

Sustaining the future.



THE ADDED VALUE OF BALANCED FERTILIZATION WITH POLY4

Ross Mitchell
Added Value Fertilizers
Madrid, February 2018



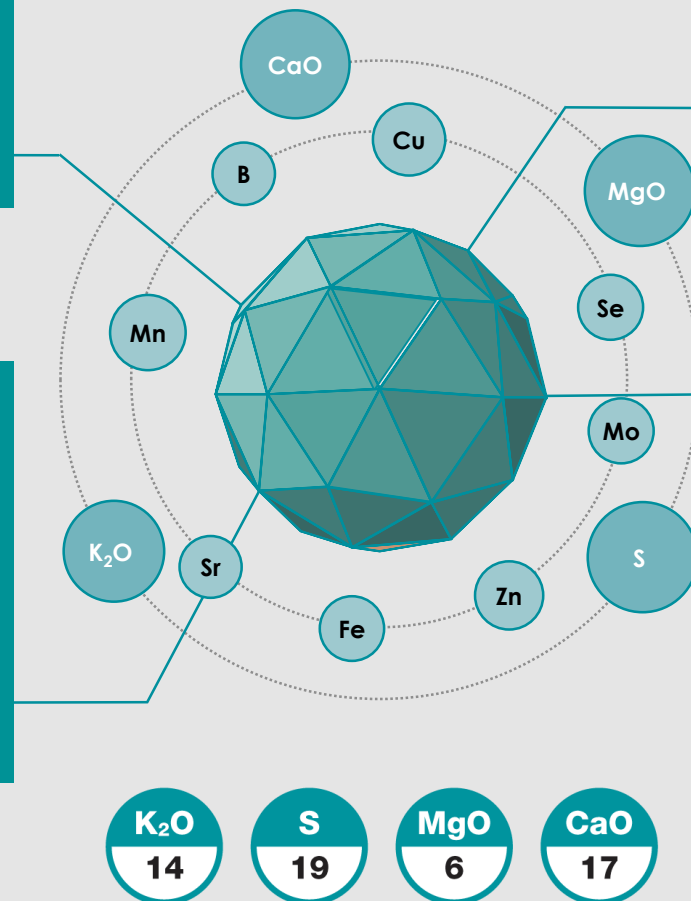
INTRODUCTION TO POLY4

EFFICIENCY

- Improves FUE by delivering greater nutrient uptake
- High nutrient density – delivers four macro nutrients in one easy-to-use, cost-effective granular delivery system

FLEXIBILITY

- Low chloride and pH neutral product that can be used on all plants and soils in all growing climates
- Successful as a straight fertilizer or as a component of blend formulations
- No negative interactions with other fertilizers
- Allows a farmer to choose the timing of application



