



# The Fertilizer Market Updates *A Global Economy*



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# Forward Looking Statements



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## DTN Retail Fertilizer Trends

Nitrogen Fertilizer Prices Lead Surge as Anhydrous Hits \$940 Per Ton  
10/27/2021 | 5:00 AM CDT

## A Nitrogen Shortage is Brewing, So What Will it Take to Cure The World's Fertilizer Deficiency?

CF Industries said a shortage of nitrogen fertilizer means the world could see a reduction in global crop yields next year. With fertilizer prices soaring, what's the cure? Ag economists weigh in.

## Food Prices Poised to Surge as Fertilizer at Highest in History

By Elizabeth Elkin +Follow  
September 19, 2021, 10:01 PM MDT

Market Extra

## Fertilizer prices soaring as natural-gas rally adds to 'perfect storm'

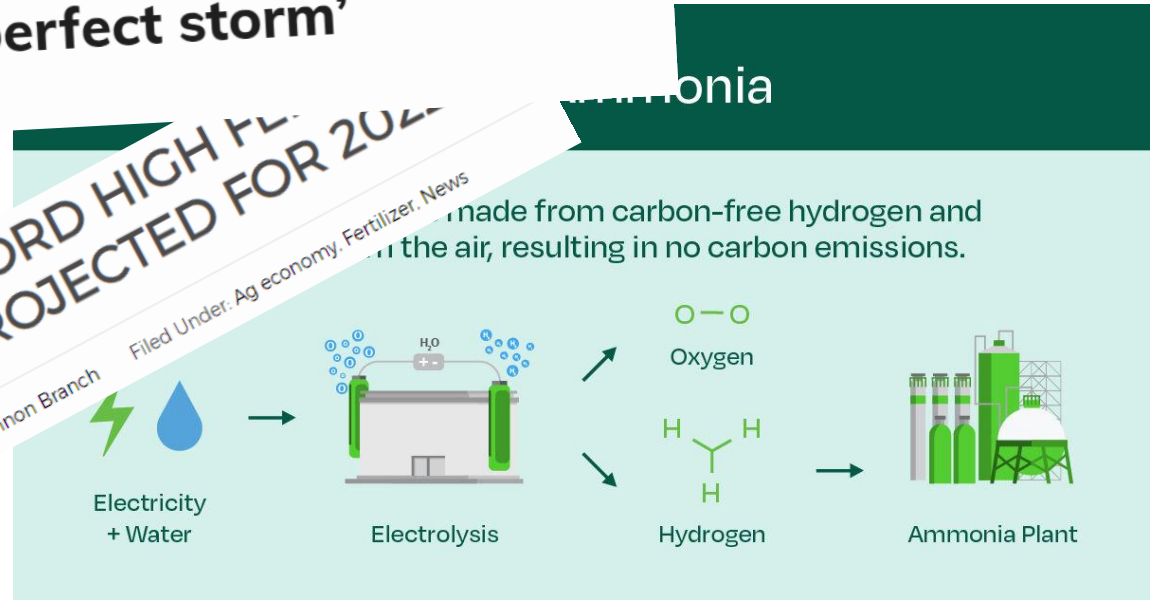
Last Updated: Oct. 9, 2021 at 2:18 p.m. ET  
First Published: Oct. 8, 2021 at 9:32 a.m. ET

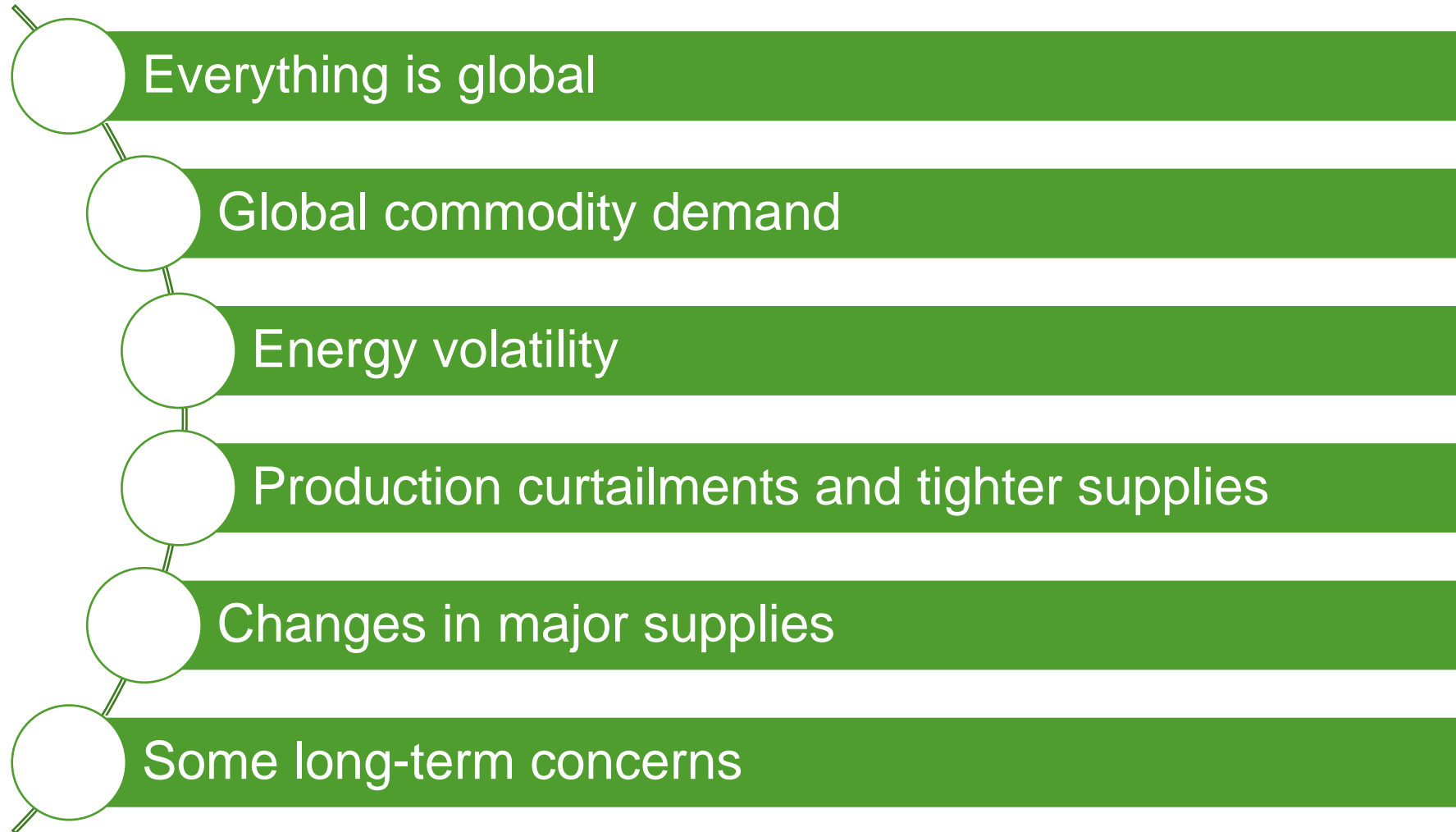
09 Nov 2021  
IEA at COP26: Ammonia Technology Roadmap: Towards more sustainable nitrogen fertiliser production

International Energy Agency

## NEAR-RECORD HIGH FERTILIZER PRICES PROJECTED FOR 2022

August 4, 2021 By Rhiannon Branch  
Filed Under: Ag economy, Fertilizer, News



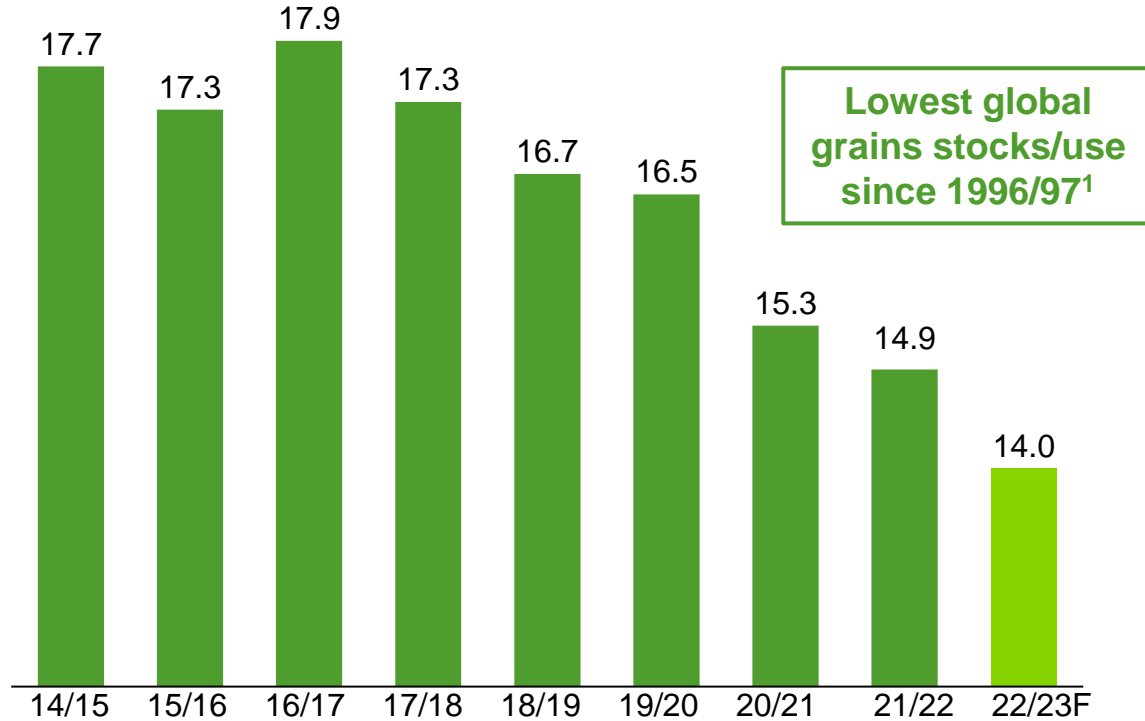


# Tight Global Grain & Oilseed Supplies

*Global grain and oilseed supplies were tight entering 2022 and are projected to be further reduced by lower corn and wheat yield expectations in the US and Europe and lower production from Ukraine*

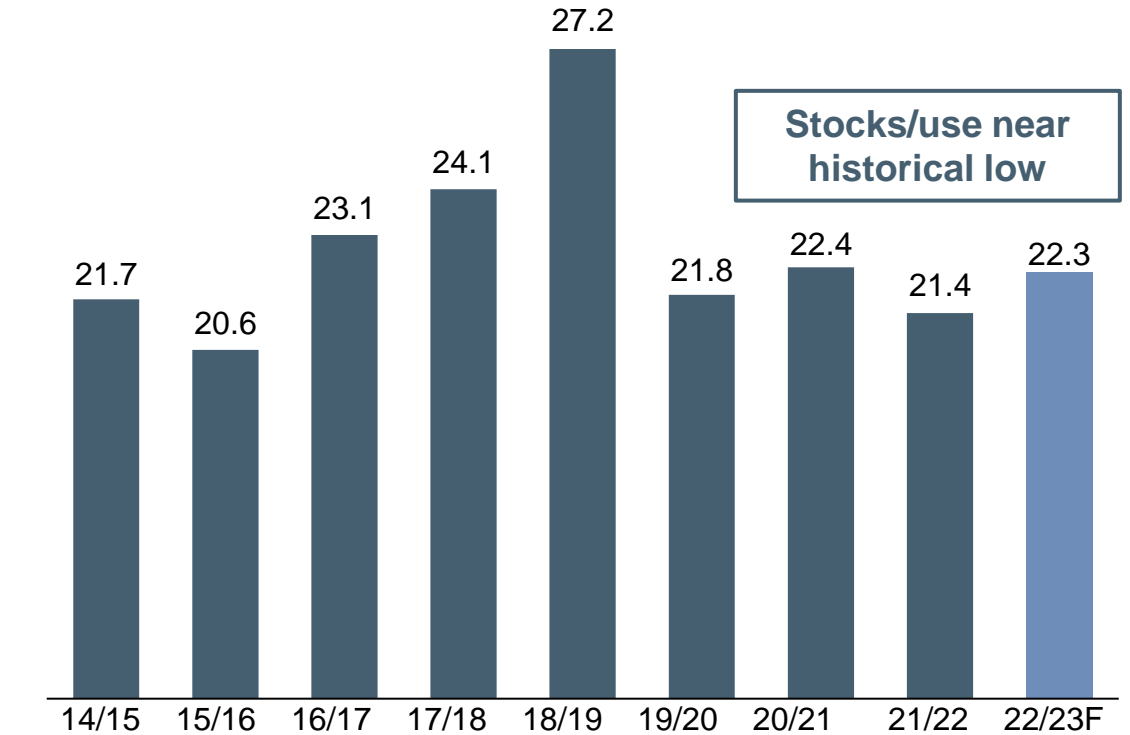
## Global Grain Stocks/Use Ratio

Percent (excluding China)



