

## DuSolo's Phosphate Rock: Market Potential and Pricing Analysis

Agroconsult Consultoria e Projetos (Agroconsult), a consulting company specialized in Brazilian agribusiness, was commissioned by DuSolo to develop a market research report aiming to estimate market potential and competitive prices for some of its phosrock products. The report was prepared and delivered in December, 2016.

### Introduction:

Brazilian agribusiness is one of the country's major industries and has made a substantial contribution to national development by fostering national production, generating foreign trade surplus and increasing national financial reserves.

According to data from CEPEA-USP, agribusiness sector represents 23% of Brazilian GDP (2015). Additionally, MAPA data shows that in 2015, agribusiness generated a US\$ 75.0 billion surplus compared to a \$20.0 billion trade surplus registered in Brazil as a whole. Therefore, this activity allows the country to sustain its positive outcomes in the balance of trade.

The relevance of agribusiness is based on the fact that Brazil is one of the world's largest agricultural producers, especially in meat, soybeans, sugar, ethanol, orange juice, coffee and cotton. The consistent growth in agricultural production underlying this performance is explained, in part, by massive productivity gains following the adoption of technologies that involve, among other measures, more intensive fertilizer usage. Currently, grains, sugarcane, forest and coffee are the main crops cultivated in the country.

Keeping an eye in the future, Agroconsult believes that the current rise in demand for foodstuffs, driven by global growth, especially in developing countries, as well as the incentives for biofuels in the Brazilian energy grid are a source of many opportunities for the Brazilian farming industry.

From 2015 to 2025, 16.6 million ha of planted area should be added to the Brazilian agriculture, but increase in production will be mainly achieved by improvements in productivity. This means that Brazilian agricultural growth will continue to be led by technology, and the area expansion will be concentrated mainly in the Cerrado region.

Agroconsult estimates that grain production could reach about 301 million tons until 2025. While this performance is dependent on improvements in crop yields, some area expansion may also be required (for both new areas and second harvest area).

For sugarcane, Agroconsult estimates that production will reach to 884 million tons by 2025, with an average growth of 2.9% y-o-y. Part of this expansion will be explained by productivity, which tends to grow at an average rate of 0.9% y-o-y, while planted area is expected to reach 12.1 million hectares in the same period (average growth of 1.9% y-o-y).

Even considering the restrictions set by Brazilian environmental legislation, a study from Embrapa (Brazilian Company for Agricultural Research) about land use in Brazil, asserts that the availability of arable land is around of 34 million hectares. However, despite the availability of area, it must be considered that the Brazilian soils have strong restrictions. There is in Brazil a predomination of low fertility soil, classified as restricted or very restricted to agricultural production. Besides the low availability of primary macronutrients (N, P and K), secondary (Ca, Mg and S) and micronutrients (Zn and Cu, among others), there are also large areas of acid soils with low CEC (cation exchange capacity), strong power to fix phosphorus besides the high exchangeable acidity (Al 3+).

Therefore, fertilizer application is vital for the performance of the farming industry and is likely to remain so for the foreseeable future. This means that increasing farmland acreage and attempts to improve productivity will be accompanied by an increase in fertilizer consumption, which clearly shows the growth potential for this market in Brazil.

#### **Brazilian Fertilizer Market:**

Due to predominance of very poor soils in Brazil, there is a need to use large amounts of fertilizers per area to make agricultural production possible and feasible.

Because of its agricultural profile and the relevant share of soybean in this activity, Brazil has a balanced nutrient consumption of nitrogen, phosphorus and potash, unlike other important markets such as China and India where nitrogen predominates.

In the past ten years, fertilizer market in Brazil grew at an annual rate of 4.1%. For the coming years, market will keep growing, but at a lower pace (3.0% y-o-y). By 2025, more than 10.6 million tons of fertilizer will be added to the Brazilian market regarding current demand levels. During 2016, farmers demanded 32,6 million tons of fertilizers. In 2025 market demand will be close to 43,2 million tons. Over the next 10 years, fertilizer consumption in Center-West will increase more than 50%. And the region will account for 51% of the additional demand in the whole country. The three most important regions for the fertilizer market (Center-West, South and Southeast) represents 86% of the total fertilizer consumption in Brazil. In 2025 this main

predominance will continue with 84% share. Phosphate fertilizer always represents about 42% of the Brazilian fertilizer market and will grow at a ratio of 2.9% y-o-y.

As a result of its soil characteristics and agricultural profile, Brazil is the world's fourth-largest consumer of fertilizers but it accounts only for 2% of the fertilizer world production and depends on imports to supply the market.

Brazil has a local industry to provide fertilizers, but the country needs to import all raw materials (except SSP) to meet its total demand. The country's dependence on imports differs among nutrients, reflecting the availability of natural resources. Currently, 77% of nutrient consumption is supplied by imports. This share achieves 95% for  $K_2O$ , 78% for N and 57% for  $P_2O_5$ .

