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WINTER 2014

Revised Recommendations Support Need for Higher Potash Application Rates

A recent Iowa State University research report revised potash application guidelines for various crops grown in the state. The new guidelines generally call for higher potash application rates at most defined soil test ranges (see charts below). For corn, using the old recommendations, a soil test level of 150 ppm (similar to the North American median soil test K level) would result in a K_2O recommendation of 45 lbs per acre. Using the new recommendations, the same soil test level would result in a recommendation of 80 lbs per acre, an increase of 77 percent. Recommended rates for soybeans grown on soils testing between 100-160 ppm were increased by 16 to 26 percent.

While the study is specific for Iowa, we believe it could impact recommendations in neighboring states. It may also provide an impetus for other universities to evaluate recommended rates, which in many cases have not been revised for several years.

In this issue

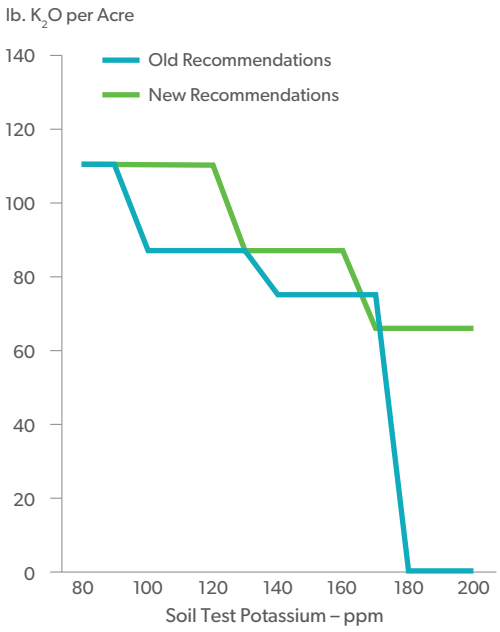
Check out the revised potash application guidelines from Iowa State University and what that may mean for growers. Read about the importance of good soil nutrition for forage crops, get an ag and fertilizer market update and be sure to visit the eKonomics site to see important changes and additions.

Iowa State Potash Recommendation Changes

Revised Recommendations Support Need for Higher Application Rates

Corn Recommendation

Soybean Recommendation



Source: Iowa State University

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Fertilizing Forage Crops

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We often focus our attention on fertilizing grain crops and ensuring that they have adequate soil nutrients to achieve their maximum potential, but the concepts are just as important to forage crops. In fact, good soil nutrition can be more important for forage crops because of the amount of nutrients removed, especially in hay production.

Nutrient Removal and Fertilization of Hay Crops

Hay crops remove substantial amounts of potassium and phosphorus from the soil because most of the vegetative growth is being harvested (Table 1). As an example, a 6 ton per acre alfalfa crop will remove 72 and 300 pounds of phosphorus and potassium per acre, respectively. Therefore, maintaining productivity can require fairly high rates of fertilization. Because of the nature of hay production, applications can and likely should be made multiple times throughout the year. Nitrogen (for grass crops) should be applied multiple times or after each cutting to increase efficiency of use. Phosphorus and potassium applications can be split between spring and fall applications.

As an example of how a good fall fertilization strategy can benefit your hay crop, consider alfalfa. After the last fall cutting of alfalfa is collected, fertilization with potassium should be considered if it is not already part of a fertilizer program. Alfalfa that has adequate levels of potassium accumulates more carbohydrates in the root system which improves its over-wintering ability and vigor early the next spring (especially in more northern latitudes). Fall fertilization should be done as soon as possible so that the plant can take advantage of the added nutrients before the onset of winter. Application can be split between fall and after the first harvest in the spring (applying half in the fall and half in the spring will minimize luxurious uptake of K by the crop early next year). Phosphorus applications can follow the same approach. Managing potassium and phosphorus fertilizers strategically can extend the life of the stand. Research has shown that one or perhaps two years of additional stand can be realized if a sound fertilizer program is followed.