## Global Oilseed Stocks/Use Ratio

Percent



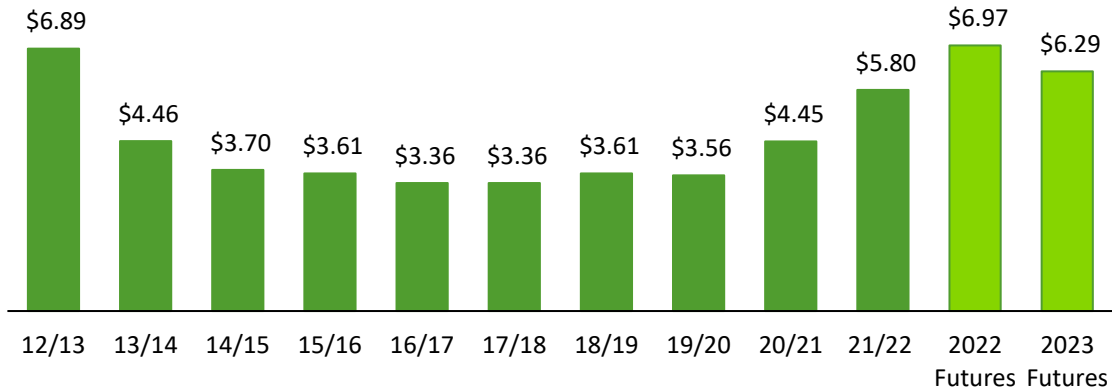
1. Excluding China, grains refer to barley, corn, millet, mixed grain, oats, rice, rye, sorghum and wheat.

2. Oilseeds refer to soybeans, canola and sunflowers.

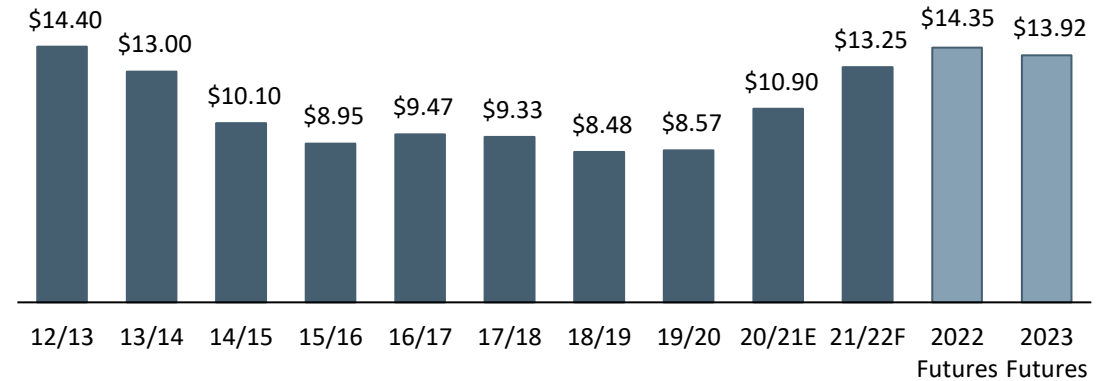
# US Season Average Realized Prices

*Supply challenges in key crop growing regions have supported strong futures prices and provide an incentive for growers to boost production in 2023*

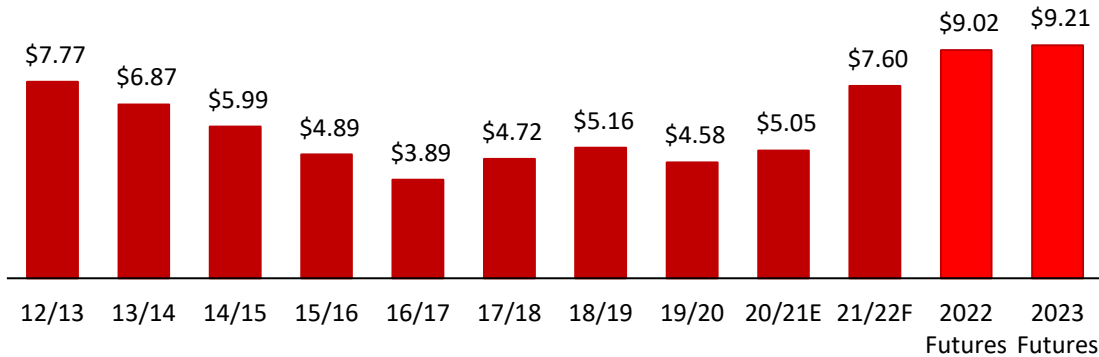
**Corn Avg. Realized Price**  
USD/bushel



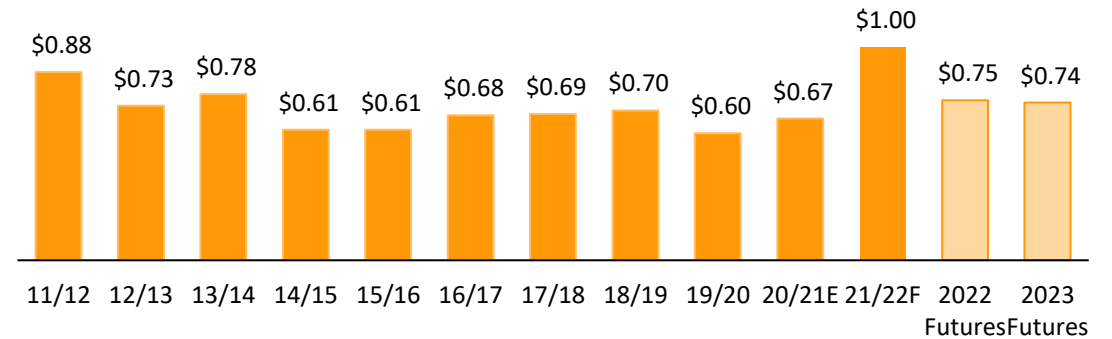
**Soybean Avg. Realized Price**  
USD/bushel



**Wheat Avg. Realized Price**  
USD/bushel



**Cotton Avg. Realized Price**  
USD/lb



Note: 2023 futures prices reference September 2023 Wheat, November 2023 Soybean, December 2023 Corn, December 2023 Cotton, as of November 1, 2022.

November 2022  
Source: USDA, Bloomberg

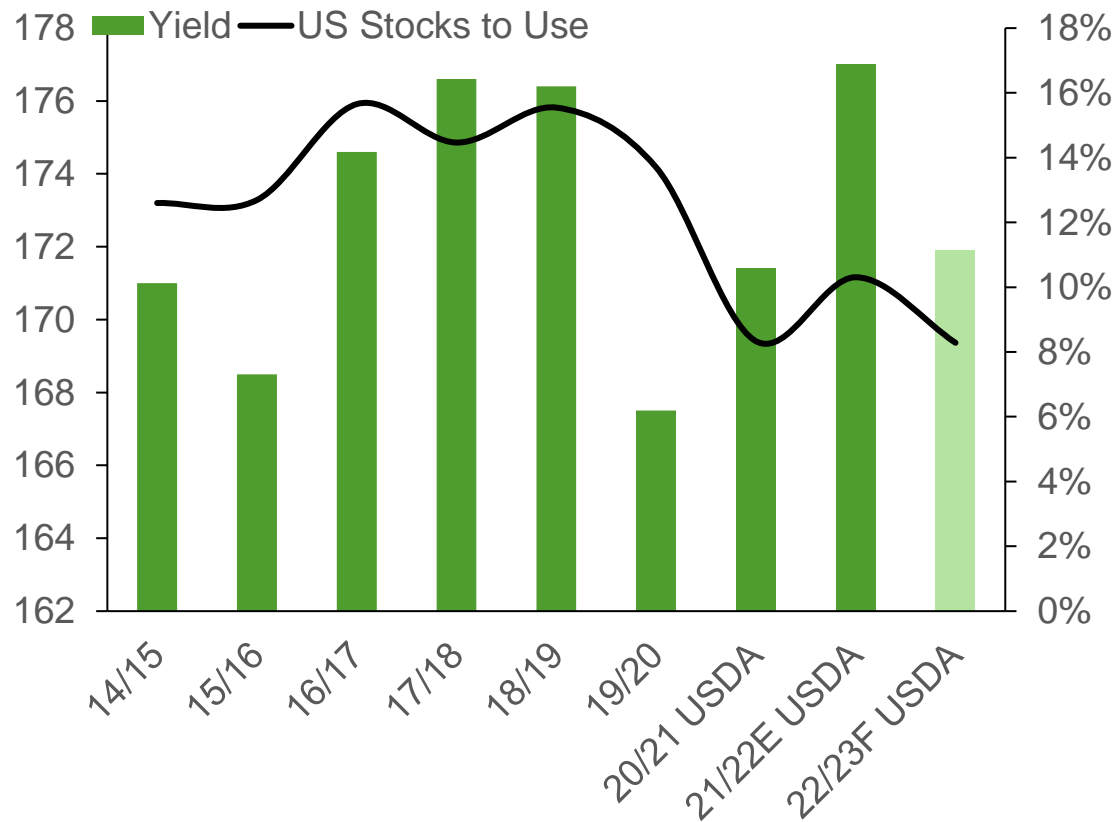
# US Crop Stocks-to-Use Ratios

*Tight supply and demand fundamentals in advance of the 2022 growing season increases sensitivity to production challenges*

