The future of fertilizer.

SIRIUS MINERALS PLC

WE'RE ABOUT GROWTH

Polyhalite as an alternative potash source in Brazil
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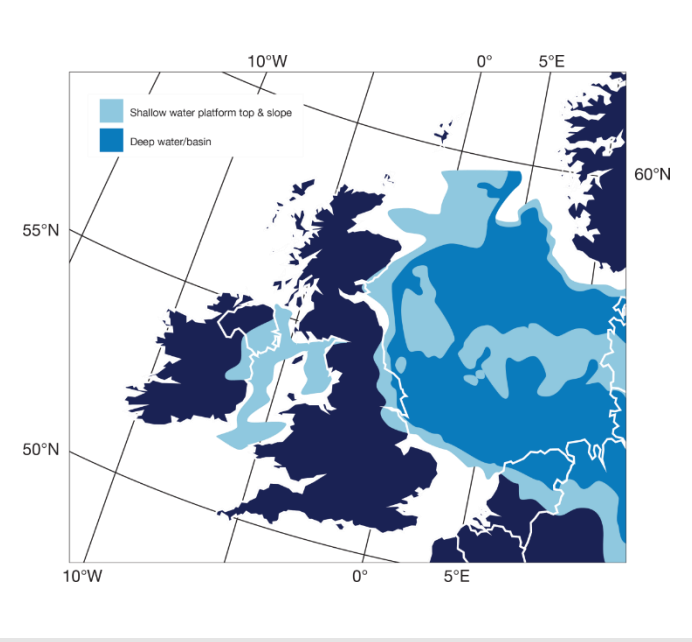
June 2017

THE EUROPEAN ZECHSTEIN DEPOSIT

Sedimentary rock layers of the middle to late Permian period

Key comments

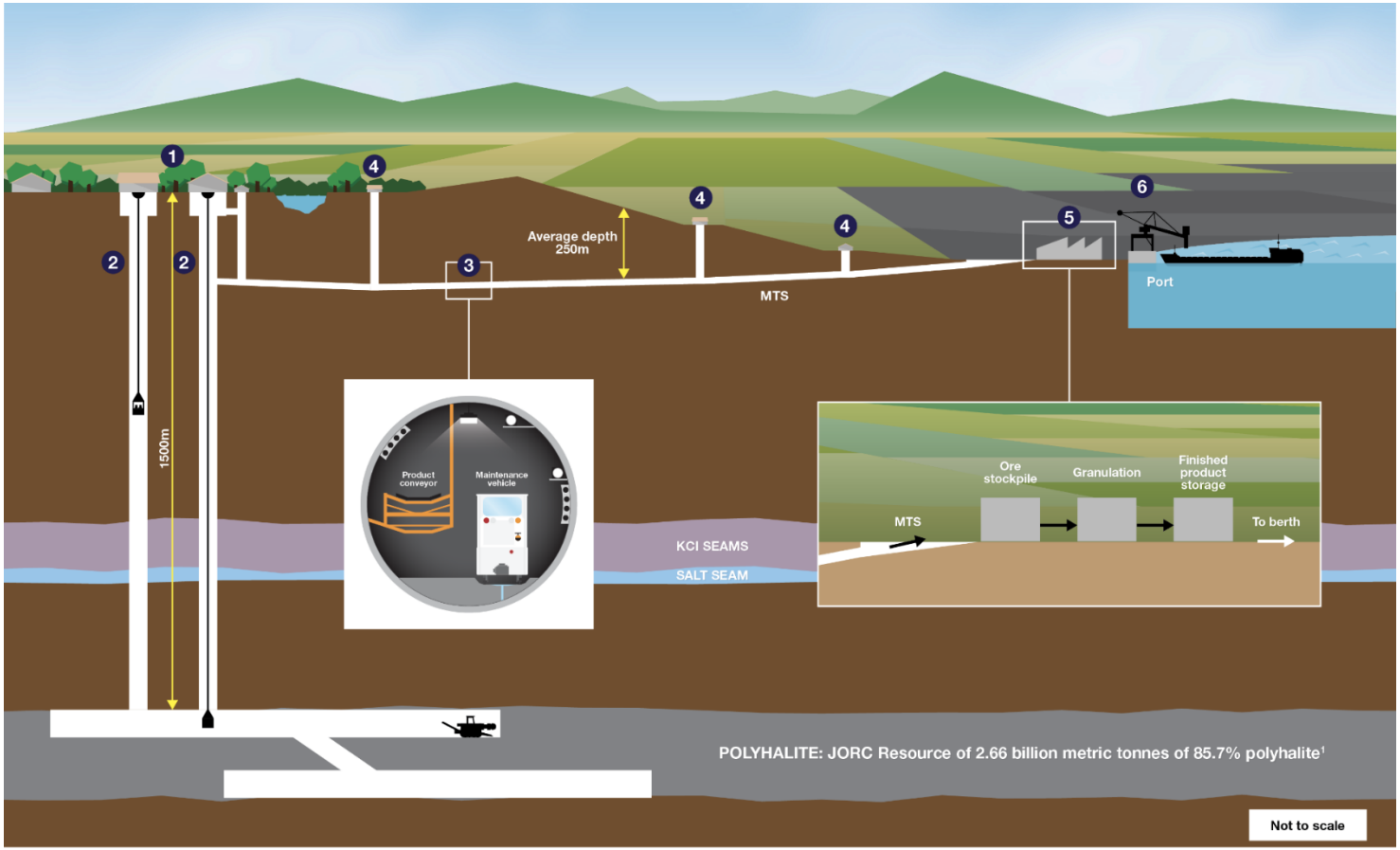
- The disappearance of the Zechstein Sea was part of a general marine regression that preceded and accompanied the Permian-Triassic extinction.
- Polyhalite is an evaporate mineral deposited here 250-260 million years ago.
- Initially discovered in 1818 by Stromeyer.
- Polyhalite is a hydrated sulphate of potassium, calcium and magnesium with formula: $K_2Ca_2Mg(SO_4)_4 \cdot 2H_2O$.
- A triclinic crystal structure with a hardness index of 2.5-3.5 Mohs.
- Sirius Minerals will mine polyhalite to produce POLY4 fertilizer.



