HIGHLIGHTS

A fertilizer plan that included POLY4 supported corn yield more than the MOP-only option.

The higher corn yield meant a US$24/ha greater margin over the fertilizer cost than the MOP blend.

The increase in margin over the three-year trial showed that POLY4 blend consistently maintained the economic benefit.

The POLY4 blend increased the economic benefit by 16% compared to the MOP blend.
TRIAL OBJECTIVE

To evaluate POLY4 as a fertilizer for corn by comparing 6:14:14 blends made with MOP and MOP+POLY4 as K sources over a three-year trial.

USDA’s World Agricultural Outlook report (Apr, 2018) states that USA, Brazil, Argentina and South Africa were major exporters of corn in 2016-17. USA and China remain the largest corn producers in the world with majority of their production remaining for domestic use.

<table>
<thead>
<tr>
<th>Country</th>
<th>Corn production (Mmt)</th>
<th>Corn exports (Mmt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>384.78</td>
<td>58.24</td>
</tr>
<tr>
<td>China</td>
<td>219.55</td>
<td>0.08</td>
</tr>
<tr>
<td>Brazil</td>
<td>98.50</td>
<td>31.60</td>
</tr>
<tr>
<td>Argentina</td>
<td>41.00</td>
<td>25.99</td>
</tr>
<tr>
<td>South Africa</td>
<td>17.55</td>
<td>2.20</td>
</tr>
</tbody>
</table>

OVERVIEW

PARTNER: FUNDAÇÃO MT
LOCATION: MATO GROSSO, BRAZIL

• In 2016-17 Brazil was one of the largest exporters of corn in the global corn market.¹ During the same crop season, Brazil produced 98.5 million tonnes of corn.²

• Trials took place in Mato Grosso, the largest corn producing state in Brazil.² This location is known for low soil K, S and Ca.

• The variety of crop trialled was corn Safrinha. Over the last eight years, this variety of corn has become the main production output in Brazil. In 2016-17 season, corn Safrinha represented more than two-thirds of 98.5 Million metric tonnes of total production.

• Corn was grown in rotation with soybean in a three-year trial on soils with low test K. Fertilizer applications were broadcast pre-planting.

• Trials plots were a complete randomised design with five replications.

• Results presented are averages of the three-year data.
**TREATMENT TABLE**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Average nutrient applied in trial (kg ha⁻¹)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td>CONTROL (N + P)</td>
<td>119</td>
</tr>
<tr>
<td>6:14:14 (TSP + SSP + MOP)</td>
<td>119</td>
</tr>
<tr>
<td>6:14:14 (MAP + MOP + POLY4)</td>
<td>119</td>
</tr>
</tbody>
</table>

**6:14:14 BLEND COMPOSITION**

**TRADITIONAL: INPUTS**

- **Urea:** 13%
- **TSP:** 13%
- **SSP:** 49%
- **MOP:** 23%

**POLY4: INPUTS**

- **Urea:** 7%
- **MAP:** 27%
- **MOP:** 11%
- **POLY4:** 51%

**CORN YIELD**

- **Control:** 5.9
- **TSP + SSP + MOP 6:14:14:** 7.0
- **MAP + MOP + POLY4 6:14:14:** 7.2

- The POLY4 blend’s nutrient spectrum and reduced chloride content supported corn yield increase.
- The results from the three-year trial showed that the inclusion of POLY4 in a fertilizer plan supported corn yield more than the MOP-only option.
**FERTILIZER COST, OUTPUT AND MARGIN**