## US Corn Ending Stocks & Stock/Use Ratio

Million Bushels

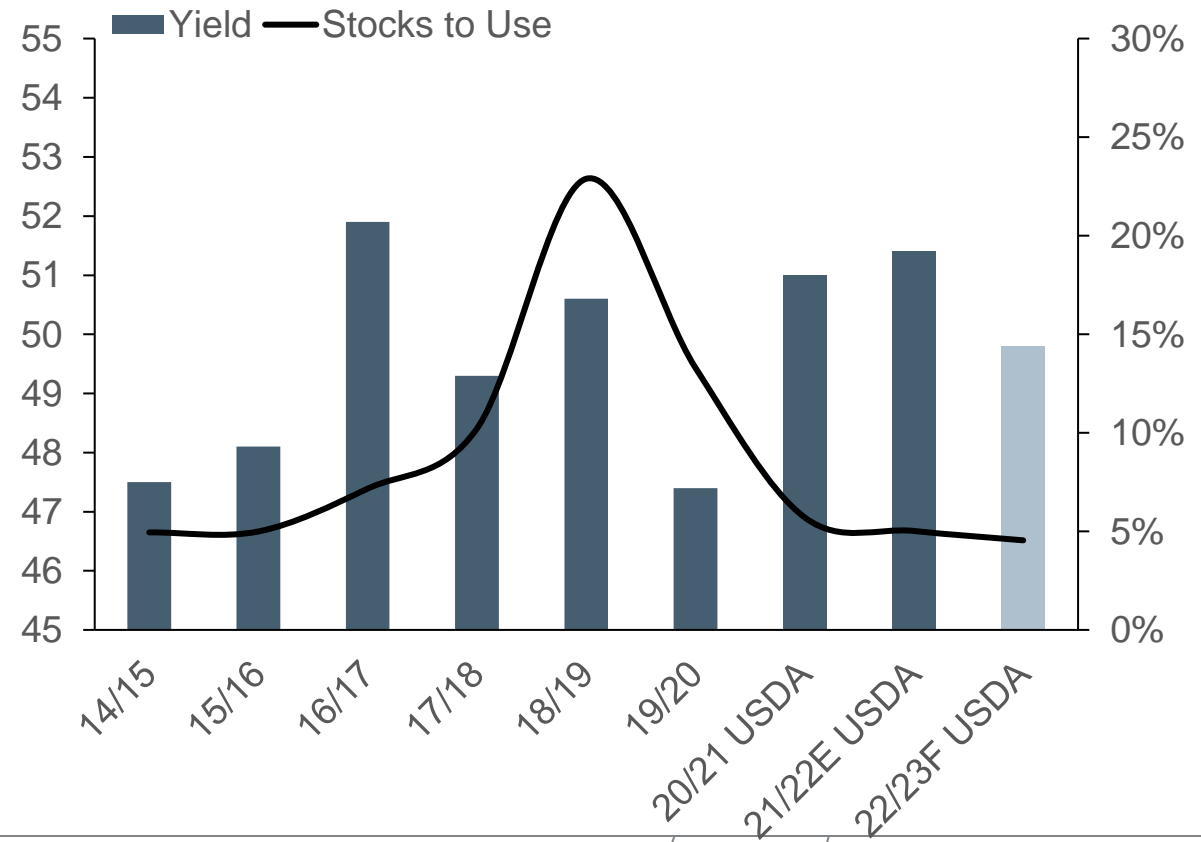
Percent



## US Soybean Ending Stocks & Stock/Use Ratio

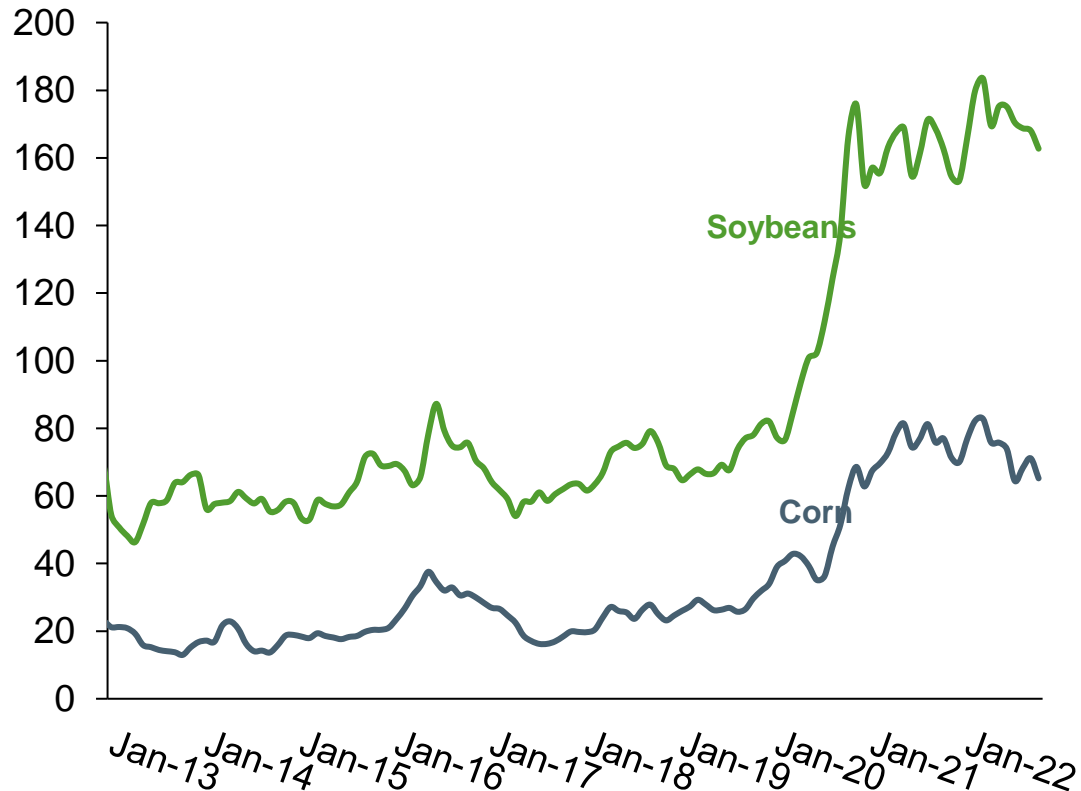
Million Bushels

Percent

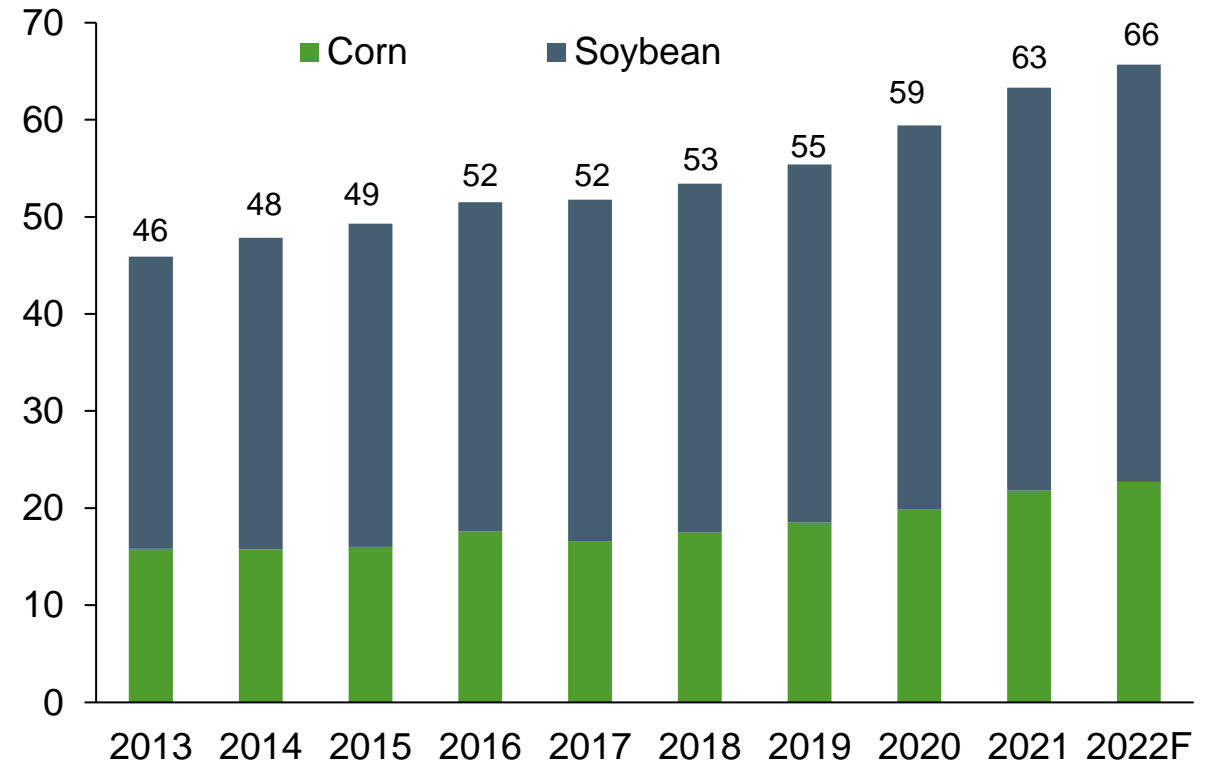


*Historically high soybean and corn prices expected to support increased acreage in the 2022 growing season*

**Mato Grosso Cash Soybean and Corn Prices**  
Real/Sack



**Brazilian Soybean and Corn Area**  
Millions hectares



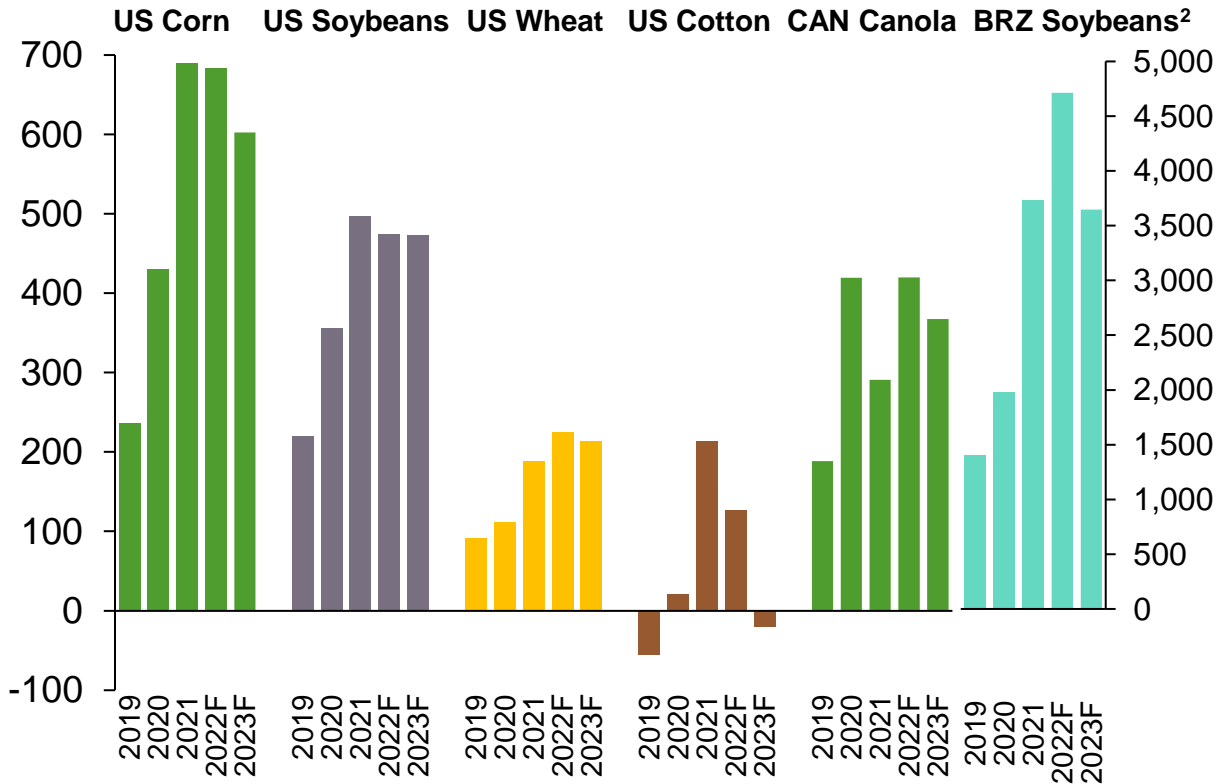
Note: Years in the right graph represent the cropping years.