KEY TAKEAWAY: Sirius Mineral's 2.66 billion tonnes resource represents 7% of the area of interest

Notes: Resource assessment in accordance with JORC code

THE PROJECT


1
2
2
3
4
4
4
4
5
6
Average depth 250m
MTS
Port
1500m
Product conveyor
Maintenance vehicle
KCl SEAMS
SALT SEAM
Ore stockpile
Granulation
Finished product storage
MTS
To berth
POLYHALITE: JORC Resource of 2.66 billion metric tonnes of 85.7% polyhalite[1]
Not to scale
1 MINE SITE
2 MINE SHAFTS
3 MINERAL TRANSPORT SYSTEM (MTS)
4 MTS ACCESS POINTS
5 MATERIALS HANDLING FACILITY (MHF)
6 HARBOUR FACILITY

A NEW BENCHMARK IN ENVIRONMENTAL IMPACT

Woodsmith Mine has been designed to minimise the impact on the National Park

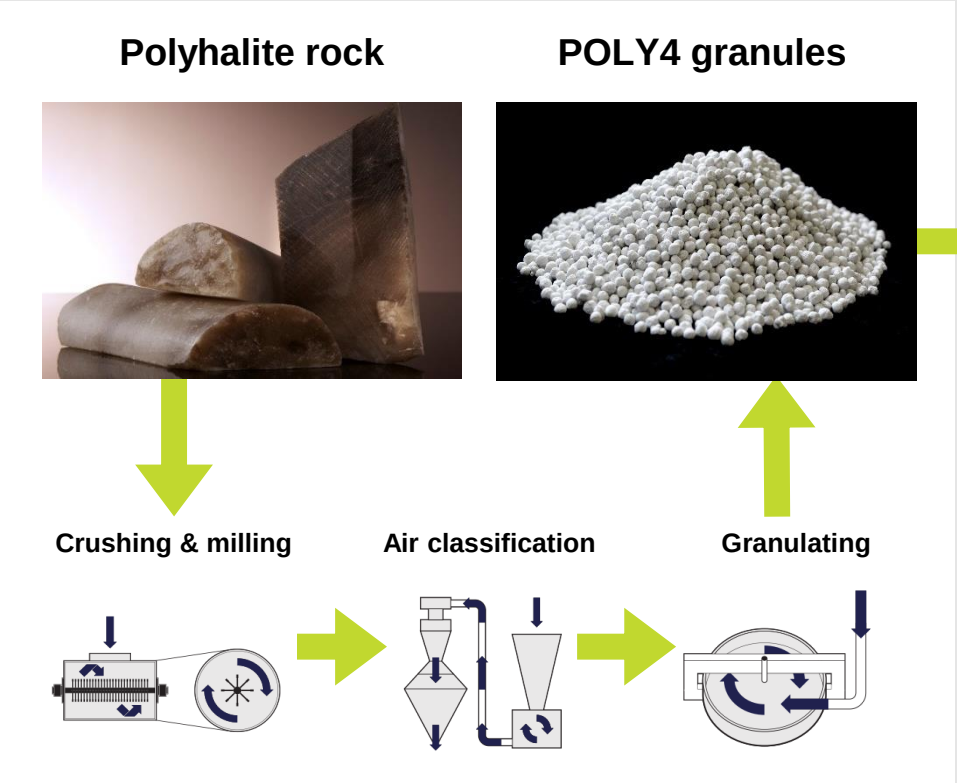
Woodsmith Mine, North Yorkshire, UK

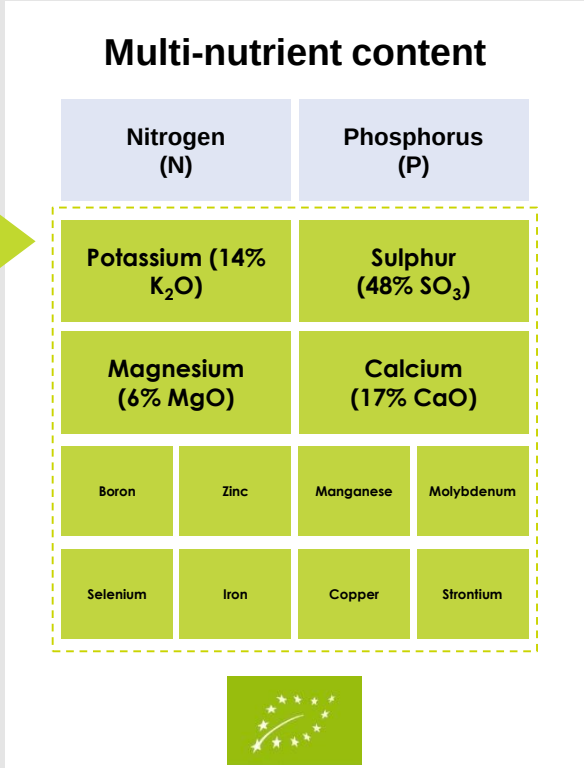
KEY TAKEAWAY: Traditional approaches to mining have historically been low cost, high impact

WHAT IS POLY4?

Polyhalite, a single source of bulk nutrients, is the foundation for POLY4

Polyhalite nutrient composition[1]



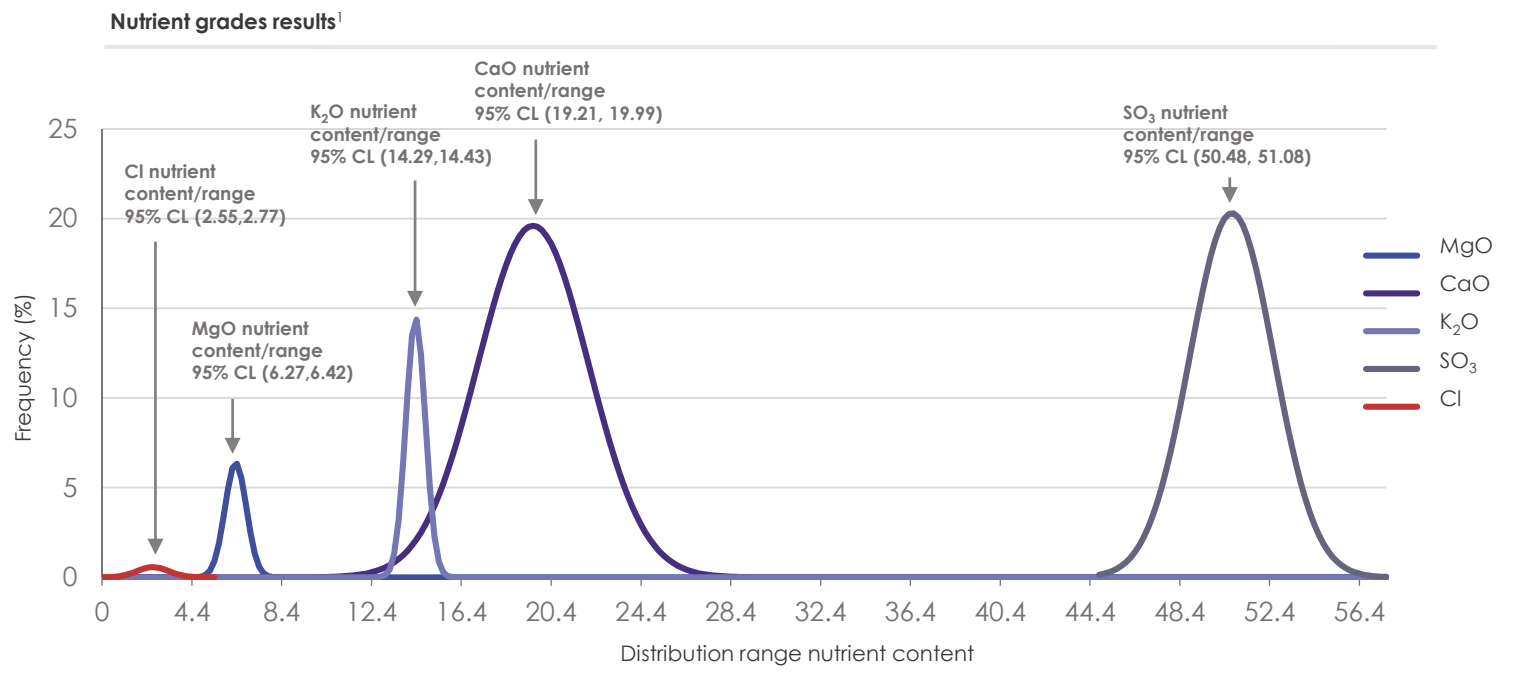


KEY TAKEAWAY: POLY4 is a natural single source of K, S, Mg, Ca with valuable micro nutrients

Notes: 1) Based on 90% polyhalite grade. Remaining content consists of Halite, Anhydrite, Magnesite, Kieserite, Hexahydrite, Szabelyite, Gypsum, Synenite, Mica; 2) POLY4 is the trademark name for Sirius Mineral's flagship polyhalite product.

