Chemicals for the Non-Chemist

Plant Nutrients and Plant Nutrient Markets

Citi Basic Materials Conference
New York, NY
December 2, 2019

Andy J. Jung
VP, Market and Strategic Analysis

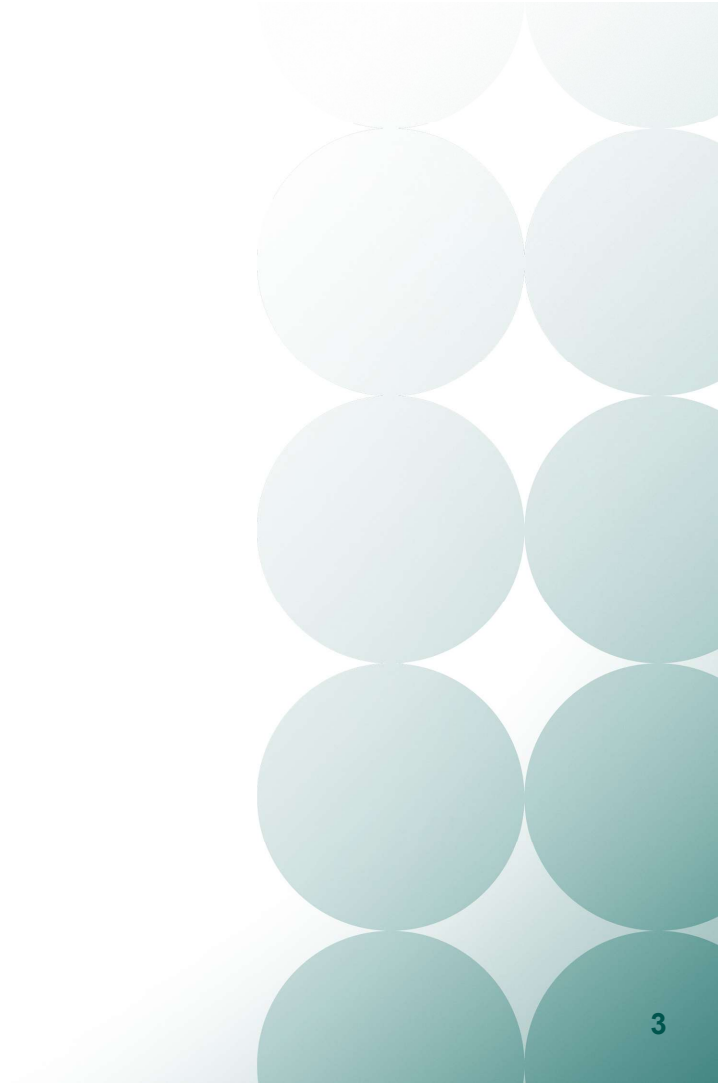
Mosaic

Forward Looking Statements

This release contains forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995. Such statements include, but are not limited to, statements about the anticipated benefits and synergies of our acquisition of the global phosphate and potash operations of Vale S.A. conducted through Vale Fertilizantes S.A. (now known as Mosaic Fertilizantes P&K Ltda) (the "Transaction"), other proposed or pending future transactions or strategic plans and other statements about future financial and operating results, fall fertilizer estimates and the benefits of the curtailment of potash and phosphates production. Such statements are based upon the current beliefs and expectations of The Mosaic Company's management and are subject to significant risks and uncertainties. These risks and uncertainties include, but are not limited to: difficulties with realization of the benefits and synergies of the Transaction, including the risks that the acquired business may not be integrated successfully or that the anticipated synergies or cost or capital expenditure savings from the Transaction may not be fully realized or may take longer to realize than expected, including because of political and economic instability in Brazil or changes in government policy in Brazil, such as higher costs associated with the new mining rules and remediation efforts, or the implementation of new freight tables; the predictability and volatility of, and customer expectations about, agriculture, fertilizer, raw material, energy and transportation markets that are subject to competitive and other pressures and economic and credit market conditions; the level of inventories in the distribution channels for crop nutrients; the effect of future product innovations or development of new technologies on demand for our products; changes in foreign currency and exchange rates; international trade risks and other risks associated with Mosaic's international operations and those of joint ventures in which Mosaic participates, including the performance of the Ma'aden Wa'ad Al Shamal Phosphate Company (also known as MWSPC), the ability of MWSPC to obtain additional planned funding in acceptable amounts and upon acceptable terms, the timely development and commencement of operations of production facilities in the Kingdom of Saudi Arabia, and the future success of current plans for MWSPC and any future changes in those plans; the risk that protests against natural resource companies in Peru extend to or impact the Miski Mayo mine, which is operated by an entity in which we are the majority owner; difficulties with realization of the benefits of our long term natural gas based pricing ammonia supply agreement with CF Industries, Inc., including the risk that the cost savings initially anticipated from the agreement may not be fully realized over its term or that the price of natural gas or ammonia during the term are at levels at which the pricing is disadvantageous to Mosaic; customer defaults; the effects of Mosaic's decisions to exit business operations or locations; changes in government policy; changes in environmental and other governmental regulation, including expansion of the types and extent of water resources regulated under federal law, carbon taxes or other greenhouse gas regulation, implementation of numeric water quality standards for the discharge of nutrients into Florida waterways or efforts to reduce the flow of excess nutrients into the Mississippi River basin, the Gulf of Mexico or elsewhere; further developments in judicial or administrative proceedings, or complaints that Mosaic's operations are adversely impacting nearby farms, business operations or properties; difficulties or delays in receiving, increased costs of or challenges to necessary governmental permits or approvals or increased financial assurance requirements; resolution of global tax audit activity; the effectiveness of Mosaic's processes for managing its strategic priorities; adverse weather conditions affecting operations in Central Florida, the Mississippi River basin, the Gulf Coast of the United States, Canada or Brazil, and including potential hurricanes, excess heat, cold, snow, rainfall or drought; actual costs of various items differing from management's current estimates, including, among others, asset retirement, environmental remediation, reclamation or other environmental regulation, Canadian resources taxes and royalties, or the costs of the MWSPC, its existing or future funding and Mosaic's commitments in support of such funding; reduction of Mosaic's available cash and liquidity, and increased leverage, due to its use of cash and/or available debt capacity to fund financial assurance requirements and strategic investments; brine inflows at Mosaic's Esterhazy, Saskatchewan, potash mine or other potash shaft mines; other accidents and disruptions involving Mosaic's operations, including potential mine fires, floods, explosions, seismic events, sinkholes or releases of hazardous or volatile chemicals; and risks associated with cyber security, including reputational loss; as well as other risks and uncertainties reported from time to time in The Mosaic Company's reports filed with the Securities and Exchange Commission. Actual results may differ from those set forth in the forward-looking statements.

