POLY4
A SIRIUS MINERALS PRODUCT

TRIAL RESULTS

SOYBEAN

BRAZIL (2015)

poly4.com

TRIAL OBJECTIVE

To evaluate soybean response to MOP and POLY4 in combination with P blends containing S, Ca and Mg under glasshouse and field conditions.

HIGHLIGHTS

8% HIGHER DRY MATTER BIOMASS

UP TO 29% IMPROVEMENT IN NUTRIENT UPTAKE

IMPROVEMENTS IN SOIL NUTRIENT LEGACY FOR K, Mg, Ca AND S

REMOVAL OF SSP IN FAVOUR OF POLY4 OFFERS ECONOMIC ADVANTAGES

TRIAL DESIGN

PARTNER: UNIVERSITY OF SÃO PAULO

LOCATION: BRAZIL

YEAR: 2015

- Soybean production is worth US$38 billion to the Brazilian economy.
- Brazil is the world's 2nd largest producer of soybeans after the US – accounting for 82Mt of soybean in 2013.
- 15 out of the 26 states grow soybeans covering 27.9 million ha.
- Achieving soybean expansion will require the use of fertilizer[1].
- Only 30% of farmers are using fertilizer[2].
- Glasshouse studies used soil filled pots with blends applied before sowing with a simulated furrow applicationw under the seed bed at 100 kg K_2O ha^{-1}.
- The field study conducted in the State of Bahia used a randomised block design with potassium fertilizer applied in advance of P blends.

NUTRIENT APPLIED IN POT STUDY (kg ha^{-1})

TREATMENT	NUTRIENTS APPLIED (kg ha^{-1})						
	N	P_2O_5	K_2O	CaO	MgO	S	Cl
Commercial 2:28:0+8S and MOP	10	140	100	107	0	38	80
POLY4 2:28:6+8S and MOP	10	140	101	75	12	40	64

NUTRIENT APPLIED IN FIELD STUDY (kg ha^{-1})

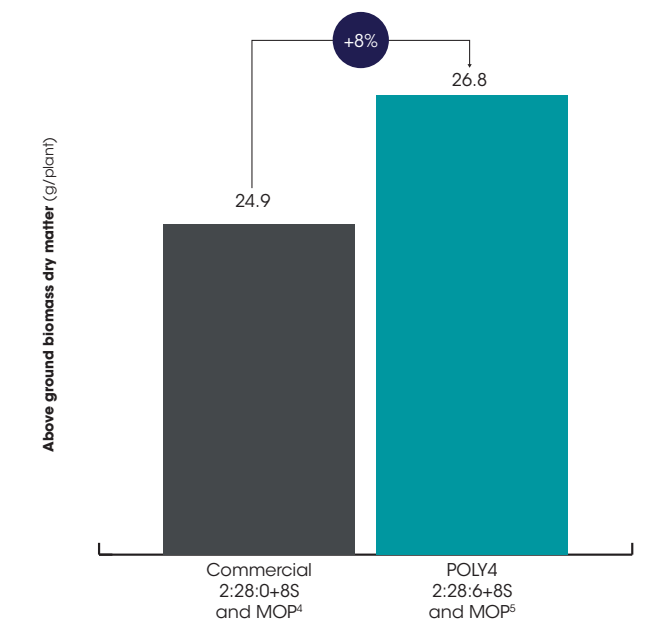
TREATMENT	NUTRIENTS APPLIED (kg ha^{-1})						
	N	P_2O_5	K_2O	CaO	MgO	S	Cl
MOP pre-planting + Commercial 2:28:0+7S	4	56	90	43	0	15	72
POLY4 pre-planting + 2:28:6+7S	4	56	90	123	39	123	19