POLY4 NUTRIENT CONTENT BASED ON TEST RESULTS

POLY4 minimum specification is 14% K_2O, 17% CaO, 6% MgO, 48% SO_3.

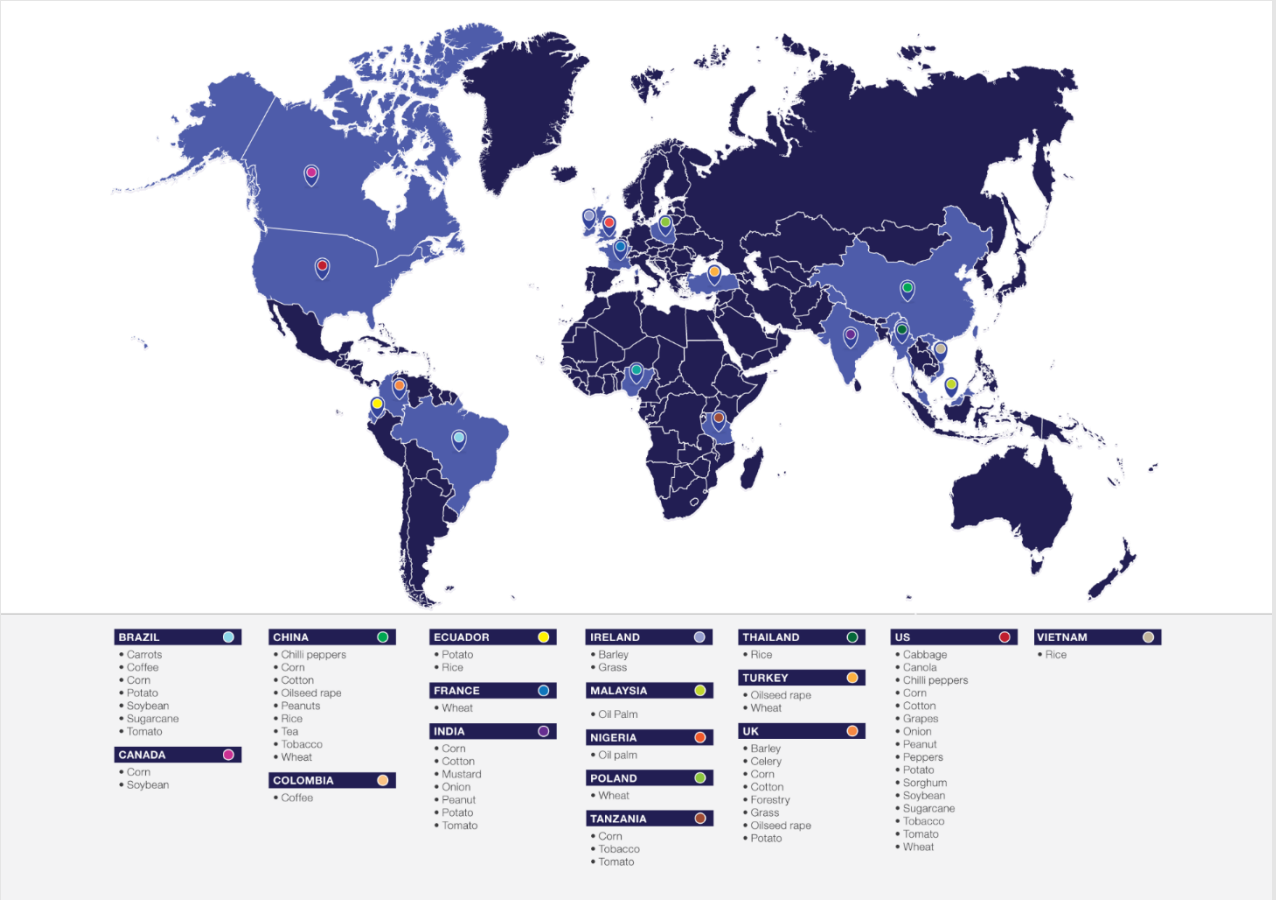


KEY TAKEAWAY: **POLY4 nutrient content is consistently above the minimum specification**

Notes: Confidence limits (CL) for each nutrient are based on analysis of 135 polyhalite samples.
Sources: Sirius Minerals; SGS France.

SIRIUS MINERALS SCIENCE PROGRAMME

Global science programme has over 210 trials in 17 countries on 27 crops



Note: Trials as of May 2017.