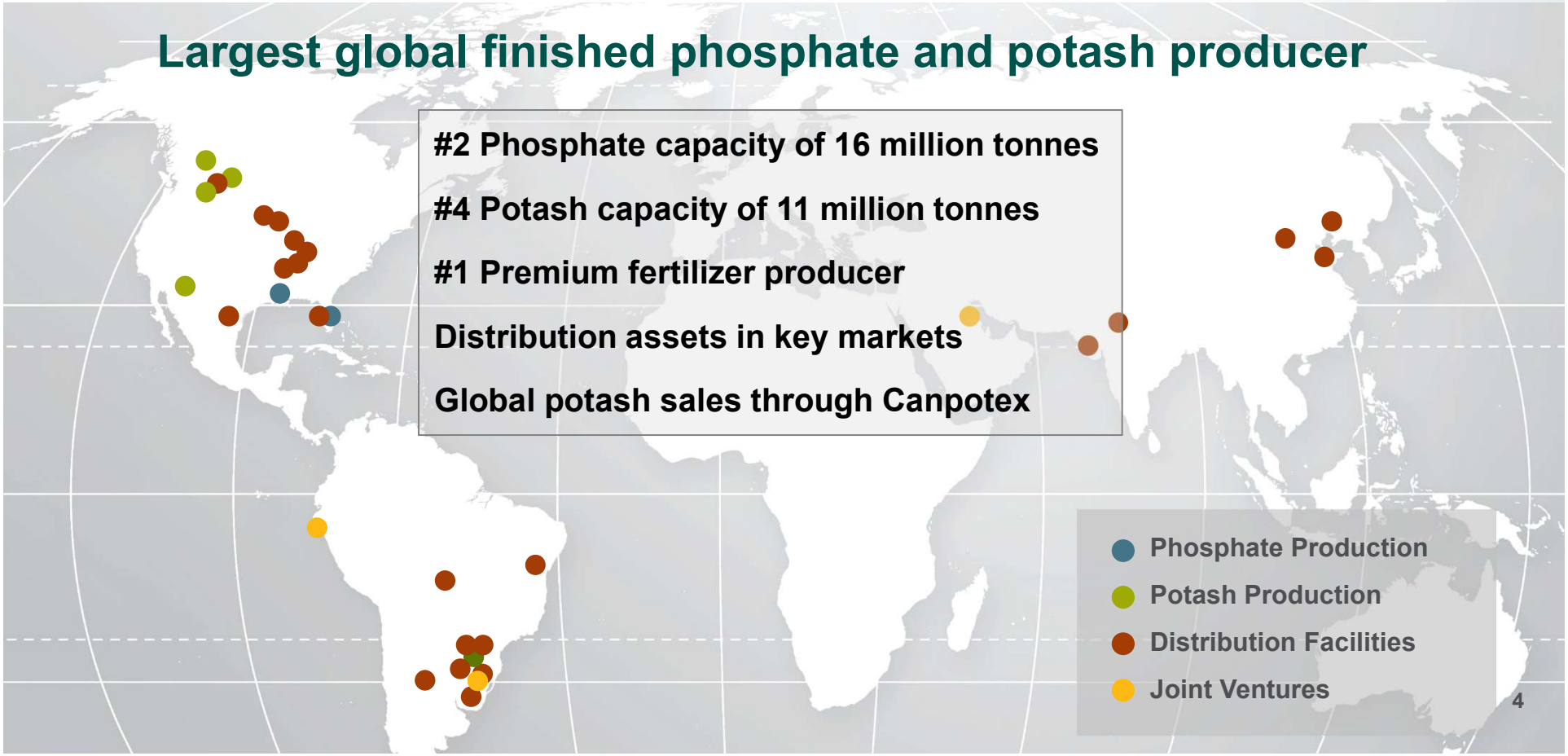
Mosaic

The Mosaic Company

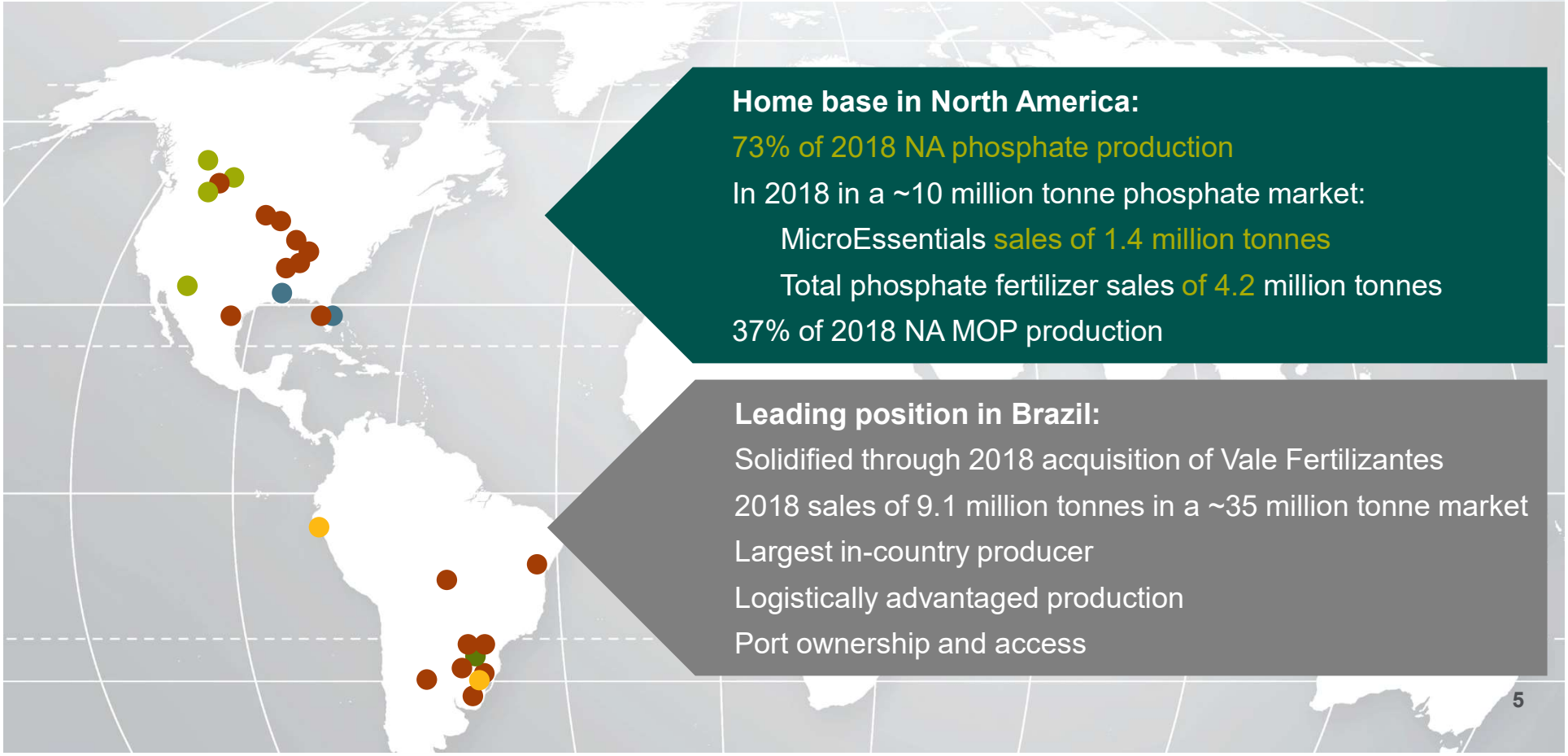


High Quality Asset Portfolio

Largest global finished phosphate and potash producer



Focused on The Americas



Home base in North America:

73% of 2018 NA phosphate production

In 2018 in a ~10 million tonne phosphate market:

- MicroEssentials sales of 1.4 million tonnes
- Total phosphate fertilizer sales of 4.2 million tonnes

37% of 2018 NA MOP production

Leading position in Brazil:

Solidified through 2018 acquisition of Vale Fertilizantes

2018 sales of 9.1 million tonnes in a ~35 million tonne market

Largest in-country producer

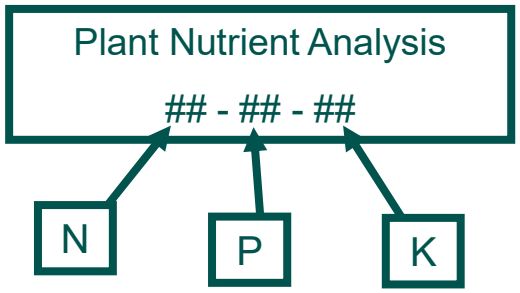
Logistically advantaged production

Port ownership and access

Plant Nutrients and Plant Nutrient Products

Plant Nutrients

- Plant nutrients are plant food
  (and common chemical elements)
- 17 chemical elements are required for plant growth
- N-P-K: the carbohydrates-protein-fat in a plant's diet
- Growing importance of secondary nutrients and micronutrients, especially in high yield systems
- Each plant nutrient product is identified by three numbers, referred to as its "analysis" – the percentage of each primary nutrient contained in a unit of the product





The Nutrient Challenge: Maintaining Soil Fertility AND Safeguarding the Environment

- Soil fertility is maintained by replenishing the nutrients removed by crops each year by following best practices and the 4-Rs

4 nutrient stewardship

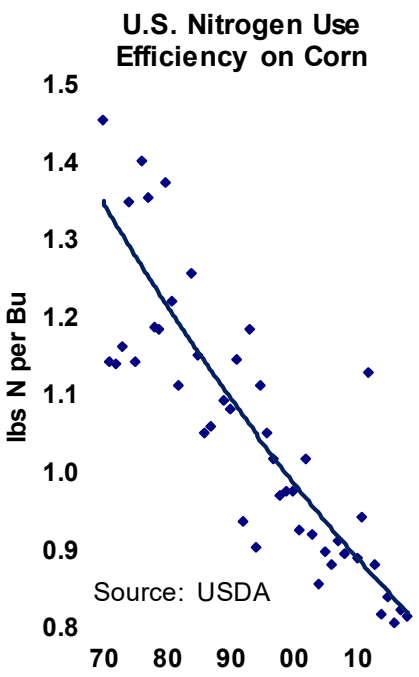
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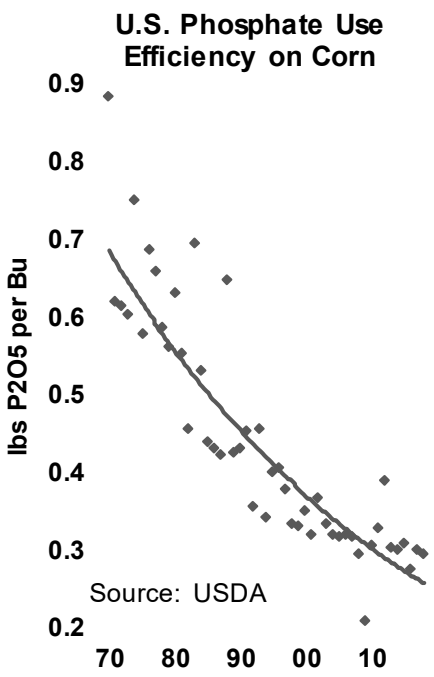
Nutrient Removal by Crop

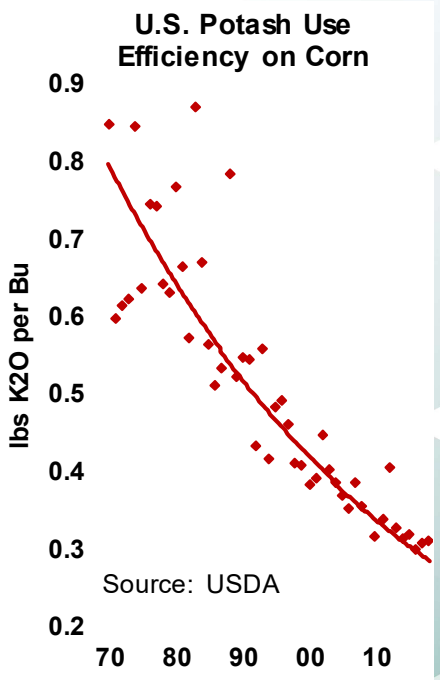
lbs Acre	N	P_2O_5	K_2O	S
Corn - 200 Bu Acre Yield				
Grain	180	76	54	16
Stalks	90	32	220	14
Total	270	108	274	30
Soybeans - 70 Bu Acre Yield				
Grain	266	59	91	13
Stover	77	17	70	12
Total	343	76	161	25
Wheat - 80 Bu Acre Yield				
Grain	120	48	27	8
Straw	56	13	96	11
Total	176	61	123	19

Source: IPNI

Increasing Efficacy of Plant Nutrient Use
(nearing maximum efficiency in the U.S.)



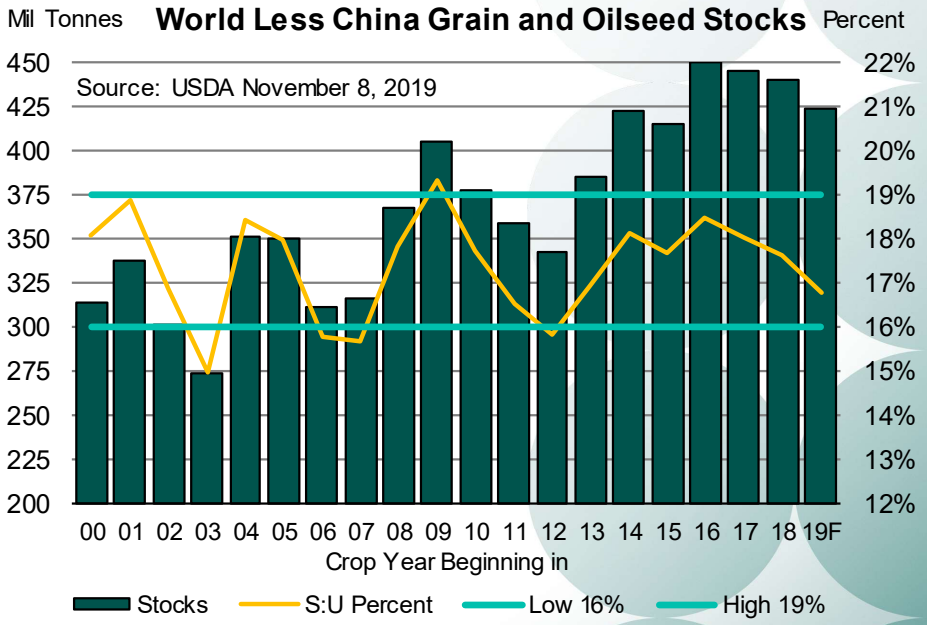




- **U.S. farmers today are harvesting more than 2x corn per acre with the same amount of commercial plant nutrients applied per acre in 1970!**

