

Market Mosaic

March 2017

2017 Phosphate Outlook



Market Mosaic is a quarterly newsletter published for our customers, suppliers and stakeholders by the Market and Strategic Analysis group of The Mosaic Company. Some issues assess the near term outlook for agricultural and plant nutrient markets while others take an in-depth look at a topic of interest to our readers.

For phosphate producers, 2017 is off to a good start. Prices and margins have moved up sharply during what typically is a seasonally slow period, and fundamentals continue to look positive heading into the upcoming application season.

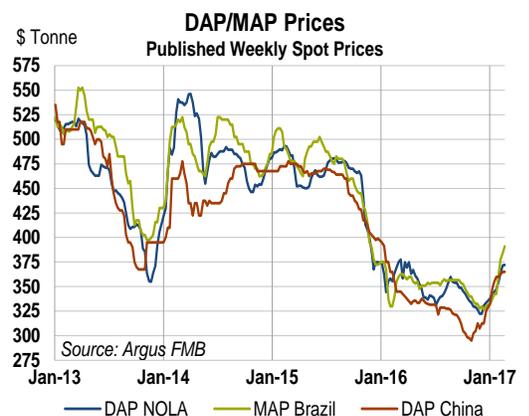
Several developments are driving up prices. Global shipments of the leading products are projected to post solid gains this year as a result of much leaner channel inventories as well as strong agronomic and economic demand drivers. Sales are off to a fast start this year because distributors who deferred purchases as prices declined last year are now scrambling to cover large commitments as prices rise this year. At the same time, Chinese export availability has declined due to a take-off of domestic shipments as well as a drop in industry output. More recently, rain storms and large swells have delayed peak shipments out of the large Jorf Lasfar facility in Morocco. Finally, it looks like new capacity will not deliver material tonnage until later this year or in 2018.

These developments have brought the global phosphate market into a much tighter balance and have quickly turned sentiment. The key question now is: How long will the current price momentum continue? This issue of Market Mosaic reviews recent developments and recaps our near term outlook, highlighting the factors that ultimately will answer this question.

Based on our analysis, we expect that the recent price momentum will continue through the upcoming application season. Momentum could even accelerate if shipping delays worsen, the application season breaks early, Chinese export availability remains limited, and agricultural commodity prices hold up. The outlook for the second half of this year looks less certain. At this point, however, the key swing factors – Chinese exports, global shipments, and the start-up of new capacity – look like they are tilting in favor of a continued tight supply/demand balance through the end of this year.

Recent Developments: Prices Take Off

After hitting bottom last December, phosphate prices have surged higher, especially since the beginning of February. The price of DAP fob NOLA barge traded at \$345 per ton at the end of February, up \$55 from its December low. The price of MAP delivered Brazil flirted with \$400 per tonne at the same time, up \$75 from the end of last year, and the price of DAP fob Chinese port spiked to \$370 per tonne at the end of February, up \$80 from its December low.



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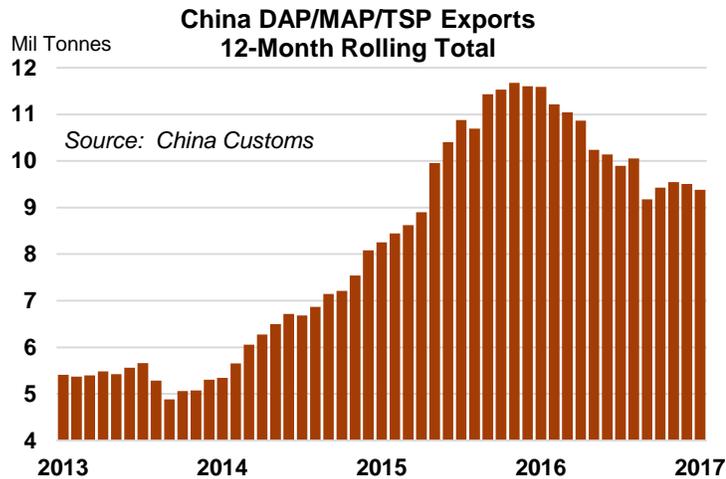
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– continued inside

In our view, four factors are driving the recent price surge: a decline in Chinese export availability, a rush of buying as distributors scramble to cover large commitments in a rising market, a jump in raw materials costs, and shipping delays from Jorf Lasfar.