Similar to grain crops, nutrient application rates are tied directly to yields achieved (and subsequent crop removal) or yield goals and soil test levels. Soils that have good soil test levels may allow for a straight maintenance approach to fertilization. With this approach, you are simply trying to resupply nutrients being removed by harvest. Using Table 1, you can easily get an idea of how much nutrient will be removed per ton of crop. To ensure that your fertilization approach is performing adequately, you

Table 1. Potassium and phosphorus removal by hay crops typically grown in North America

Crop	Phosphorus removal (P_2O_5)	Potassium removal (K_2O)
	pounds per ton	
Alfalfa	12	50
Orchardgrass	13	54
Fescue	12	54
Ryegrass	12	43
Red clover	12	42
Sorghum sudangrass	15	58
Bromegrass	10	46
Birdsfoot trefoil	11	42
Timothy	11	42

Source: International Plant Nutrition Institute

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can soil test every other year to check the status of your soil. One word of caution on soil testing, do not sample after a recent application of fertilizer. Collect the soil sample in the fall before the last cutting.

While you might be tempted to think that nutrient application is less important for hay crops than grain crops, think about fertilization from a pure economic perspective. If inadequate nutrition is limiting forage productivity then not only does your productivity and subsequent revenue go down, but the cost of producing a ton of forage can actually go up. Stated another way, decreasing fertilizer rate to "save" input costs that result in decreased forage yield can cause the cost of production on a per ton basis to increase.

Fertilization of Pastures

The goal of pasture production is different than hay production. Weight gain of the foraging animal is what matters. Intuitively, the weight gain achieved is a function of forage yield (and quality) and concentration of animal units foraging. If forage yield is decreased due to inadequate soil nutrient status, then the concentration of animal units must decrease to maintain weight gain. Increasing forage yield can allow for increased animal unit concentration while maintaining weight gain of each animal.

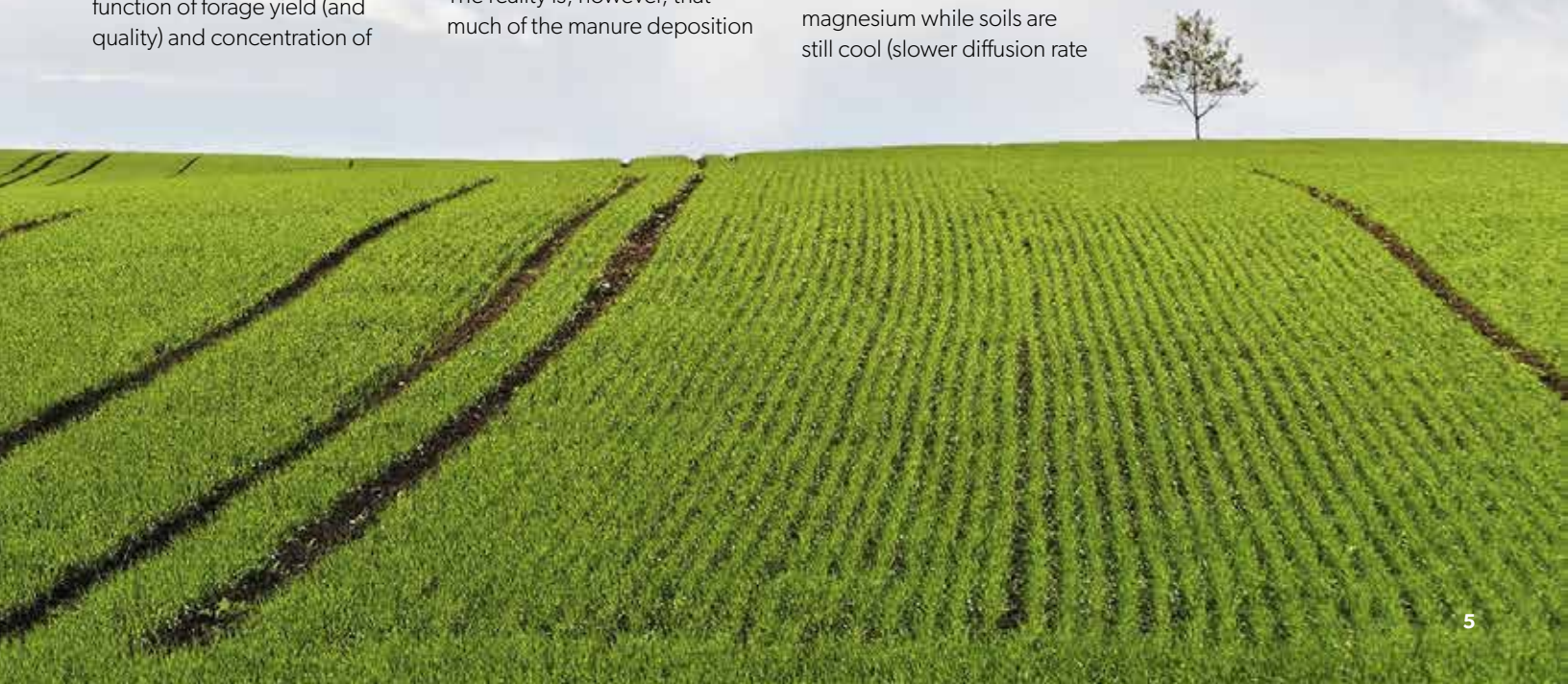
Pastures are obviously different in their nutritional needs from hay fields. Because animals are grazing these fields actively rather than complete vegetative removal, nutrient application rates are usually lower. The caveat to the previous statement is the soil nutritional status. Depleted soils will require higher rates of fertilization to bring the soil back to a level that will support high productivity and carrying capacity. Soils that have good soil test levels can receive maintenance application rates that are substantially lower than hay fields.