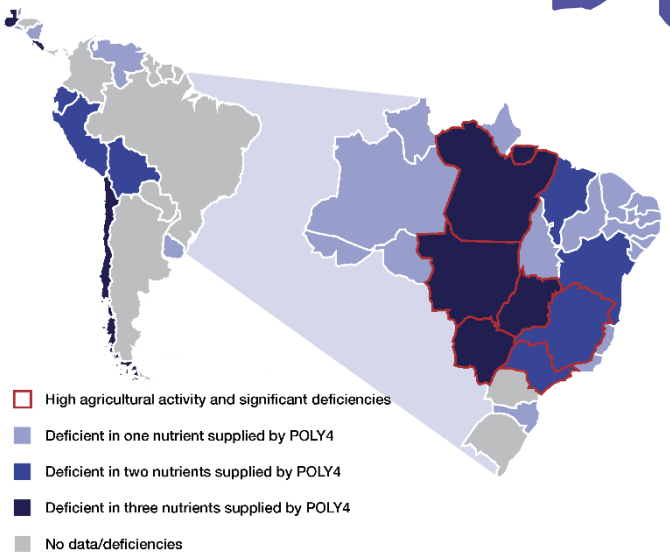
SIRIUS MINERALS TRIAL PROGRAMME AND REGIONAL OPPORTUNITIES

POLY4 has been extensively trialled in several key Brazilian agricultural regions

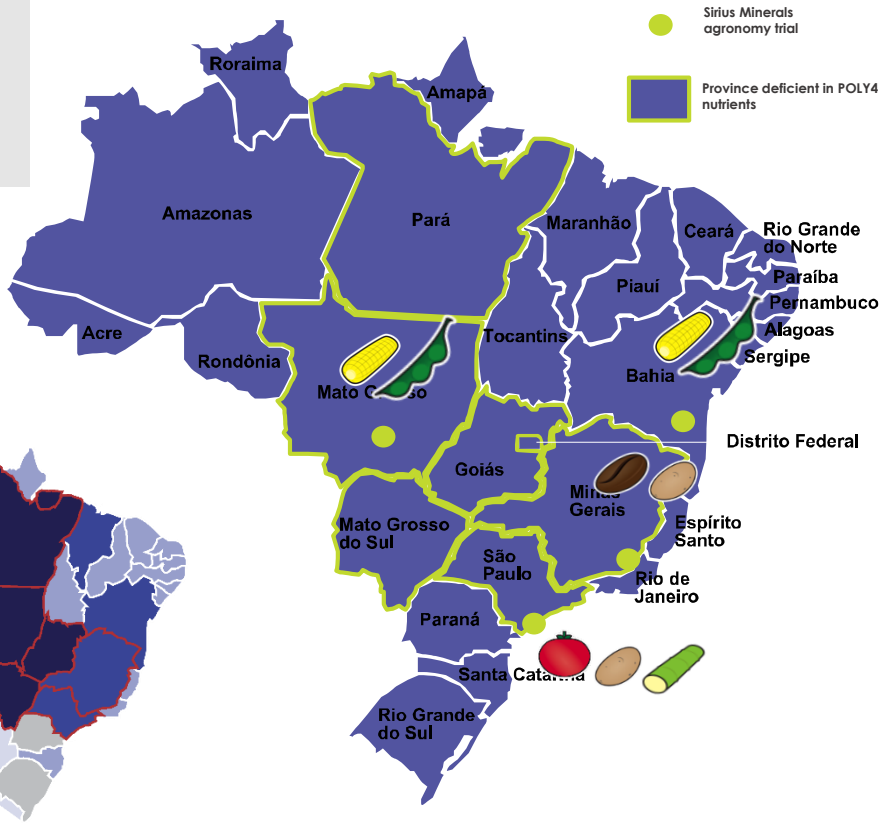
Key comments

- Brazil will become the single most important soybean producer by 2025 with production estimated to reach 135 million tonnes.
- Many of the agricultural active areas are also deficient in K, Ca, Mg and/or S.
- 20 trials have been conducted in Brazil over the past four years.
- Trials currently cover four provinces on both high value and broadacre crops.