1. USDA (United States Department of Agriculture, 2017); 2. Meredith Agrimedia (2017); 3. The total N supply included 30 kg N ha\(^{-1}\) from soybean and 68 kg N ha\(^{-1}\) from urea as top dressing; 4. Initial soil analysis based on average for 2014, 2015 and 2016 trials: pH 4.9; P 1 mg kg\(^{-1}\); K 66 mg kg\(^{-1}\); Ca 184 mg kg\(^{-1}\); Mg 325 mg kg\(^{-1}\); available S 4 mg kg\(^{-1}\); 5. Nutrient composition: urea: 46:0:0; TSP: 0:45:0 + 15% CaO; SSP: 0:18:0 + 12% S + 28% CaO; MAP: 11:52:0; MOP: 0:0:60; POLY4: 0:0:14 + 19% S + 6MgO + 17CaO; 6. Results presented are based on data from GENSTAT regression analysis at average K\(_2\)O rate of 50 kg ha\(^{-1}\); 7. Yield results are average estimates from 2014, 2015 and 2016 trials; 8. Fertilizer prices were obtained from CRU and are based on average fertilizer prices: MOP (US$302/t), POLY4 (US$200/t), SSP (Brazil Inland: US$229/t), TSP (US$354/t), urea (US$289/t) and MAP (US$437/t). Analysis accounts for fertilizer application or spreading cost of US$13.07/t; 9. Average corn price = US$162/t; 10. Net return = crop output minus (cost of fertilizer material + cost of fertilizer application). The total cost calculation took into consideration the cost of additional 68 kg N ha\(^{-1}\) from urea as top dressing. Nutrient composition: urea: 46:0:0; TSP: 0:45:0 + 20CaO; SSP: 0:18:0 + 11S + 28CaO; MAP: 11:52:0; MOP: 0:0:60; POLY4: 0:0:14 + 19S + 6MgO + 17CaO; 11. Margin-fertilizer ratio = margin (US$/ha) divided by fertilizer cost (US$/ha); 12. The marginal benefit-cost ratios were estimated using the benefit (yield) of the control as reference.

**FINANCIAL RATIOS**

- Marginal benefit-cost ratio indicates the additional economic benefit derived in adding fertilizer, whereas margin-fertilizer cost ratio shows the economic benefit obtained for every dollar spent on fertilizer.
- The POLY4 blend increased the economic benefit by 16% compared to the MOP blend.
- A dollar spent on the POLY4 blend generated a greater output than that spent on MOP.

**Note:** 1) USDA (United States Department of Agriculture, 2017); 2) Meredith Agrimedia (2017); 3) The total N supply included 30 kg N ha\(^{-1}\) from soybean and 68 kg N ha\(^{-1}\) from urea as top dressing; 4) Initial soil analysis based on average for 2014, 2015 and 2016 trials: pH 4.9; P 1 mg kg\(^{-1}\); K 66 mg kg\(^{-1}\); Ca 184 mg kg\(^{-1}\); Mg 325 mg kg\(^{-1}\); available S 4 mg kg\(^{-1}\); 5) Nutrient composition: urea: 46:0:0; TSP: 0:45:0 + 15% CaO; SSP: 0:18:0 + 12% S + 28% CaO; MAP: 11:52:0; MOP: 0:0:60; POLY4: 0:0:14 + 19% S + 6MgO + 17CaO; 6) Results presented are based on data from GENSTAT regression analysis at average K\(_2\)O rate of 50 kg ha\(^{-1}\); 7) Yield results are average estimates from 2014, 2015 and 2016 trials; 8) Fertilizer prices were obtained from CRU and are based on average fertilizer prices: MOP (US$302/t), POLY4 (US$200/t), SSP (Brazil Inland: US$229/t), TSP (US$354/t), urea (US$289/t) and MAP (US$437/t). Analysis accounts for fertilizer application or spreading cost of US$13.07/t; 9) Average corn price = US$162/t; 10. Net return = crop output minus (cost of fertilizer material + cost of fertilizer application). The total cost calculation took into consideration the cost of additional 68 kg N ha\(^{-1}\) from urea as top dressing. Nutrient composition: urea: 46:0:0; TSP: 0:45:0 + 20CaO; SSP: 0:18:0 + 11S + 28CaO; MAP: 11:52:0; MOP: 0:0:60; POLY4: 0:0:14 + 19S + 6MgO + 17CaO; 11. Margin-fertilizer ratio = margin (US$/ha) divided by fertilizer cost (US$/ha); 12. The marginal benefit-cost ratios were estimated using the benefit (yield) of the control as reference.

**Sources:** Fundação MT (2014, 2015, 2016) 5000-FMT-5010-14, 5000-FMT-5012-15 & 5000-FMT-5014-16

siriusminerals.com | +44 1723 470 010 | commercial@siriusminerals.com

Registered Address: 3rd Floor Greener House, 66–68 Haymarket, London SW1Y 4RF, UK

Company Registered Number: 4948435