Since the field is grazed, the animal actually reallocates much of the nutrient consumed through manure deposition. The reality is, however, that much of the manure deposition occurs near the water source, so grazing animals normally do a poor job of nutrient redistribution. Just like in hay production systems, soil testing is a good tool to monitor the nutrient status of the field, but visual assessment can also be effective. If "cow pox" starts to occur, it likely means that the field is inadequately fertilized. Cow pox is the formation of areas where forage growth is obviously better due to animal defecation. The manure nutrients are providing nutrition to the forage that the rest of the field is missing.

Pasture production systems do have different rules for fertilization from hay crops due to the presence of the foraging animal and their nutritional requirements. The most important time to be mindful of nitrogen and potassium application rates is typically early in the spring as crops break dormancy and resume growth. Excessive availability of nitrogen can promote rapid growth decreasing the plant's ability to take up adequate magnesium while soils are still cool (slower diffusion rate within the soil). This causes the forage to be deficient in magnesium which can cause grass tetany of the foraging animal (specific to ruminant animals). Excessive potassium fertilization can also induce magnesium deficient forage as potassium uptake can reduce magnesium concentration in the forage tissue. To avoid this potential issue keep early season application rates of both nitrogen and potassium lower until soil temperatures warm up. Providing magnesium supplementation can also decrease grass tetany incidence.

Take Home

Forage production is an intensive cropping system that removes a considerable amount of potassium and phosphorus from the soil. To maintain productivity and profitability pay close attention to yields and subsequent nutrient removal while keeping an eye on soil test levels.



Jeff Holzman
Director, Market Research
PotashCorp

Global Agriculture and Fertilizer **Markets Update**

Agriculture is never a static industry and the past year again reminded us of this fact. This article reviews the major changes that occurred in agriculture and fertilizer markets and provides a preview of the factors to watch in 2014.

Looking Back at 2013

Grain and oilseed supply was extremely tight through the first half of 2013, supporting robust prices for agriculture commodities — which in turn encouraged record global planted area and efforts to increase yields. Despite a slow start to the planting season in the Northern Hemisphere, growing conditions were generally favorable for crop development. The large increase in supply resulted in lower crop prices during the second half of the year and stimulated a strong rebound in demand. USDA projects global grain consumption will increase by 6 percent during the 2013/14 crop year. This demand response has cushioned some of the impact of the record crop and helped support prices above the historical average.

Global fertilizer markets underwent a number of changes with each nutrient facing unique challenges in both supply and demand. In potash, global operating rates were below the historical average and increased competitive pressures resulted in lower prices in all key markets. The change in strategy announced by Uralkali in late July created considerable market uncertainty and significantly impacted demand in most markets during the second half. As a result, we estimate global potash shipments reached approximately 53 million tonnes (as shown in Figure 1 on page 4), down from our forecast of 55-57 million tonnes at the beginning of the year.

