POLY4
A SIRIUS MINERALS PRODUCT

TRIAL RESULTS

SOYBEAN

FUNDAÇÃO, BRAZIL (2014, 2015, 2016)

HIGHLIGHTS

The inclusion of POLY4 in fertilizer programmes produced higher yields.

POLY4 blend increased financial margins by up to US$22/ha.

POLY4 programme demonstrated greater financial efficiency for both 0:14:14 and 0:18:18 treatments.

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TRIAL OBJECTIVE

To evaluate POLY4 as a fertilizer for soybean in Brazil and to compare its performance with commercial programmes in a three-year trial rotation with corn.

The USDA reported that in the 2016 – 2017 season soybean production sat at an estimated 348 million tonnes globally. USA, Brazil and Argentina were the top soybean producers collectively contributing 81% to the global market. China also is among one of the largest soybean producers.

Country	Share of global production
USA	33%
Brazil	31%
Argentina	17%

OVERVIEW

PARTNER: FUNDAÇÃO MT

LOCATION: Mato Grosso, Brazil

YEAR: 2014, 2015 and 2016

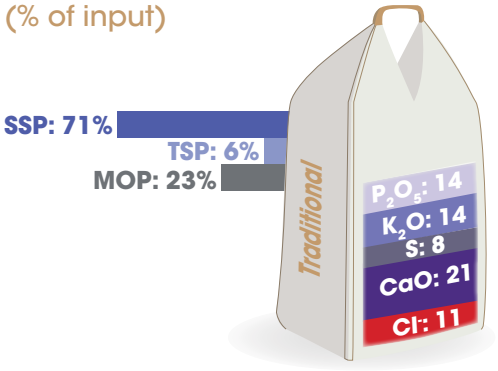
- Brazil produced 31% of the world's soybean in 2016 - 2017 and is projected to become the world's largest soybean producer by 2026.[1,2,3]
- Soybean production in Brazil accounts for about 35% of K_2O fertilizer use.[4]
- Soils in the Mato Grosso region are often low in K, S and Ca, and these nutrients are required in local fertilizer plans.
- Soybean crop typically removes approximately 75 kg K_2O ha^{-1}.
- In this trial soybean was grown for three years in rotation with corn on soils with a low concentration of available K and S.
- Fertilizer applications were broadcast pre-planting.
- Trials plots were a complete randomised design with five replications.
- Treatments were equivalent commercial blends with the K derived from either MOP or POLY4.
- Results presented are averages of the three-year data.

TEATMENT TABLE[5,6]

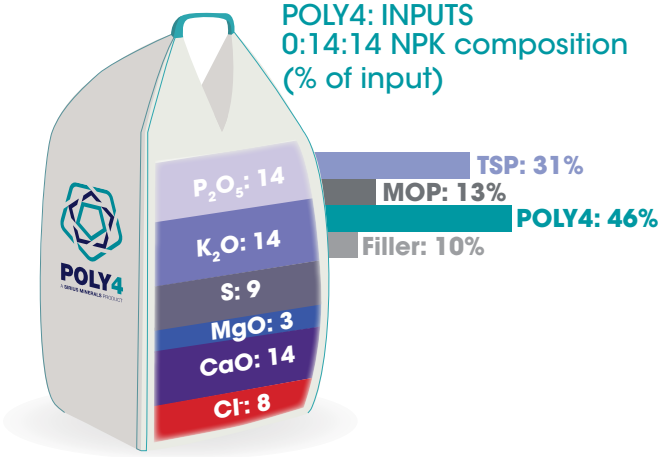
Treatment	Nutrients applied (kg ha^{-1})						
	N	P_2O_5	K_2O	MgO	CaO	S	Cl^-
P + Ca (control)	0	90	0	0	39	0	0
TSP+SSP+MOP (0:14:14)	0	90	90	0	135	55	72
TSP+MOP+POLY4 (0:14:14)	0	90	90	18	89	57	48
TSP+SSP+MOP (0:18:18)	0	90	90	0	89	28	72
TSP+MOP+POLY4 (0:18:18)	0	90	90	12	73	39	55

NPK BLENDS COMPOSITION[7]

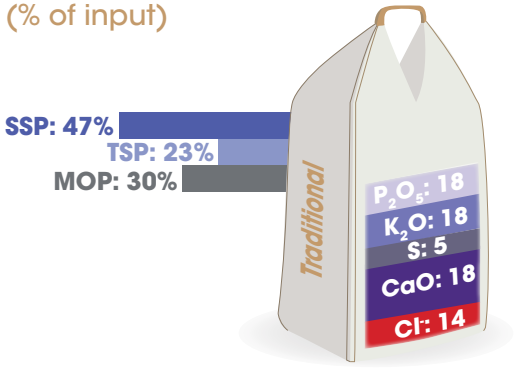
TRADITIONAL: INPUTS
0:14:14 NPK composition
(% of input)