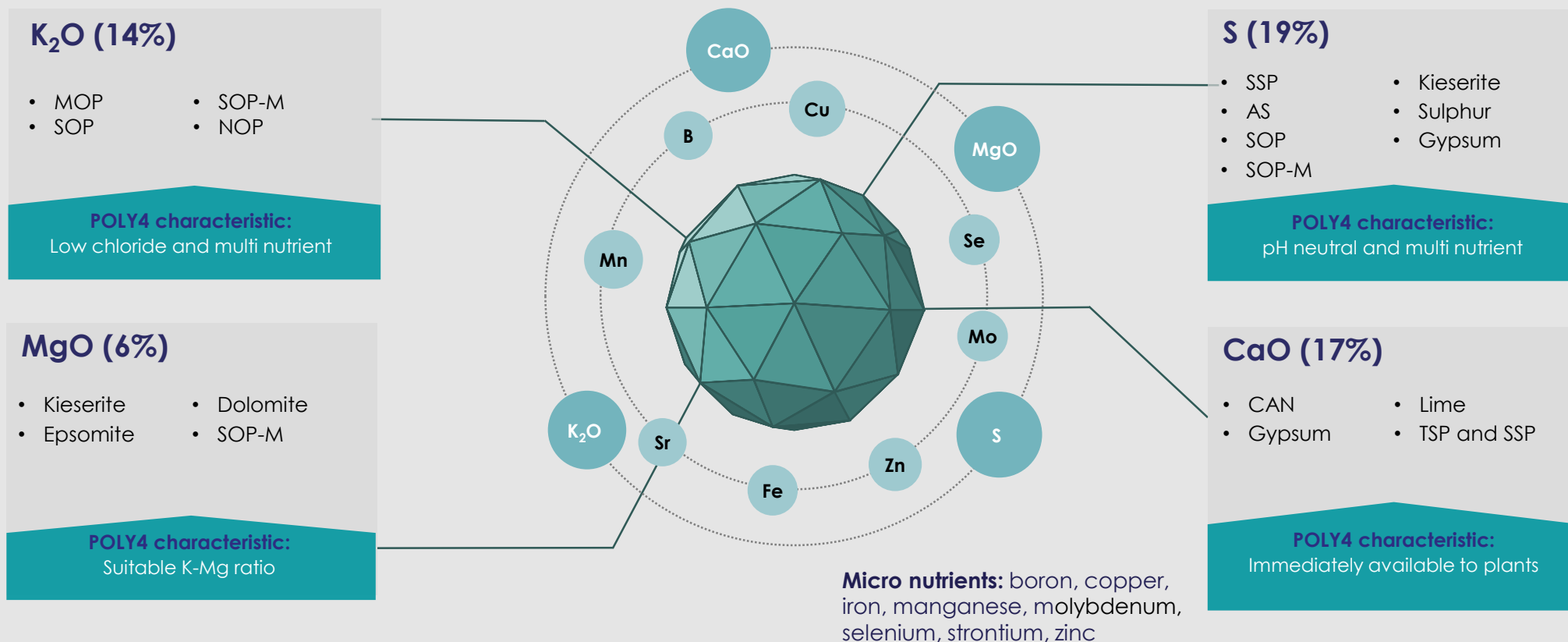
EFFECTIVENESS

- Improves both yield and quality
- Improves macro and micro nutrient uptake
- Minimises crop losses through disease resilience
- Has a desirable nutrient release profile
- Granular product that handles, stores, blends and spreads effectively

SUSTAINABILITY

- Improves soil strength, structure and nutrient legacy
- Reduces agriculture's impact on the environment by improving FUE, reducing erosion and nutrient loss
- Certified for organic use
- Excellent environmental profile

PRODUCT SUBSTITUTION: THE RIGHT TO PLAY



Note: *48% SO₃. MOP – muriate of potash (KCL), SOP – potassium sulphate, SOP-M – potassium magnesium sulphate, NOP – potassium nitrate, SSP – single super phosphate, AS – ammonium sulphate, CAN – calcium ammonium nitrate, TSP – triple super phosphate