Phosphate markets were impacted by the lack of substantive engagement from buyers in India. Its DAP/MAP imports, which had recently accounted for more than one-third of global trade in these products, were down more than 2 million tonnes in 2013. The reduction in global trade combined with a modest increase in capacity put downward pressure on prices for most phosphate products. The North American market faced increased competition from imported solid fertilizer products.

Record Chinese urea exports and increased shipments from Middle East producers were more than adequate to meet robust global demand. Supply issues in North Africa, Iran and Trinidad provided some support for ammonia prices relative to urea. However, they still declined compared to the previous year due to weaker demand for ammonia in the phosphate sector and some producers increasing ammonia sales at the expense of other products. Nitrogen markets showed signs of improvement near the end of the year due to plant curtailments in higher-cost regions, export permit issues in North Africa and strong import demand from South Asian countries.

Factors to Watch in 2014

The outlook for global fertilizer consumption remains strong driven by the need to replenish soil nutrients following the record crop produced in 2013. Despite lower crop prices compared to last year, we believe the reduction in fertilizer prices will support and in some cases improve farmer affordability.

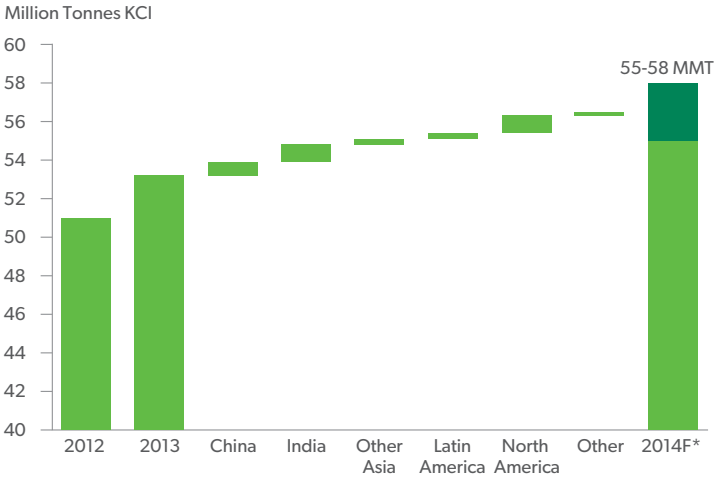
In North America, we expect some shifts in cropping mix this spring with the potential for a reduction in US corn acres likely to gain the most attention. Lower corn acres could reduce nitrogen consumption but with total cropped area expected to remain high, we do not anticipate a major impact on phosphate and potash usage. The fall application period was condensed in some regions of North America and this could provide additional support for spring demand.

Following consecutive years of weaker-than-expected potash demand, we anticipate a rebound in 2014 and more consistent buyer engagement throughout the year. We believe distributor inventory levels were very low in most major markets to begin the year and a favorable relationship between crop and potash prices will support consumption growth. Global shipments could increase to a range of 55-58 million tonnes (as shown in Figure 1 on the right). Shipments at the low end of our range could occur if market uncertainty persists into the first half of 2014, impacting buying patterns in major offshore markets. Demand at the higher end of the range would require greater market engagement early in the year, including a significant improvement in demand from India. Based on projected demand growth and an estimated 3 percent reduction in global operational capability, we believe potash supply and demand could be relatively balanced in 2014.

The outlook for world phosphate markets will depend on the magnitude and timing of a recovery in India's demand. Its retail DAP inventories have been drawn down significantly, which is expected to support an improvement in import demand. Political and economic factors will play a part in determining the strength of this recovery. Demand in other regions, particularly Latin America, was strong in 2013 and we believe this will continue into 2014. On the supply side, DAP exports from Saudi Arabia are expected to increase and Moroccan volumes could rise with the development of new granulation capacity. Given the growth in supplies from these regions, we expect US and Chinese exports could be relatively flat in 2014.

Supply-related issues will remain at the forefront in the nitrogen market. The relaxation of China's urea export tax policy is expected to support the competitiveness of its product and could result in more even distribution of exports throughout the year. North African nitrogen capacity has increased but issues related to gas supply and government export approvals have impacted supply and created market uncertainty. The major factor to watch in the US market is the slow pace of imports through the first six months of the fertilizer year (as shown in Figure 3 on the right). If the level of imports does not pick up early in the year, we believe there is potential for tighter nitrogen supply conditions as the spring season approaches.