In China, production and exports of the leading phosphate products are declining as a result of unprofitable economics and more stringent environmental regulations. Exports dropped to 9.5 million tonnes in 2016, a decrease of 2.1 million from the 2015 record. The 12-month rolling total peaked at 11.7 million tonnes in October 2015 and since then has trended downward toward the 9.0 million tonne mark. The latest CRU estimates indicate that production of these products declined the equivalent of 3.7 million tonnes of DAP in 2016.

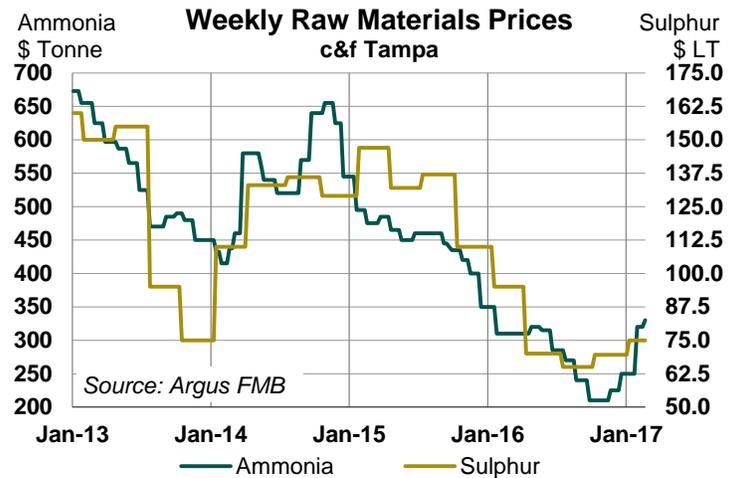


A take-off of domestic shipments coupled with production cutbacks continues to crimp export availability so far this year despite the elimination of a \$15 per tonne export tax on January 1. Customs statistics show that DAP/MAP/TSP exports totaled less than 215,000 tonnes in January, a drop of almost 40% or more than 130,000 tonnes from the two-year average for the month, and exports for the first quarter are projected to fall far short of the higher levels of the last two years.

After deferring purchases and depleting channel inventories as prices declined last year, distributors in several regions now are rushing to cover large commitments for the upcoming application season. Statistics are beginning to trickle in that confirm anecdotal reports of brisk sales to start the year. In Brazil, ANDA statistics for January showed that total plant nutrient shipments jumped 24% or more than one-half million tonnes from a year earlier. DAP/MAP/TSP imports were up 22% to start the year. Our Brazilian team now projects total shipments in the first quarter will increase 17% or 1.0 million tonnes from a year ago. In the United States, the U.S. Army Corps of Engineers reported that plant nutrient

deliveries along the Arkansas River system in January surged 85% from a year ago.

A run-up in raw materials costs also has pressured phosphate prices. For U.S. producers, higher ammonia and sulphur prices have boosted costs \$30 per tonne of DAP since late last year. The jump in Tampa ammonia prices from \$210 per tonne in November to \$330 in March accounts for most of the increase, but the price of sulphur delivered Tampa also moved up \$5 per long ton in the first quarter. Tight fundamentals have enabled producers to quickly pass through higher raw materials costs.



Most recently, rain storms and large swells have disrupted loading out of Jorf Lasfar, the world's largest phosphate facility located on Morocco's Atlantic coast. Several publications reported that as many as two dozen vessels were waiting to load at the end of February, with shipments expected to be delayed at least two to four weeks.

First Half: More Upside than Downside Risk

Given these developments, it looks like there is more upside than downside price risk heading into the upcoming application season. Demand prospects continue to look strong. After increasing 1.6 million tonnes last year, we project that global shipments will increase another 1.7 million this year, and rising prices are pulling demand forward. Mild weather also is raising expectations of an early start to the North American spring season. Chinese export availability is expected to remain limited due to large domestic shipments as well as lower industry output. Loading delays at Jorf Lasfar seem to be getting longer rather than shorter. Finally, agricultural commodity prices continue to trade at levels that underpin solid on-farm use.

How much upside during the next few months is hard to gauge. The current state of affairs is similar in some ways to the situation three years ago. At that time, the NOLA DAP price surged \$180 per ton from a low of \$320 in November 2013 to almost \$500 by the end of March 2014.