Regional soil challenges



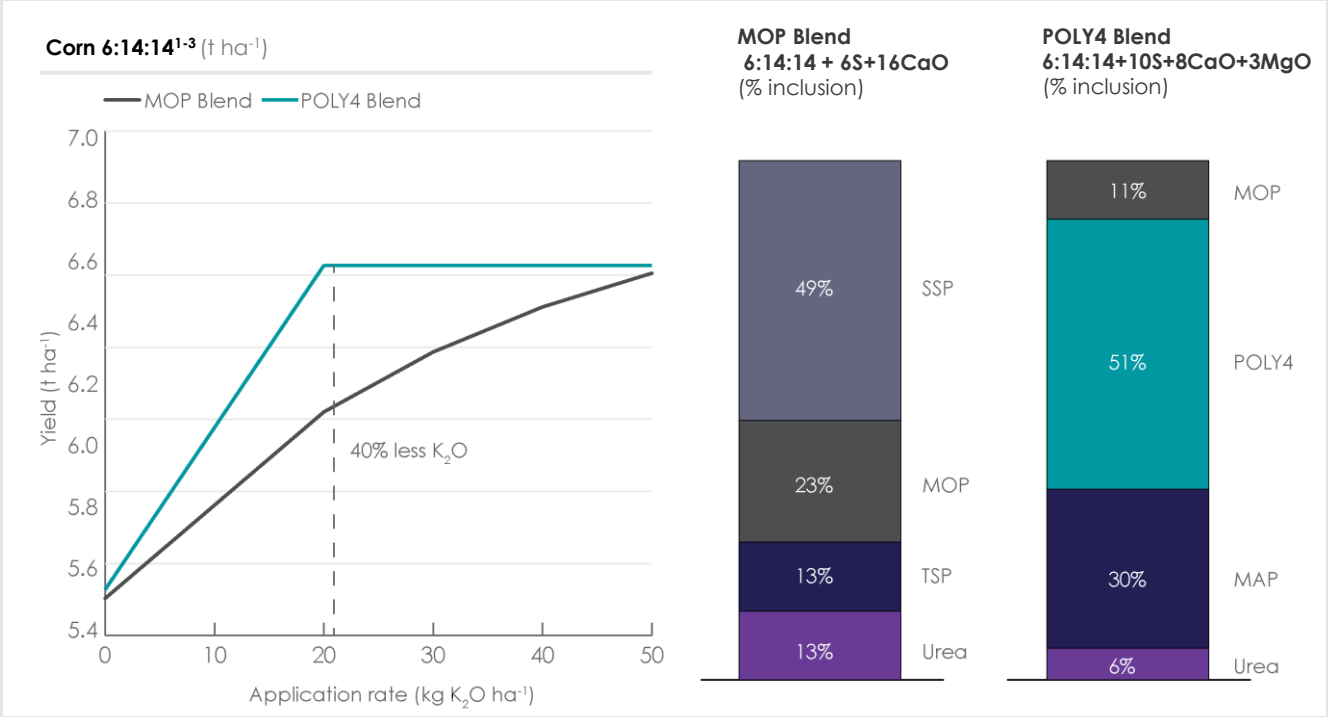
Regional agronomic trial overview



Source: Sirius Minerals.

BRAZIL CORN RESULTS

POLY4 blends can maintain yields at lower K_2O applications.



KEY TAKEAWAY: **POLY4 blends support crop yields at lower application rates**

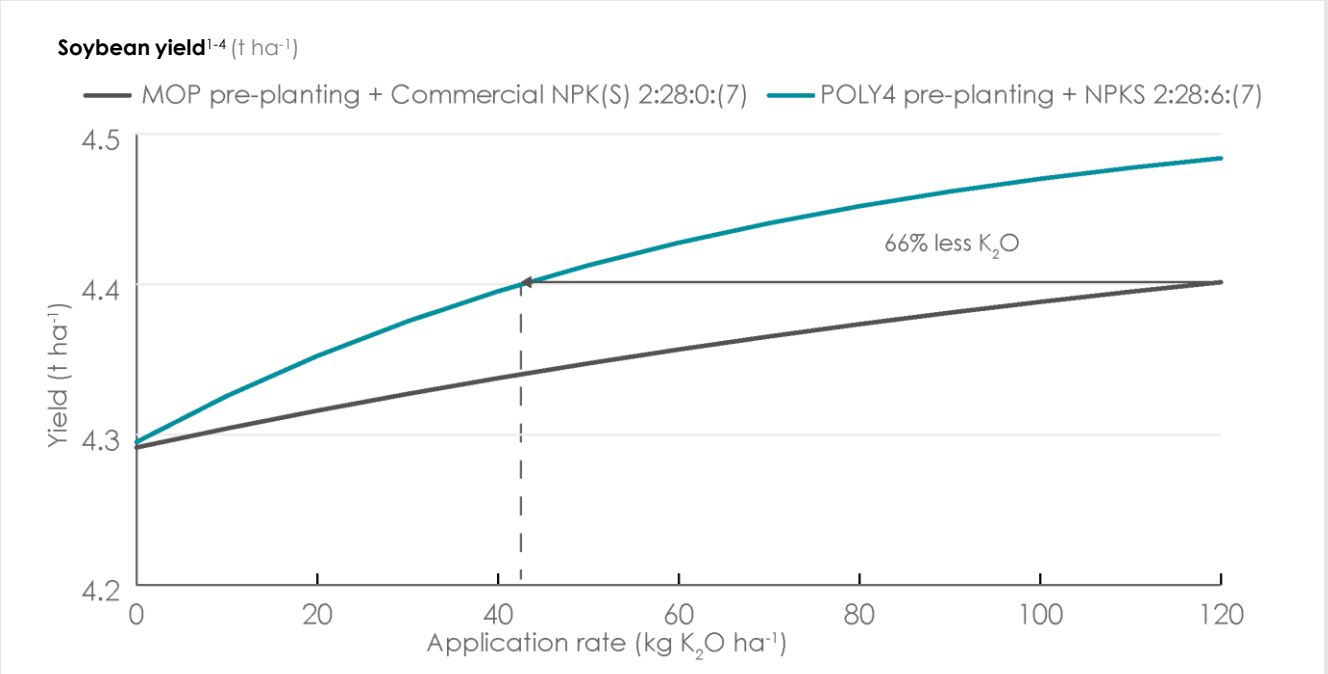
Notes: 1) GENSTAT regression analysis; 2) Lower K_2O options achieve crop nutrient offtake; 3) Initial soil analysis : pH 4.9; P 18 mg kg^{-1}, K 66 mg kg^{-1}, Mg 325 mg kg^{-1}, Ca 184 mg kg^{-1} S 5 mg kg^{-1};
Sources: University of São Paulo 2015.