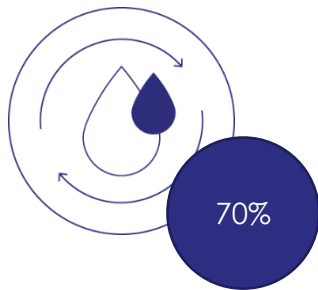
PRODUCT CHARACTERISTICS



Effective nutrient
release



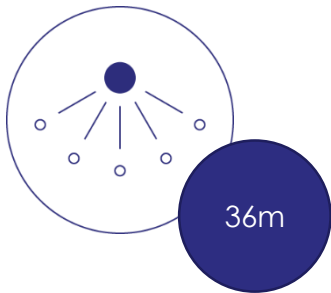
Critical relative
humidity



Suitable crush
strength



Effective spreading



Low
chloride



Soil pH



Blend compatible



Low carbon
footprint



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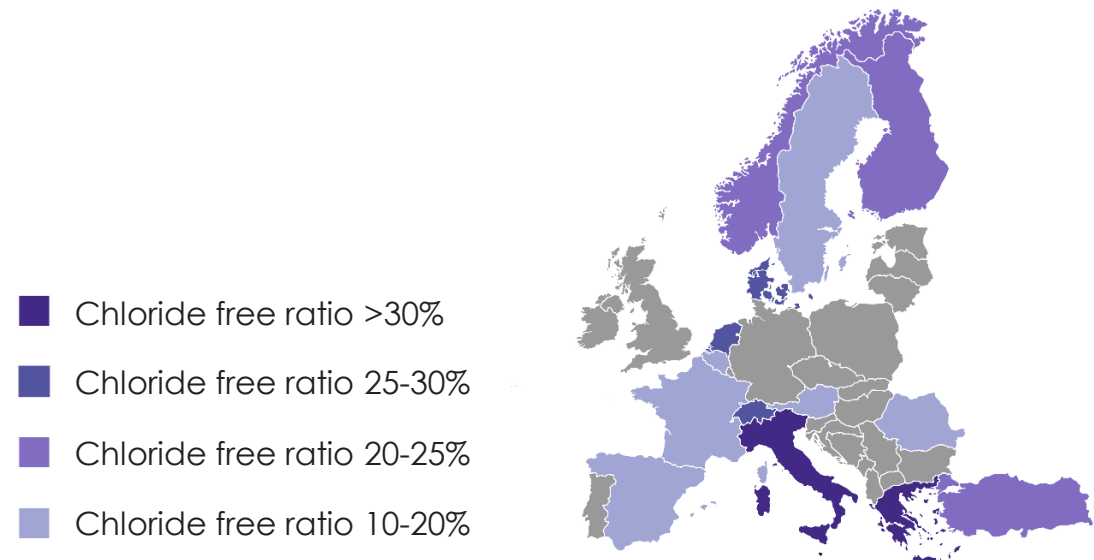


THE EUROPEAN MARKET

POLY4'S RIGHT TO PLAY IN EUROPE

Significant contestable market size of ~66 Mtpa in POLY4 equivalent with a high demand for multi-nutrient K_2O , S and MgO products

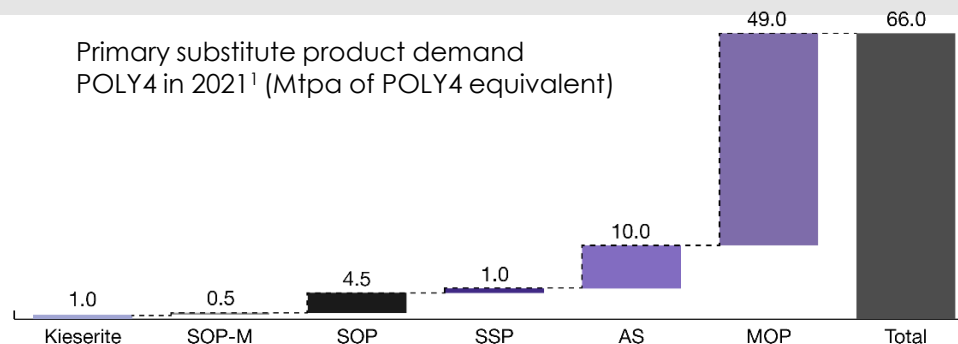
EU consumption on a chloride free K_2O ratio basis² (Mtpa of POLY4 equivalent)