Much like last year, distributors had cleaned out channel inventories as prices declined in 2013. Buyers then rushed to the market to

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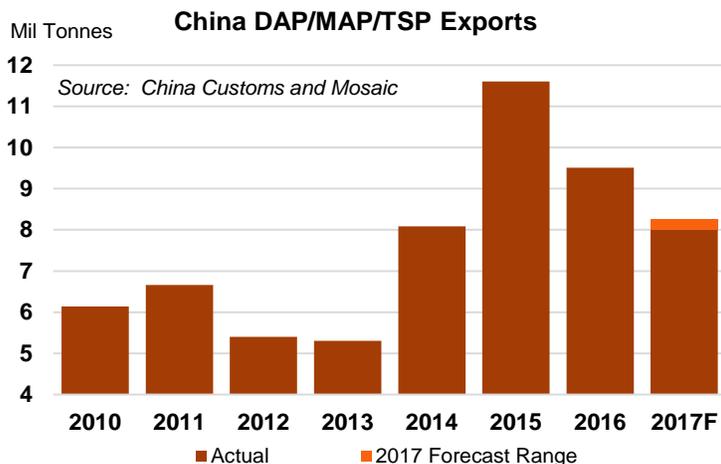
- Dr. Michael R. Rahm

cover large commitments once prices began to turn up. As a result, global shipments climbed 3% or almost two million tonnes in 2014. North American shipments jumped 7% or 650,000 tonnes.

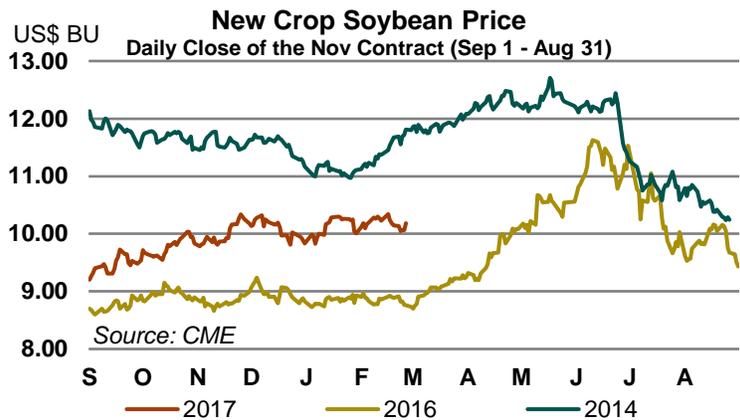
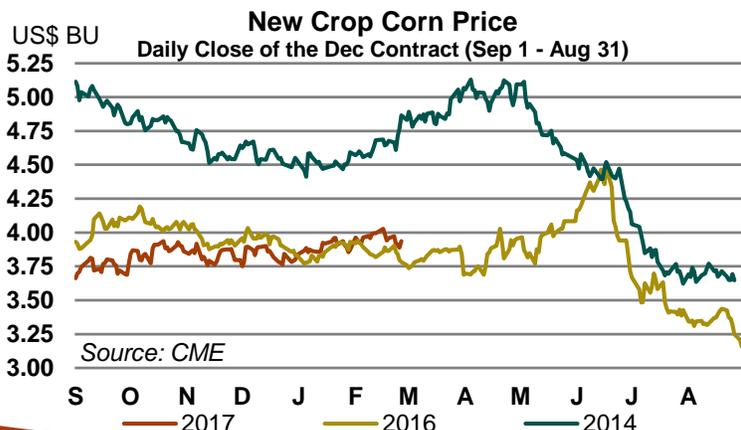
Logistical bottlenecks also accelerated price gains in 2014. Weather-related loading disruptions delayed shipments out of Jorf Lasfar from four to six weeks during the first quarter of 2014. And, it is worth noting that prices surged despite the Ma'aden project in Saudi Arabia ramping up operating rates from 55% in 2013 to 71% in 2014, and despite the imminent start-up of the first two Jorf Phosphate Hubs in Morocco.

There are, however, some important differences. Current and expected raw materials costs are lower this year. For U.S. producers, the Tampa ammonia price was \$415 per tonne in February 2014 vs. \$330 today, and the Tampa sulphur price was \$110 per long ton three years ago vs. \$75 this quarter. So, raw materials costs three years ago were almost \$35 per tonne of DAP greater than today.

More importantly, raw materials costs surged during the first half of 2014. The Tampa ammonia price spiked to \$580 by April, and the Tampa sulphur price jumped to \$133 in Q2. Raw materials costs are expected to remain stable or even decline later this year. If that happens, producers can realize higher margins from smaller increases in phosphate prices.



