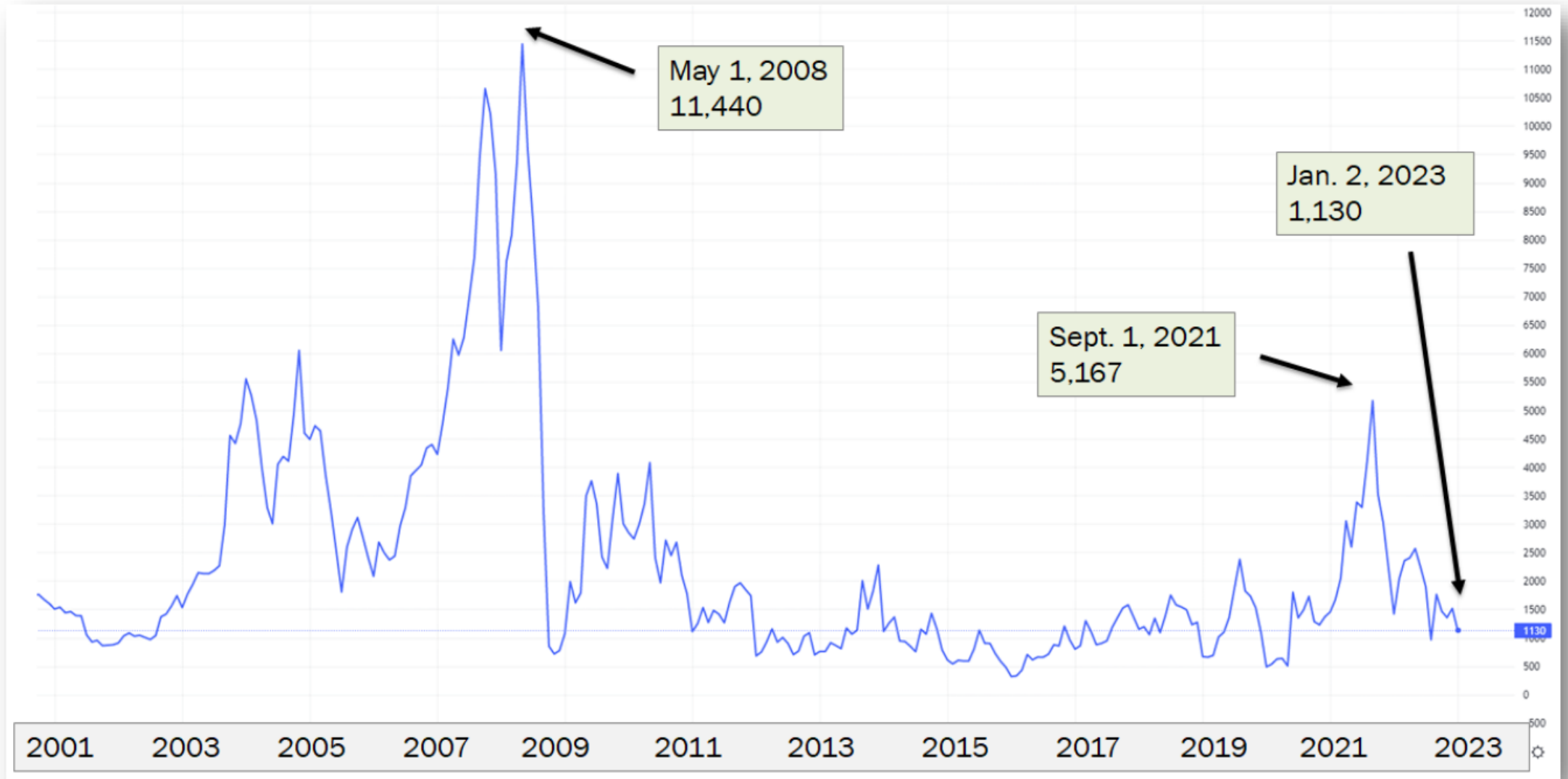
# Global container freight rate index from July 2019 to Nov. 2022 (in U.S. dollars)



**76%**  
**since**  
**peak**  
**(Sept. 2021)**

Source(s): Freightos; ID 1250636 (downloaded from statista.com)

# Baltic Dry Index: January 2001 – January 2023



Source: <https://tradingeconomics.com/commodity/baltic>

# Factors Affecting Fertilizer Prices

- Commodity prices continue to buoy global fertilizer prices.
- Natural gas prices have come down, which should assist in lower N prices.
- Shipping rates are down substantially from post pandemic highs.
- Many factors are moving toward supporting lower prices.
- Global events will continue to affect fertilizer supply and demand in 2023.