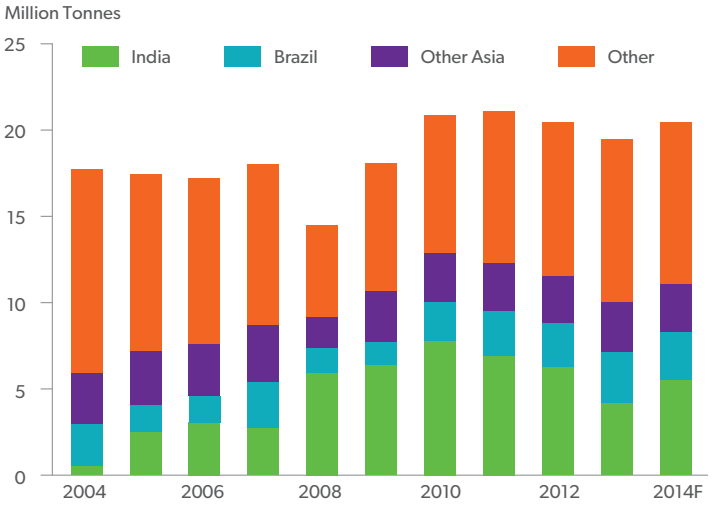
Figure 1: World Potash Demand
Growth Anticipated in 2014



* Forecast per PotashCorp

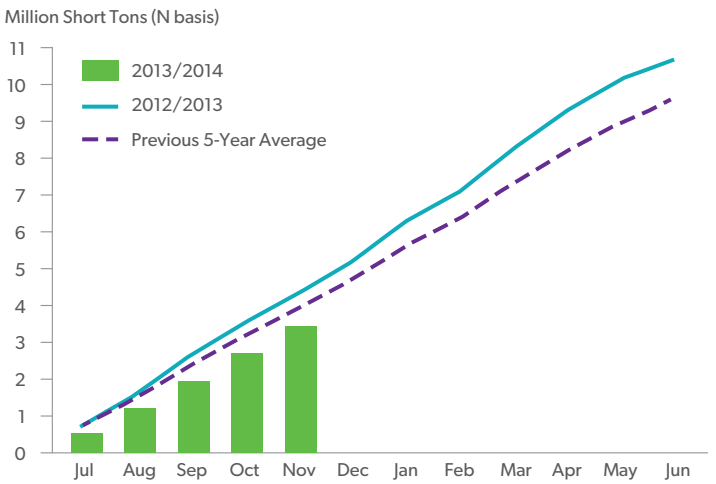
Source: Fertecon, CRU, Industry Publications, PotashCorp

Figure 2: World DAP and MAP Imports
Demand Recovery in India to Support Global Phosphate Trade



Source: CRU, PotashCorp

Figure 3: US Cumulative Nitrogen Imports
Potential for a Robust Spring



Note: Nitrogen imports include ammonia, urea, and UAN.

Source: USDOC, PotashCorp

Have you visited www.potashcorp-eKonomics.com lately?

Since its launch last year, the eKonomics website has grown into a comprehensive resource allowing farmers to get the information they need to help make more informed farm management decisions.

Over the past few weeks, we've made several site enhancements including the addition of data for several new states, regions and provinces allowing more farmers to access and use the tools and resources for their specific needs. We've also added new crops to both the Nutrient Removal and Nutrient ROI Calculators. Specific updates include:

Nutrient Removal Calculator

- New crop additions including cassava, peanuts, sunflowers, tobacco (burley) and tobacco (flue-cured)
- The option to select between imperial or metric units

Nutrient ROI Calculator

- New crop additions including cotton, spring and winter wheat
- The addition of Missouri, Nebraska, the Northern & Southern Plains, the Southeast and the province of Ontario
- The ability for users to input their individualized nutrient analyses allowing for a more accurate ROI calculation

Finally, we've added a "News" section to the site that will contain agronomic articles, tips and advice from PotashCorp's Dr. Robert Mullen as well as other top ag experts.

We invite you to check back often as the site continues to evolve with new videos, research, upgraded features and fresh content, with the goal of helping you make more informed business decisions.

Visit www.potashcorp-eKonomics.com and follow us on Twitter @eKonomics_PCS.

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