The role of China also is different today than three years ago. In 2014, additional tonnage was needed from China to meet global demand. And China delivered – DAP/MAP/TSP exports increased from 5.3 million tonnes in 2013 to 8.1 million in 2014. Unlike three years ago, fewer exports are required from China this year, and it remains unclear how industry and government initiatives to reduce output and restructure the sector will play out, especially if prices continue to move higher.



Finally, although key crop prices are only a bit lower today than three years ago, fundamentals are not as robust given the large stock builds during the last three years. Sentiment, however, remains positive. Commodity funds continue to hold hefty long positions in part as a hedge against an expected uptick in inflation. Nevertheless, absent a weather shock, crop prices likely will provide a drag on any phosphate price run this time around.

Second Half Outlook: Tilting Toward Tight

While we see more upside than downside price risk heading into the upcoming application season, the outlook for the second half of this year looks less certain. At this point, however, key swing factors – Chinese exports, global shipments, and the start-up of new capacity – look like they are tilting in favor of a continued tight supply/demand balance through the end of this year.

Lower Chinese Exports in 2017

Chinese exports are one of the key swing factors that will impact second-half prices and margins. Forecasts vary widely, but we project that exports of the main phosphate products will decline to around 8 million tonnes this year. Industry and government objectives look tightly aligned today, and an accelerated restructuring of the domestic industry and further declines in output and exports are expected this year.

After piling up big losses last year, the leading Chinese producers are seeking to restore profitability by accelerating the planned restructuring of the large and diverse phosphate industry. And big losses piled up as prices collapsed last year. YTH and Yihua, two of the big four phosphate producers, recently warned that 2016 losses are expected to total \$465 million and \$160 million, respectively, and the Chinese government reported that 70% of domestic producers were not profitable last year.

Plans outlined at the National Phosphate and Compound Fertilizer Industry Annual Conference last May called for the permanent closure of “outdated” facilities with capacity of 3.0 million tonnes P₂O₅ or the equivalent of about 6.5 million tonnes DAP by the end of this decade. Publications reported that the 6+2 Group, made up of six of the largest domestic producers and the two main distributors, are developing detailed initiatives to boost industry profitability and accelerate restructuring yet ensure adequate domestic supplies. Initiatives include setting a minimum export price, establishing operating rate guidelines, raising rock prices, and forming a sulphur sourcing joint venture among some members.

The Chinese government also appears intent on improving air and water quality. Photos of masked citizens making their way through dense smog in Beijing highlight the public’s growing

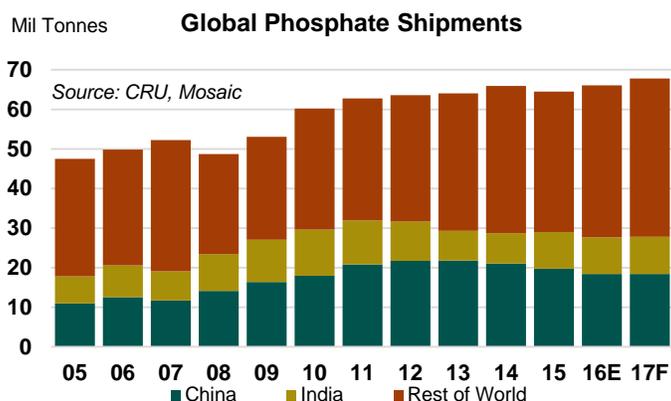
dissatisfaction with current air and water quality, particularly in large and increasingly affluent urban centers. The government is responding by initiating environmental audits of industrial sites and developing plans to close the most egregious violators. This government crackdown is expected to provide an assist to the industry's restructuring efforts.

Recent reports indicate that nearly 300 government inspectors began audits of industrial sites in six northern provinces at the end of February. Several non-integrated NPK facilities but no large-scale phosphate plants operate in these provinces. Subsequent audits in southern and eastern provinces, however, will include phosphate producers in Hubei, Sichuan, and Chongqing provinces. Although there is no precedent for such audits, Beijing authorities are managing the process and the worst violations are expected to result in shut downs via the cutoff of electricity and water supplies. The only remedy for some phosphate facilities that discharge phosphogypsum and effluents into waterways may be permanent closure.