POT STUDY

ABOVE GROUND BIOMASS DRY MATTER

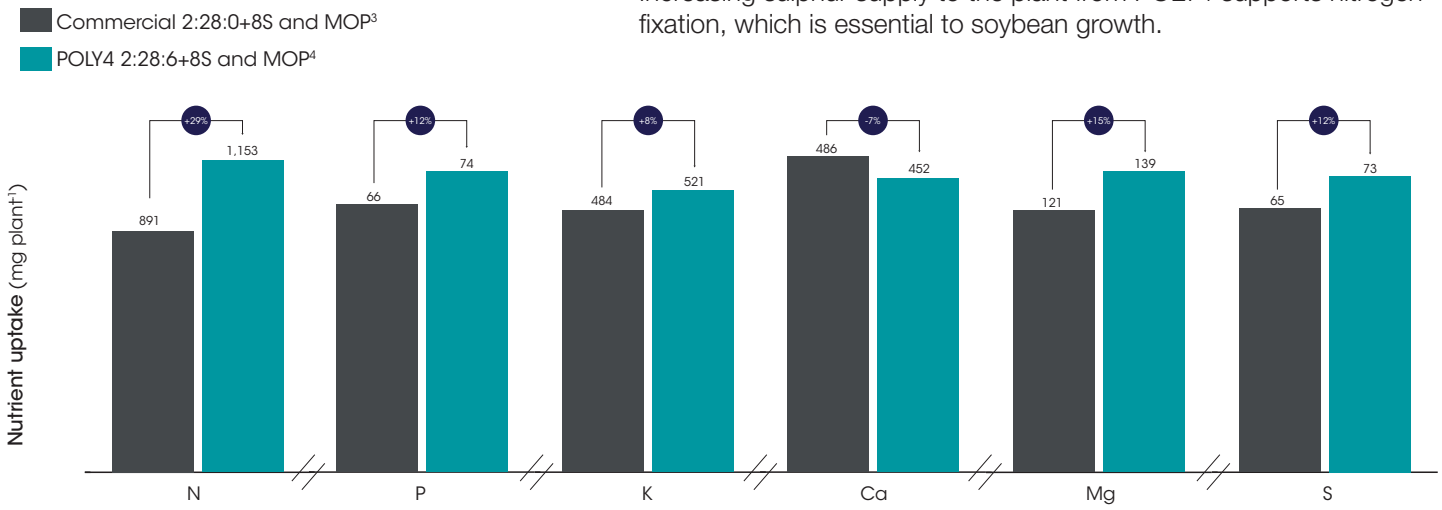
(g plant^{-1})[4,5]

- The POLY4 blend delivers additional potassium, showing an 8% improvement in soybean dry matter.
- Soil potassium levels indicate that maintenance is required in the fertilizer plan.
- The magnesium and micro-nutrient content in the POLY4 option differentiates it from the commercial option, resulting in improved crop biomass.



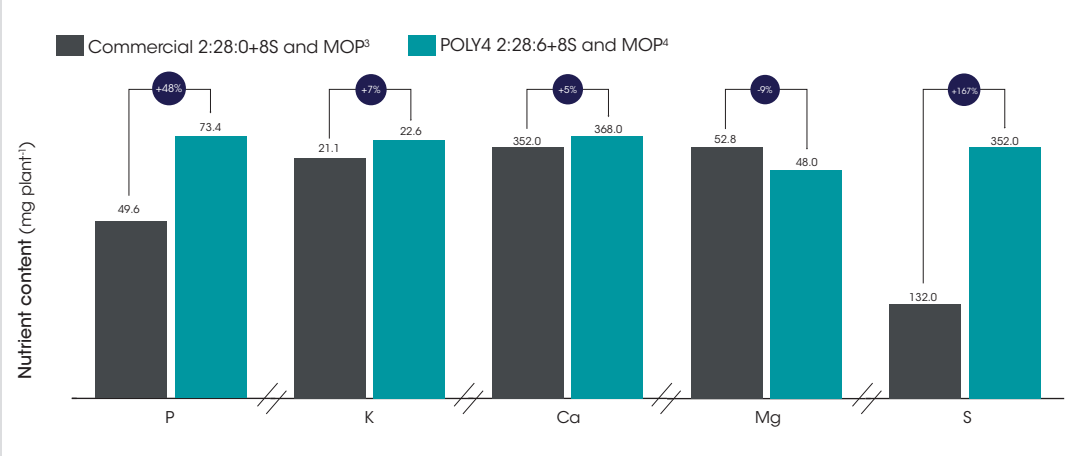
TOTAL NUTRIENT UPTAKE (mg plant^{-1})[3-6]