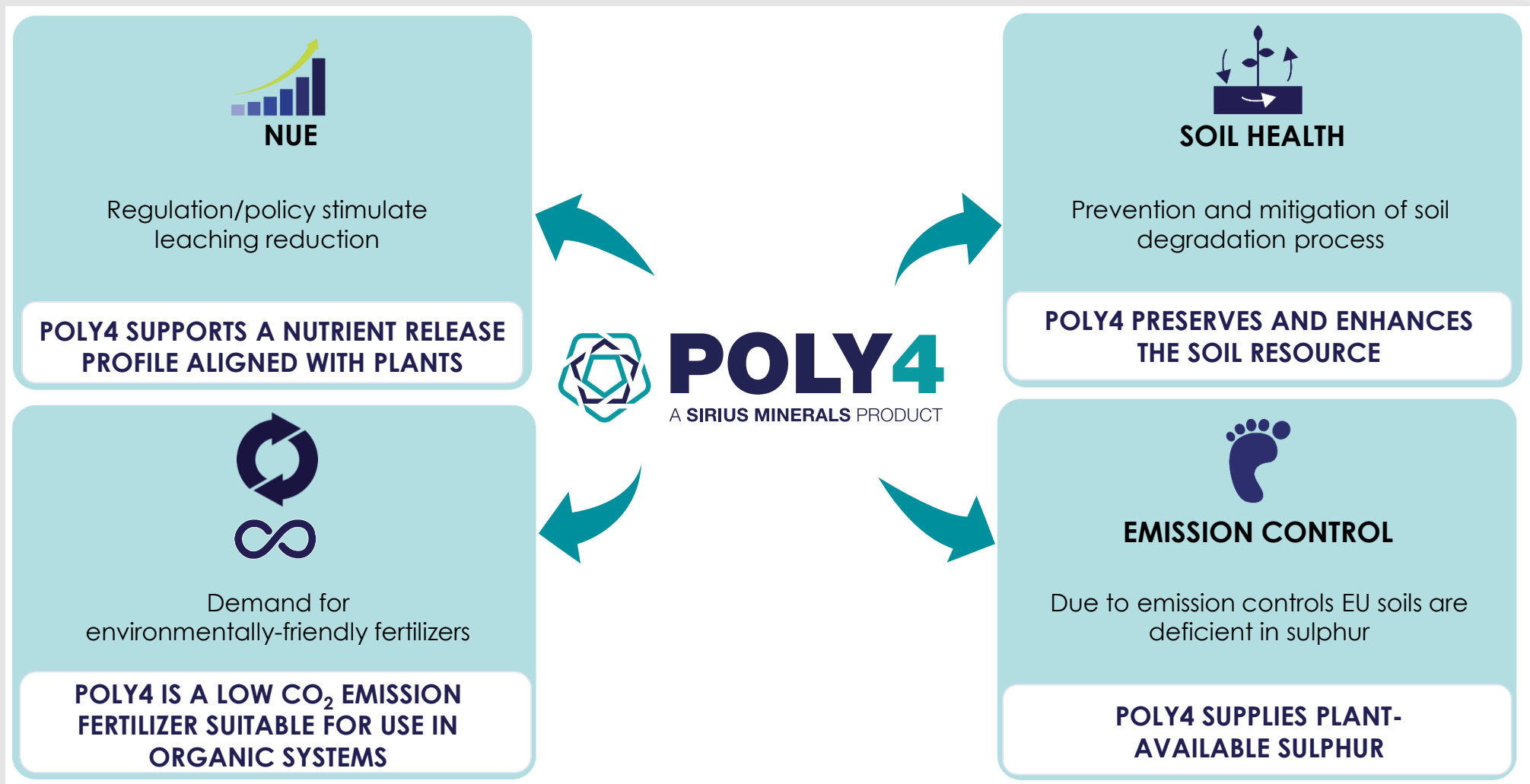
Sulphur deficiencies (unmet demand)³



Primary substitute product demand POLY4 in 2021¹ (Mtpa of POLY4 equivalent)