In addition, other developments also support forecasts of less rather than more exports in the future. The government will impose new taxes on discharges into air and waterways beginning in January 2018. These taxes potentially could raise production costs \$10 to \$30 per tonne of DAP/MAP. The much-feared collapse of the RMB has not occurred. In fact, the RMB has stabilized in the 6.8-6.9 per dollar range since the beginning of the year so exporters have not benefited from a much weaker currency, as many analysts had expected.

Continued Demand-Pull Pressure

Back-half demand is the second and potentially most important swing factor that will impact prices and margins later this year. Broad-based and steady demand growth is a key feature of our phosphate outlook. Global shipments of the leading phosphate products are projected to increase to a record 67.8 million tonnes this year, an increase of 2.6% or 1.7 million from last year. That follows a 2.4% or 1.6 million tonne gain in 2016.



Shipments have broken quickly out of the gate, and demand is expected to stay strong during the last half of this year. For example, in Brazil, we project that DAP/MAP/NPS/TSP shipments will increase 10% or 760,000 tonnes to 8.5 million tonnes this year. Of the total, first-half shipments are projected to increase 14% or 420,000 tonnes and second-half shipments are forecast to climb 7% or 340,000 tonnes from the high levels of last year.

In India, DAP shipments are projected to increase 2% or about 200,000 tonnes to 9.4 million tonnes this calendar year with first-half shipments off about 150,000 tonnes but back-half shipments up 350,000 from a year earlier.

Positive Demand Drivers

Positive agronomic and economic drivers as well as much leaner channel inventories underpin our record shipment forecast for this year. Agronomic requirements have taken a big step up along with global grain and oilseed production during the last few years, and farm economics, while not as robust as a few years ago, still remain profitable at current crop and plant nutrient prices.

Record harvests have removed record amounts of phosphate from farm fields during the last few years. We will use U.S. corn production as the poster child for the nutrient removal story. U.S. corn yields averaged 171 bushels per acre during the last three years, up 12% or 19 bushels from the prior three-year average (the prior three-year averages cited here exclude the low yields for the drought-ravaged crop in 2012). In Iowa, yields averaged 191 bushels per acre, up 14% or 24 bushels for the same periods. In Illinois, yields also averaged 191 bushels per acre during the last three years, up 16% or a staggering 27 bushels from the prior three-year average.

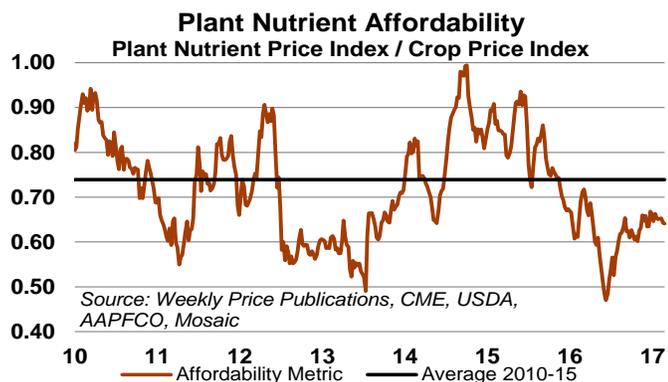
U.S. Corn Yields

Bu Ac	USA	Iowa	Illinois
2010	152.6	165.0	157.0
2011	146.8	172.0	157.0
2013	158.1	164.0	178.0
Avg	152.5	167.0	164.0
2014	171.0	178.0	200.0
2015	168.4	192.0	175.0
2016	174.6	203.0	197.0
Avg	171.3	191.0	190.7

Source: USDA

Assuming each bushel of corn removes 0.3 lbs. of P₂O₅ from the field, the Iowa and Illinois corn crops removed 20 to 25 more pounds of phosphate per acre over the last three years than what was removed during the previous three harvests. Farmers would need to increase application rates 30% to 40% from typical recommendations in order to replace the additional nutrients removed by recent record corn crops. So, the multiple reports from our account managers that Corn Belt farmers are boosting phosphate (and potash) application rates this year are not surprising, especially given much lower retail prices today.

Economic drivers also remain positive. Based on current crop prices and plant nutrient costs, our affordability metric still points to above-average affordability. Most crop prices continue to trade at relatively high levels – despite the record U.S. harvest last fall and what looks increasingly like a record South American crop this year. At the end of February, 2017 corn, soybean and wheat prices still exceeded new crop values a year earlier, and prices for other important crops such as palm oil, cotton, sugar, and coffee were up sharply from 2016 lows.