Positive Demand Driver: Continued Ag Growth

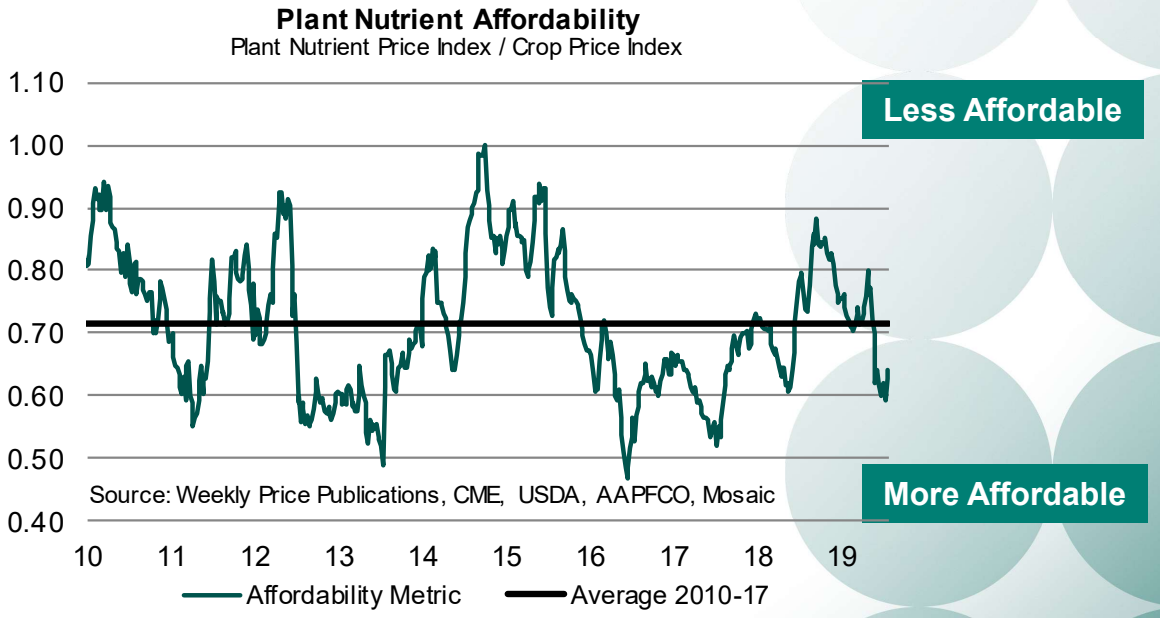
- Strong and steady demand growth
- Stocks as a percentage of use projected to drop to less than 17% by the end of 2019/20
- **The Food Story remains intact** – the world will continue to need to plant more area and increase yields to meet grain and oilseed demand.



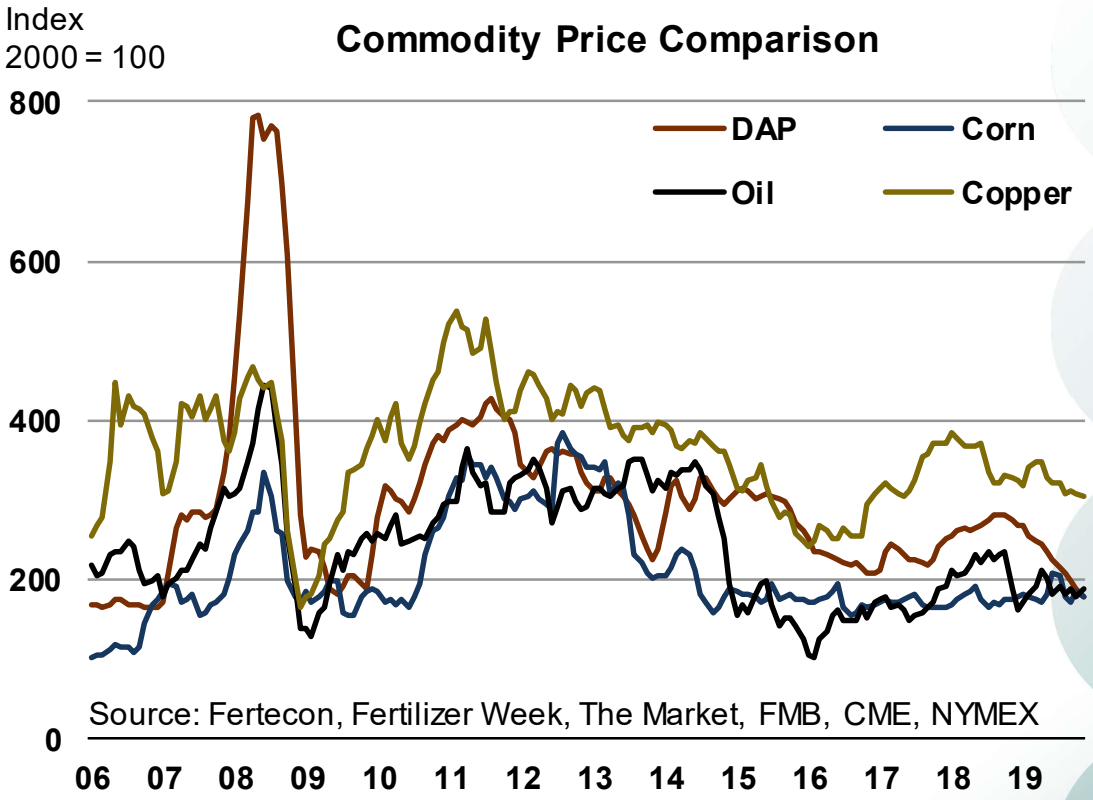
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Positive Demand Driver: Affordable Nutrients

- Agronomic necessity to replenish NPK removed by big consecutive harvests worldwide
- 'OK' agricultural commodity prices prevailing today
  - Very affordable NPK prices relative to ag commodity prices



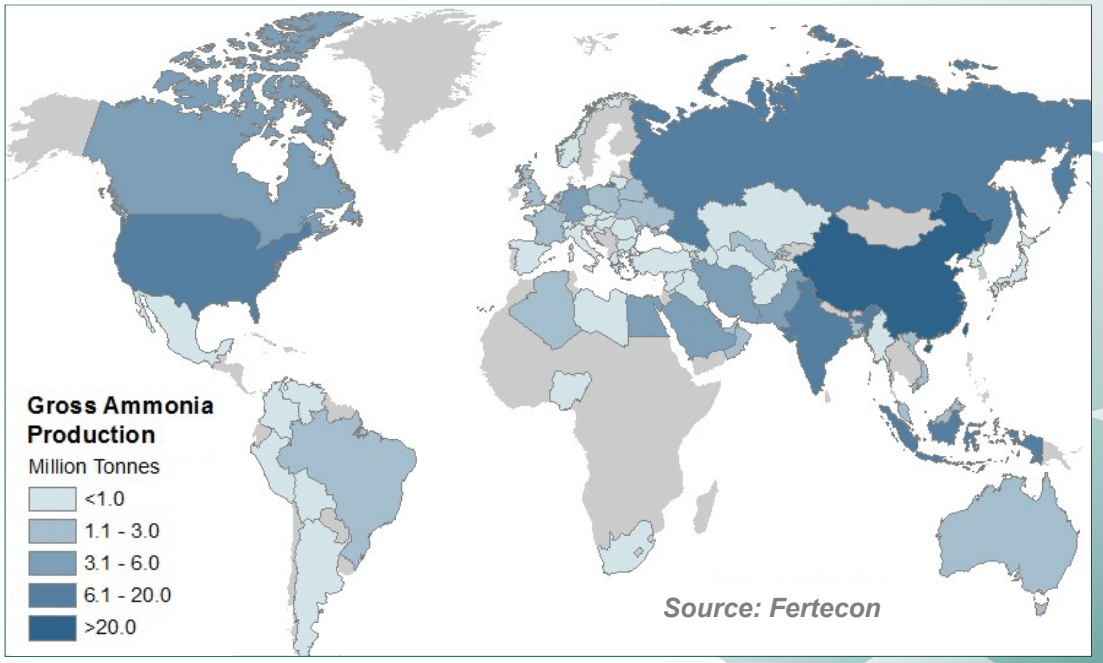
Reminder: Commodity Markets are Cyclical

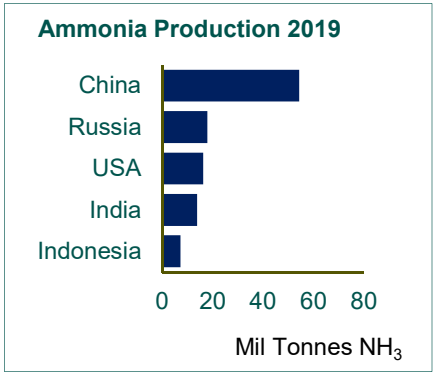


Nitrogen

Primary Nutrient Overview: Nitrogen (N)

- Production process: Energy intensive Haber-Bosch process to synthesize ammonia (NH3) from:
  - Inert atmospheric N + H that is typically sourced from hydrocarbon feedstock (~3/4 is natural gas)
- 2019 global use estimates (Fertecon)
  - About 181 million tonnes ammonia produced, with ~75% used for fertilizers

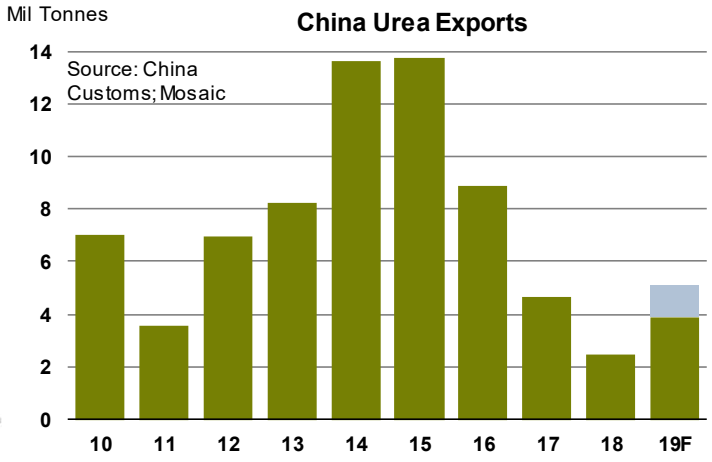




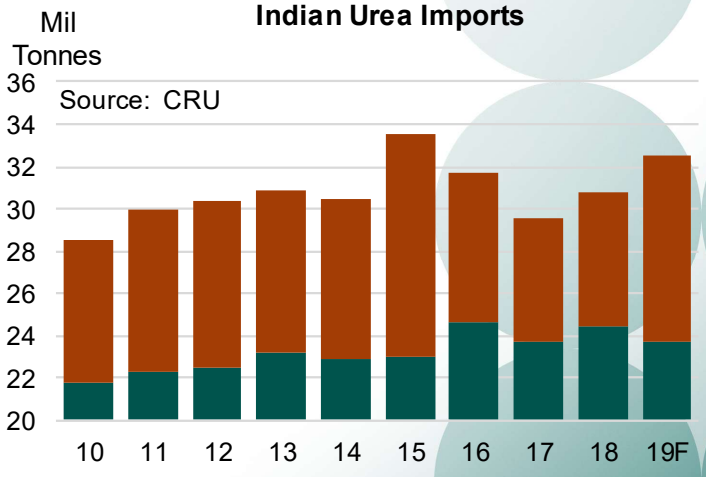
Source: Fertecon

Nitrogen Factors to Watch

- **Chinese urea production** and exports, with the latter expected to more than double in 2019
  - Coal prices
  - Decontrol of natural gas prices
  - Environmental regulations