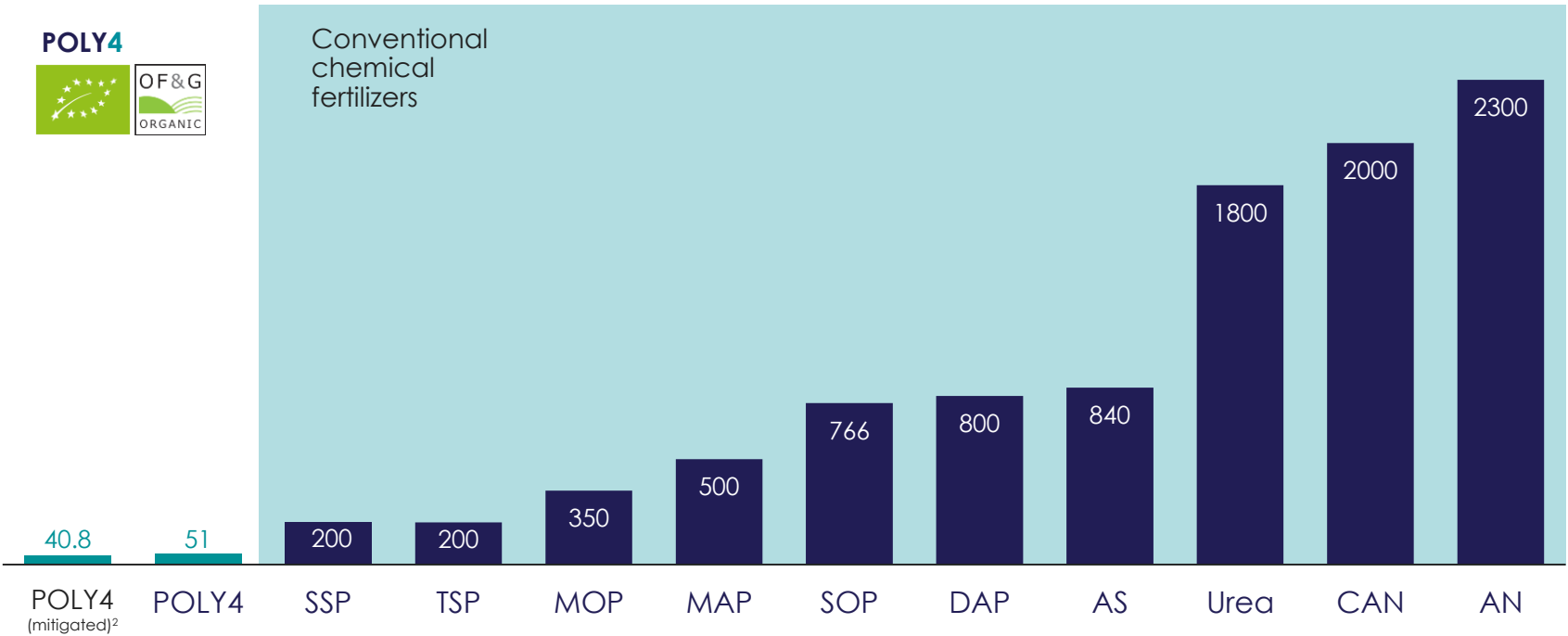


EUROPEAN DRIVE FOR SUSTAINABILITY



LOW CARBON FOOTPRINT

CO₂ emissions of common fertilizers¹(kg t⁻¹ of fertilizer)



Notes: 1) SSP – single super phosphate, TSP – triple super phosphate, MOP – muriate of potash, SOP – sulphate of potash, MAP – monoammonium phosphate, DAP – diammonium phosphate, AS – ammonium sulphate, CAN – calcified ammonium nitrate, AN – ammonium nitrate; 2) 10% mitigation from renewable energy sources and 10% from tree planting offset.
Sources: Sirius Minerals 2015; Ricardo-AEA Ltd. 2014.

SOIL STABILISATION

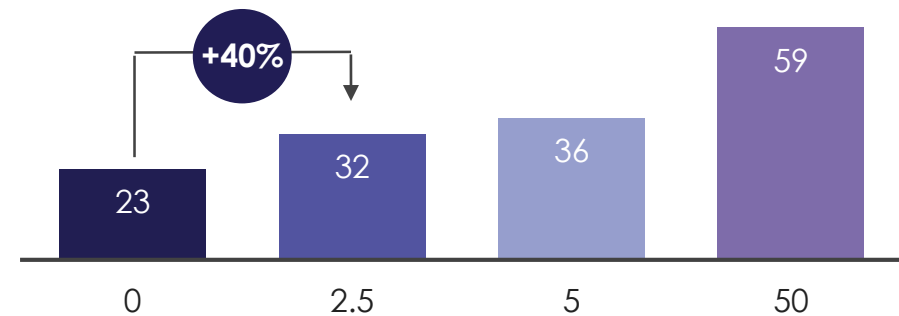
Key findings

- Preserves the soil resource
- Enables water and air infiltration, improving soil chemistry
- Improves root penetration, increasing anchorage
- Inhibits runoff reducing flood risk