*Crop prices remain elevated, supporting historically high grower margins and strong demand for crop inputs*

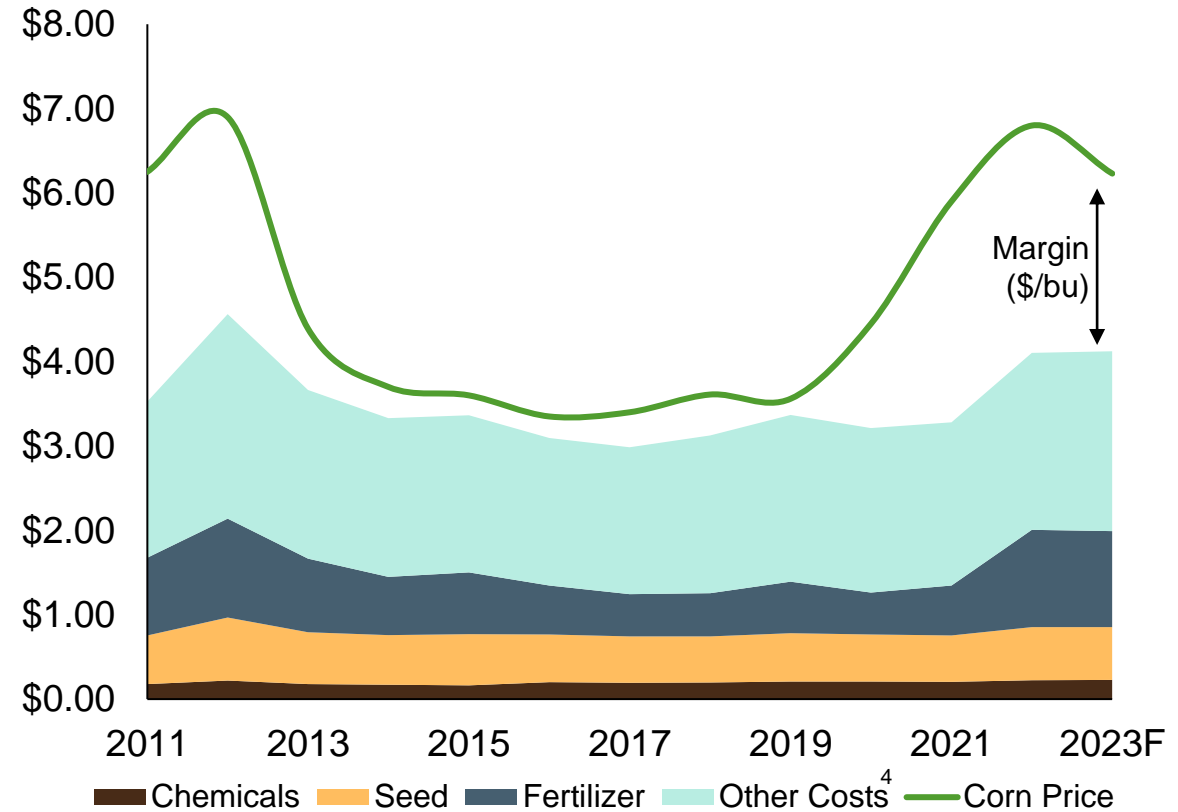
## Key Crop Grower Cash Margins<sup>1</sup>

Local Currency Margin/Acre



## US Corn Cash Selling Price & Costs<sup>3</sup>

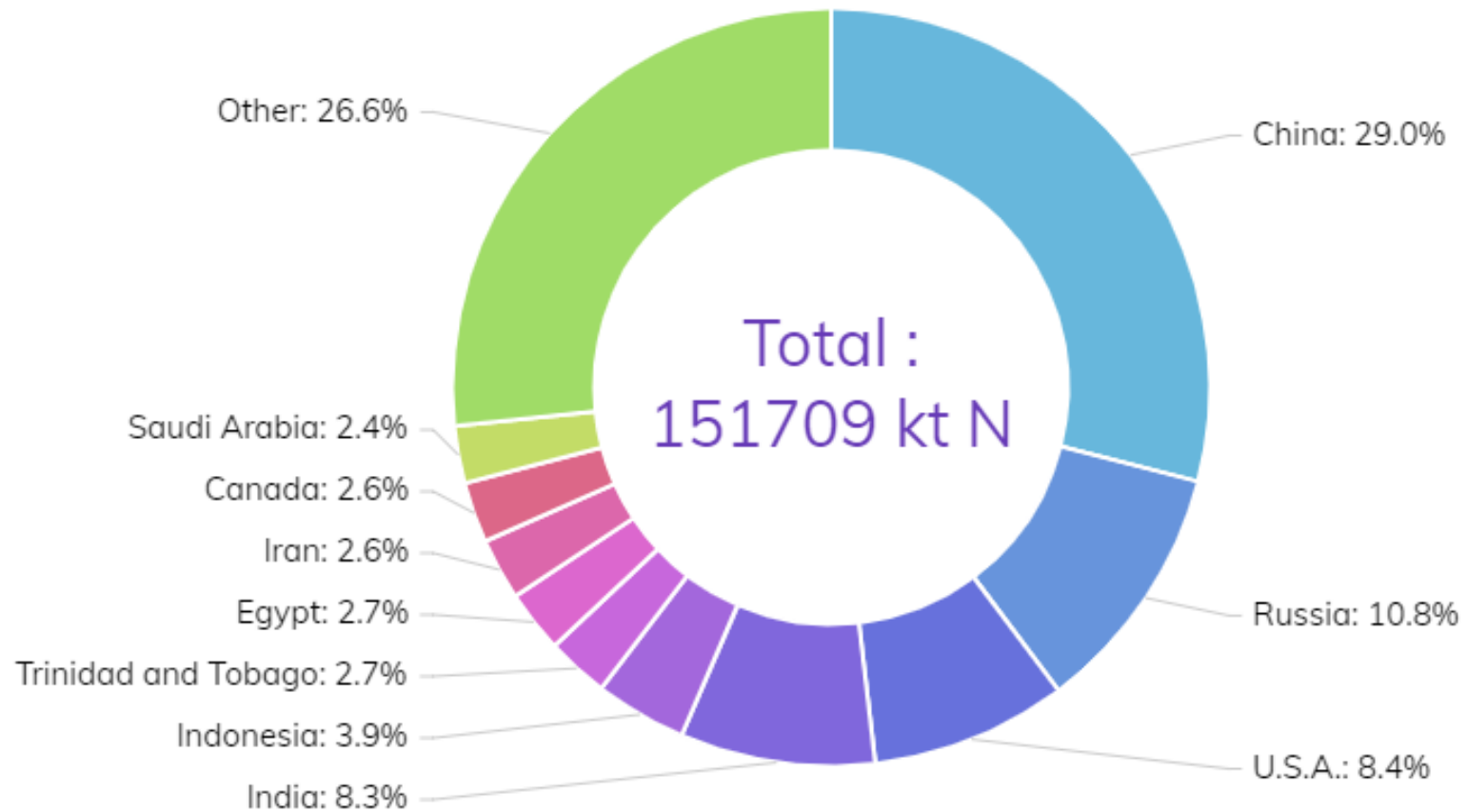
US\$/bu



1. Brazil is local currency margin/hectare.  
 2. Due to crop year timing in Brazil the 2023F references the 2022/23 crop year, which is being planted in Q3 & Q4 2022 with growers realizing returns in 2023.  
 3. Annual cash costs on a per bushel basis are impacted by both realized inflation/deflation and by the annual corn yield.  
 4. Cash rent, along with other variable costs like fuel, energy, repairs, etc. is included in other costs.

## 3.3. Top 10 Countries by Activity and by Product

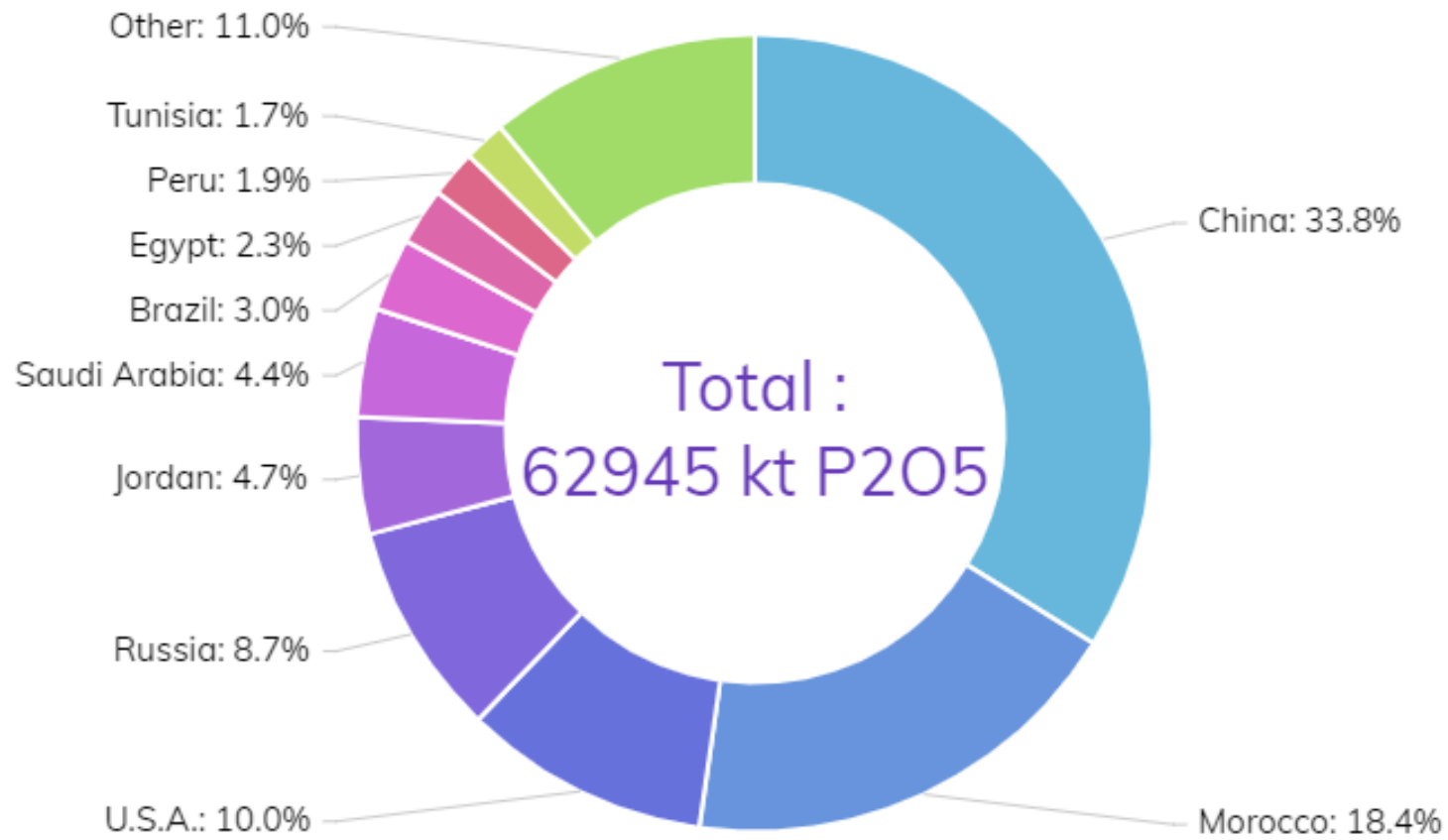
Ammonia production in 2021



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## 3.3. Top 10 Countries by Activity and by Product

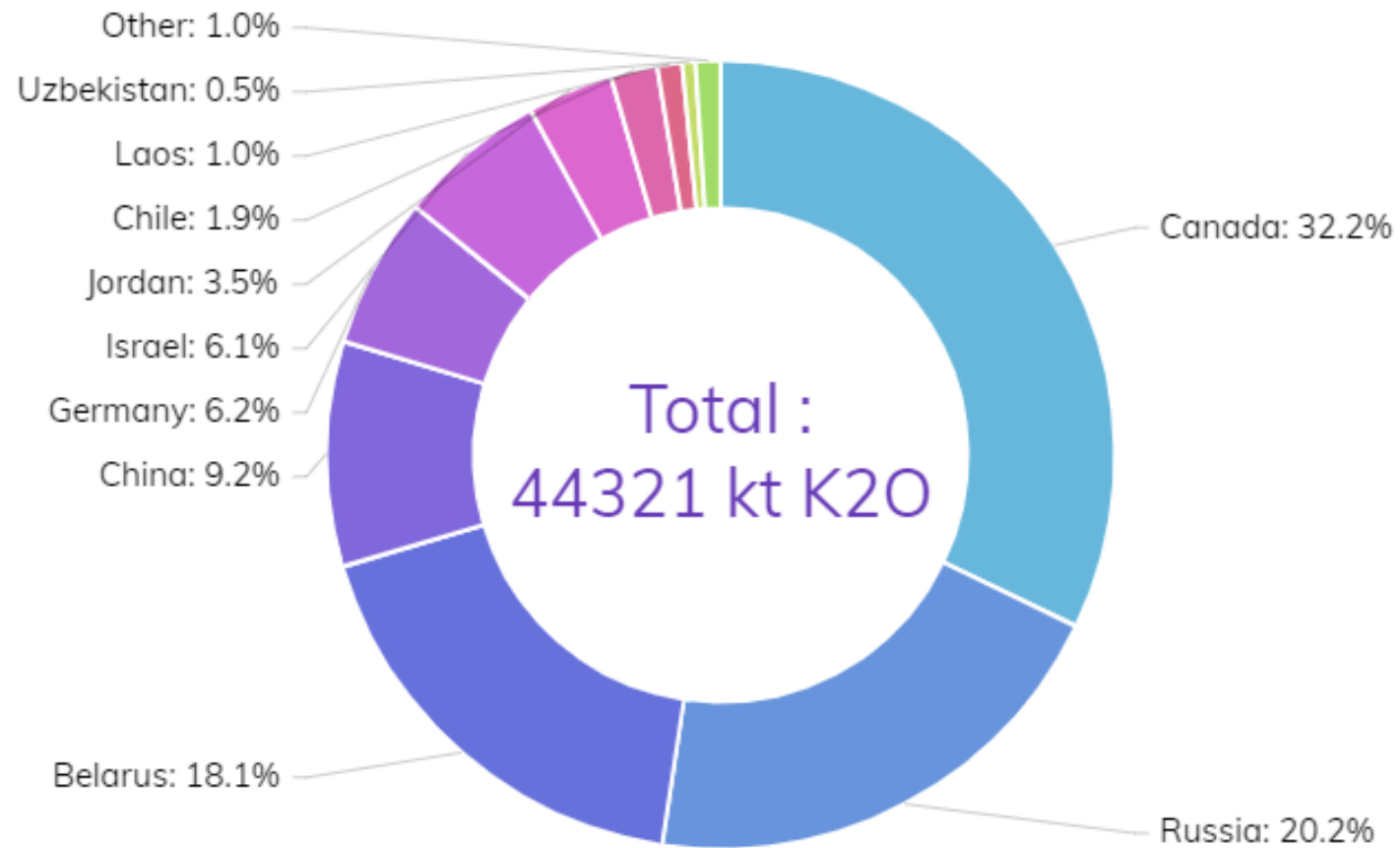
Phosphate Rock production in 2021



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### 3.3. Top 10 Countries by Activity and by Product