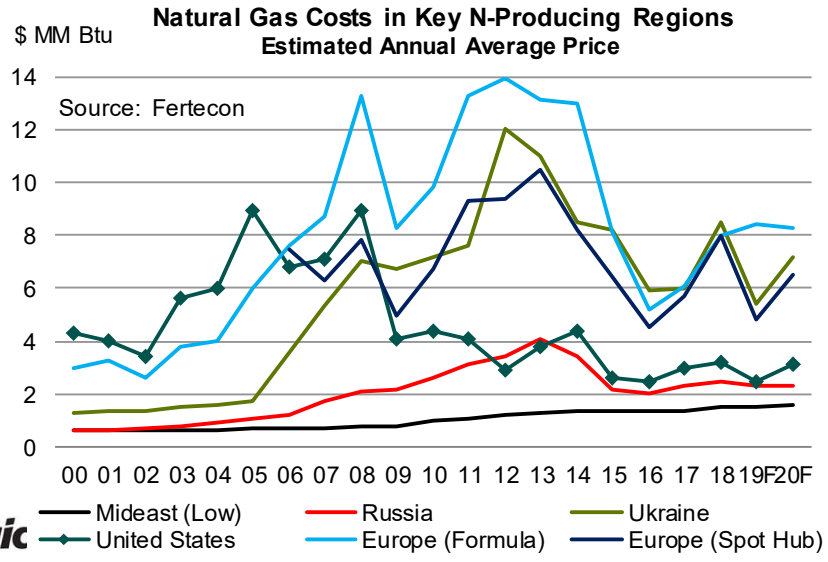


- **Demand** drivers
  - Agricultural commodity prices
  - Nitrogen use efficiency gains in China / India
  - New substitute technology for HB process
- **Indian policies**
  - Nitrogen subsidy
  - Make-in-India initiatives (the restart idled plants)

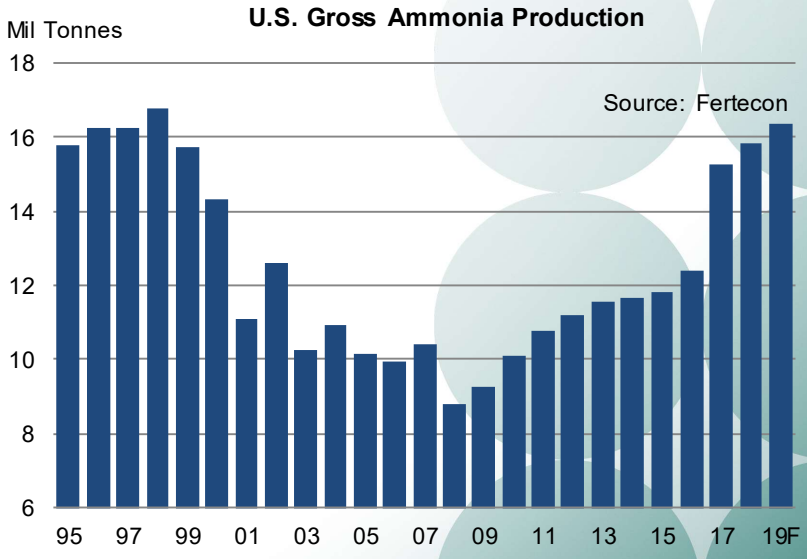


Nitrogen Factors to Watch

- **Feedstock Costs**
  - European gas costs sharply higher in ‘18
  - Convergence towards other benchmarks in ‘19
  - Some analysts forecast divergence in ‘20 (supporting higher ammonia pricing)



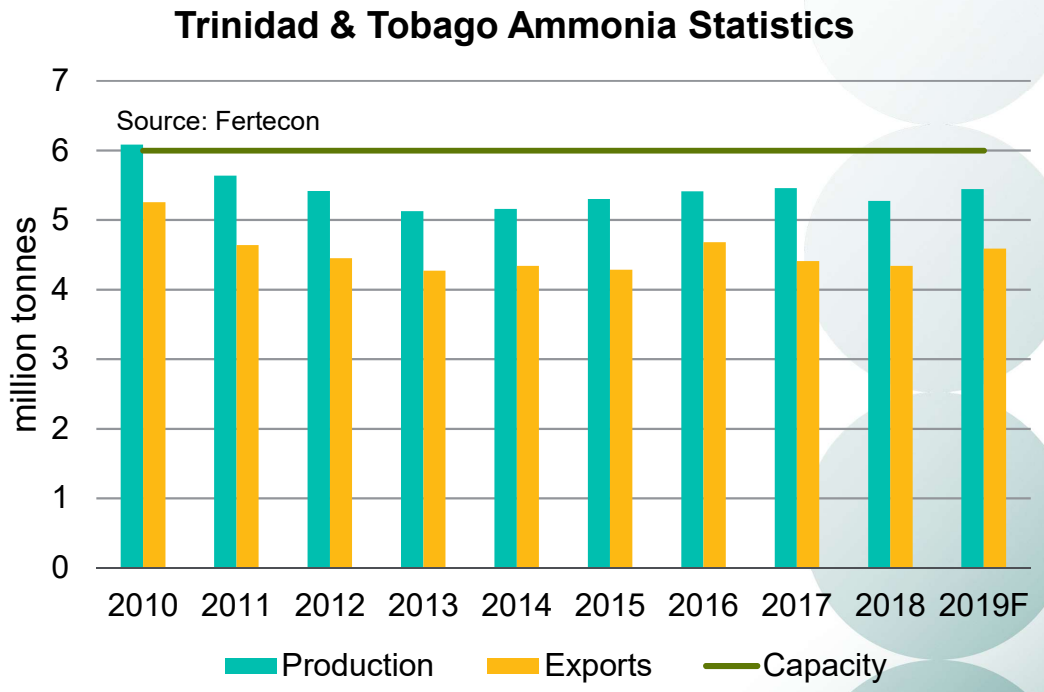
- Absorption of **new capacity**
  - USA – a new normal at ~16mmt
  - Ramp ups in FSU, Africa and India



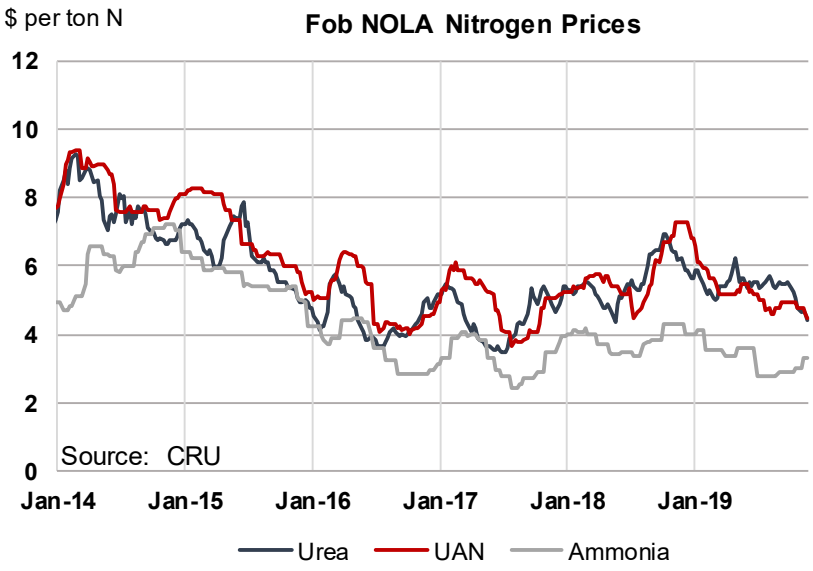
Mosaic

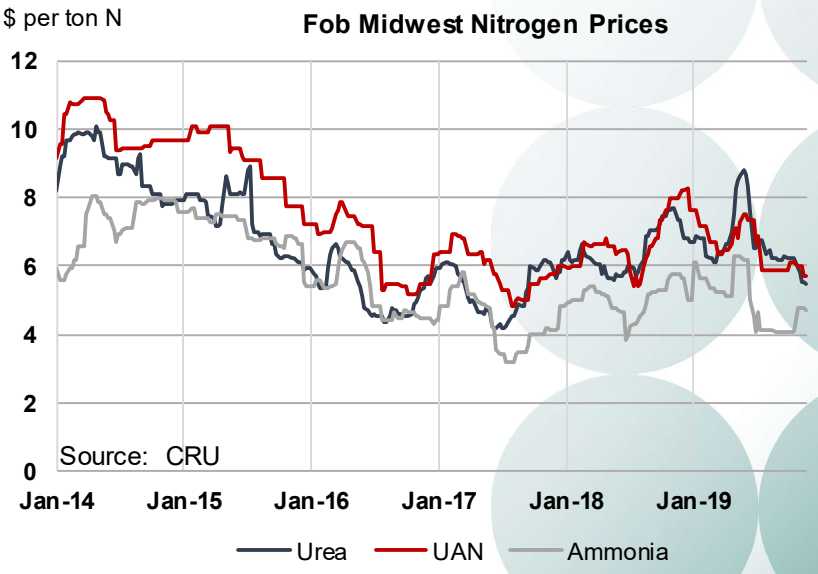
Nitrogen Factors to Watch: Trinidad Supply

- Production has been rangebound for a decade
- Yara announces closure of small 270ktpa plant
- Could a similar fate befall others?
  - Even if so (which we deem unlikely), there are also potential supply offsets elsewhere