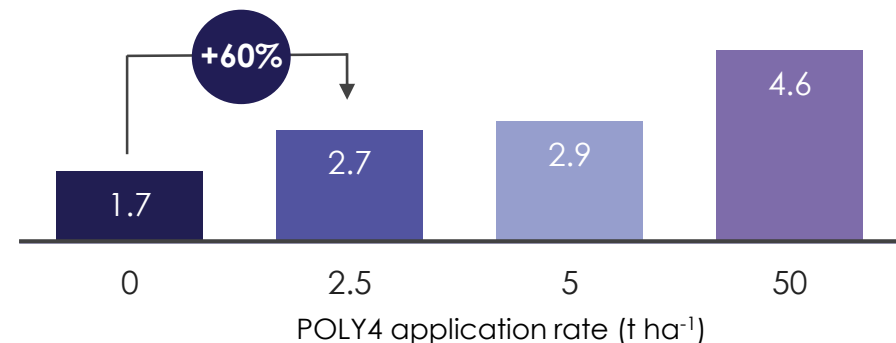
Agricultural soil challenges:



Soil tensile strength (kPa)



Soil resilience to compaction (Young's Modulus MPa)^{1,2}



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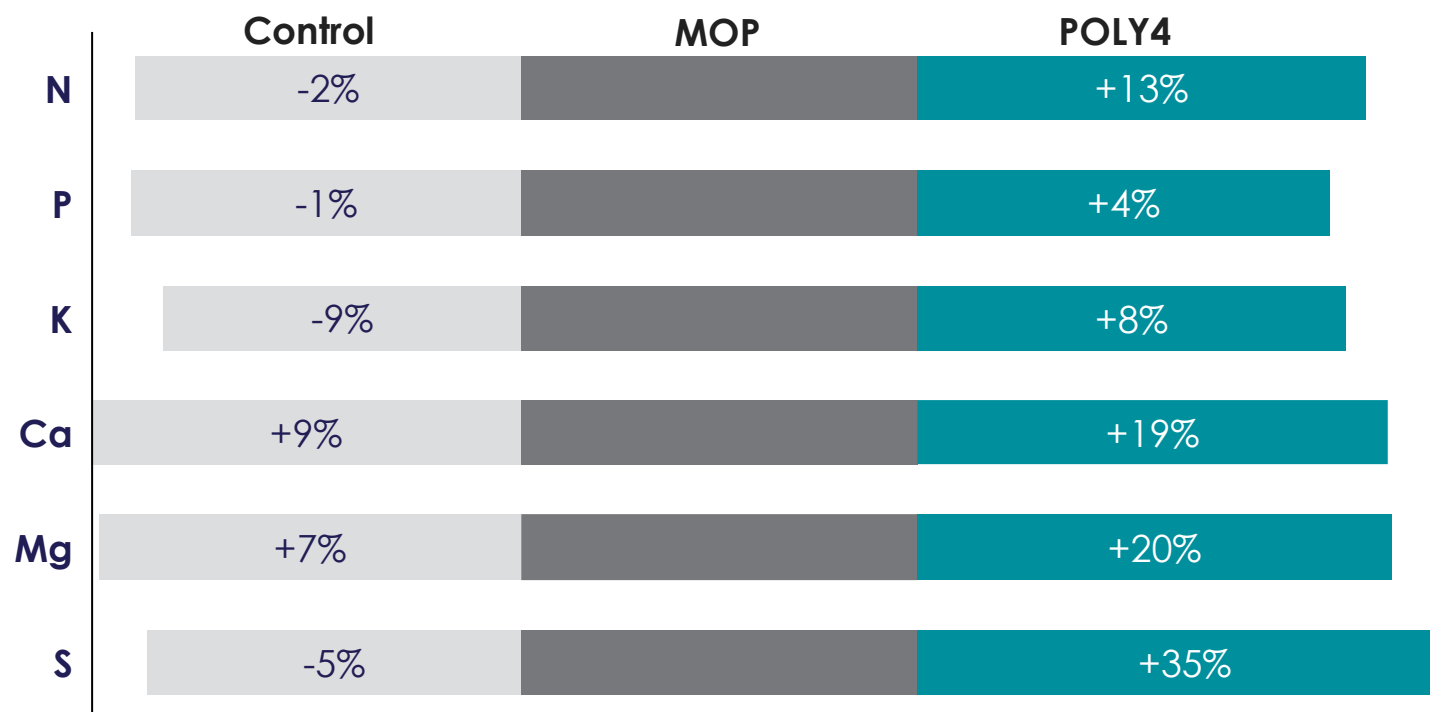