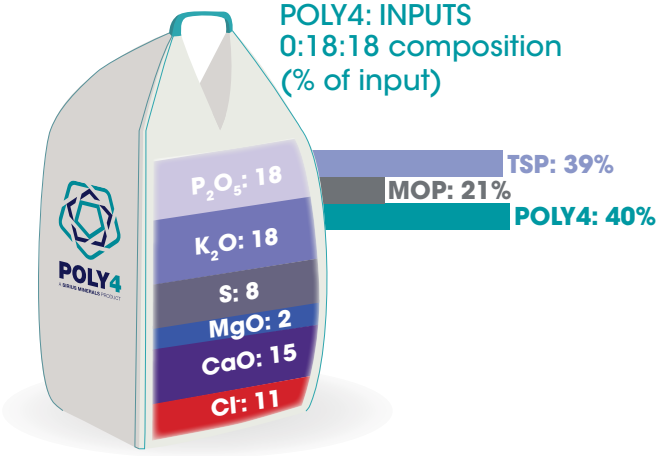
POLY4: INPUTS
0:14:14 NPK composition
(% of input)



TRADITIONAL: INPUTS
0:18:18 composition
(% of input)

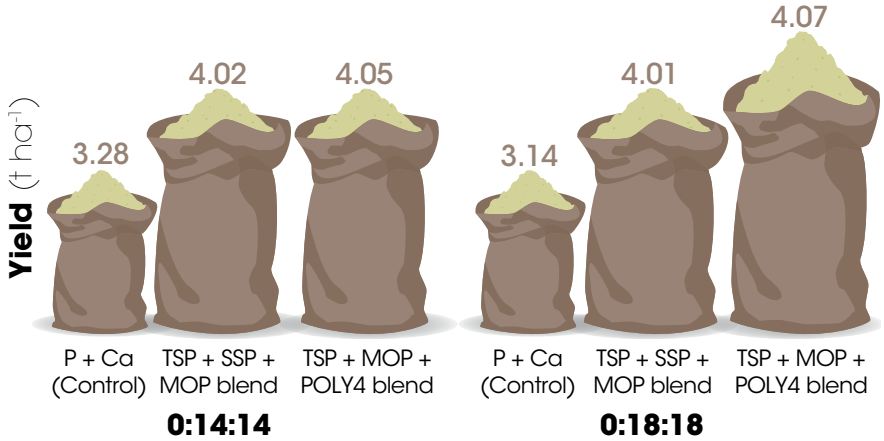


POLY4: INPUTS
0:18:18 composition
(% of input)



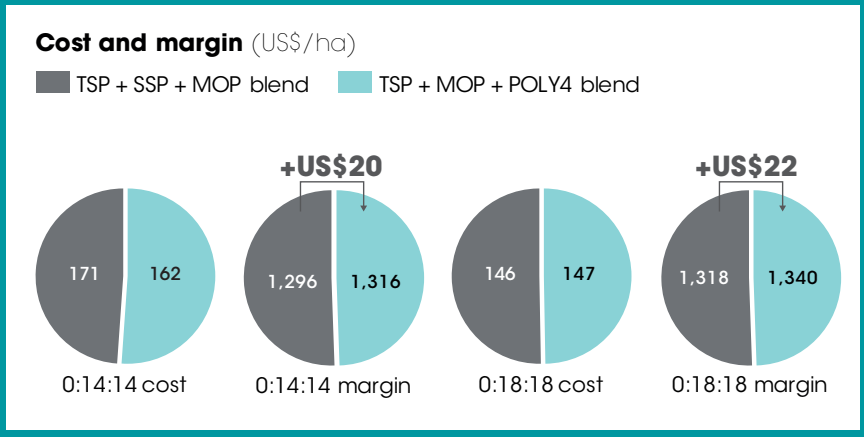
SOYBEAN YIELD[8,9]

- The three-year average data showed that POLY4 consistently improved yield over that period.
- The inclusion of POLY4 produced higher yields for both fertilizer programmes.