Nitrogen Factors to Watch: Product switching

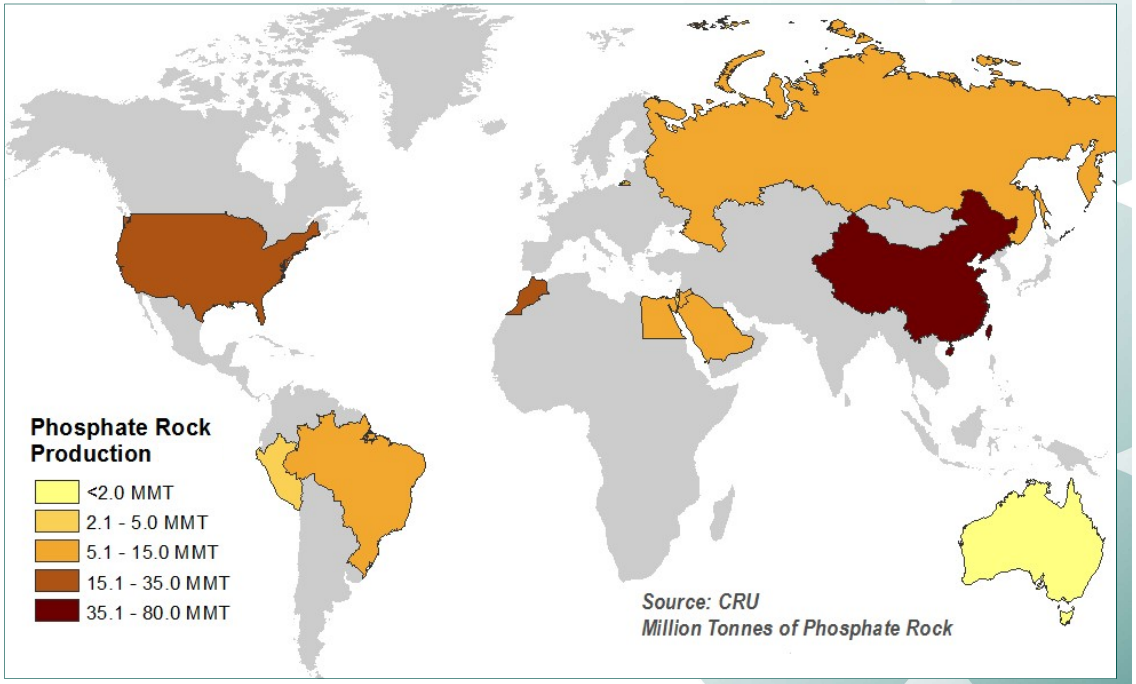


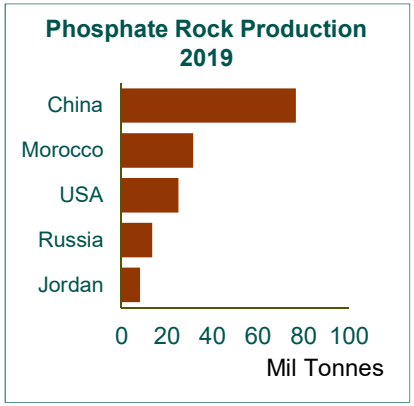


Phosphate

Primary Nutrient Overview: Phosphorus (P)

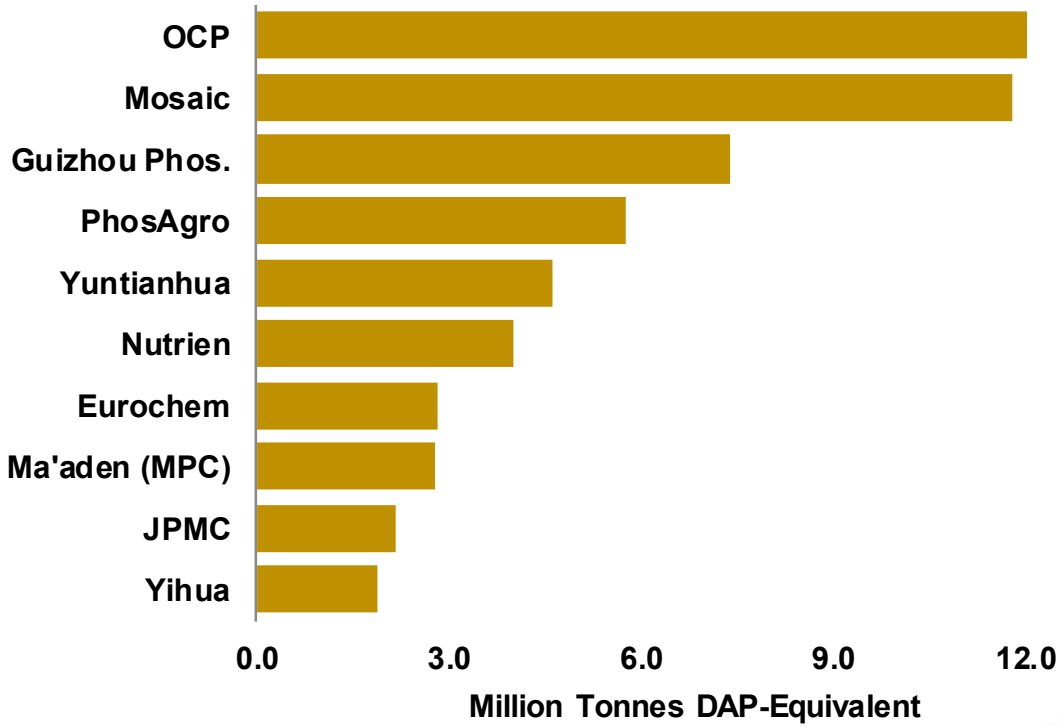
- Production process – making phosphorus water soluble
- Key inputs: phosphate rock mineral ore, sulphur and ammonia
- Intermediate product: phosphoric acid (for most products)
- 2019 global use estimates (CRU; Mosaic)
  - Ag: ~45 mmt P_2O_5 or ~87% of total
  - Feed/Industrial: ~7 mmt P_2O_5 or ~13% of total





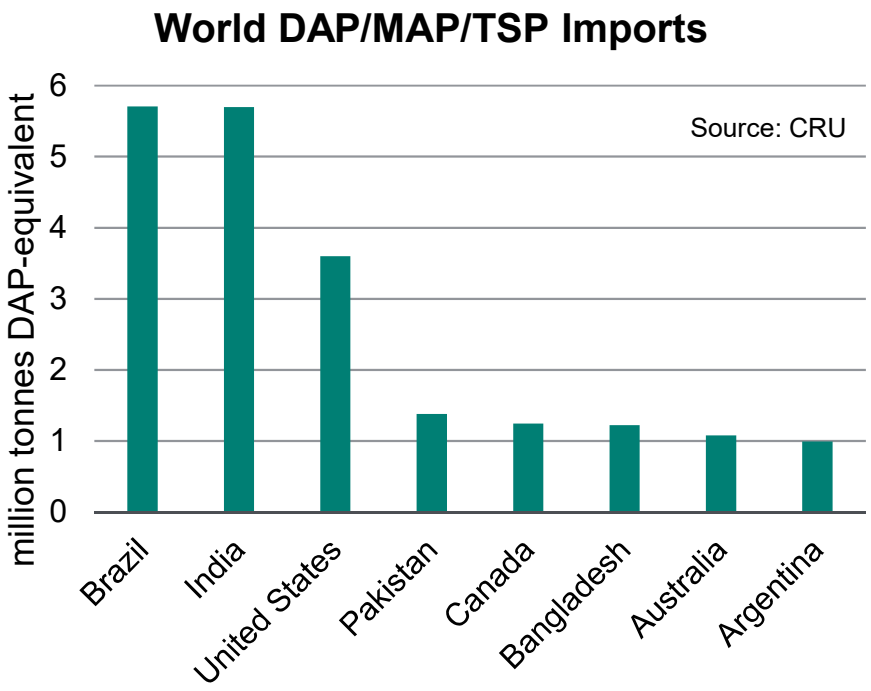
Source: CRU

Phosphate Fertilizer Producers Top 10

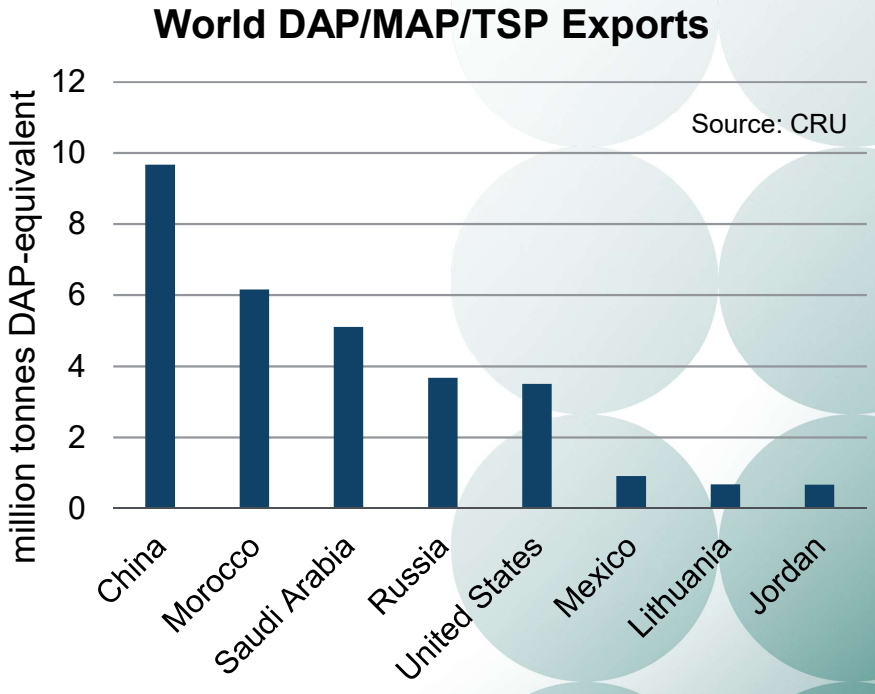


Based on 2018 production
P_2O_5 production based on PACID and SSP production
Source: Company reports, IFA, CRU, and Mosaic

Key 2019 Phosphate Trade Flows (DAP/MAP/TSP)