BRAZIL SOYBEAN RESULTS

POLY4 blends support high yields from reduced input costs

Key comments

- In Brazil, MOP is applied in advance of soybean emergence to lower negative impacts of chloride.
- By substituting for SSP with POLY4, as the S source, we improve crop fertilization balance with an additional 17 kg MgO, 21 kg CaO and 38 kg S ha^{-1} at 40 kg ha^{-1} K_2O.
- Potassium fertilizer replaces crop offtake at a recommended rate of 88 kg K_2O ha^{-1} [5]



KEY TAKEAWAY: **POLY4 delivers the option to reduce inputs**

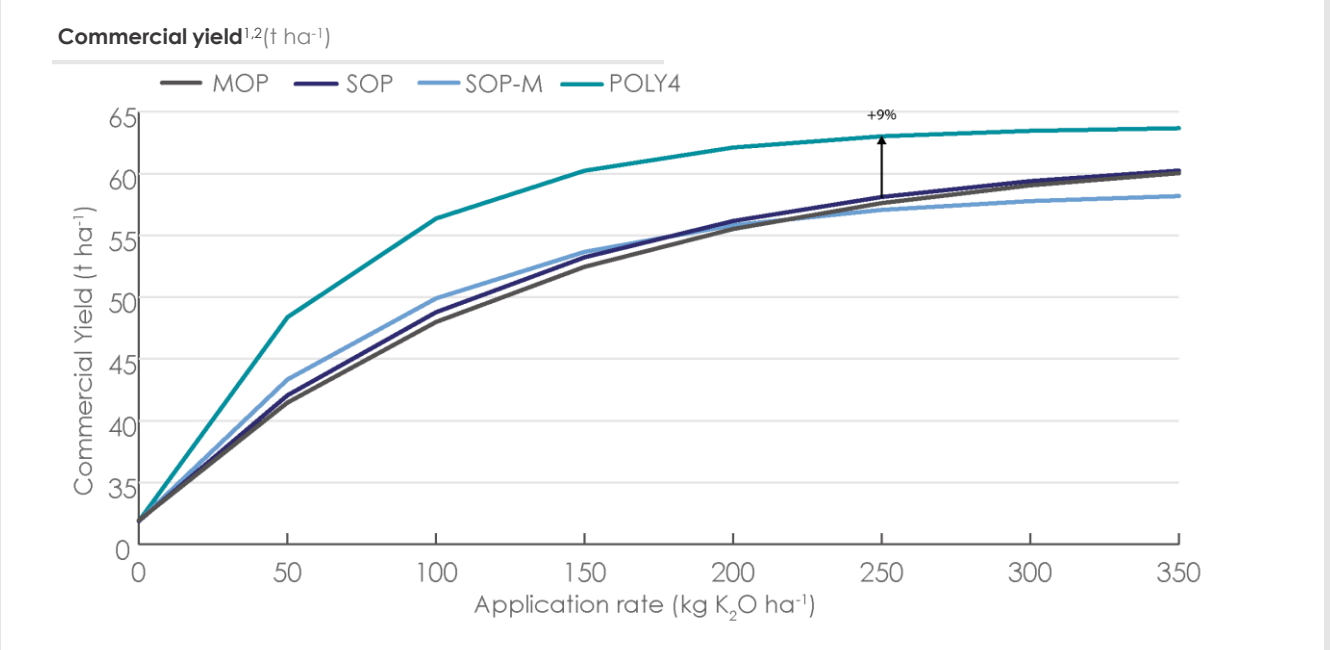
Notes: 1) GENSTAT regression analysis; 2) All plots received N 4kg ha^{-1}; 56 kg P_2O_5 ha^{-1} and K_2O ha^{-1} from MOP or POLY4 according to treatment; 3) Commercial blend made with SSP, TSP and MAP plus MOP at 30 days pre-planting; 4) POLY4 blend made with POLY4, TSP and MAP plus POLY4 at 30 days pre-planting; 5) Based on Bataglia and Mascarenhas 1978 recommended at 4.4 t ha^{-1} yield x 20 kg K_2O t^{-1}; Initial soil analysis pH 5.5; P 33 mg kg^{-1}, K 98 mg kg^{-1}, Mg 49 mg kg^{-1}, Ca 340 mg kg^{-1}; Sources: University of São Paulo 2015; Sirius Minerals.

COMMERCIAL TOMATO YIELD

Improving tomato marketable yield leads to higher returns for growers

Key comments

- The addition of sulphur from SOP or SOP-M showed no yield improvement over MOP.
- POLY4 improved tomato yields by 8–9% over other potassium fertilisers at recommended rate of 250 kg K_2O ha^{-1}.
- POLY4 supplied calcium which is important in improving commercial yield. At 350 K_2O from the POLY blend supplies an additional 18 MgO + 51CaO + 57S.



