

Sustaining the future.



WE'RE ABOUT DELIVERING THE SOLUTION

Improving NPKs through a simple
multi-nutrient NPK feedstock

Robert Meakin



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THE PRODUCT

INTRODUCTION TO POLY4

K₂O
14

S
19

MgO
6

CaO
17

EFFICIENCY

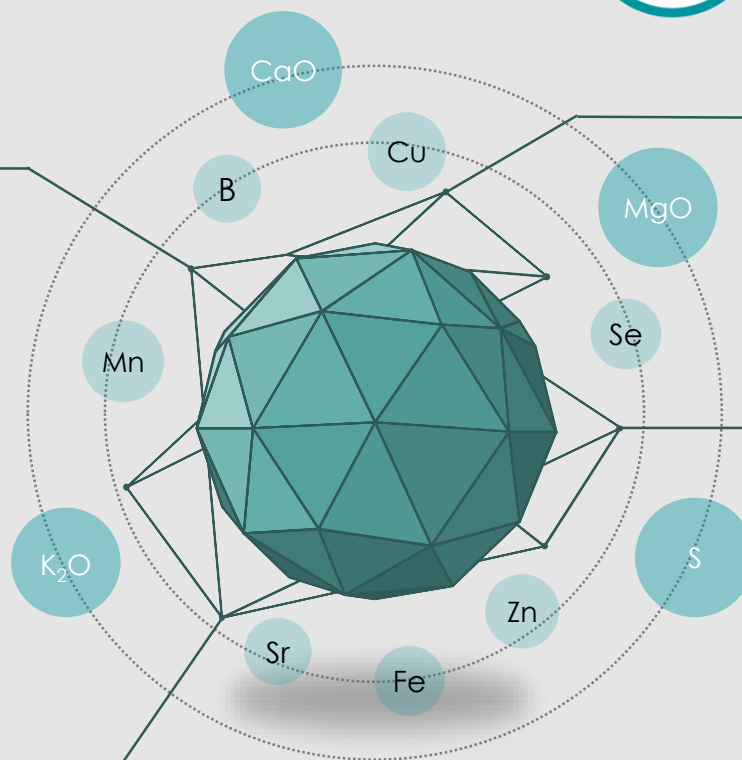
POLY4 characteristic:

- Delivers greater nutrient uptake
- Delivers four macro nutrients in one product
- Desirable nutrient release profile

FLEXIBILITY

POLY4 characteristic:

- No negative interactions with other fertilizers
- Handles, stores, blends and spreads effectively
- Allows a farmer to choose the timing of application



EFFECTIVENESS

POLY4 characteristic:

- Improves both yield and quality
- Improves macro and micro nutrient uptake
- Minimises crop losses through disease resistance
- Low chloride and pH neutral

SUSTAINABILITY

POLY4 characteristic:

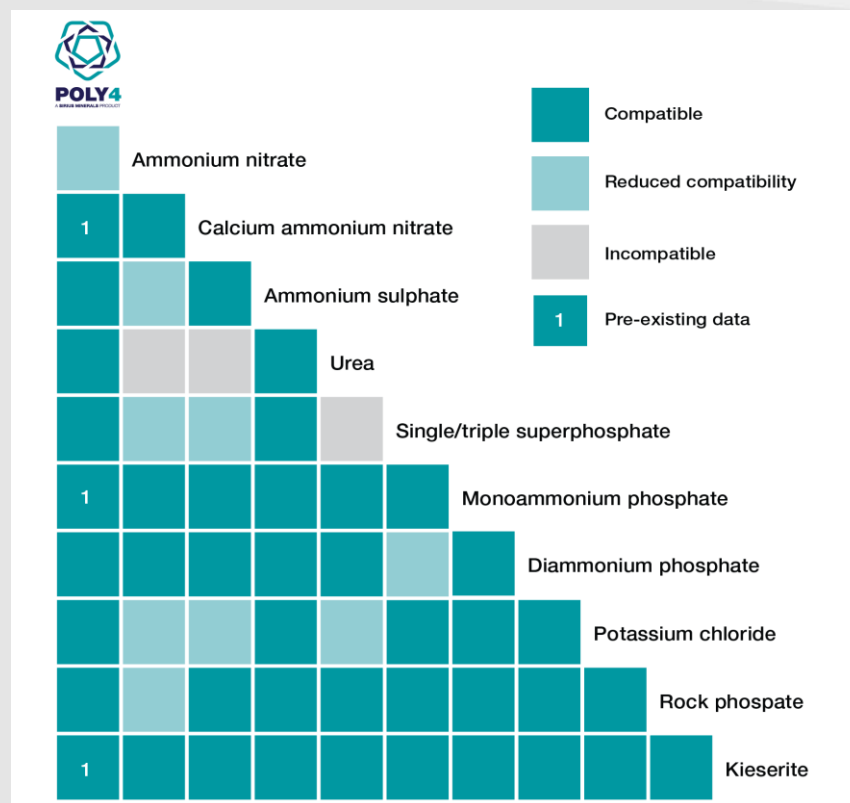
- Improves soil strength, structure and nutrient legacy
- Reduces agriculture's impact by improving Fertilizer Use Efficiency
- Certified for organic use and low environmental impact

COMPATIBILITY AND PRACTICALITY

DRY BLEND	Influence up to 50% (w/w) POLY4 composition		
	Compatibility		
Urea-DAP-KCI-POLY4	Improved		

COMPACTED NPK COMPOUND	Influence up to 50% (w/w) POLY4 composition		
	Abrasion resistance	CRH	Dust
Urea-DAP-KCI-POLY4	Improved	~	Improved

STEAM GRANULATED NPK COMPOUND	Influence up to 50% (w/w) POLY4 composition		
	Abrasion resistance	Impact resistance	Dust
Urea-DAP-KCI-POLY4	Improved	Improved	Improved



KEY TAKEAWAY:

POLY4 HAS A POSITIVE IMPACT ON DRY BLENDS, COMPACTED AND STEAM-GRANULATED COMPLEXES

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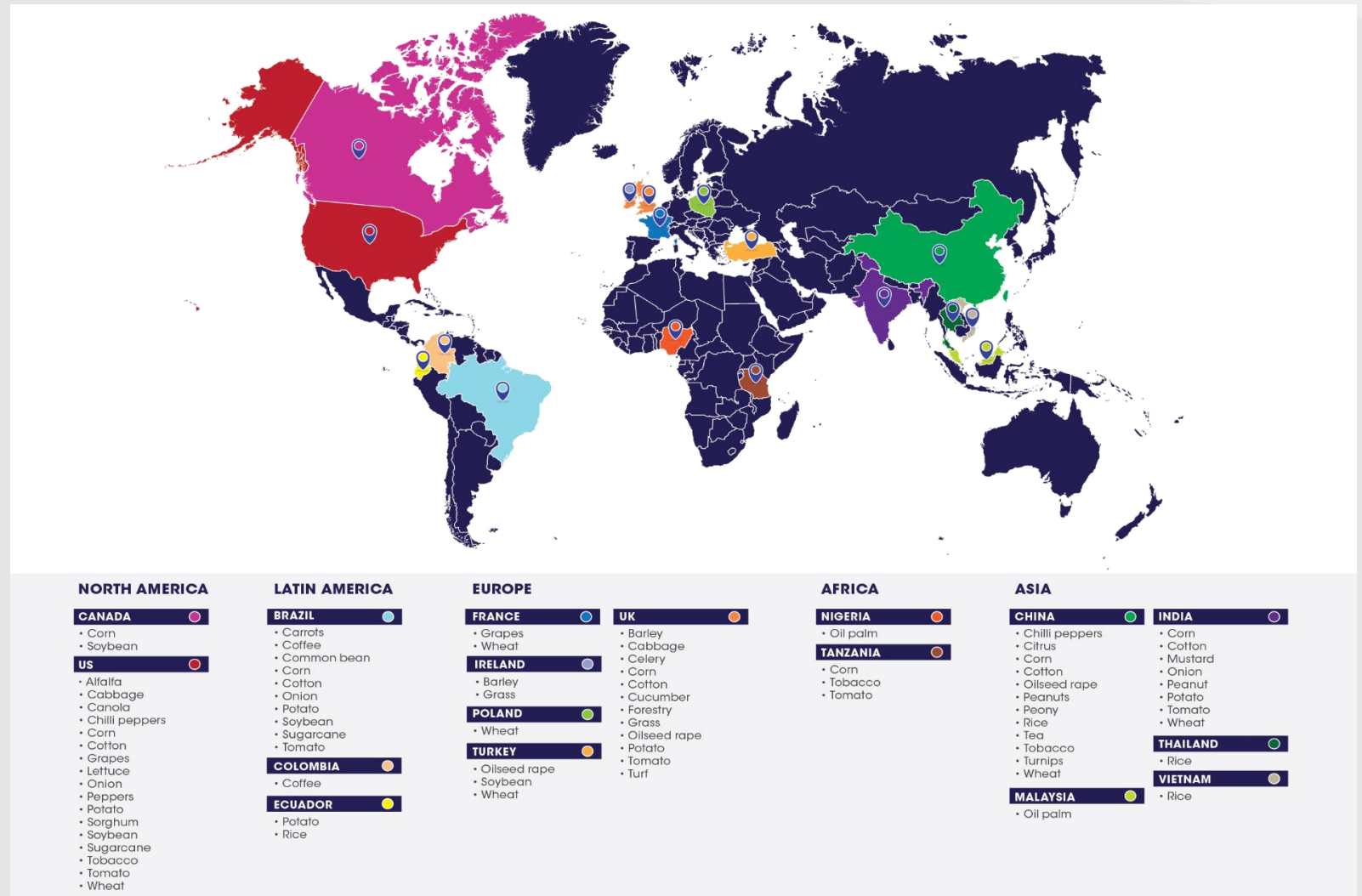
RESEARCH AND DEVELOPMENT

SIRIUS MINERALS R&D PROGRAMME

Trials
260+

Crops
32

Countries
17

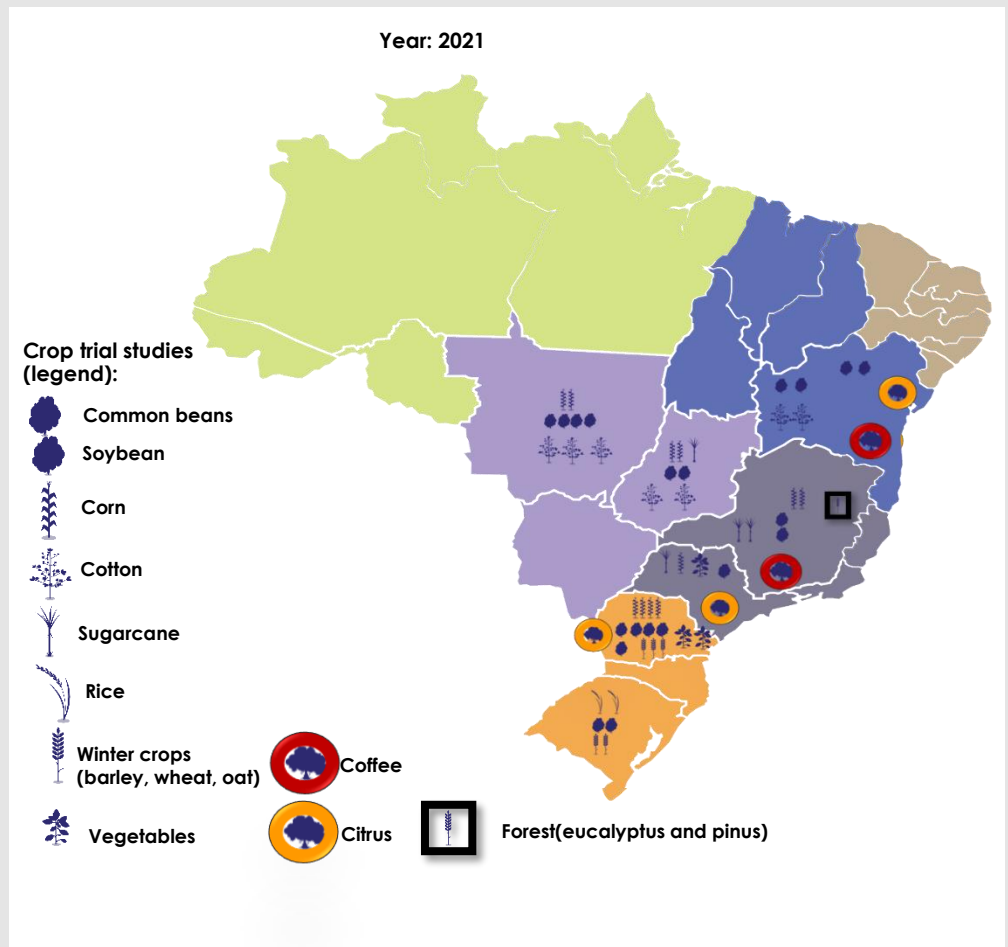
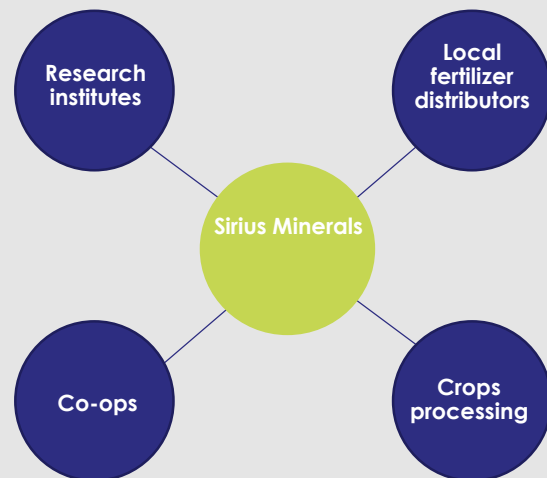


Notes: Trials as of January 2018

R&D MARKET ADOPTION PROGRAM IN BRAZIL

Clear pathway for R&D market adoption is set out to validate the agronomic and commercial value on both broad-acre and high-value crops with local partners.