- Substituting SSP in the commercial blend for POLY4 adds magnesium, supporting balanced fertilization.
- These results are indicative of POLY4's sulphur, magnesium and potassium availability being exploited for crop growth.
- Increasing sulphur supply to the plant from POLY4 supports nitrogen fixation, which is essential to soybean growth.



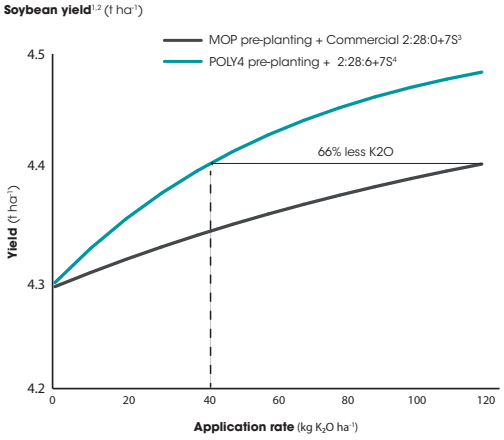
POST TRIAL SOIL NUTRIENT ANALYSIS (mg kg^{-1})[3-6]

- Soil nutrient levels post cropping are the result of inputs minus nutrient offtake and leaching losses.
- Plant nutrition use and soil losses are affected by the nutrient source.
- In this trial, nutrient offtake was increased and soil nutrient residues were higher following POLY4 application.



FIELD TRIAL

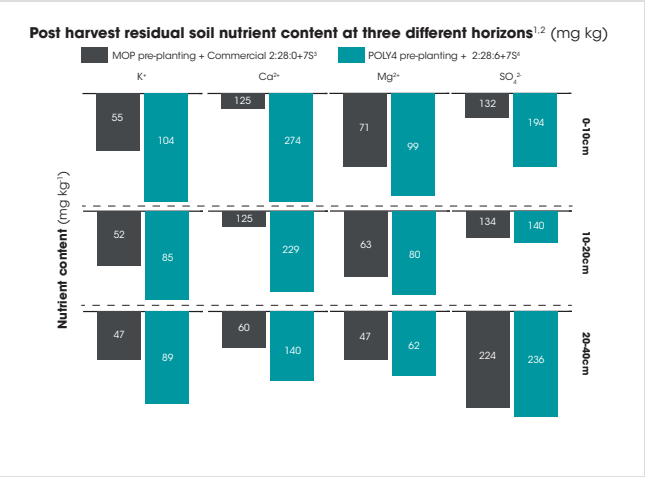
YIELD (t ha^{-1})[7-10]



- In Brazil, MOP is applied in advance of soybean emergence to lower the negative impacts of chloride.
- Potassium fertilizer replaces crop offtake at a recommended rate of 88 kg K_2O ha^{-1} [11].
- Using POLY4 the yields were higher than the current commercial practice.
- Maximum yield of 4.4 t ha^{-1}, currently supported with the commercial option at 120 kg K_2O ha^{-1} can be achieved with less K_2O if the POLY4 option is chosen.
- By substituting SSP with POLY4, as the S source, we support the same yield and improve crop fertilization balance with an additional 17 kg MgO, 21 kg CaO and 38 kg S ha^{-1}.