Since 2000, Brazilian fertilizer production fluctuates around 8.0 to 10.0 million tons. In the past five years, though, production has been decreasing despite the upwards trend in demand. Currently, phosphate fertilizers represent about 80% of total national production.

Considering the Brazilian Fertilizer Industry opportunities, we expect an improvement in its capacity with the start up of new facilities. Nevertheless, domestic production will be far from reaching domestic consumption.

#### **The Product, Rock Phosphate Consumption in Center-West and Pricing:**

As previously addressed, the fertilizer market is expected to grow over the next years, especially in Cerrado Region. Considering this particular area, three key states deserve to be highlighted: Mato Grosso (MT), Tocantins (TO) and Goiás (GO).

In 2016, both states may consume more than 11 million fertilizer tons, of which 4.5 million refers to phosphate fertilizer, responding to 1.8 million tons of  $P_2O_5$ . Part of this volume is effectively consumed by perennial crop as well as semi-perennial, such as grasslands, commercial reforestation and sugarcane. Additionally to this market, the phosphating procedure is also considered, being used in order to correct the phosphorus levels presented in new first planting areas.

Several sources of phosphorus have been used to supply this nutrient. Currently, the most popular sources are: rock reactive phosphates, triple superphosphate, monoamonic phosphate and simple superphosphate. Common to all of them is the fact that they all are rapidly solubilized. However, while this feature is extremely important for the short cycle crops, which require immediate supply of phosphorus, it is in fact a problem for the long cycle crops such as perennials and semi-perennials.

The Brazilian soils are acids and present unavailable phosphorus due to a particular natural phenomenon called fixation. Because of that, currently these crops have been supplied with both soluble products and by-products of the phosphate industry. In terms of solubility, it is seen that sources easily solubilized are desirable for long cycle crops. Thus, it is possible to understand that there is an opportunity for products with more appropriate behavior to the perennial crops and the correction of phosphorus in the soil, which is a rock phosphate.

For while, to estimate price and market potential, Agroconsult is considering that the Dusolo's Phosphate Rock provides 12% and 15% of  $P_2O_5$  as a reference. Due to its features, Dusolo's Phosrock is naturally applied in perennial crops or in new areas that will receive an annual crop for the first time. As both products herein analyzed offer the same nutrient ( $P_2O_5$ ) and have the same behavior when applied to the soil, the choice between them will be a matter of price and handled volume. Generally speaking, market gives priority to more concentrated products.

When compared to other phosphate sources, the rocks to be worked by Dusolo differ from the soluble sources because they have non-acidified gradual solubility behavior, therefore being slightly affected by pH effects such as nutrient losses in the soil (which means they are suitable for long cycle crops). Moreover, compared to some byproducts originated from rock mined to fertilize production purposes and that are sold in the market, Dusolo rocks are favorable because they are dry and offer greater phosphorus concentration, thereby facilitating the handling by the final user. Nevertheless, the price will be the main decision factor to be considered by the user. In this case, the value charged for each percentage unit of phosphorus ( $P_2O_5$ ) is going to be used as comparison by farmers.

Therefore, to estimate Dusolo's competitive price in each market – Mato Grosso, Goiás and Tocantins – Agroconsult has considered competition with SSP, MAP, STP and PhosRock regarding the cost per point (%) of  $P_2O_5$ . Then, net-back prices were calculated discounting freight value and taxes (ICMS of 8.4% for Mato Grosso and 0% for Goiás and Tocantins) considering that the products will be originated from Campos Bellos/GO.

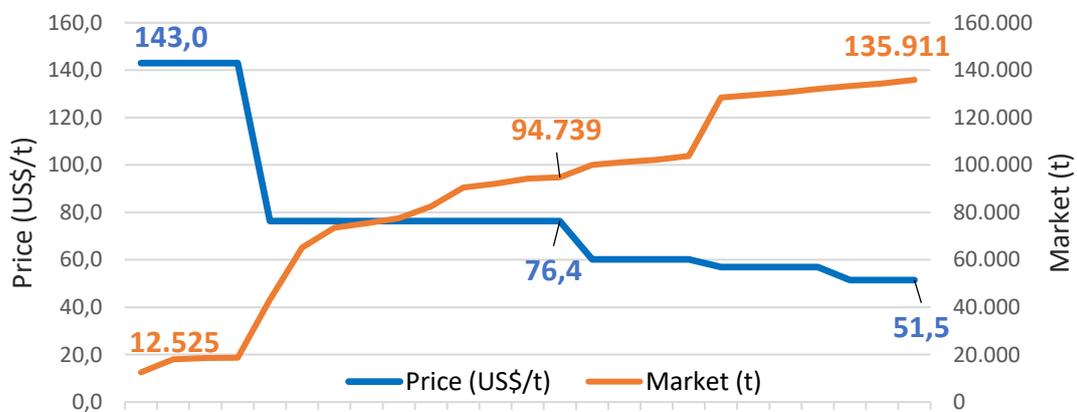
In the first moment, Agroconsult understand that perennial crops (sugarcane, forest and pasture) are among those ones immediately able to receive the kind of product sold by DuSolo with a positive response. So, market potential has been estimated by the equivalent volume of the New Product required to supply the same amount of  $P_2O_5$  provided through other sources currently applied as single element in pasture, sugarcane and commercial forest in the following regions: Tocantins, Goiás (East, Southeast and North) and Mato Grosso (South and East).