Levels and type of stakeholders of R&D programme for demonstration:

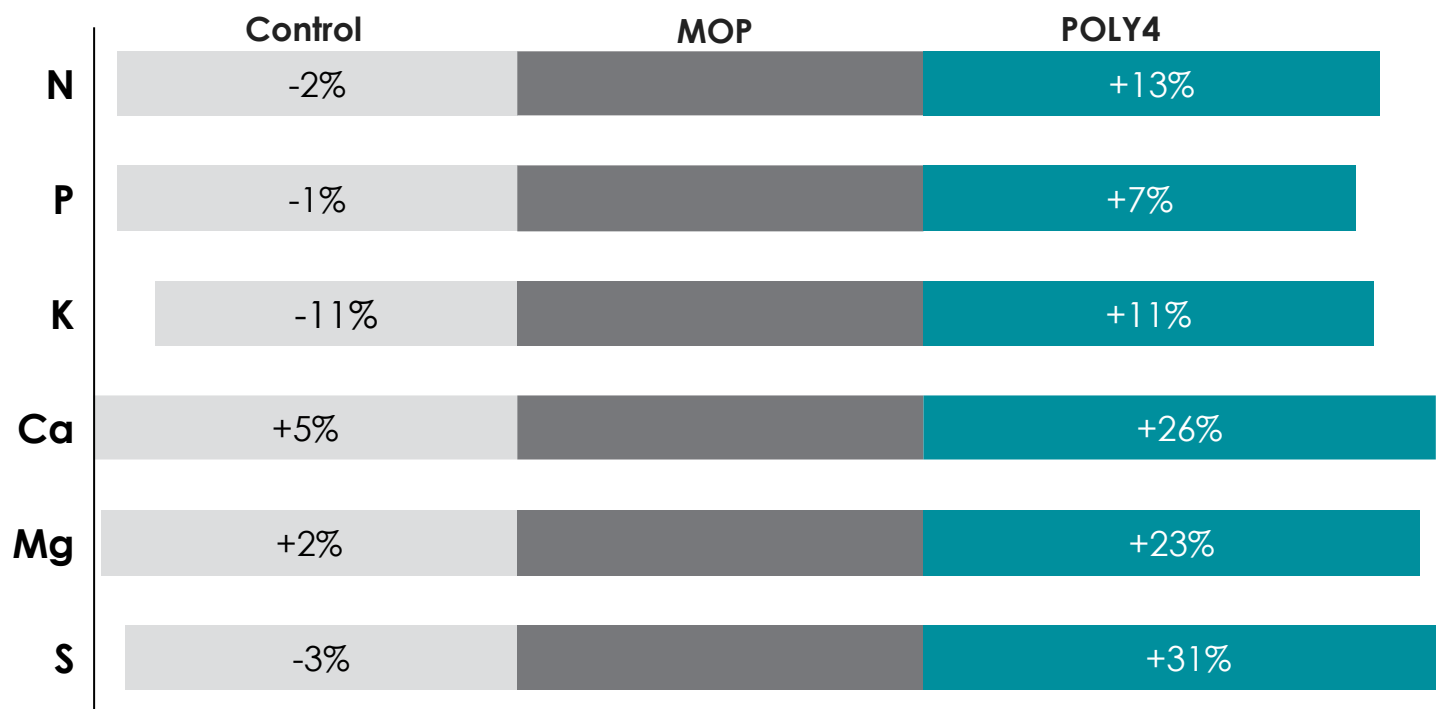


GLOBAL: NUTRIENT UPTAKE AND YIELD IMPROVEMENT

SUSTAINED MACRO-NUTRIENT DELIVERY

Macro-nutrient uptake results from global trials¹

Improvements in macro-nutrient uptake compared to MOP



Initial soil analysis¹

Soil measurement	Value
P (mg kg ⁻¹)	38
K (mg kg ⁻¹)	100
Mg (mg kg ⁻¹)	116
Ca (mg kg ⁻¹)	1311
S (mg kg ⁻¹)	20
OM (g kg ⁻¹)	19

KEY TAKEAWAY:

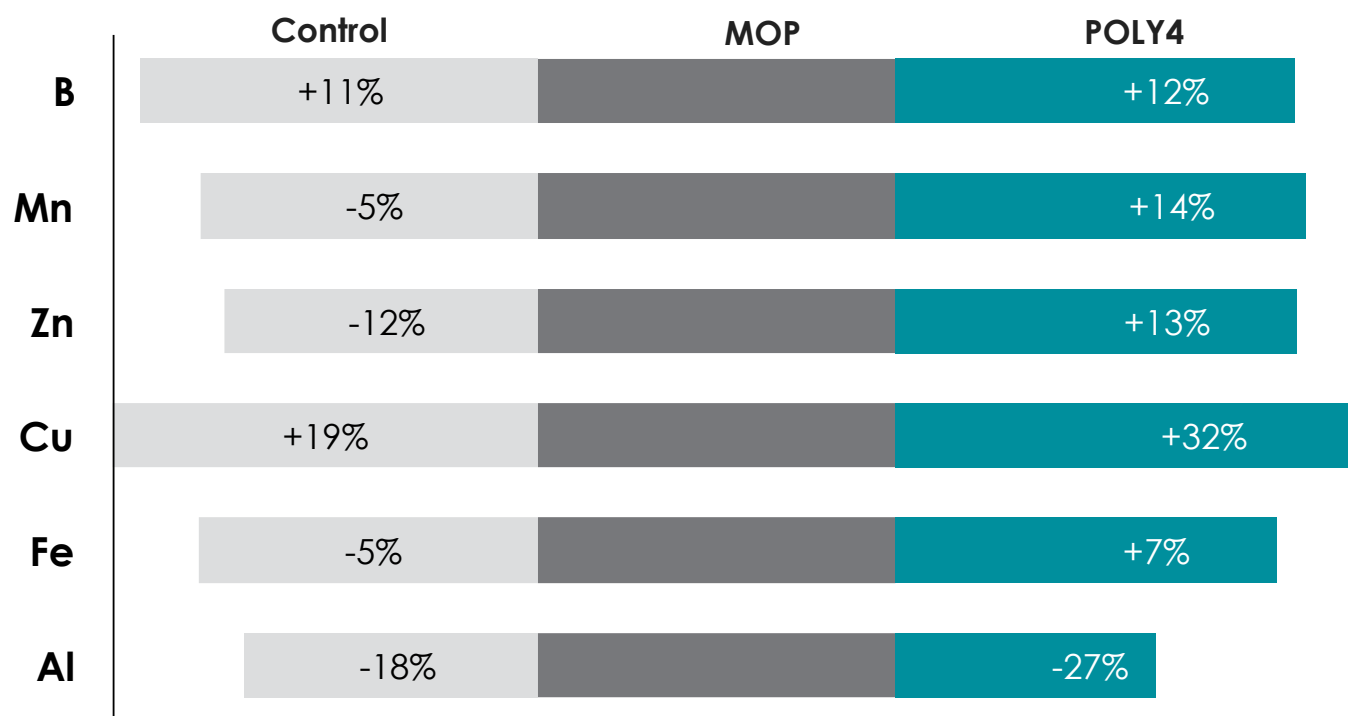
POLY4 OUTPERFORMED MOP IN MACRO-NUTRIENT UPTAKE

Notes: 1) The results are based on 32 trials, which include trials conducted in Asia (China), Europe (UK & France), Latin America (Brazil) and North America (US) covering both high-value and broad-acre crops such as tea, tobacco, tomato, soybean, wheat, potato and corn.
 Source : Sirius Minerals