Historical Perspective

A look back at phosphate shipments since 2005 provides important context for current forecasts. Global shipments increased at a break-neck pace of 4.9% per year from 2005 through 2010, jumping 12.7 million tonnes in just five years. However, China and India accounted for 93% of the gain with shipments in both countries surging at double-digit rates during this tumultuous period for different reasons (detailed in regional highlights below).

Global shipments increased at a compound annual growth rate (CAGR) of just 1.4% from 2010 to 2015 due to the heavy drag from China and India during this period. Combined China and India shipments declined 600,000 tonnes while shipments in the rest of the world increased 4.9 million tonnes or at a healthy CAGR of 3.0% during this period.

Since 2015, demand growth appears back on a higher and less volatile trajectory of 2.5% per year. Today, broad-based and steady demand growth is a key feature of our phosphate outlook.

Regional Highlights

In China, the good news is that phosphate shipments are forecast to stabilize following three years of large declines. Despite all of the noise about changes in corn and other agricultural commodity programs, domestic crop prices remain at relatively high levels and support solid on-farm demand. Most importantly, it appears distributors finally have worked down large channel inventories. Anecdotal reports indicate producers are shipping fast and furious right now to meet spring demand.

It is worth noting that Chinese shipments nearly doubled from 11.0 million tonnes in 2005 to a peak of 21.8 million in 2013 as a result of both increases in on-farm use and a planned build-up of inventories. Following the price spike in 2007/08 and well-placed complaints from farmers about high prices and product shortages, the government initiated programs to build strategic reserves with big national distributors and to provided low- or no-interest loans to incent producers and other distributors to hold ample inventories. The government recently scrapped some initiatives such as the low- or no-interest loan programs due to the exponential growth in the domestic capacity and less concerns about domestic supplies and prices.

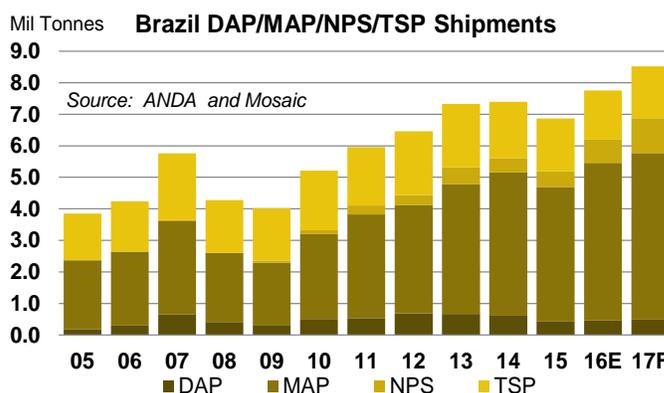
In India, shipments are forecast to grow 1.7% or about 200,000 tonnes to 9.4 million in 2017. The forecast assumes a good monsoon, moderate increases in retail prices, a small bump in the subsidy, a relatively stable rupee, and continued high

support prices for key crops this year. Large movement during the current Rabi season likely flushed retail inventories and sets the stage for gains this year.

Projected phosphate shipments, however, still are far off the 2010 peak. Shipments soared from 6.9 million tonnes in 2005 to a record 11.6 million in 2010. Extraordinary demand growth during this period of record high prices was the consequence of the subsidy program. At the time, the government paid importers a variable subsidy equal to the difference between the international price and a low fixed retail price. So, farmers were insulated from the spike in phosphate prices during this period, and use climbed given 2008-like crop prices and 1980s-like retail crop nutrient costs.

However, shortly after paying the 2008/09 subsidy bill of more than \$21 billion, the government revamped the program by fixing the subsidy at a lower level and allowing retail prices to fluctuate with international prices and the value of the rupee. As a result, retail DAP prices increased more than 150% following the overhaul. Add a couple of sub-par monsoons and the result was a collapse of shipments from 11.6 million in 2010 to a low of 7.5 million in 2013.

In Brazil, demand continues to march upward driven by high local currency prices for the country's main crops. The latest ANDA statistics indicate that total phosphate shipments increased more than 9% to 4.8 million tonnes P₂O₅ last year, and shipments are forecast to increase by a similar amount again this year. Shipments of high analysis products including DAP, MAP, NPS, and TSP are projected to climb to 8.5 million tonnes this year, up 10% or 760,000 tonnes from last year. Imports of these products are forecast to increase 18% or more than 1.0 million tonnes to 6.6 million tonnes this year.