BEYOND JUST NUTRIENT VALUE

SUSTAINED MACRO-NUTRIENT DELIVERY

MACRO-NUTRIENT UPTAKE RESULTS FROM EUROPEAN TRIALS

Improvements in macro-nutrient uptake compared to MOP¹



Initial soil analysis¹

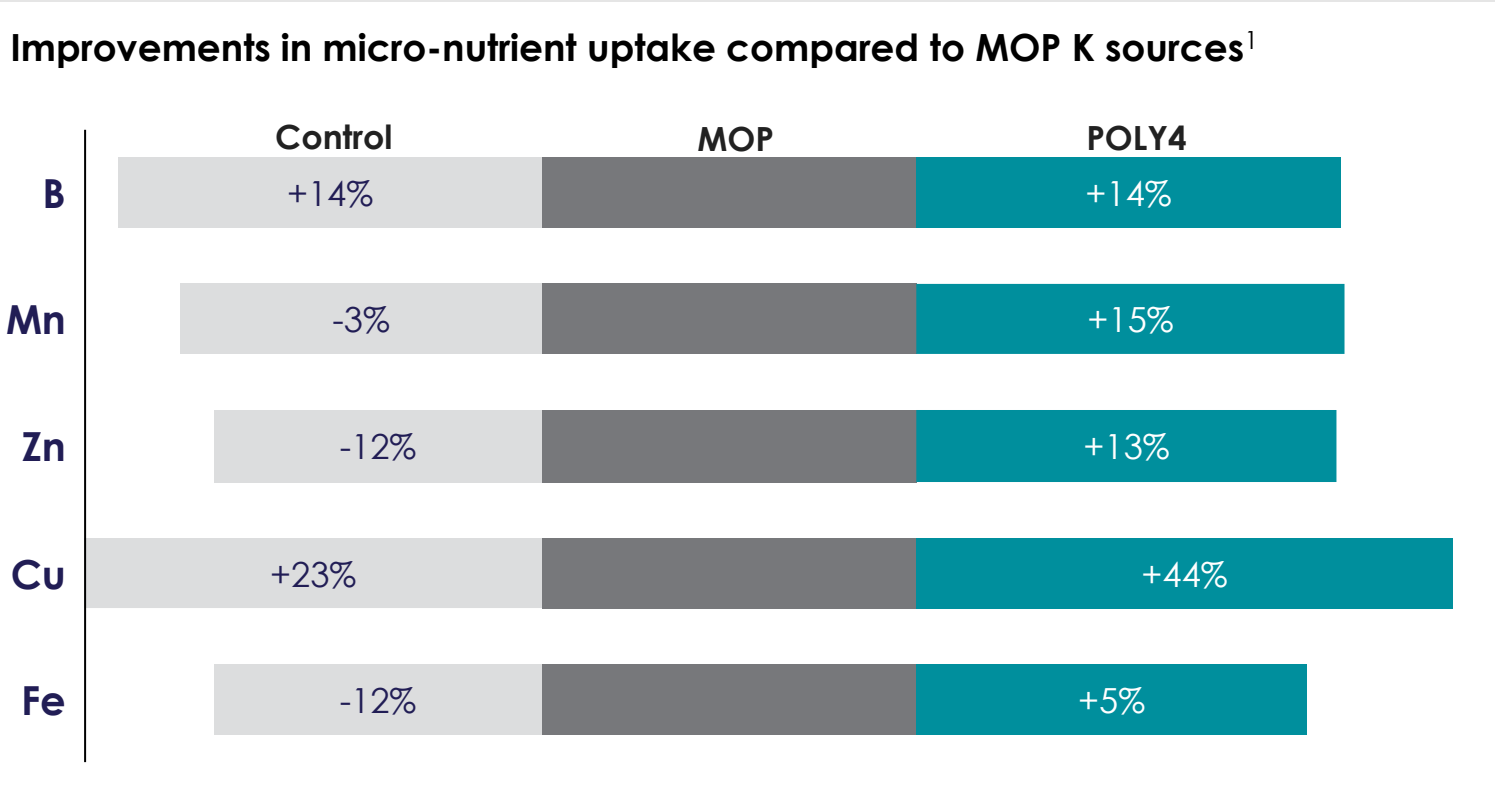
Soil measurement	Value
P (mg kg ⁻¹)	55
K (mg kg ⁻¹)	103
Mg (mg kg ⁻¹)	95
Ca (mg kg ⁻¹)	1897
S (mg kg ⁻¹)	4
OM (g kg ⁻¹)	19