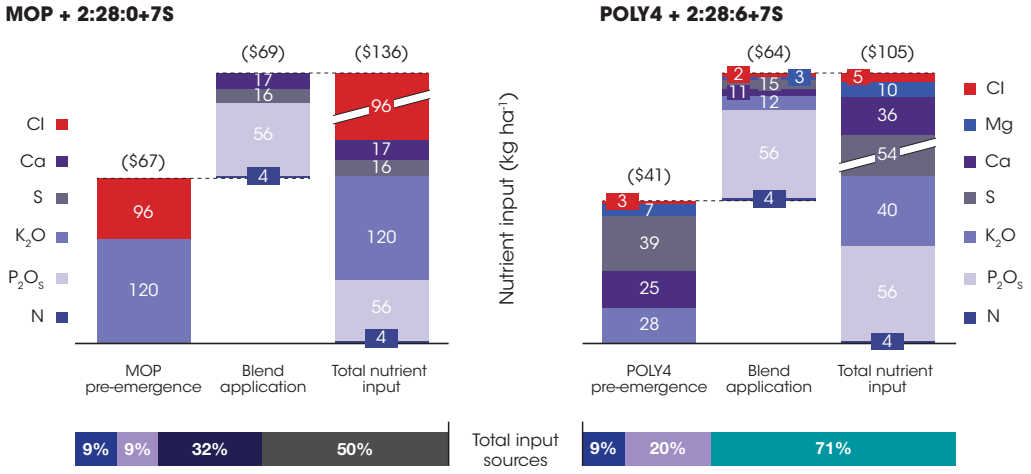
POST TRIAL NUTRIENT ANALYSIS (mg kg^{-1})[8-10, 12]

- Fertilizer plans were balanced for NPK[1].
- POLY4 improves soil health by increasing potassium, calcium, magnesium and sulphur across multiple horizons.



FARMER ECONOMICS

(kg ha^{-1} and cost in US$)[13,14,15]



1) Forecast by OCED/FAO 2015; 2) Census conducted by Brazilian Institute of Geography and Statistics in 2006; 3) GENSTAT mean results; 4) All pots received 10 kg N ha^{-1}; 140 kg P_2O_5 ha^{-1}; 100 kg K_2O ha^{-1}; 5) Commercial blend made with SSP, TSP and MAP with MOP providing 100 kg K_2O ha^{-1}; 6) POLY4 blend made with POLY4, TSP and MAP with 29 kg K_2O ha^{-1} from POLY4 and 71 kg K_2O ha^{-1} from additional MOP; 7) GENSTAT regression analysis; 8) All plots received N 4 kg ha^{-1}; 56 kg P_2O_5 ha^{-1} and K_2O ha^{-1} from MOP or POLY4 according to treatment; 9) Commercial blend made with SSP, TSP and MAP plus MOP at 30 days pre-planting; 10) POLY4 blend made with POLY4, TSP and MAP plus POLY4 at 30 days pre-planting; 11) Based on Bataglia and Mascarenhas (1978) recommended at 4.4 t ha^{-1} yield x 20 kg K_2O ha^{-1}; 12) GENSTAT means of 30 – 120 kg K_2O ha^{-1}; 13) Weight of MOP starter + Blend 2:28:0+7S was 200kg MOP + 200kg blend 2:28:0+7S = 400kg total input; ; 14) Weight of POLY4 starter + POLY4 blend 2:28:6+7S was 203kg POLY4 + 200kg blend 2:28:6+7S S = 403kg; 15) Fertilizer prices based on quoted CRU Brazil prices Q3-2015 TSP (US$375/t), SSP (US$298/t), MAP (US$479/t), MOP (US$317/t), POLY4 price (US$200/t). Initial soil analysis (0 – 10cm) pH 5.5; P 33 mg kg^{-1}, K 98 mg kg^{-1}, Mg 49 mg kg^{-1}, Ca 340 mg kg^{-1}. Sources: FAO 2013, OCED/FAO 2015; Brazilian Institute of Geography and Statistics, 2006; University of São Paulo 2015, USDA 2015, Sirius Minerals 4000-USP-4014-14.

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