SUSTAINED MICRO-NUTRIENT DELIVERY

Micro-nutrient uptake results from global trials¹

Improvements in micro-nutrient uptake compared to MOP K sources



Initial soil analysis

Soil measurement	Value
B (mg kg ⁻¹)	1.0
Mn (mg kg ⁻¹)	20
Zn (mg kg ⁻¹)	6.0
Cu (mg kg ⁻¹)	5.0
Fe (mg kg ⁻¹)	87

KEY TAKEAWAY:

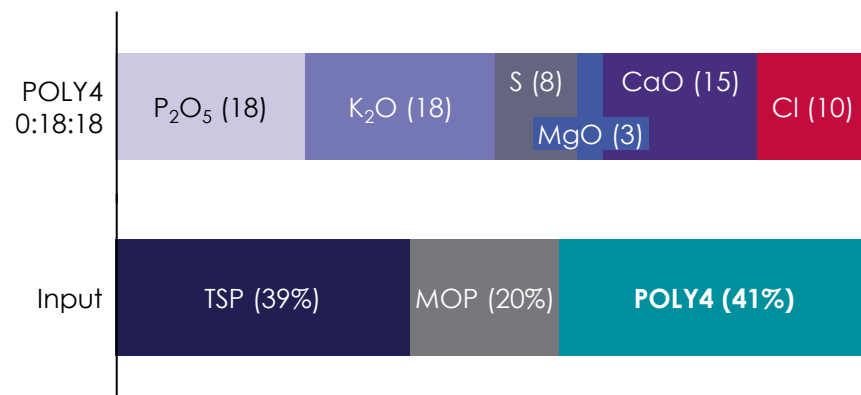
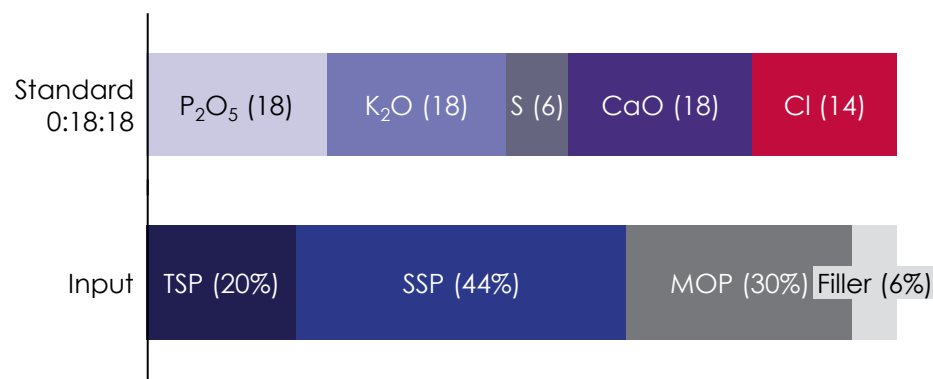
POLY4 OUTPERFORMED MOP IN MACRO-NUTRIENT UPTAKE

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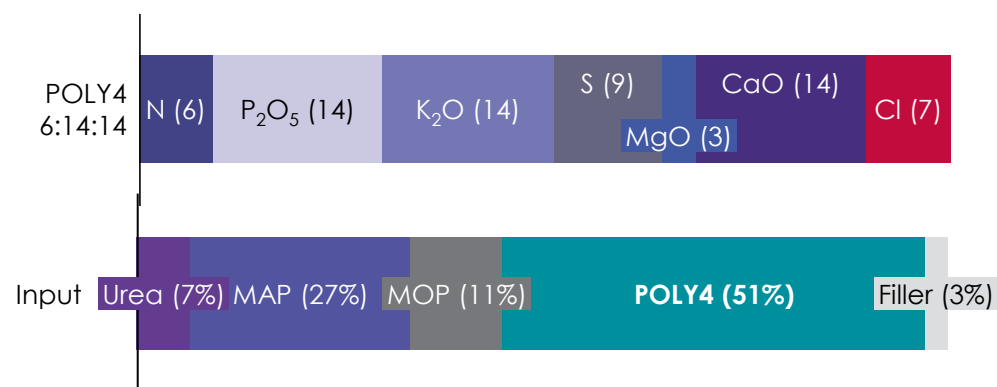
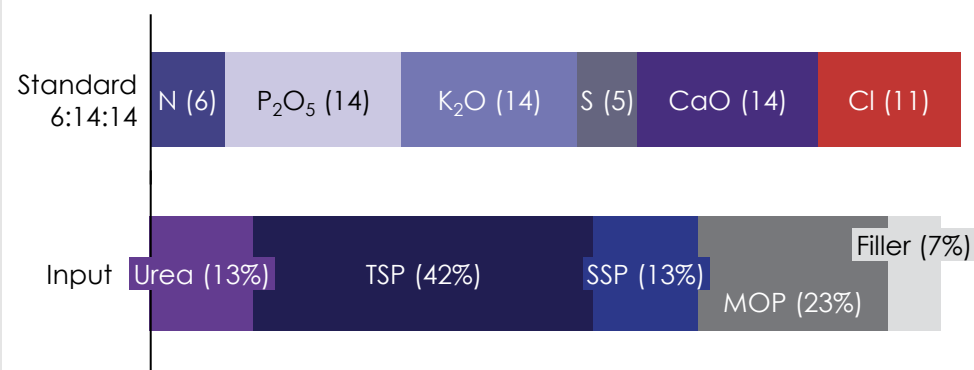
Source : Sirius Minerals