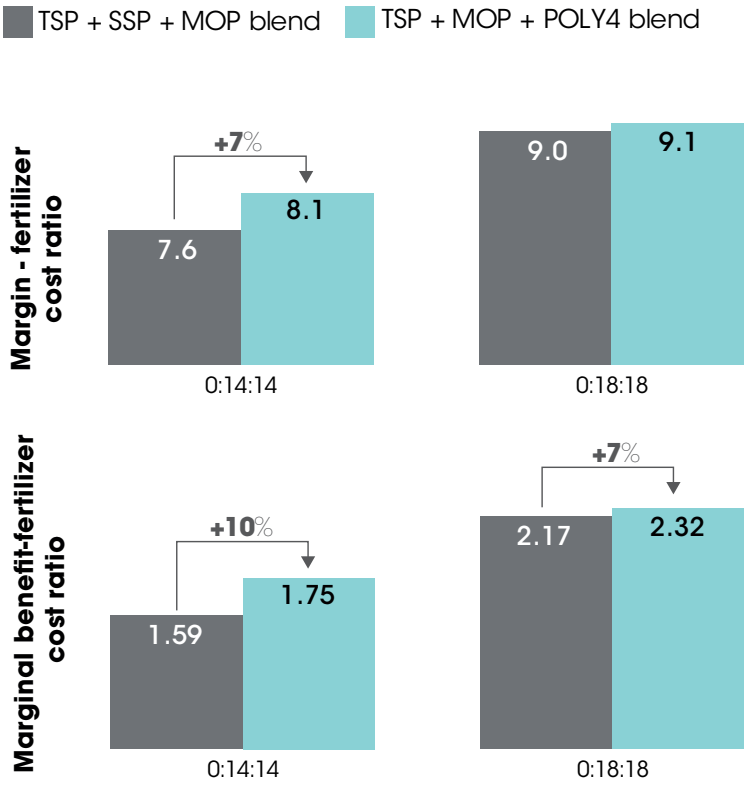


FERTILIZER COST AND MARGIN[8-14]

- The POLY4 blend increased financial margins for both programmes with similar or less fertilizer cost. The higher soybean yield achieved with the POLY4 meant greater margins by US$20/ha for 0:14:14 blend and by US$22/ha for 0:18:18 blend.
- The increase in margins was largely due to yield improvements. Over the three-year trial the POLY4 blend consistently maintained the economic benefit.



FINANCIAL EFFICIENCY[8-14]



- Marginal benefit-cost ratio indicates the additional economic benefit derived from adding K fertilizer compared to the P + Ca (control) option. Whereas margin-fertilizer cost ratio shows the economic benefit obtained for every dollar spent on fertilizer.
- Larger numbers demonstrate the greatest financial efficiency and impact of fertilizer expenditure.
- Expenditure on POLY4 programmes was the most efficient by both measures and for both fertilizer programmes.

Note: 1) USDA Oilseeds World Markets and Trade (2017); 2) Agrinews (2014); 3) BrazilGovNews (2017); 4) International Plant Nutrition Institute, IPNI (2014); 5) All treatments received 90 kg K_2O ha^{-1} from MOP and/or POLY4 and 90 kg P_2O_5 ha^{-1} from SSP and/or TSP respectively for the 0:14:14 and 0:18:18 trials; 6) Initial soil analysis based on 2014 trial: pH 5.7; 28 mg P kg^{-1}, 67 mg K kg^{-1}, 760 mg Ca kg^{-1}, 324 mg Mg kg^{-1}, 6 mg available S kg^{-1}; 7) Nutrient composition: TSP: 0:46:0 + 20CaO; SSP: 0:16:0 + 11S + 28CaO; MAP: 11:52:0; MOP: 0:0:60; POLY4: 0:0:14 + 19S + 6MgO + 17CaO; 8) Results presented are based on a K_2O rate of 90 kg ha^{-1}; 9) Yield results are average estimates from 2014, 2015 and 2016 trials. 10) Fertilizer prices were obtained from CRU and are based on average fertilizer prices for Brazil from 2014 to 2016: MOP (US$302/t), POLY4 (US$200/t), SSP (Brazil Inland: US$229/t) and TSP (US$354/t). Analysis accounts for fertilizer application or spreading cost of US$13.07/t; 11) Margin = crop output – (cost of fertilizer material + cost of fertilizer application); 12) The margin-fertilizer cost ratio = margin divided by cost of fertilizer (US$/ha); 13) The marginal benefit-fertilizer cost ratio = fertilizer-treated crop output minus P + Ca (control) crop output (US$/ha) divided by treated crop cost (cost of fertilizer + cost of fertilizer application) minus P + Ca (control) cost (cost of fertilizer + cost of fertilizer application (US$/ha)); 14) Soybean price average for three trial years was US$365/t (local price).

Sources: Fundação MT (2014, 2015, 2016) 5000-FMT-5011-14, 5000-FMT-5013-15 & 5000-FMT-5015-16

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