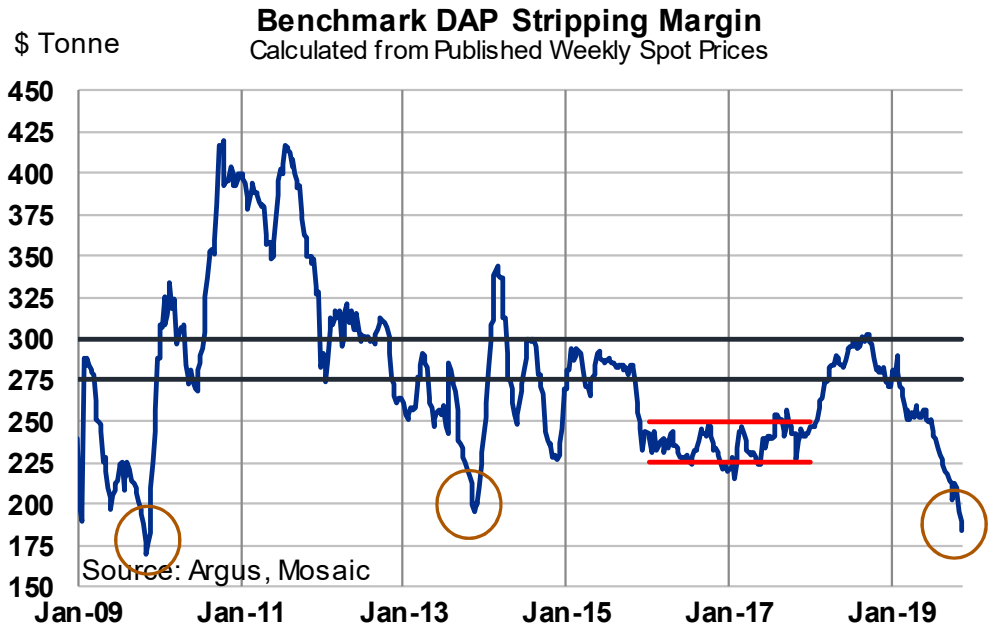


- Top 8 countries represent 63% of imports



- Top 8 countries represent 92% of exports

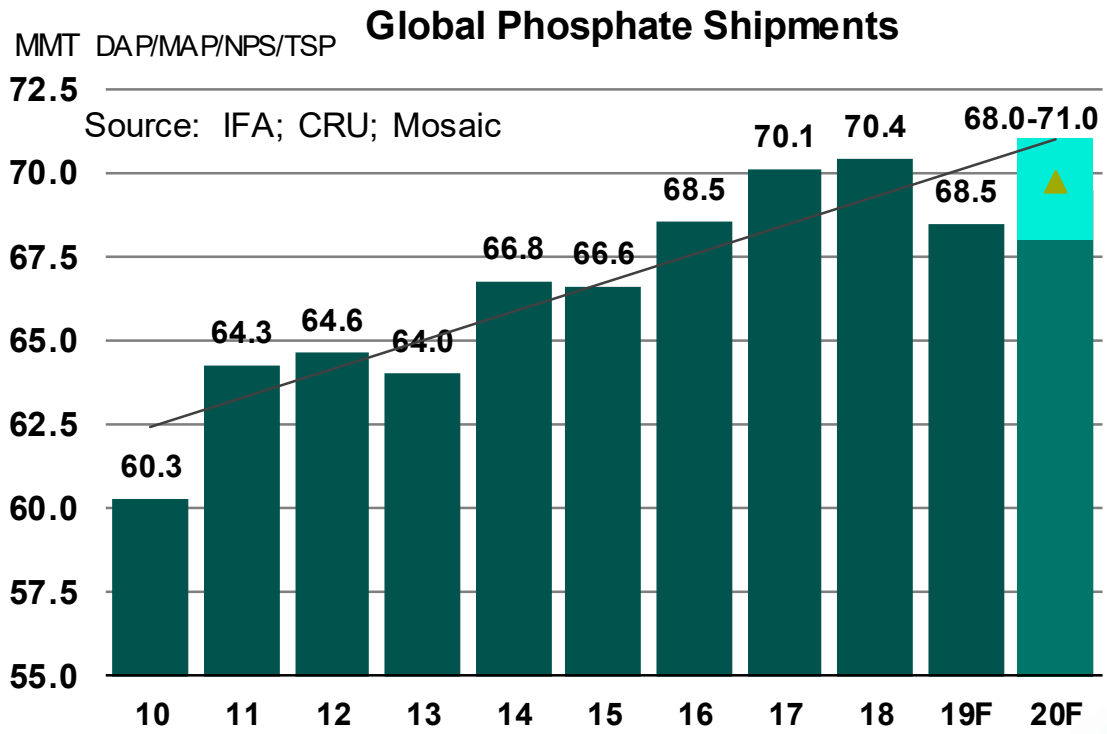
Phosphate Margins At Unsustainable Level



We calculate a DAP benchmark stripping margin from published spot prices for DAP, sulphur and ammonia. It is a gauge that registers fundamental changes in the phosphate market over time and is not intended to approximate Mosaic's realized margins.

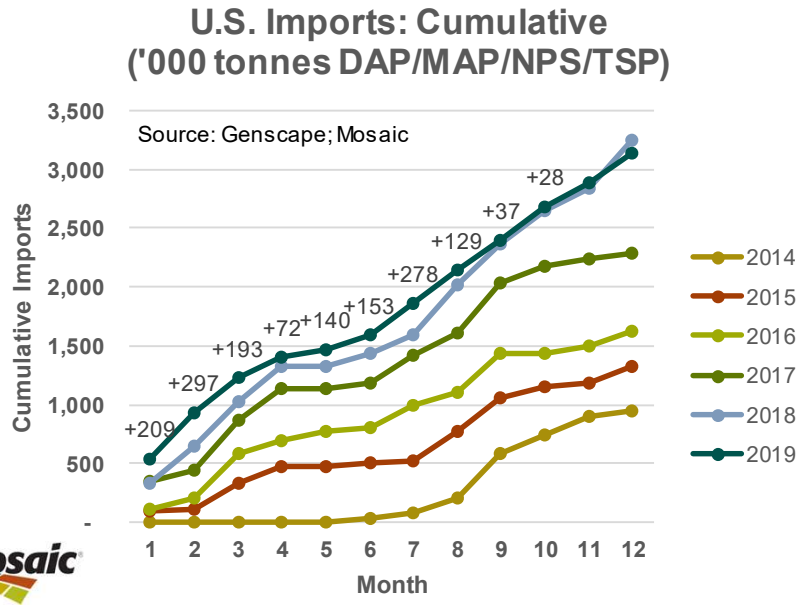
- The benchmark DAP margin has dipped below the $200/t threshold
- This is well below the $225-250/t channel that we have noted previously as unsustainable long-term
- In the past decade, there have been 3 instances where sub-$200/t has occurred, but note that the time spent below $200/t was short-lived and the rebound sharp

Projecting a moderate demand recovery in 2020

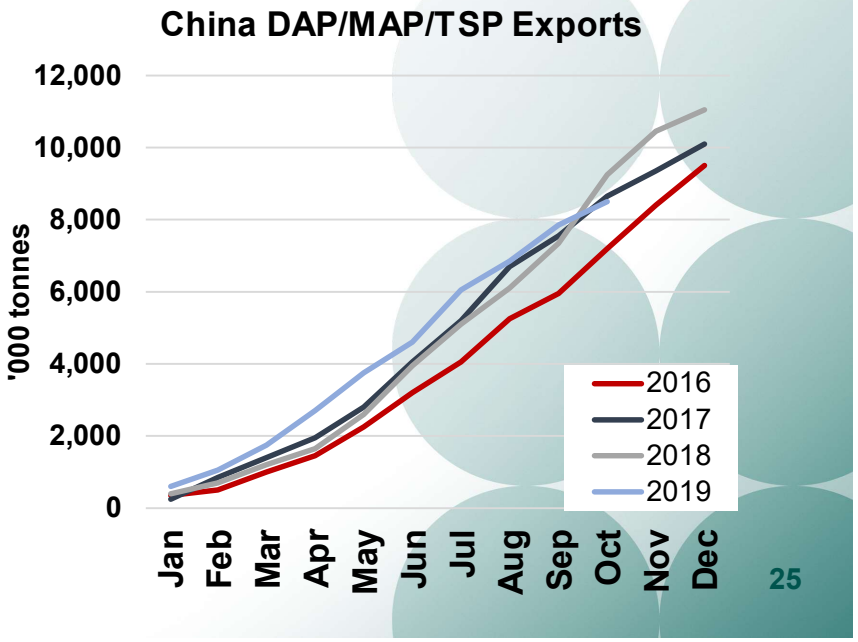


Phosphate Factors to Watch

- **U.S. imports**
  - Is ~3.25mmt the new normal?
  - Just one good season of demand to clear the channel and allow price recovery

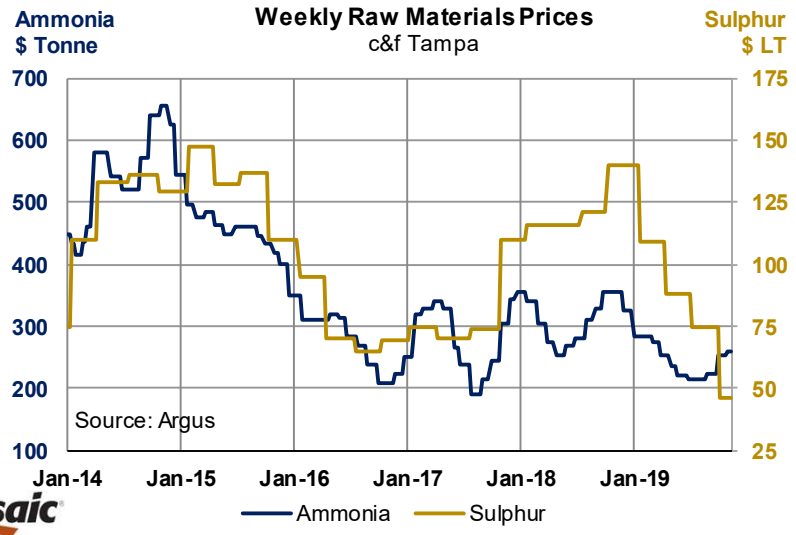


- **Chinese production and exports**
  - Market- and regulation-driven restructuring
  - Pace of DAP/MAP/TSP exports slowing – 8.5mmt Jan-Oct is down 8% y-o-y (~750,000 MT)