MOP (Potash) production in 2021



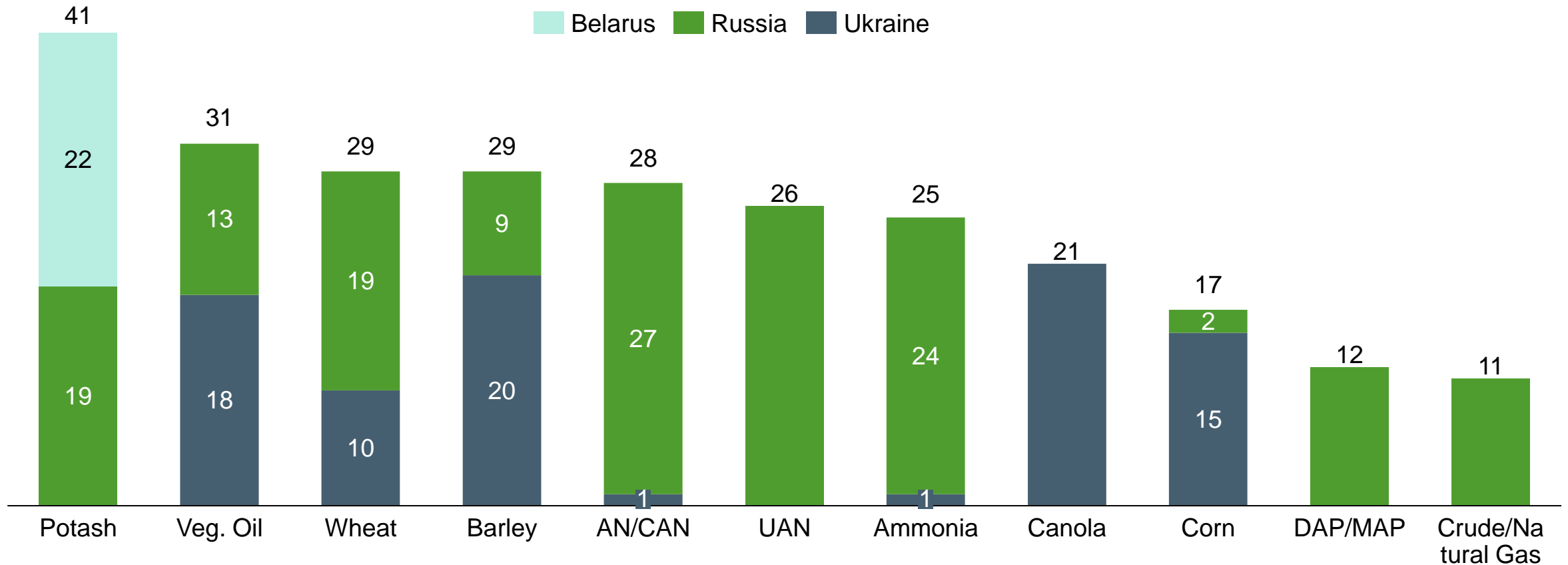
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# Ukraine Conflict Creates Tightened & Uncertain Supplies of Key Commodities

*The reduction of Eastern European exports has created significant supply tightness for energy, fertilizers and crop commodities, which in the short-term cannot be addressed by any other producer*

## Key Global Crop, Fertilizer & Energy Export Market Share<sup>1</sup>

Percent

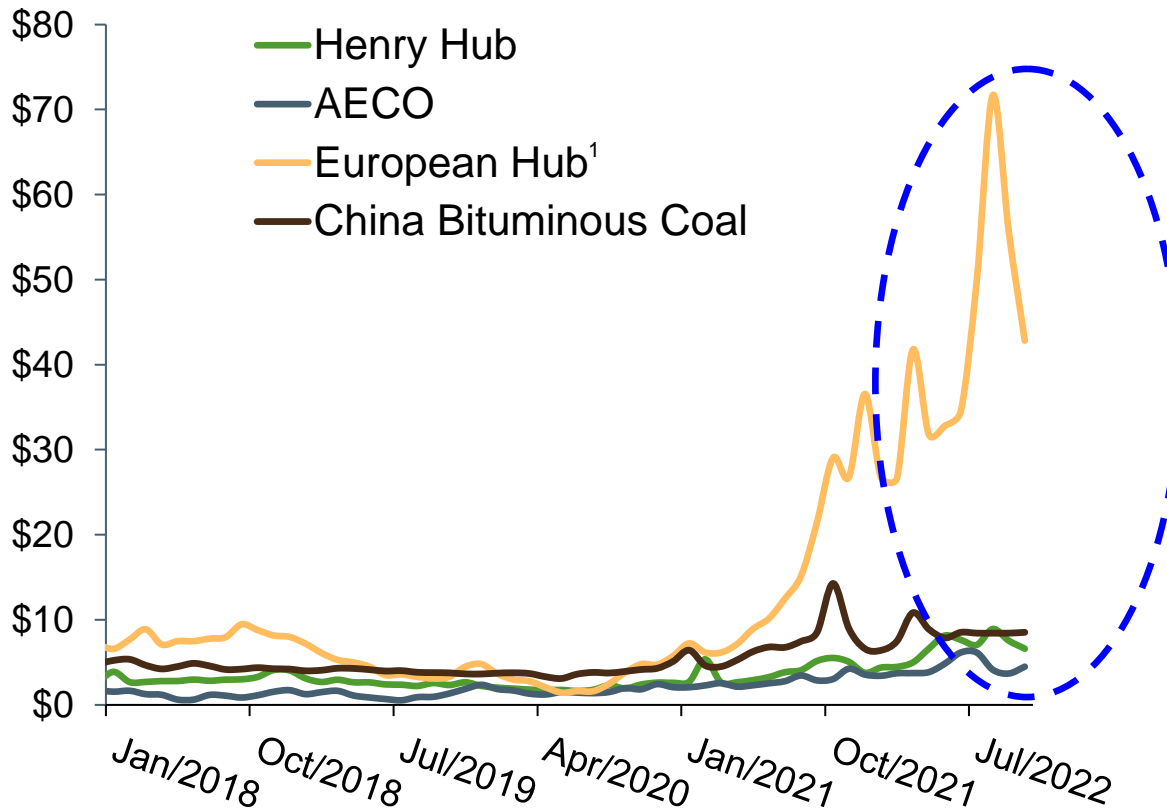


1. Based on the 5-year average exports from 2017-18 to 2021-22

*Record high natural gas prices in Europe have contributed to plant shut-downs and reduced operating rates in 2022, impacting supply and supporting prices for all nitrogen products*

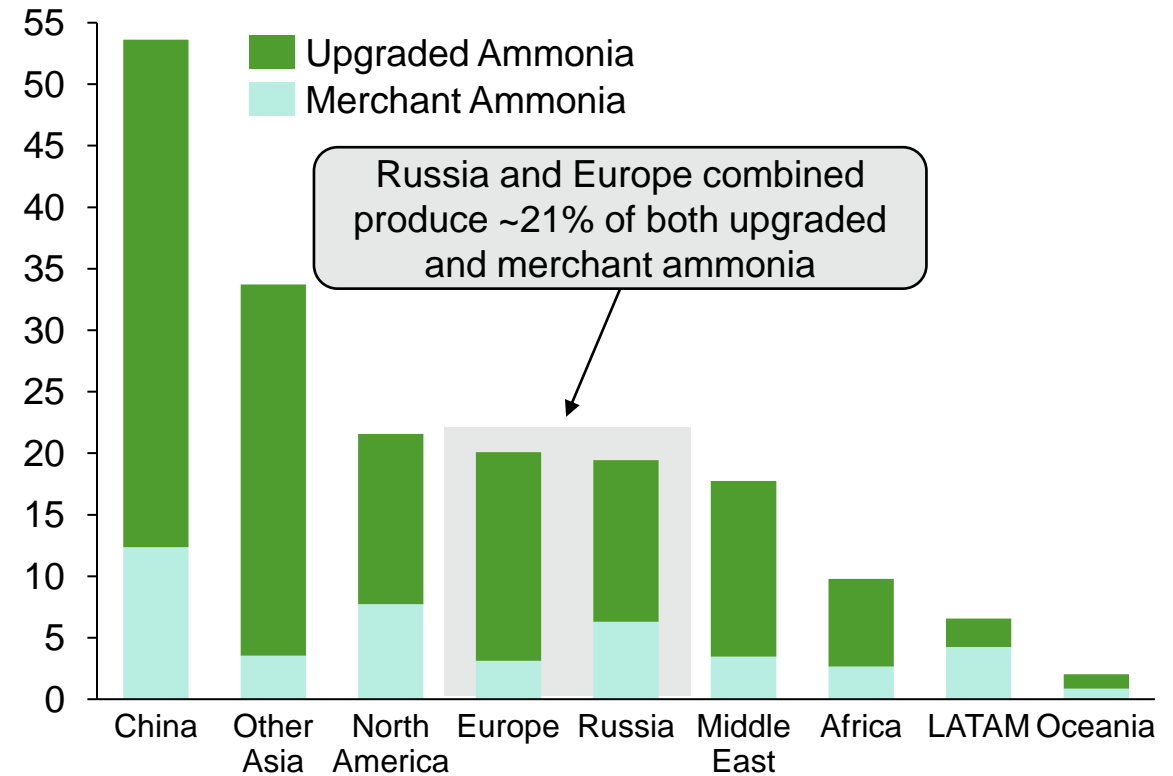
## Energy Feedstock Prices

US\$/MMBtu



## Share of Global Ammonia Production²

Million Tonnes



1. Presented on a US\$/MMBtu equivalent basis.  
 2. Based on average share of global production from 2019-2021.

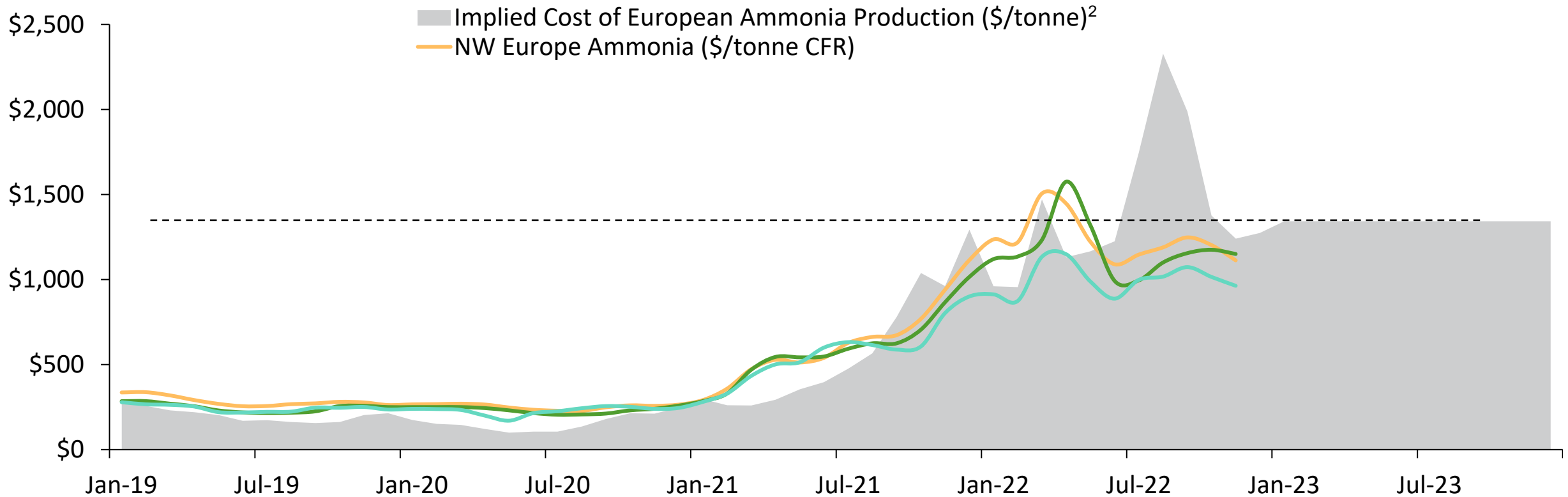
# High EU Natural Gas Prices Result in Significant Nitrogen Curtailments