Both price and market potential analysis consider that the Dusolo will operate in the Single Element market with no intermediaries, in other words, the company will sell and deliver their products straight to farmers. Currently, single element market totalizes 1,600,000 tons in selected states. It is estimated that single element market for phosphates in Mato Grosso, Tocantins and Goiás reaches 689,893 tons of P<sub>2</sub>O<sub>5</sub>.

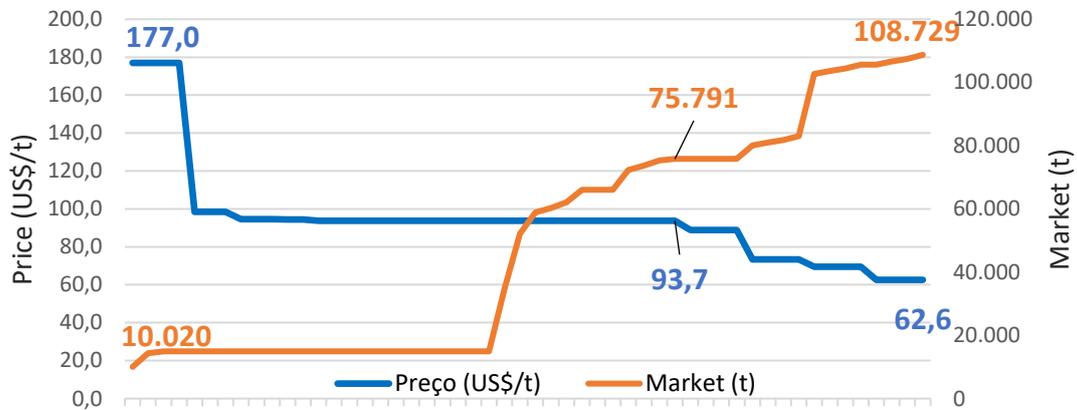
It is important to take into account that the product to be sold by Dusolo, no matter the one to be chosen between the two options herein analyzed – has a low P<sub>2</sub>O<sub>5</sub> concentration. Even if it presents a good efficiency, the dosage must be higher than any other P sources commonly used in Brazil. This brings more effort to transport the product from its origin to the farm and to apply it into the soil.

The market potential, in the case of straight sales, would be 135.9 thousand tons with prices (FOB Campos Bellos) at US\$ 51.5 per metric ton for a 12% P<sub>2</sub>O<sub>5</sub> Rock and 108.7 thousand tons at US\$ 62.6 per metric ton for a 15% P<sub>2</sub>O<sub>5</sub> Rock. In both cases the estimate potential focus on pasture, forest and sugarcane demand in the states of MT, GO, and TO.

### Sensitivity Analysis: Price Level vs. Market Potential - 12% P<sub>2</sub>O<sub>5</sub>



### Sensitivity Analysis: Price Level vs. Market Potential - 15% P205



Agroconsult recommends that DuSolo put an effort to sell straight to farmers. Sales occur through a direct contact of the company's commercial team or sales agent (i.e.: agricultural inputs retailers or sales person) with the end user. The sales team or agent will be responsible for providing agronomic and technical support to farmers as well as negotiating payment and financial conditions (i.e.: prices with CIF or FOB model, credit, discounts). DuSolo should be prepared to provide not just the fertilizer, but also the funding for farmers.

Dusolo has a disadvantage in being new in the fertilizer market, and the company should charge a lower price than its competitors to get market share and establish itself in the market. The sales team will be an important link with farmers, as important as price and product, and must be managed under a strong relationship strategy.

Another point of attention is that Dusolo's competitors have a high bargaining power (since they operate with a capacity superior to the growth of the market). Dusolo entry into the Brazilian market may bother its competitors, allowing them to adopt strategies to avoid losing market share, such as lowering the raw material price.

Thus, what will decisively affect Dusolo competitiveness in the Brazilian market is its cost structure and sales team skills. The advantage of Dusolo lies on the faster delivering of the product, given its proximity to consumers when compared to its international competitors.