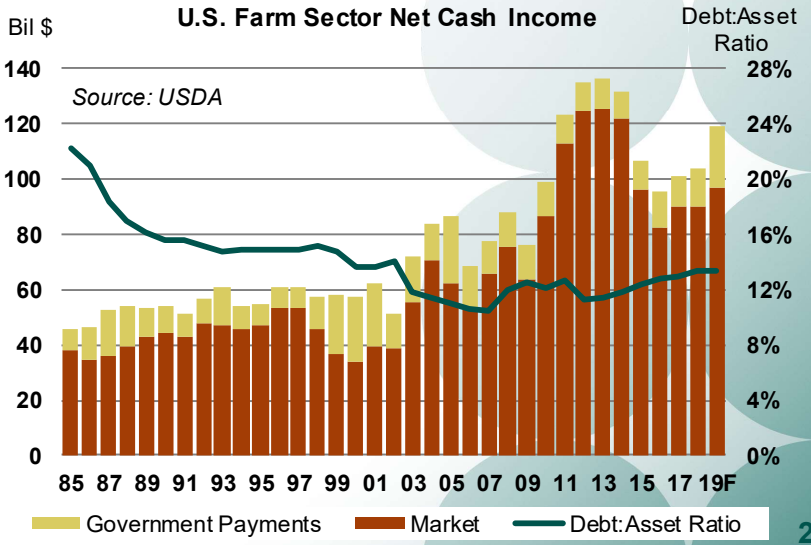


Phosphate Factors to Watch

- **Capacity ramp ups**
  - Little new capacity for the next couple of years
- **Raw materials costs**
  - Channel-bound ammonia
  - Sulphur looks to stay weak



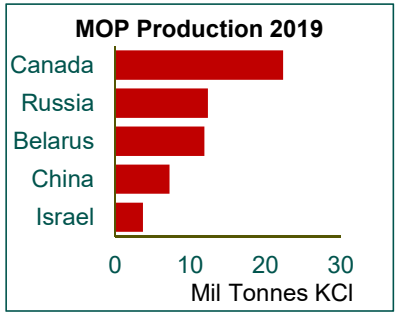
- **Demand** trends / drivers
  - Brazil keeps growing plus gains elsewhere
  - Balanced nutrient use initiatives
  - Agricultural commodity prices (U.S. ag economy remains healthy)



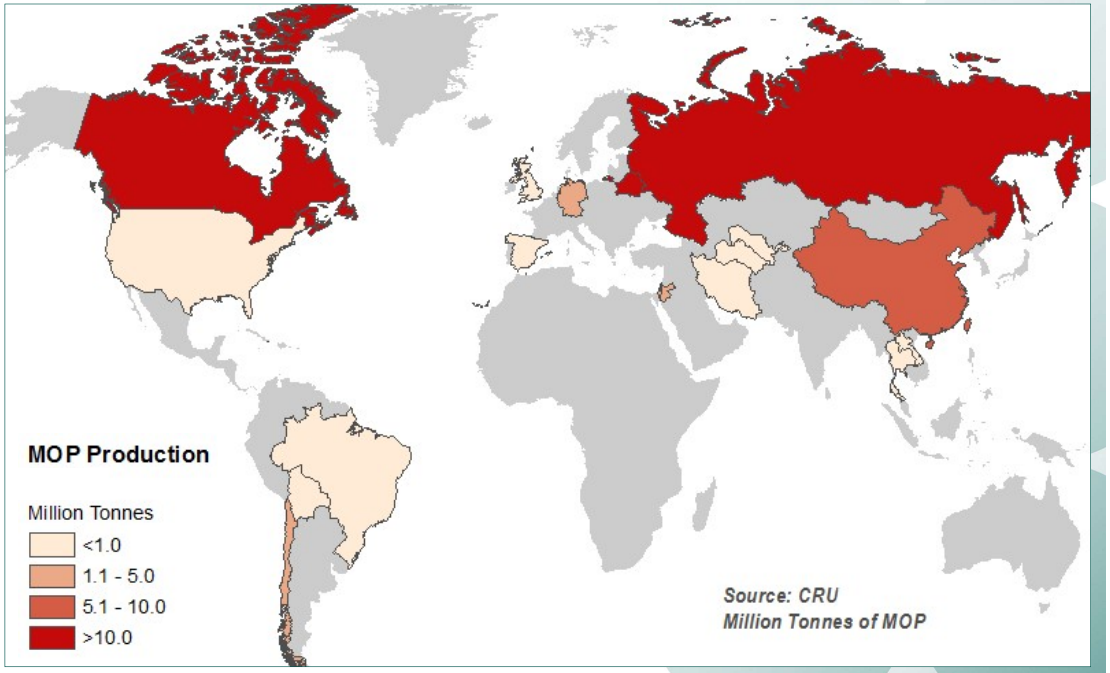
Potash

Primary Nutrient Overview: Potassium (K)

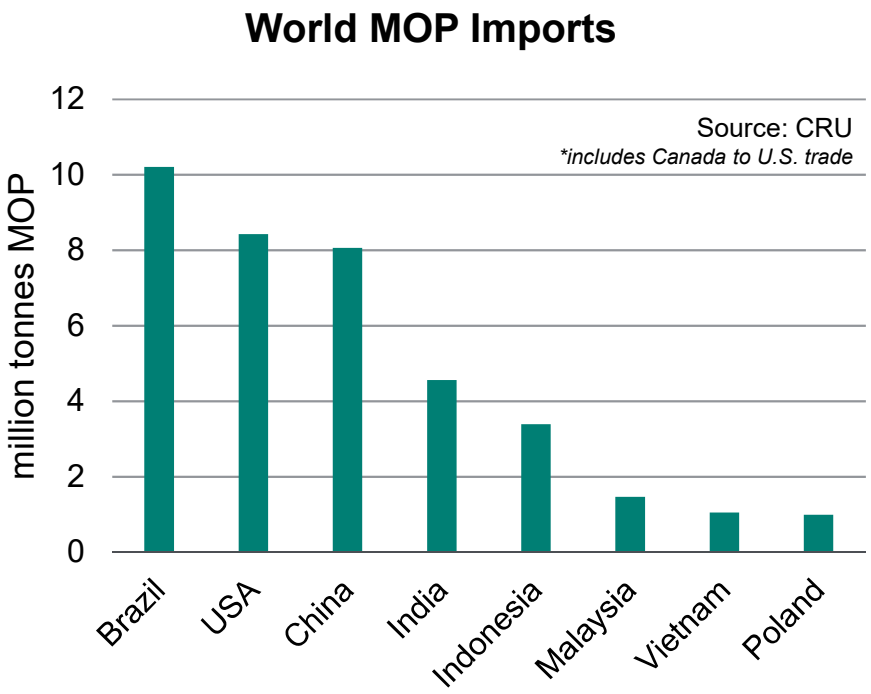
- Production process: separation processes with no chemical reaction
  - For sylvinite ore, KCl typically is separated from NaCl using flotation
- Key input: potash mineral ore
  - Shaft mines (~70% production)
  - Solution mines (~4% of production)
  - Surface brines (~26% or production)
- 2019 global use estimates (IFA; CRU; Mosaic)
  - Ag: ~34mmt K_2O (~83% of demand)
  - Industrial: ~7mmt K_2O (~17% of demand)

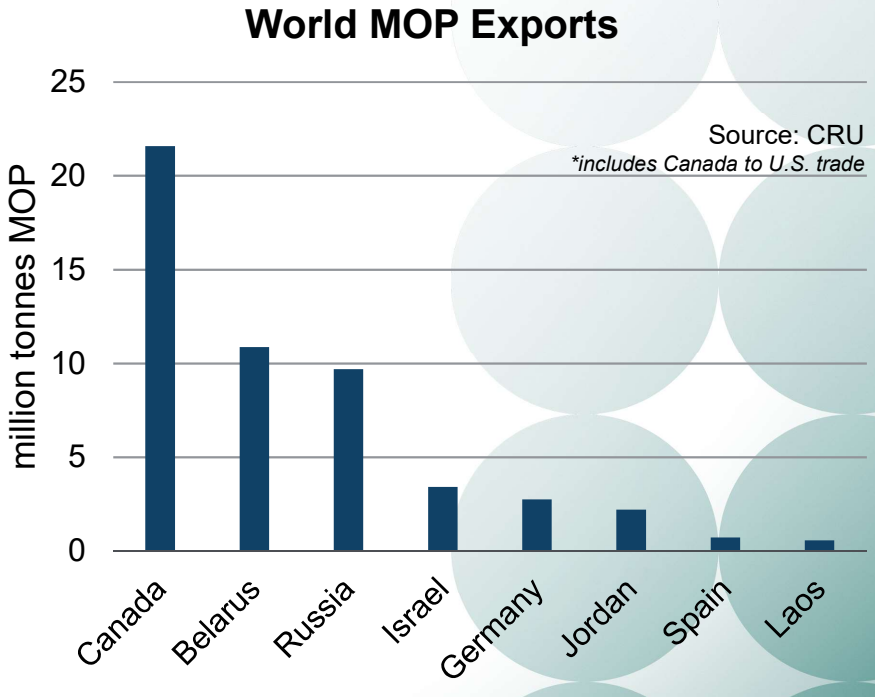


Source: CRU



Key 2019 Potash Trade Flows (MOP)