ALTERNATIVES IN NPK BLENDS COMPOSITION

Soybean: 0:18:18 blend composition

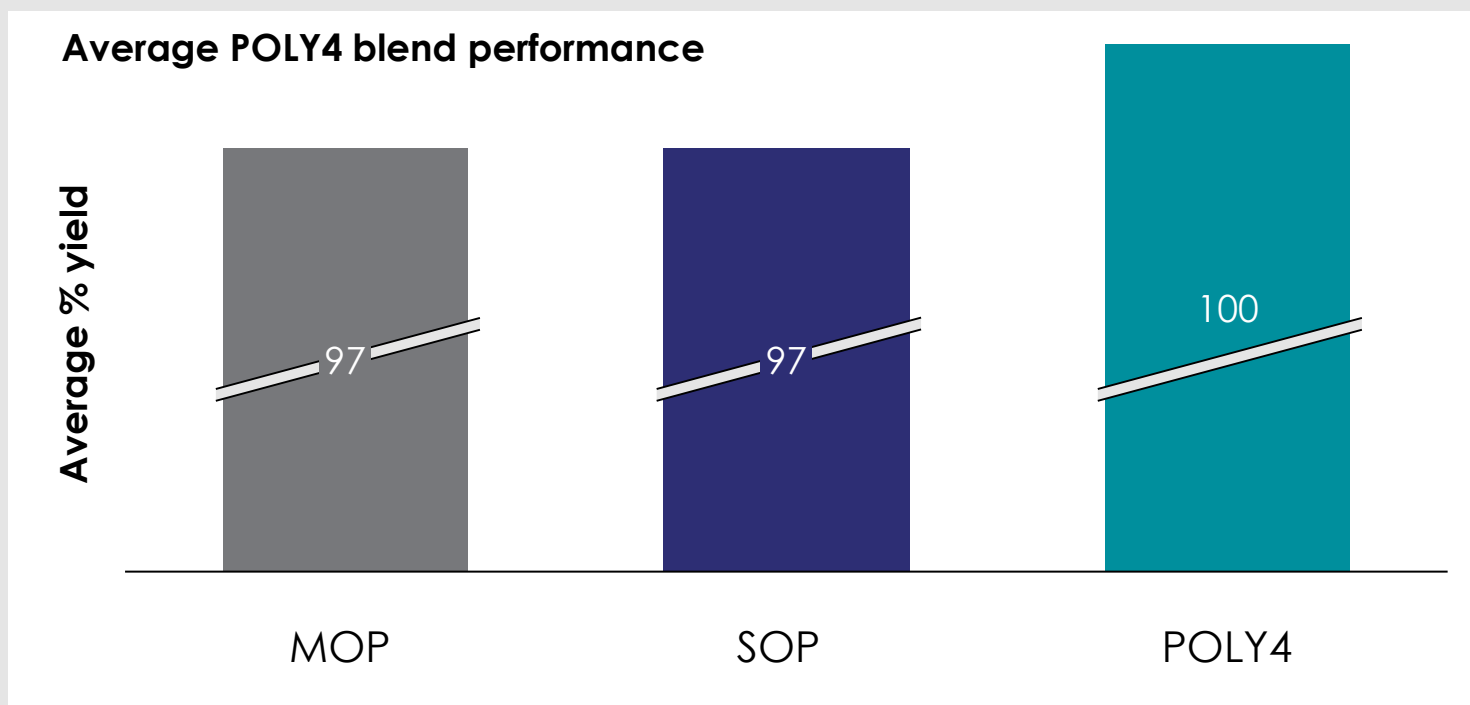


Corn: 6:14:14 blend composition



LATIN AMERICA: POLY4 BLEND PERFORMANCE COMPARED TO STANDARD NPK, Ca, Mg, S BLENDS

Yield results from blend trials in Brazil¹



Initial soil analysis

Soil measurement	Value
P (mg kg ⁻¹)	12
K (mg kg ⁻¹)	34
Mg (mg kg ⁻¹)	173
Ca (mg kg ⁻¹)	471
S (mg kg ⁻¹)	13
OM (g kg ⁻¹)	11

KEY TAKEAWAY:

POLY4 OUTPERFORMED MOP AND SOP REFLECTING THE ADDED BENEFIT FOR FARMERS

Notes: 1) The results are based on trials in Latin America (Brazil) covering crops such as tomato, soybean, potato, corn and carrot.
Source: Sirius Minerals. There are only four blend trials (in Sao Paulo) in which SOP was involved.

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TRIAL RESULTS

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CROP TRIAL: SOYBEAN

PARTNER: UNIVERSITY OF SÃO PAULO



INTRODUCTION/TRIAL DESIGN

- Brazil produced 31% of the world's soybean in 2013 and is projected to become the world's largest soybean producer by 2026
- Soybean production in Brazil accounts for about 35% of K₂O fertilizer use in Brazil
- Treatments were equivalent commercial blends with the K derived from either MOP or POLY4
- The trial was randomized complete block design with seven replications.