*Despite a recent decline in European natural gas prices, more than one third of Europe's ammonia production is curtailed and natural gas prices are expected to remain high and volatile through the winter*

## European Gas, Ammonia Production Costs<sup>1</sup> & Key Ammonia Prices

Units shown in legend



1. Future production costs estimated based on forward curve for Dutch TTF, as of November 4, 2022.

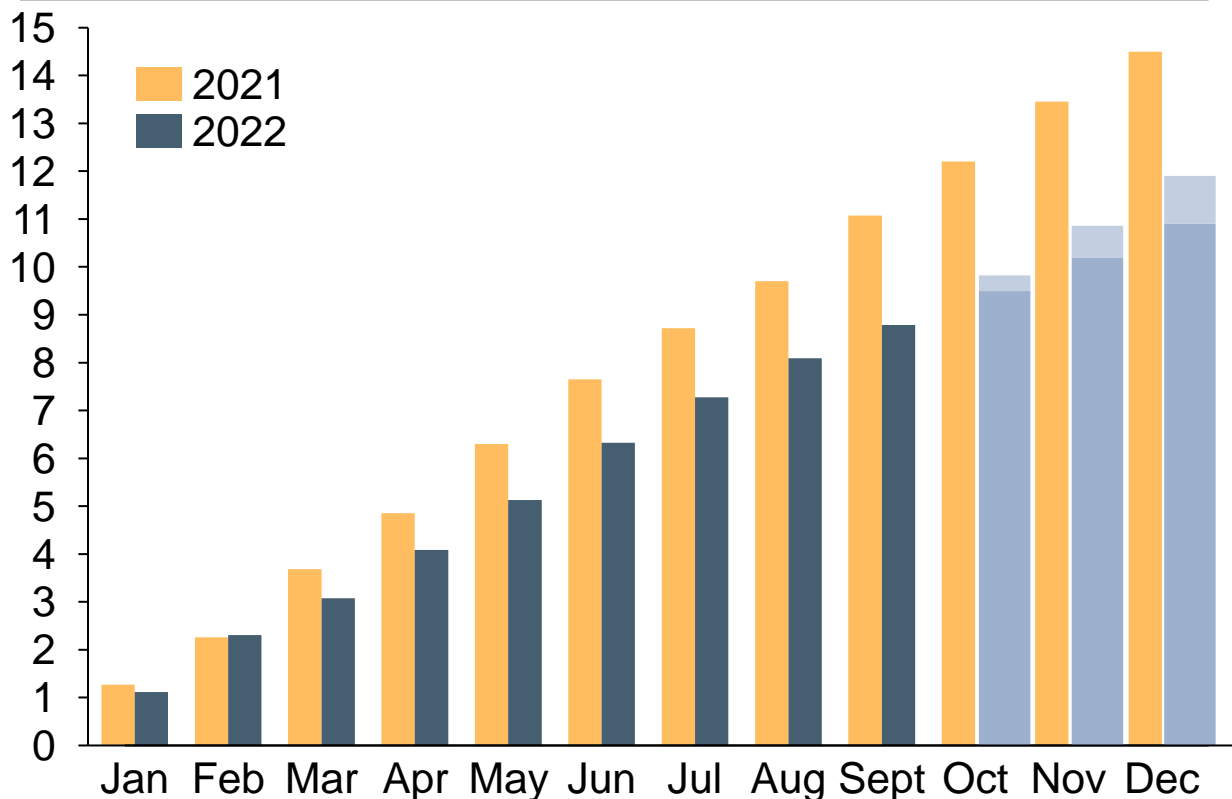
2. Based on forward Netherlands TTF natural gas futures curve as of November 4, 2022.

# Reduction in Eastern European Potash Shipments

*Potash shipments from Belarus are projected to be down 50 to 60 percent and Russia down 20 to 25 percent in 2022 compared to the prior year.*

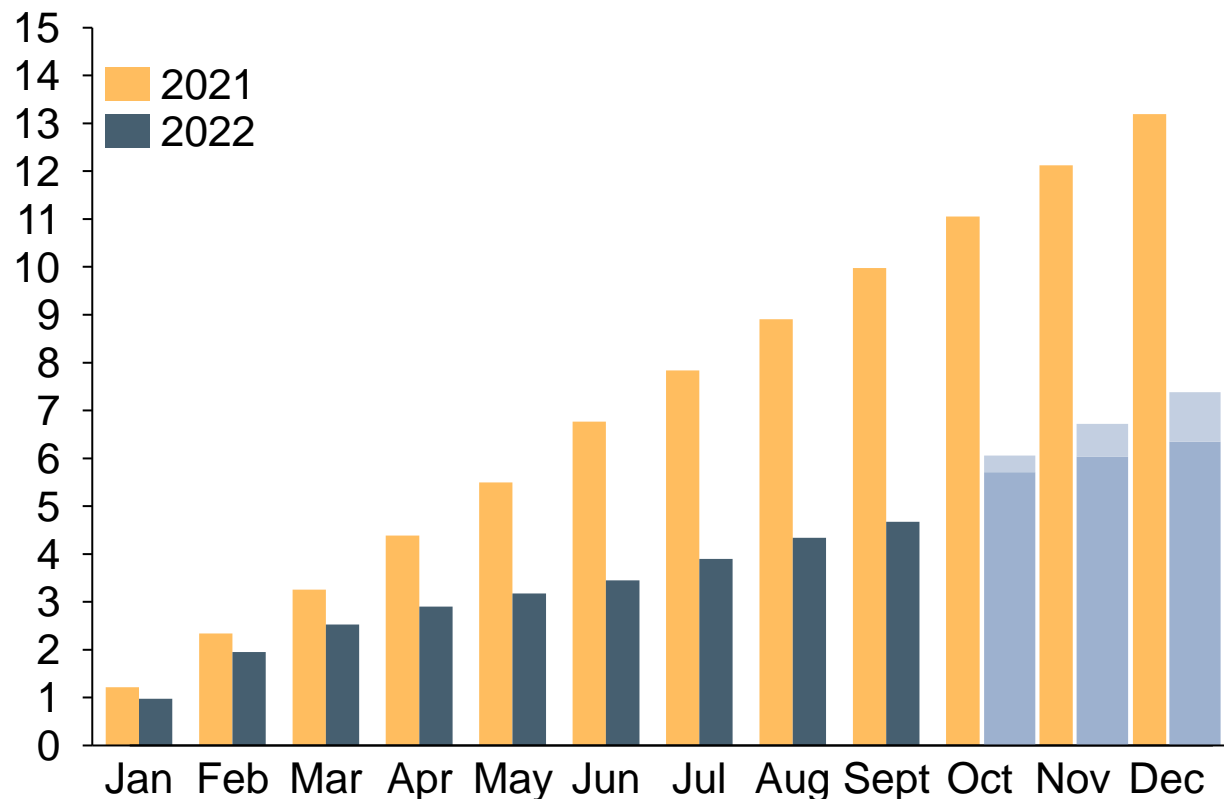
## Russia Potash Shipment Assumptions

Millions of Tonnes KCl



## Belarus Potash Shipment Assumptions

Millions of Tonnes KCl



Note: Russia & Belarus shipments include both domestic and offshore deliveries.

November 2022  
Source: Argus, CRU, Nutrien

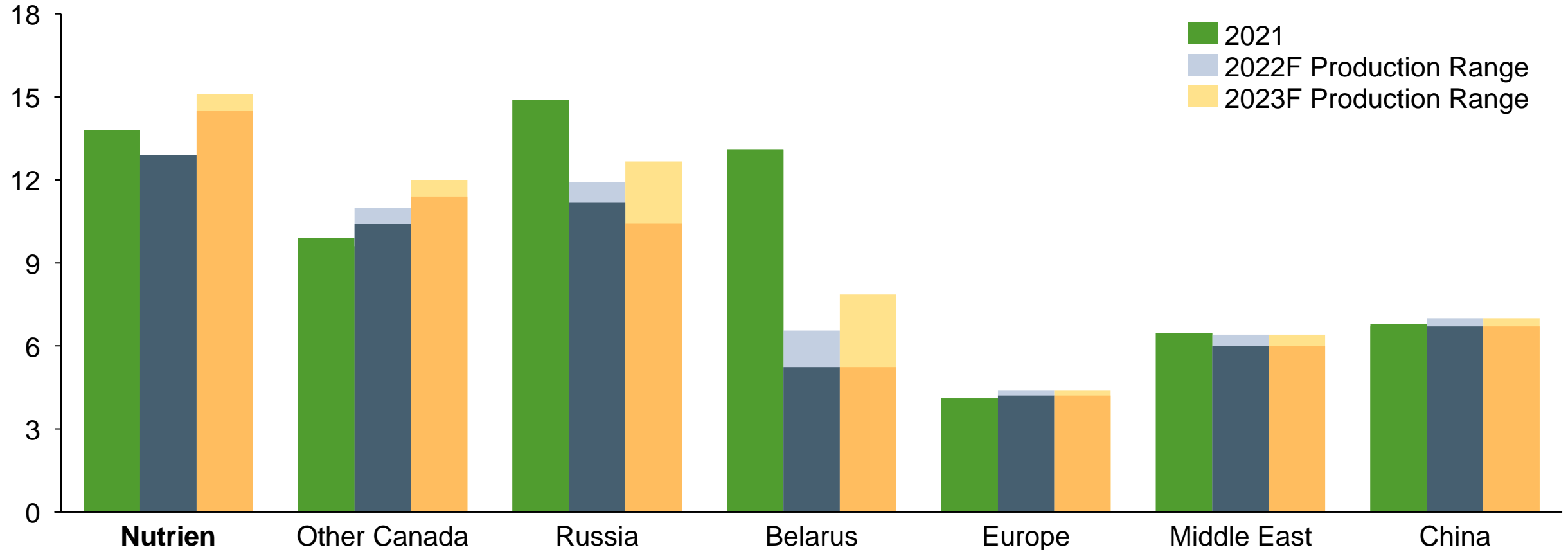


# Potash Production in Selected Regions

*Expect significant reduction in shipments from Eastern Europe due to sanctions and other restrictions to continue into 2023.*

## Potash Production in Selected Regions\*

Millions of Tonnes KCl



\* Production changes differ from our expectations in operational capability.