In North America, we project that shipments will increase almost 400,000 tonnes during the 2016/17 fertilizer year. The gain is the result of both continued strong on-farm demand as well as a near-empty pipeline at the start of the fertilizer year on July 1, 2016. The fall application season exceeded expectations by all accounts. We estimate that shipments from July through December exceeded levels a year earlier by 5% or about 210,000 tonnes. For those worried that the fall season stole tonnage from the spring season, we project that shipments from January through June will top last year's total by 4% or 190,000 tonnes.

Our forecast of U.S. on-farm use assumes that farmers will plant approximately 91 million acres of corn, 87 million acres of soybeans and 47 million acres of wheat this year. U.S. P&K

average application rates are expected to increase on corn and soybeans due to large withdrawals during the last three years and the low cost of replacing or building soil phosphorus levels.

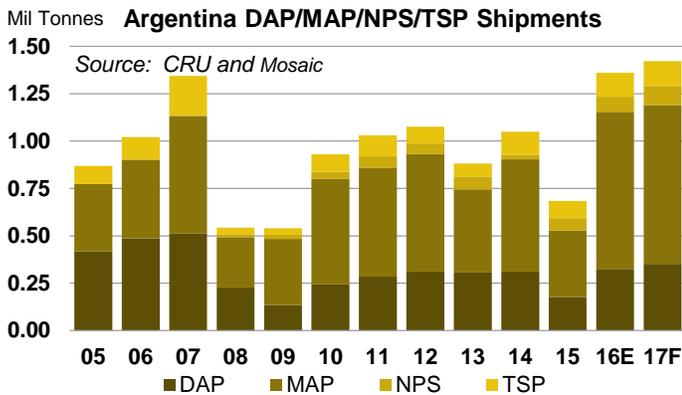
While China, India, Brazil and North America capture most of the headlines, several other regions such as Africa, Argentina, Central America, the former Soviet Union, Turkey, Pakistan, and Southeast Asia also registered impressive gains last year. In Argentina, phosphate shipments doubled from the depressed level in 2015 and bested the previous high-water mark set way back in 2007. Argentine farmers planted and fertilized more area in response to much-improved farm economics resulting from a weaker peso and the elimination of the 35% tax on

corn and wheat exports. Pakistan, Thailand and Vietnam each set phosphate shipment records last year yet ended recent application seasons with low inventories. In Russia, plant nutrient demand is booming along with agricultural production due to the combination of generally favorable weather and the highly depreciated ruble. Turkey imported 1.2 million tonnes of the leading phosphate products last year, up 132% from 2015 and 200,000 tonnes more than the previous peak.

No Material New Supplies Until Later This Year

Finally, when and how quickly new capacity starts up is expected to impact prices and margins one way or another later this year. OCP is scheduled to begin commissioning its third Jorf Phosphate Hub (JPH III) in the first quarter and its fourth hub (JPH IV) before the end of the year. The Ma'aden Wa'ad al Shamal Phosphate Company (MWSPC) joint venture in Saudi Arabia also is expected to start up later this year.

We do not expect that these projects will have a material impact on the supply/demand balance this year. The net impact of JPH III may be muted if OCP still is retrofitting other phosphoric acid plants to run on wet rather than dry rock. And, if history is any guide, ramp-ups of massive greenfield phosphate projects typically take longer than most analysts expect.



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These risks and uncertainties include but are not limited to risks and uncertainties arising from the possibility that the closing of the proposed Transaction may be delayed or may not occur, including delays or risks arising from any inability to obtain governmental approvals of the Transaction on the proposed terms and schedule, any inability of Vale to achieve certain other specified regulatory and operational milestones or to successfully complete the transfer of the Cubatão business to Vale and its affiliates in a timely manner, and the ability to satisfy any of the other closing conditions; our ability to secure financing, or financing on satisfactory terms and in amounts sufficient to fund the cash portion of the purchase price without the need for additional funds from other liquidity sources; difficulties with realization of the benefits of the proposed 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; 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 risk that protests against natural resource companies in Peru extend to or impact the Miski Mayo mine, the ability of the Wa'ad Al Shamal Phosphate Company (also known as 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, the future success of current plans for MWSPC and any future changes in those plans; 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 or Canada, 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.