Poultry Litter  
Manure  
Compost  
Bio solids



# POULTRY LITTER AND ALTERNATIVE NUTRIENT SOURCES



# Poultry Litter

- Poultry litter
  - Availability
  - Clean out and Transportation costs
- Nutrient variability (N-P-K)
  - Necessitates testing
- Nutrient availability to the crop
- Other nutrients can be beneficial
- Implications for organic matter and long-term soil health

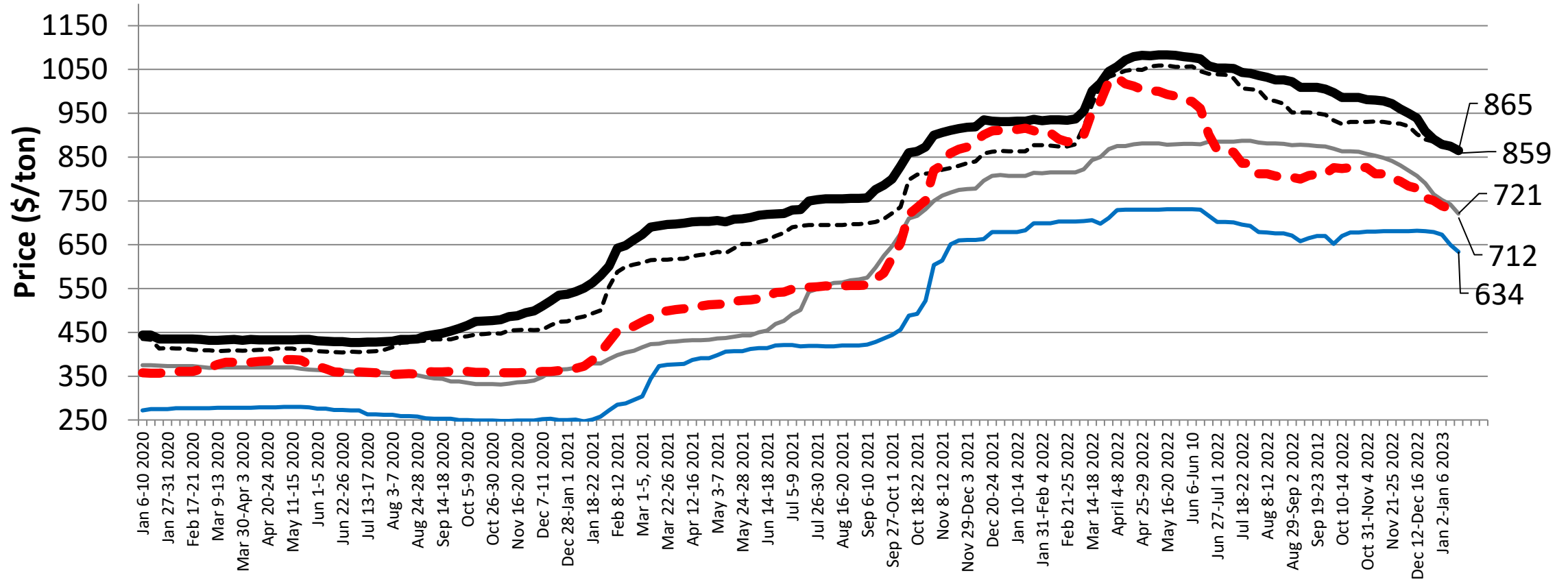
# Value of Poultry Litter

- Poultry litter pounds per ton
  - N-50 lbs (1/2 available), P-45 lbs, K-47lbs (University of Kentucky Study)
- At average commercial fertilizer prices January 2023
  - UREA \$712/ton (\$0.77/lb) = \$19.25/ton
  - DAP \$859/ton (\$0.63/lb) = \$28.35/ton
  - Potash \$721/ton (\$0.60/lb) = \$28.20/ton
  - \$75.80 in available nutrient value (not price)



# REDUCING COSTS AND 2023 PRICE OUTLOOK

# Select Fertilizer Prices, 2020-2023



--- DAP (18-46-0)

— MAP (11-52-0)

— POTASH (0-0-60)

- - - UREA (46-0-0)

— UAN32

865  
859  
721  
712  
634

# Pay attention to interest rate / financing charges

## \$50,000 Operating Utilization

Interest Rate	3.25%	5.5%	7.5%
Interest	\$1,625	\$2,750	\$3,750
Change	-	\$1,125	\$2,125
\$/head	\$32.50	\$55.00	\$75.00

Assumptions: 50 head.

# Reducing Costs

- Not an easy task and will require creativity. “right rate, right source, right placement, and right timing to maximize returns.”
  - Soil testing – know what you have.
  - Alternative nutrient sources – poultry litter, manure, other.
  - Lime / PH adjustment?
  - Timing and application rate .
  - Eliminate / reduce products that are not contributing to sufficient yield gains relative to cost.
  - Species composition.
  - Maximum Return to Nitrogen (MRTN).
  - Manage profit margin not production.

# What can you do?

- Timing
  - Pre purchases
  - Buy and store
  - Spring versus fall application
- Bulk discounts
  - Pooling purchases with neighbors or extended family
- Purchase source
  - Shop around vs value of a relationship
  - Online or alternative source purchases

**Most of these strategies will not result in dramatic reductions in cost in the current environment.**

# Take Home Message

- Fertilizer prices are down from peaks but are likely to remain elevated in 2023. Come down in 2024?
  - Prices will continue to be influenced by energy and commodity prices.
- Need to be thinking about profit maximizing decisions not yield or price maximizing.
- Price nitrogen fertilizers multiple times during the year. Pricing nitrogen at multiple points will reduce the risk of pricing all nitrogen at its highest point and will result in an average price for the farm nearer the average for the season.
- Beware of financing charges.
- More aggressive on planning and seeking alternative sources of nutrients.
- Continued volatile prices should be expected.



February 4, 2023

Dr. S. Aaron Smith Associate Professor and Extension  
Economist

Department of Agricultural and Resource Economics  
University of Tennessee Institute of Agriculture

Email: [aaron.smith@utk.edu](mailto:aaron.smith@utk.edu)

Web Page: <https://cropeconomics.tennessee.edu>



**THANK YOU**