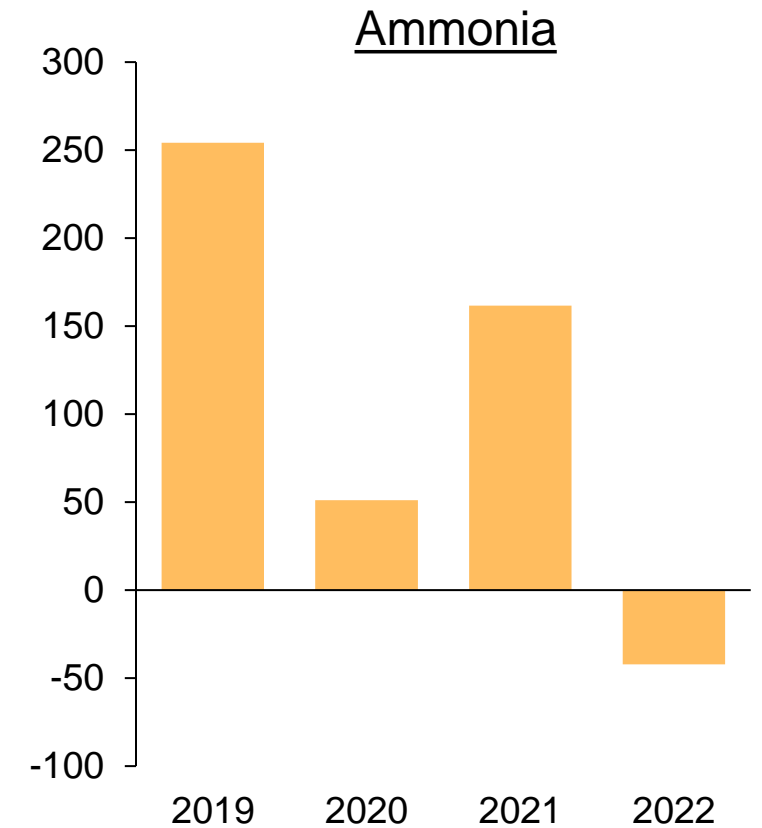
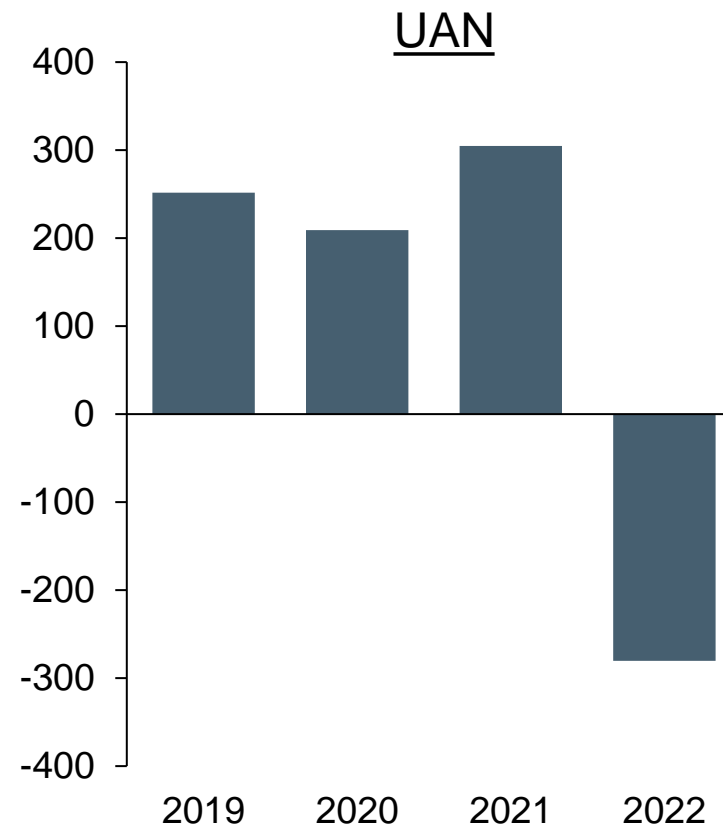
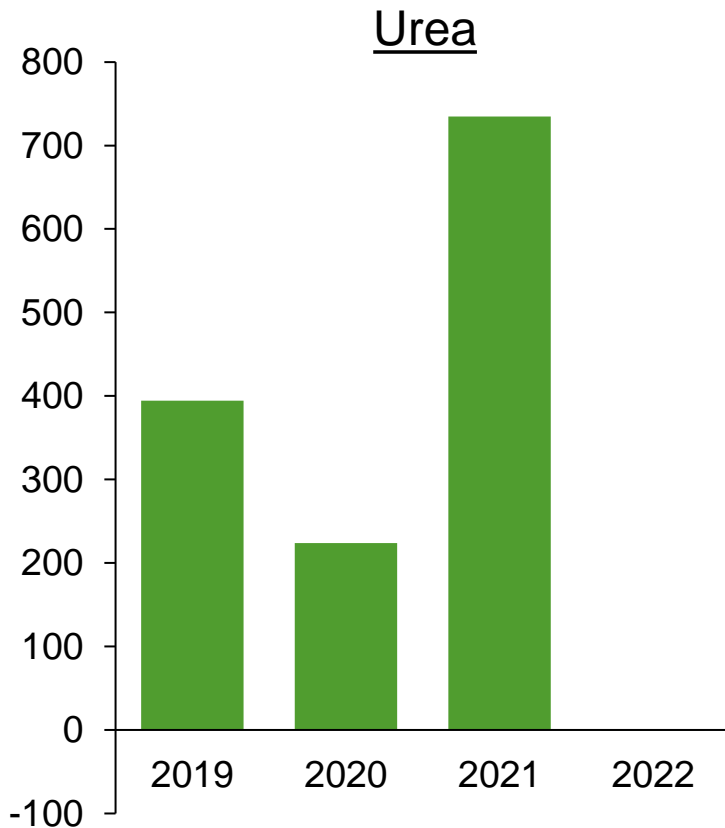
# Significant Tightening of US Nitrogen Import Balances



*Strong offshore demand, particularly the shift in trade flows to Europe, and relatively low offshore imports has tightened the US nitrogen supply/demand balances*

## US Nitrogen Net Offshore Imports (Jul-Sep)

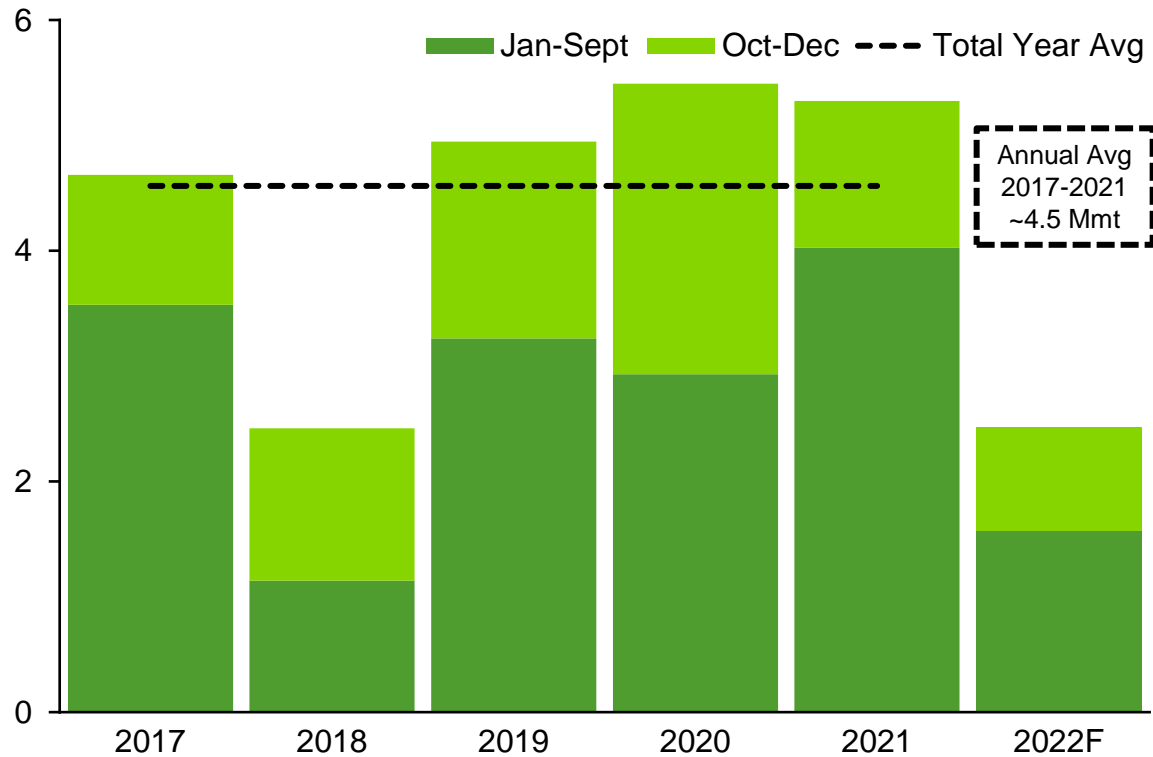
000 Tonnes (Offshore Imports less Offshore Exports)



*Government export restrictions have limited Chinese Urea & DAP/MAP exports further tightening global supplies*