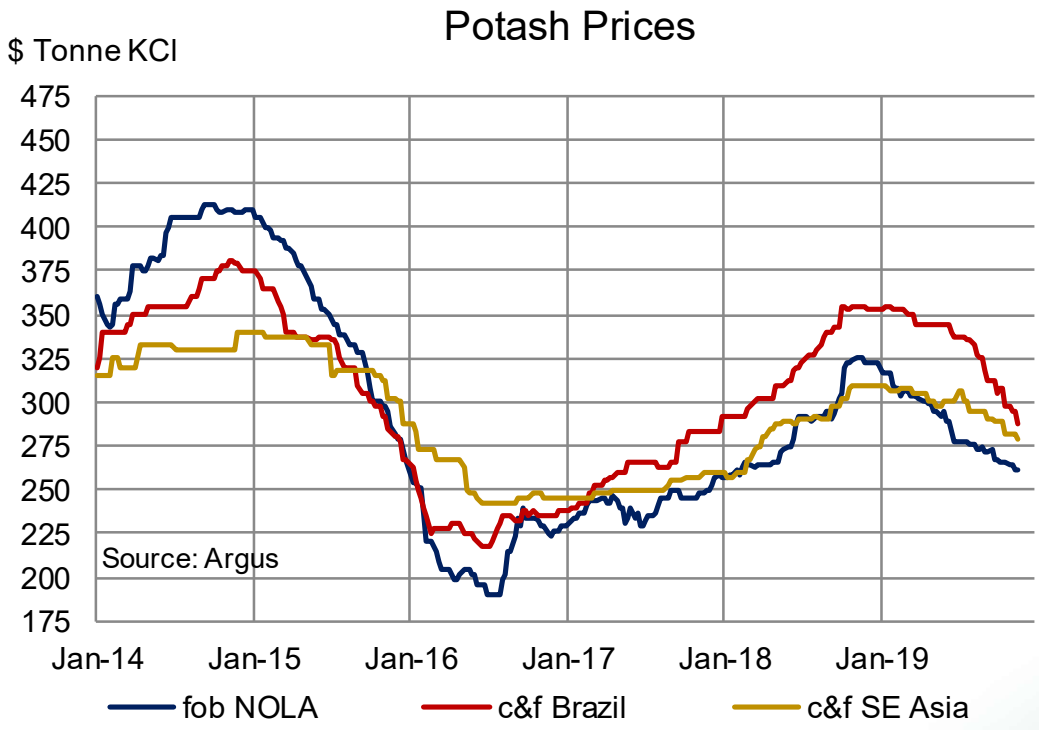




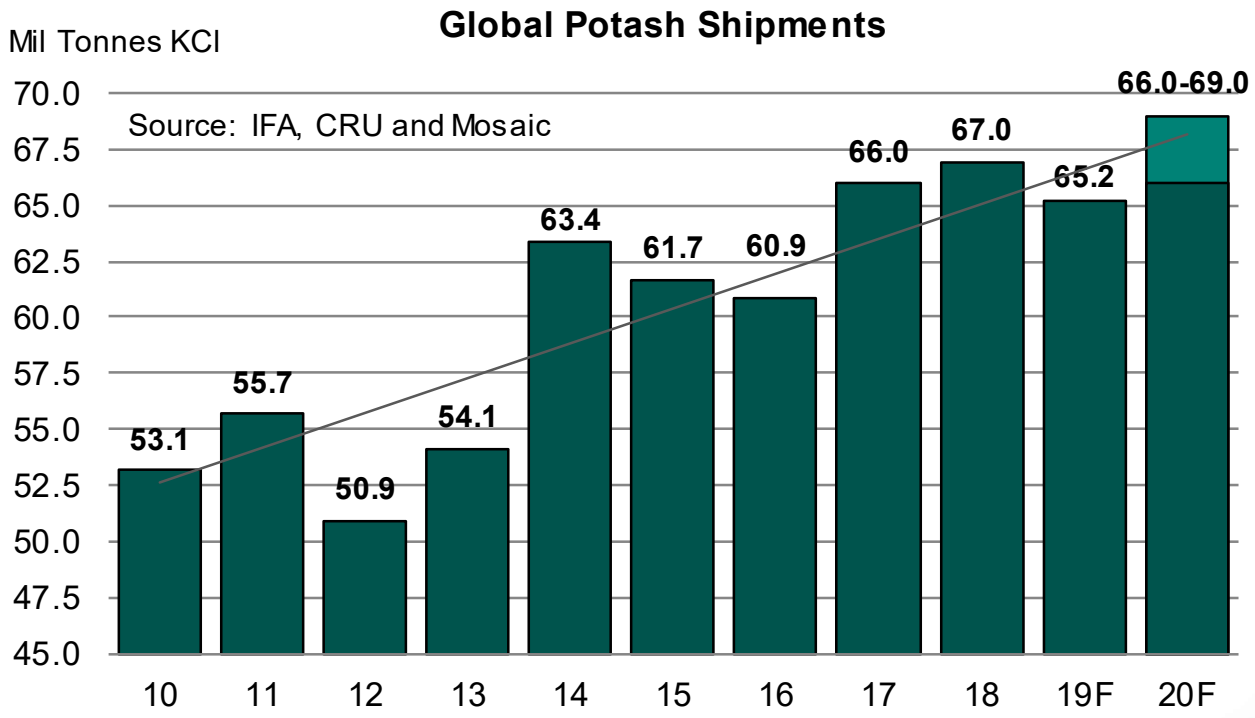
- Top 8 countries represent 73% of imports

- Top 8 countries represent 99% of exports

Prices trend lower in 2019 on weak demand; stabilizing on producer cutbacks



Forecasting a return to trend growth in 2020



Potash Factors to Watch

- **Industry curtailments** and/or restructuring
  - Closures due to depleted resources, inflows or economics
  - Curtailments due to market conditions

Announced 2019 MOP Production Curtailments (tonnes)

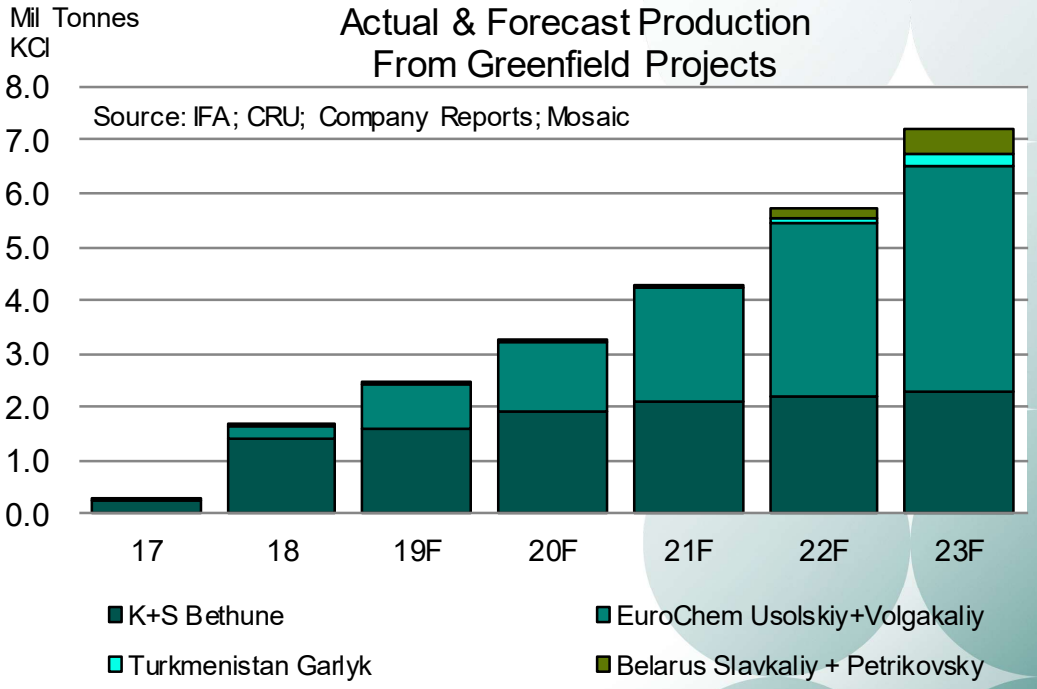
Company	Announce-ment Date	Action	Production Cut	
			Low Case	High Case
Mosaic	6-Aug-19; 10-Oct-19	Temporary idling	600,000	600,000
Belaruskali	5-Sep-19	Up to 30% production cut Sep-Dec	400,000	1,200,000
Nutrien	11-Sep-19; 4-Nov-19	8 week idling in Q4	1,000,000	1,000,000
Uralkali	20-Sep-19	Production cut in Q4	350,000	500,000
K+S	23-Sep-19; 14-Nov-19	Up to 500kt production cut in 2019	400,000	500,000
ICL	24-Sep-19	Production cut in Q4	75,000	180,000
Total			**2,825,000**	**3,980,000**

Source: Company reports; Mosaic estimates

** Excludes Nutrien recent Rocanville idling*

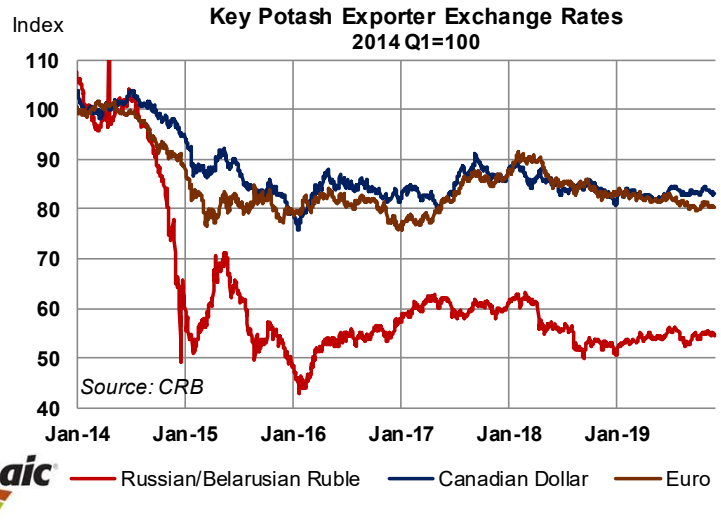
Potash Factors to Watch

- Ramp-up of new greenfield capacity
  - Canada (K+S Bethune)
  - Russia (EuroChem Usolskiy and Volgakaliy)
  - Others

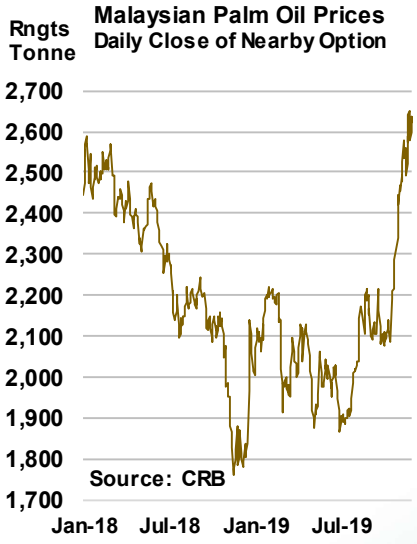


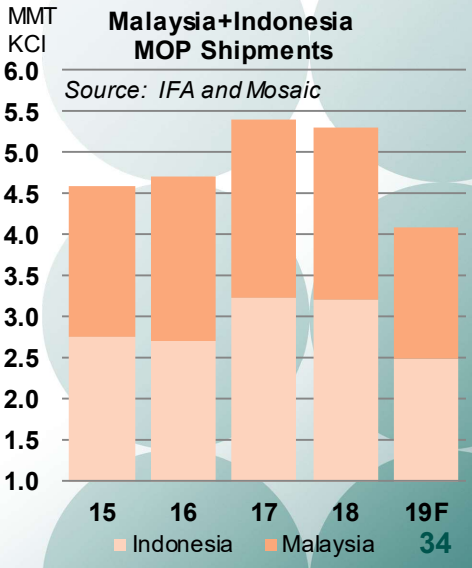
Potash Factors to Watch

- **Demand** trends / drivers
  - Brazil keeps growing plus recovery/gains elsewhere
  - Agricultural commodity prices
  - Balanced nutrient use initiatives
- **Exchange rates**



- Palm oil prices and **rebound in SE Asia shipments**





Thank You!

Questions?

Chemicals for the Non-Chemist

Plant Nutrients and Plant Nutrient Markets

Citi Basic Materials Conference
New York, NY
December 2, 2019

Andy J. Jung
VP, Market and Strategic Analysis

Mosaic