KEY TAKEAWAY: POLY4 highlights the crop need to access a broad range of nutrients

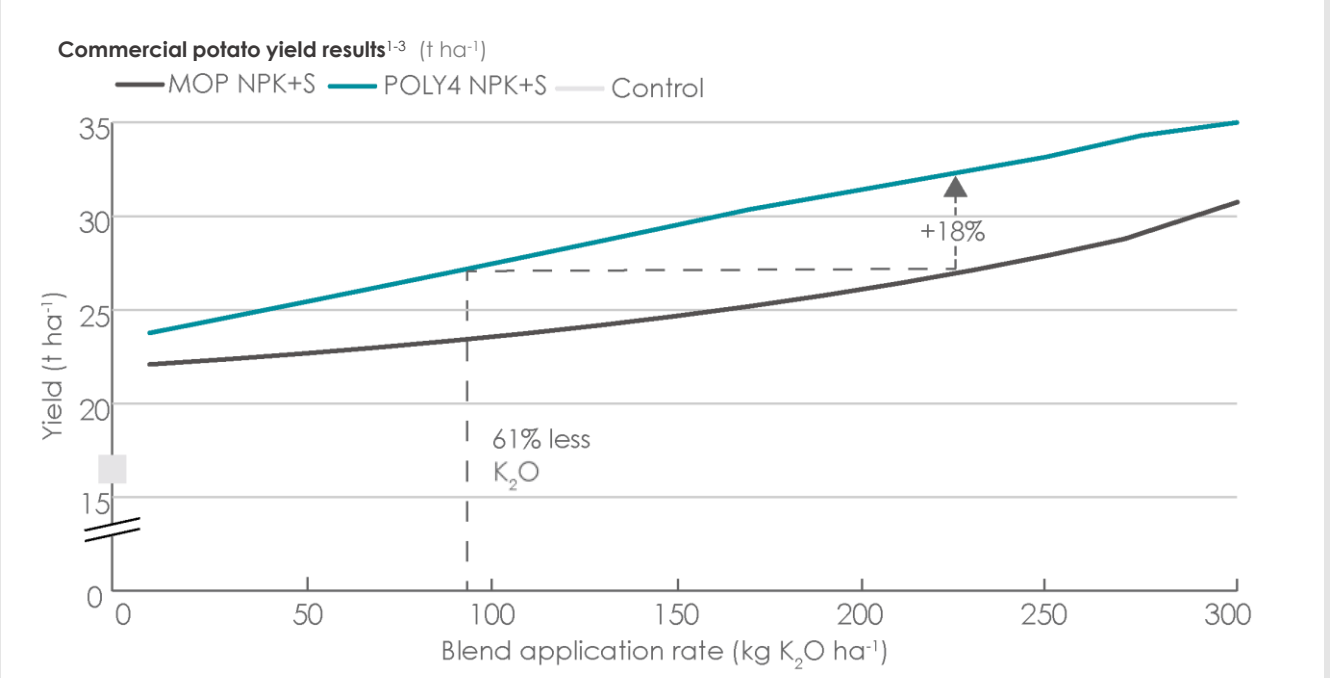
Notes: 1) GENSTAT regression analysis; 2) All plots received 300 kg N ha^{-1} and 500 kg P_2O_5 ha^{-1} from Urea and MAP. Initial soil analysis: pH 5.8, P 24 mg kg^{-1}, K 24 mg kg^{-1}, Ca 232 mg kg^{-1}, Mg 58 mg kg^{-1}, S 5 mg kg^{-1}. Source: University of São Paulo (4000-USP-4016-15).

POTATO BLEND FERTILIZER YIELD RESPONSE

POLY4 yield results compared to commercial NPK+S plan

Key comments

- Increasing K_2O application (75-300) resulted in increasing yields in a stable 150 N and 525 P_2O_5 background use 4:14 2-8 blends.
- At the recommended rate of 220 kg K_2O ha^{-1}, POLY4 NPK+S showed a yield improvement of 18% over MOP NPK+S.
- The removal of SSP lowers the Ca in favour of Mg and lower chloride from the more efficient POLY4 blend supporting yield improvement.
- Current practice supplied 309S + 433 Ca, POLY option 102-407S + 19-78Mg + 65-260 Ca.



KEY TAKEAWAY: **POLY4 can support the current yield from reduced application rates**

Notes: 1) GENSTAT regression; 2) MOP NPK+S plan was made from urea, TSP, SSP and MOP; 3) POLY4 NPK+S plan uses Urea, MAP and POLY4; Initial soil analysis: pH 5.6, K 86 mg kg^{-1}, Ca 563 mg kg^{-1}, Mg 106 mg kg^{-1}, S 30 mg kg^{-1}. Source: University of São Paulo (4000-USP-4015-15).

BALANCED FERTILIZATION SHOULD BECOME THE NORM

Sustainable food production is best served with balanced fertilization

Key comments

- Not all K sources are the same.
- Choose the right source for the circumstances.
- Balanced supply of crop nutrient requirements replenishes offtake.
- Consider a wider nutrient spectrum to obtain the best for all inputs.

The 'Law of the Minimum' is the basis of balanced fertilization

A deficiency of any single nutrient will limit yield, just as the shortest stave will limit the barrel's capacity

KEY TAKEAWAY: **Balanced fertilization optimizes crop performance and efficient use of Potash inputs**

Sources: Heady et al, Iowa State University.