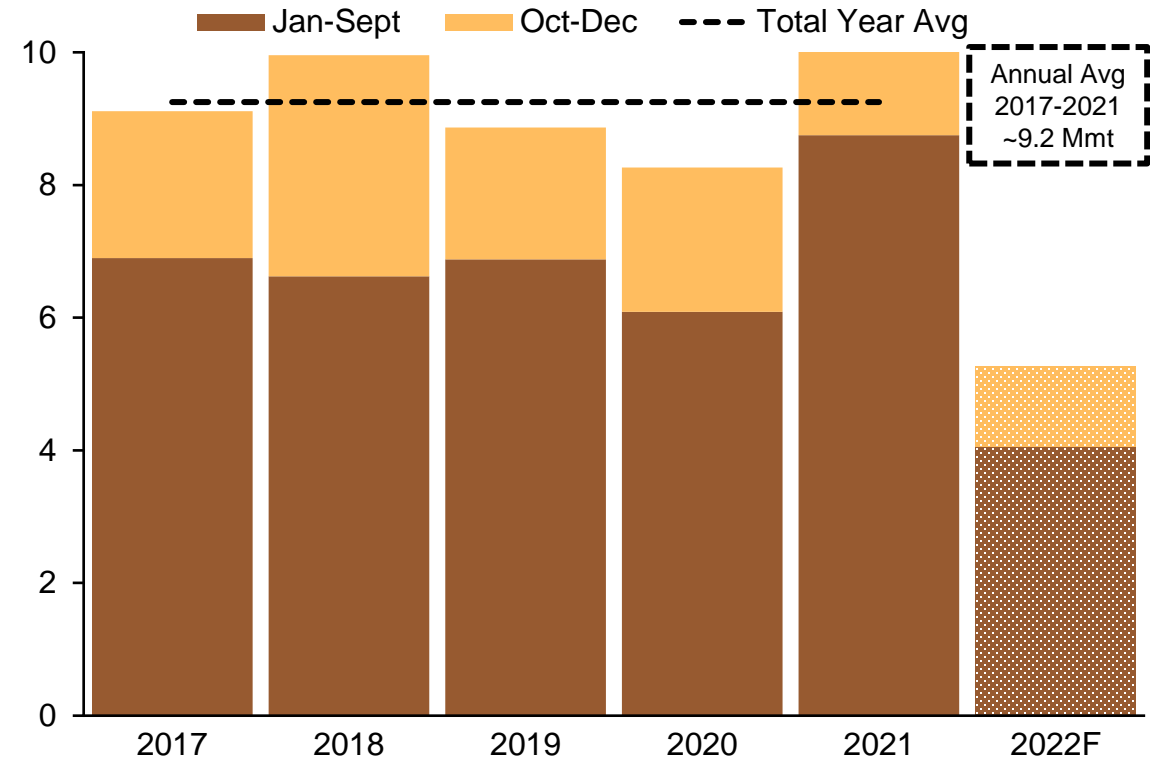
## China Urea Exports

Millions of Tonnes



## China DAP/MAP Exports

Millions of Tonnes



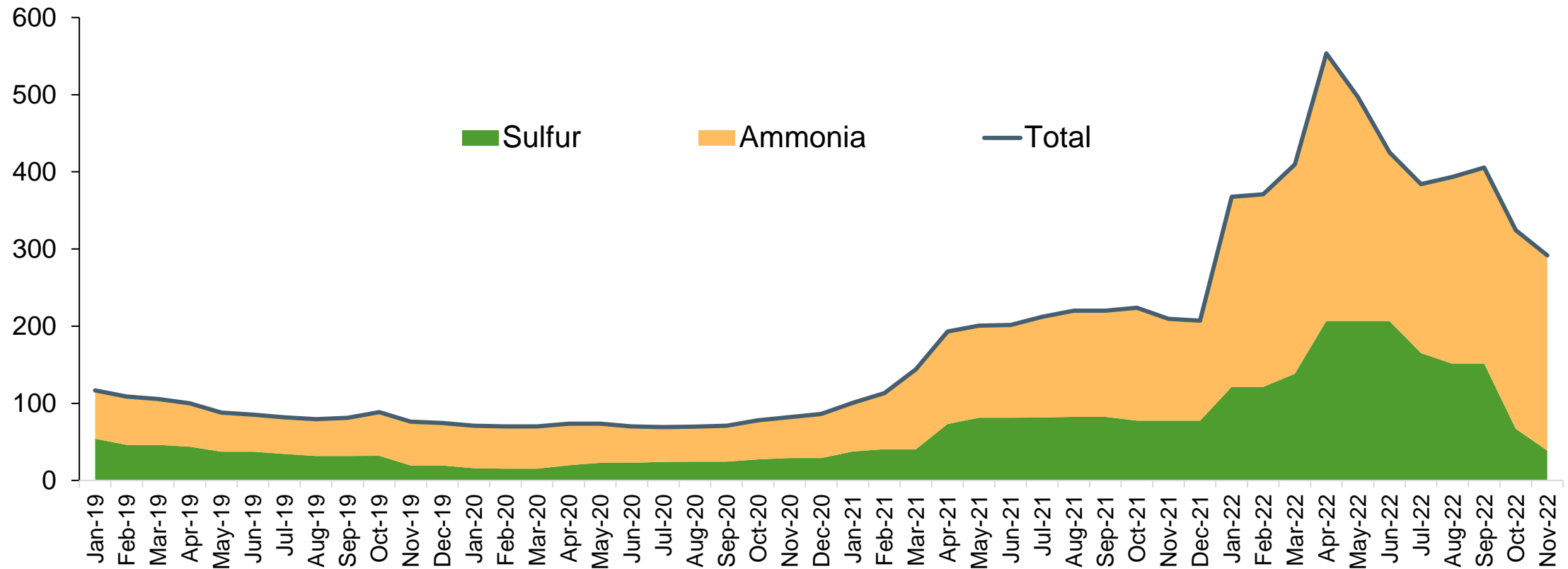
# Higher Input Costs Impact Phosphate Pricing



*DAP/MAP production costs impacted by higher sulfur and ammonia pricing, relative to history*

## Historical Proxy SE US DAP, Sulfur & Ammonia Costs

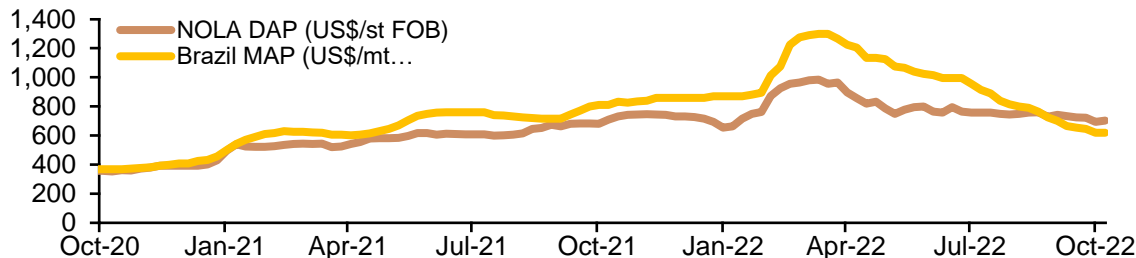
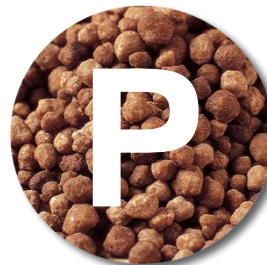
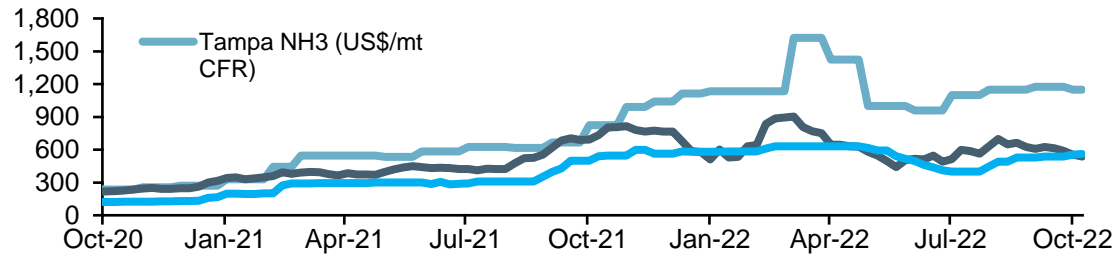
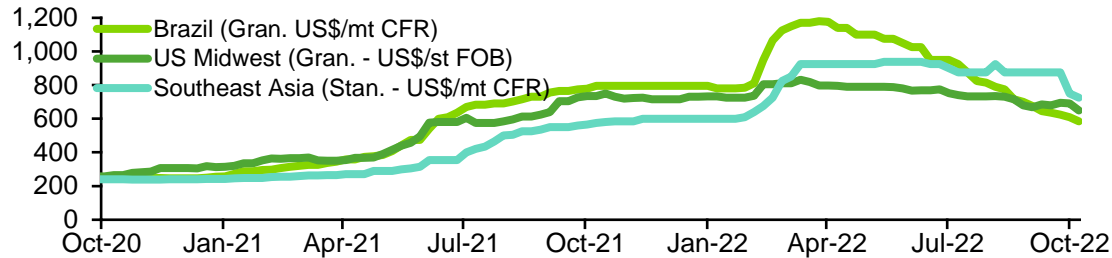
\$/tonne



*Fertilizer prices weakened following Northern Hemisphere spring planting, but remain historically high*

## Selected Fertilizer Prices

US\$ per Unit



## Fertilizer Market Drivers

- ❑ Potash shipments from Belarus are projected to be down 50 to 60 percent and Russia down 20 to 25 percent in 2022 compared to the prior year
- ❑ Expect robust agricultural fundamentals will support increased global potash consumption in 2023 and pent-up demand will emerge as inventories are drawn down and prices stabilize.
- ❑ Historically high European natural gas prices have led to significant curtailments of ammonia and downstream nitrogen products
- ❑ Shifts in nitrogen global trade flows have led to higher US exports and lower import volumes
- ❑ Chinese export restrictions have limited exports in 2022 and are expected to persist into 2023
- ❑ Lower Chinese operating rates have contributed to relatively tight global phosphate supplies

- Will move away from fossil fuels affect global sulfur supplies?

Received: 1 December 2021 | Revised: 7 July 2022 | Accepted: 25 July 2022  
DOI: 10.1111/geoj.12475

ARTICLE



## Sulfur: A potential resource crisis that could stifle green technology and threaten food security as the world decarbonises

Mark Maslin<sup>1</sup>  | Livia Van Heerde<sup>1</sup> | Simon Day<sup>2</sup>

- How will low-carbon ammonia as a fuel affect nitrogen supply/demand balance?

PETROCHEMICALS

## Is ammonia the fuel of the future?

Industry sees the agricultural chemical as a convenient means to transport hydrogen

by **Alexander H. Tullo**

March 8, 2021 | A version of this story appeared in **Volume 99, Issue 8**

## Ammonia as fuel

- A path to zero carbon emissions?
- Potential to replace fossil fuels?
- Producing  $\text{NH}_3$  ( $\text{H}_2$ ) from renewable energy
- Ammonia as hydrogen carrier or direct combustion
- Safer and easier to transport and store
- Existing infrastructure
- Can be mixed with natural gas for some applications

## Ammonia as fertilizer

- Haber-Bosch ammonia synthesis has significant carbon footprint
- Major contributor to agricultural carbon emissions
- Pressure on fertilizer producers to reduce emissions footprint

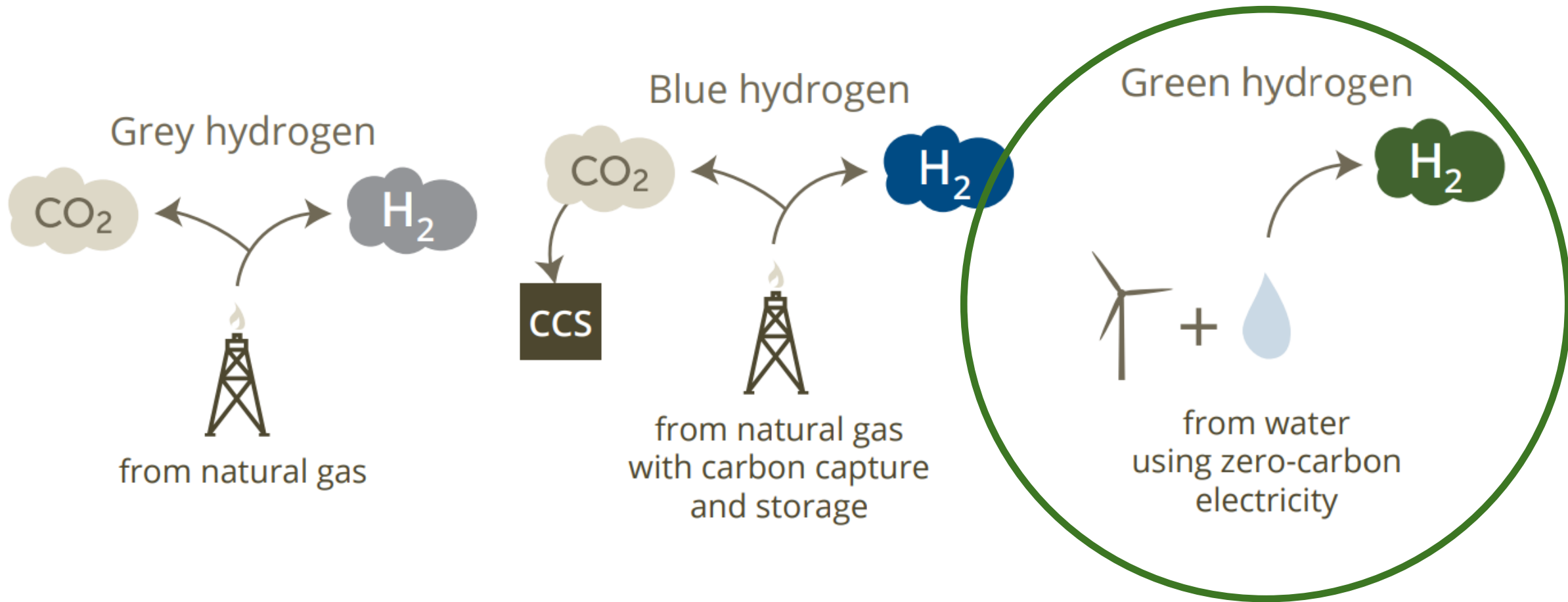
Shipping is 2% of global emissions of which 80% is long-distance (ie marine)

Converting to H<sub>2</sub> (NH<sub>3</sub>) could require **500-600 millions** tons ammonia

What is the environmental impact of three to four times current reactive nitrogen load?



# Primary Ammonia Synthesis Processes



How does agriculture deal with the greatly increased cost (2-5x current)?

Where does the energy come from for the quantity of ammonia needed?

How can nuclear energy play a role?

Will the reduced transportation costs of localized production offset the higher costs?

Can many smaller localized facilities meet peak ammonia demand periods?

How will competing energy demands affect fertilizer supply/demand balance?

Strong global demand for commodities supports high crop & input prices

China push for higher yields/grain imports to rebuild swine herds

Energy volatility has increased

Skyrocketing energy costs in Europe and China

Production curtailments resulting from high energy costs

Low fertilizer-commodity inventories in key global markets

Sanctions on Belarus and Russian potash

Tariffs on Moroccan phosphate

Growers must continue to implement best management practices (4Rs) to promote optimum nutrient use efficiency.

Soil test to know what is needed

Proper placement and timing

Proper nutrient balance

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