TREATMENT TABLE

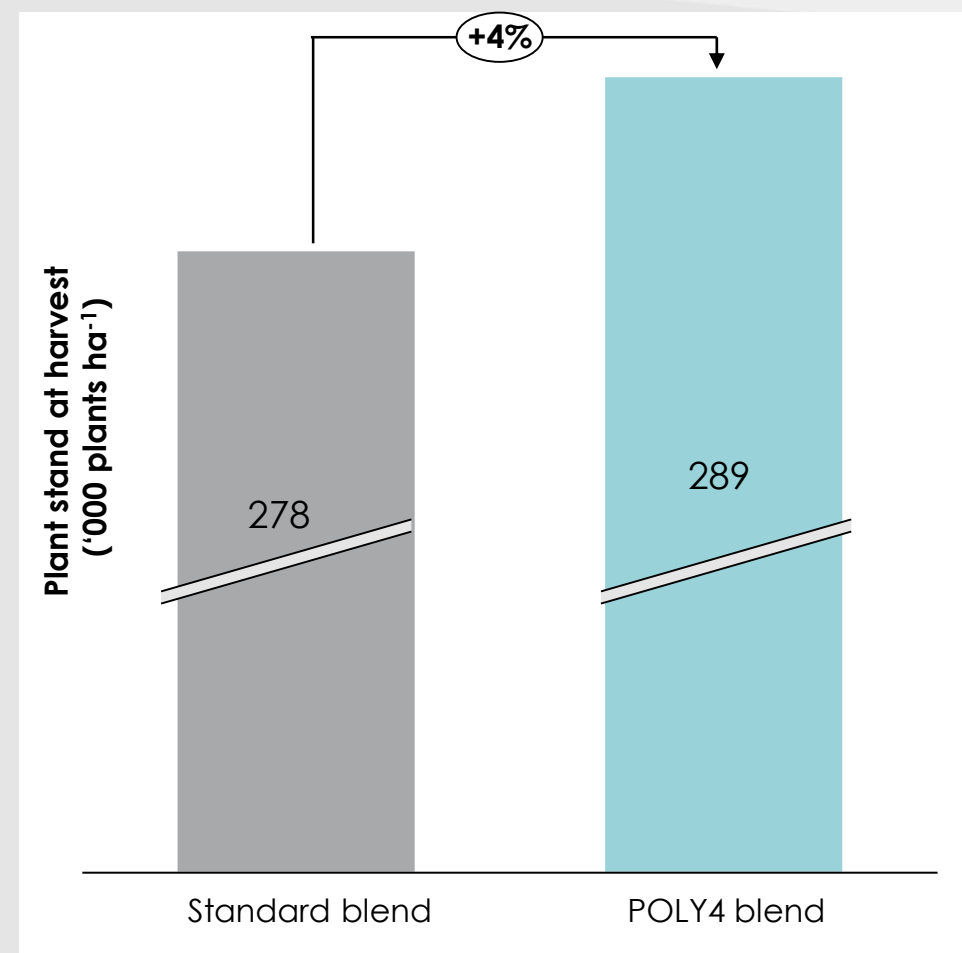
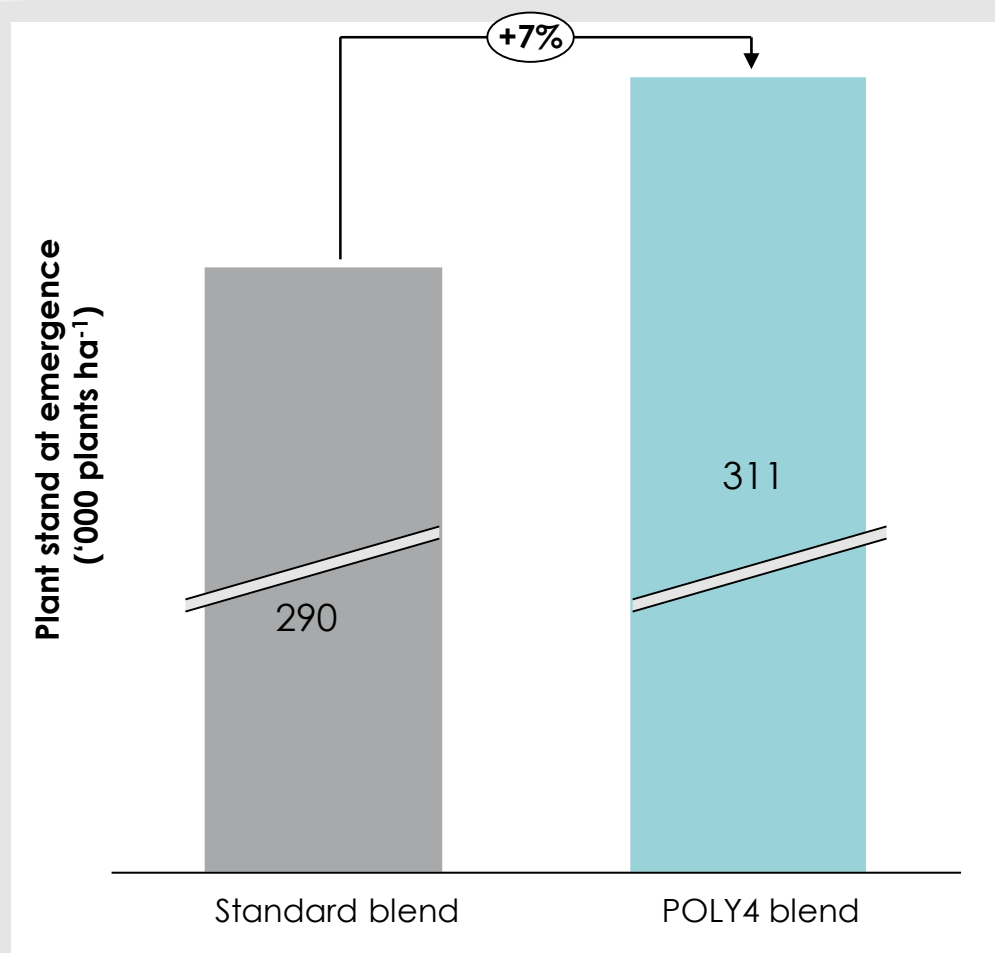
Treatment	Average nutrients applied in trial (kg ha ⁻¹)					
	P	K ₂ O	CaO	MgO	S	Cl
Control	72	0	71	0	23	0
Standard 0:18:18 blend	72	72	71	0	23	58
POLY4 0:18:18 blend	72	72	58	10	31	44

INITIAL SOIL ANALYSIS

Nutrients	Amount of nutrient in soil (mg kg ⁻¹)
Soil organic matter	2.2%
P	15
K	32
Ca	160
Mg	49
S	10

TRIAL OBJECTIVE: TO EVALUATE POLY4 IN A COMMERCIAL FERTILIZER PROGRAMME FOR SOYBEAN IN BRAZIL

PLANT POPULATIONS

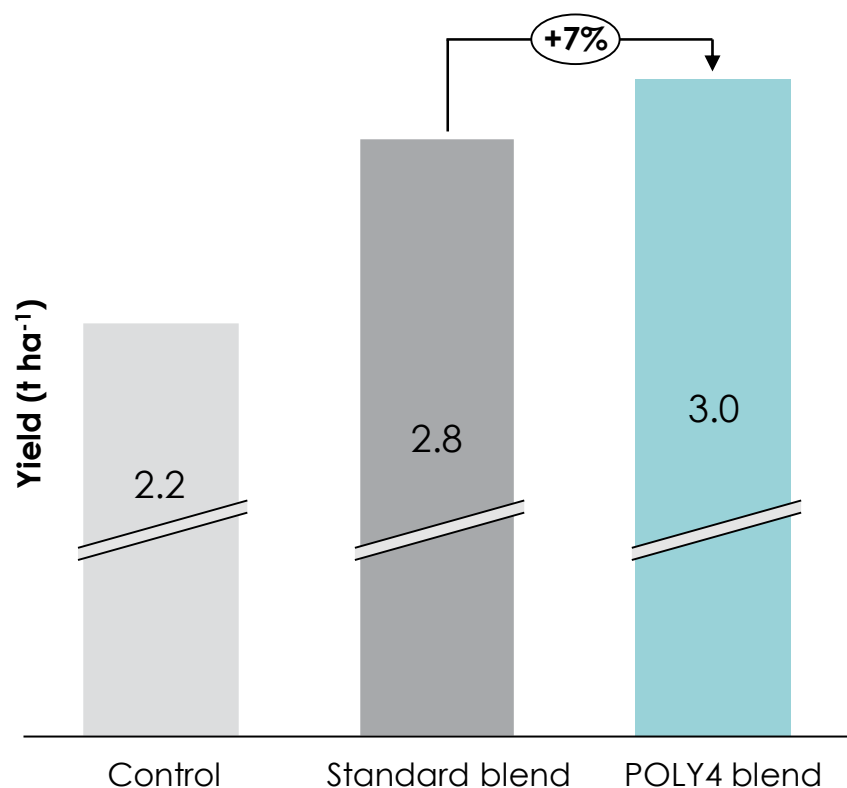


KEY TAKEAWAY:

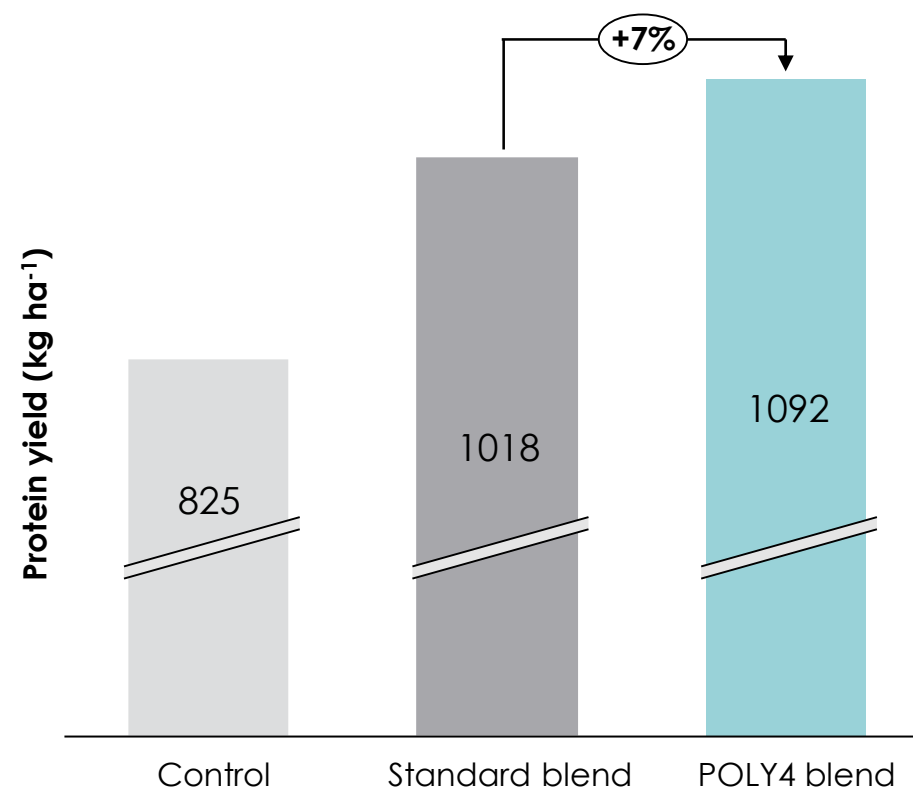
POLY4 SUPPORTS AND SUSTAINS CROP ESTABLISHMENT

YIELD AND QUALITY

SOYBEAN YIELD



PROTEIN YIELD

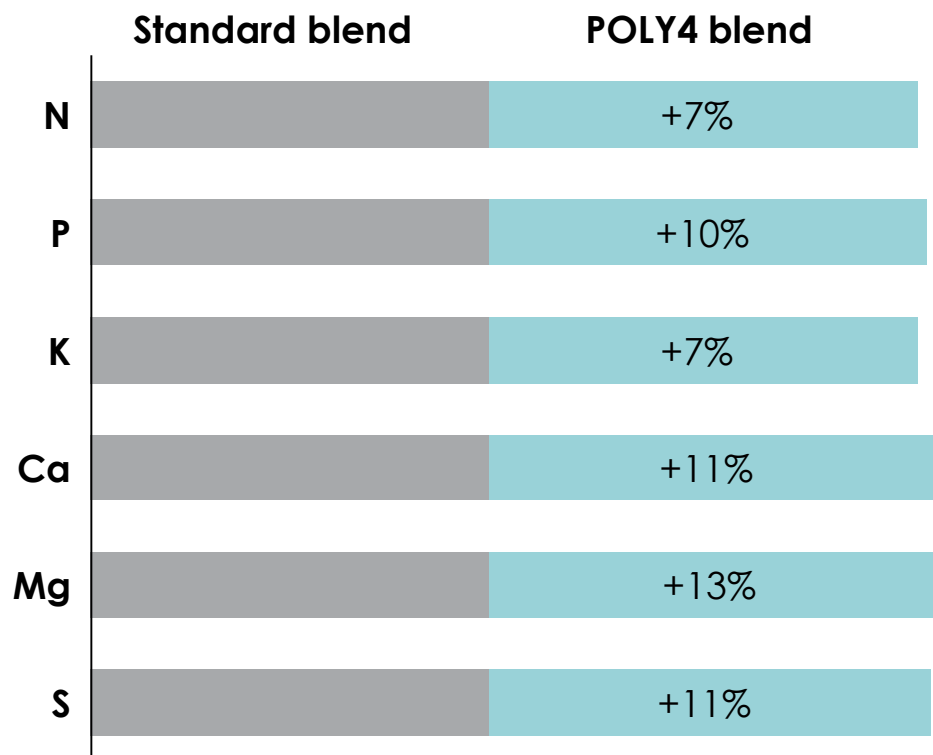


KEY TAKEAWAY:

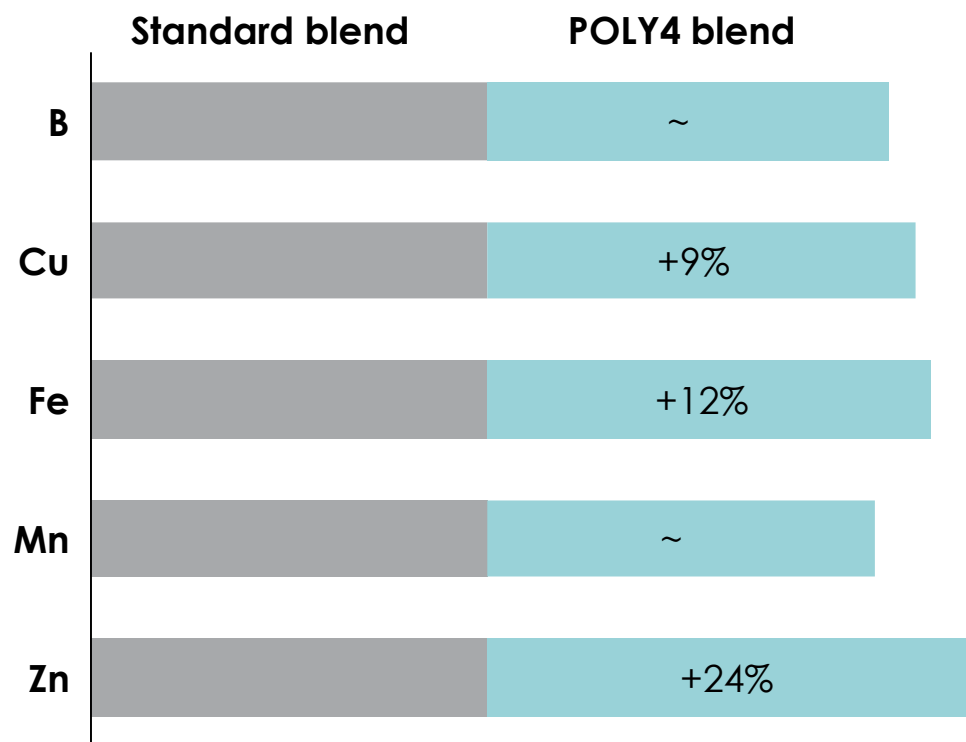
THE POLY4 BLEND HAD THE GREATEST SOYBEAN AND PROTEIN YIELDS

GRAIN NUTRIENT OFFTAKE

Improvements in macro-nutrient uptake compared to the standard blend



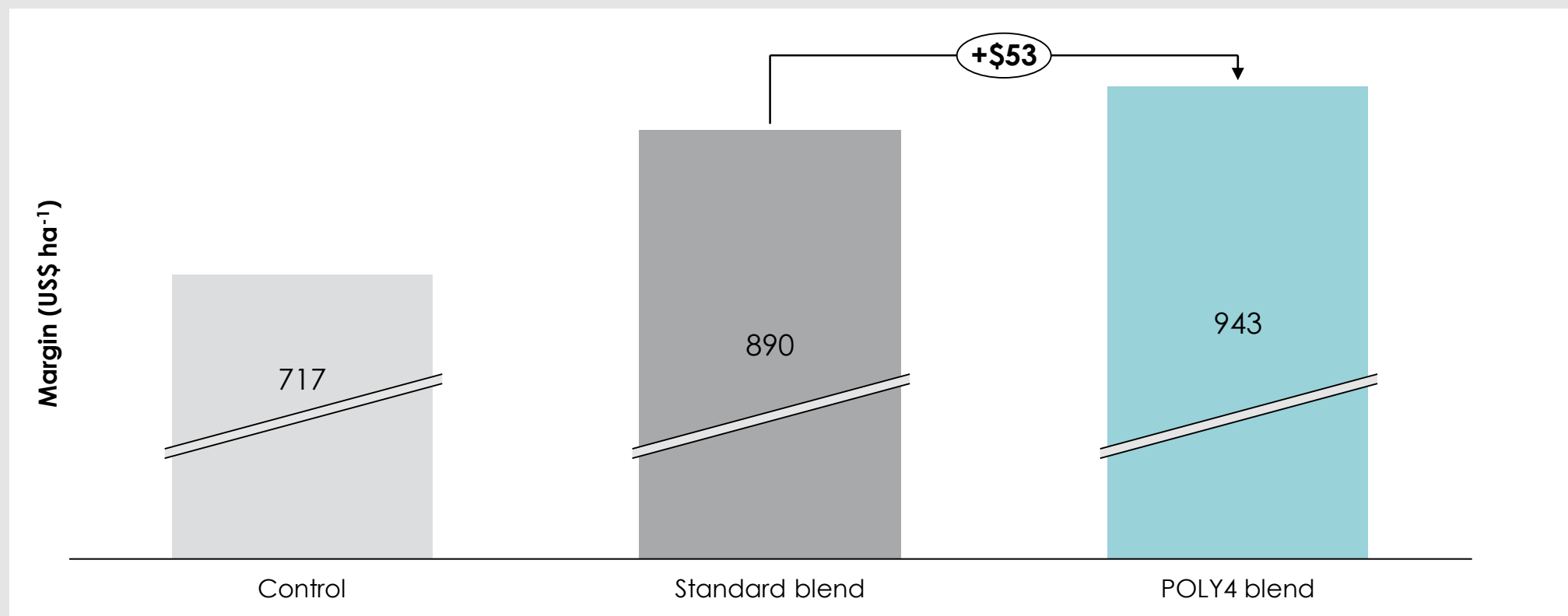
Improvements in micro-nutrient uptake compared to the standard blend



KEY TAKEAWAY:

THE POLY4 BLEND ENHANCED MACRO AND MICRO NUTRIENT OFFTAKE

MARGIN



KEY TAKEAWAY:

THE POLY4 BLEND GAVE THE GREATEST MARGIN

Notes: Standard blend contained muriate of potash (MOP), single super phosphate (SSP) and triple super phosphate (TSP); POLY4 blend contained MOP, TSP and POLY4. Results presented are based on data from GENSTAT ANOVA means at K₂O rate of 72 kg ha⁻¹. Fertilizer prices were obtained from CRU and are 2017 prices for Brazil: MOP (US\$262 t⁻¹), POLY4 (US\$200 t⁻¹), TSP (US\$281 t⁻¹), SSP (US\$144 t⁻¹). Costs include spreading cost of US\$13.07 t⁻¹. Soybean price was obtained from FAOSTAT (US\$344 t⁻¹). Margin = Crop Output – (Cost of fertilizer material + Cost of fertilizer application). University of São Paulo (2016) 4000-USP-4022-16.

SENSITIVITY ANALYSIS

Additional margin gain (US\$ t⁻¹)

Marginal
cost of SSP
production

		MOP price (US\$ t ⁻¹)															
		210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360
SSP price (US\$ t ⁻¹)	66	37	37	37	38	38	39	39	39	40	40	40	41	41	42	42	42
	140	51	51	51	52	52	53	53	53	54	54	54	55	55	56	56	56
	150	53	53	53	54	54	54	55	55	56	56	56	57	57	57	58	58
	160	54	55	55	56	56	56	57	57	58	58	58	59	59	59	60	60
	170	56	57	57	58	58	58	59	59	59	60	60	61	61	61	62	62
	180	58	59	59	59	60	60	61	61	61	62	62	62	63	63	64	64
	190	60	61	61	61	62	62	62	63	63	64	64	64	65	65	65	66
	200	62	62	63	63	64	64	64	65	65	65	66	66	67	67	67	68
	210	64	64	65	65	65	66	66	67	67	67	68	68	68	69	69	70
	220	66	66	67	67	67	68	68	68	69	69	70	70	70	71	71	71
	230	68	68	68	69	69	70	70	70	71	71	71	72	72	73	73	73
	240	70	70	70	71	71	72	72	72	73	73	73	74	74	75	75	75
	250	72	72	72	73	73	73	74	74	75	75	75	76	76	76	77	77
	260	73	74	74	75	75	75	76	76	76	77	77	78	78	78	79	79
	270	75	76	76	76	77	77	78	78	78	79	79	79	80	80	81	81

KEY TAKEAWAY:

THE POLY4 BLEND GENERATED EXTRA MARGIN THAN THE STANDARD BLEND UNDER LOWER SSP AND MOP PRICES

Notes: Standard blend contained muriate of potash (MOP), single super phosphate (SSP) and triple super phosphate (TSP); POLY4 blend contained MOP, TSP and POLY4.

SUMMARY

- POLY4 is practical solution for nutrient delivery, compatible and suitable as a blend component or as a stand-alone product
- Crops depend on timely availability of a balanced supply of appropriate nutrients
- POLY4 will ensure improved macro and micro nutrient supply supporting quality and plant health
- POLY4 supports rapid crop establishment
- Crop yields are improved above conventional, high specification nutrient-balanced alternatives
- POLY4 fertilizer plans offer resilience to input-price fluctuations providing assured economic success

KEY TAKEAWAY:

MULTI-NUTRIENT FERTILIZER POLICIES IMPROVE YIELD AND FUE

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THANK YOU