KEY TAKEAWAY:

POLY4 OUTPERFORMED MOP IN MACRO-NUTRIENT UPTAKE

SUSTAINED MICRO-NUTRIENT DELIVERY

MICRO-NUTRIENT UPTAKE RESULTS FROM EUROPEAN TRIALS



Initial soil analysis¹

Soil measurement	Value
B (mg kg ⁻¹)	0.6
Mn (mg kg ⁻¹)	24
Zn (mg kg ⁻¹)	8.9
Cu (mg kg ⁻¹)	5.7
Fe (mg kg ⁻¹)	95

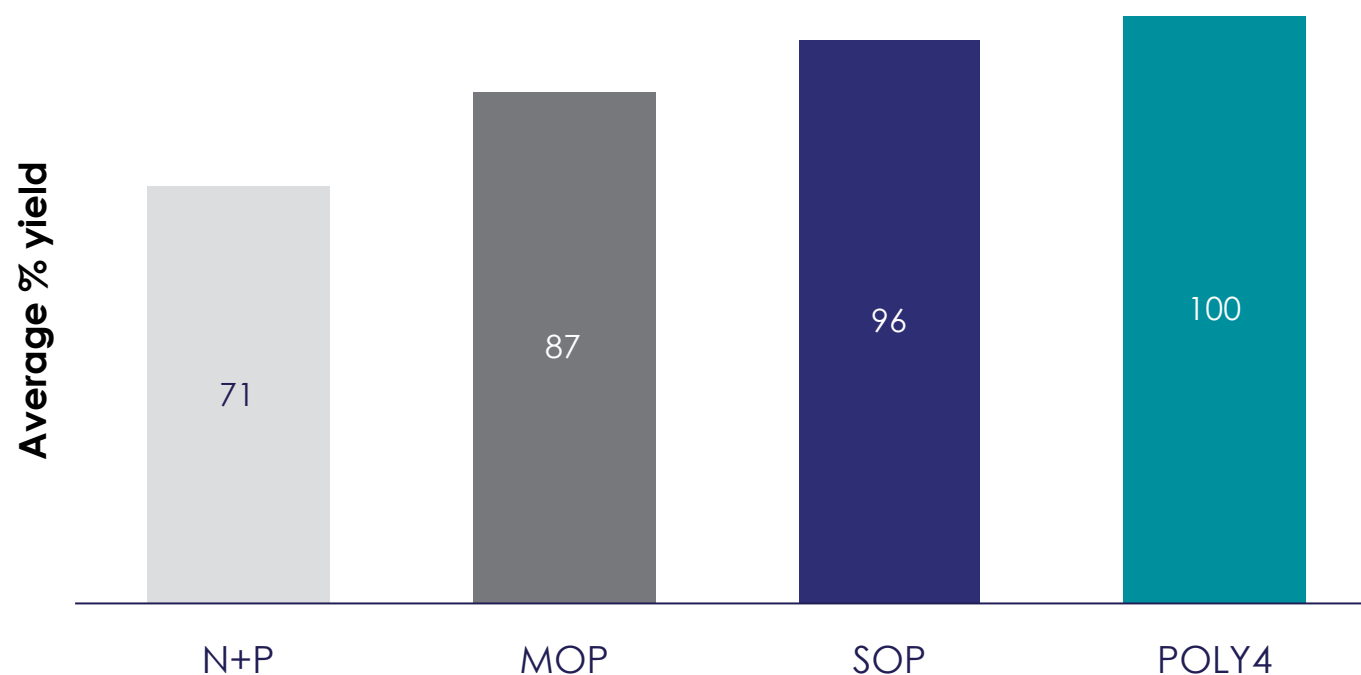
KEY TAKEAWAY: POLY4 OUTPERFORMED MOP IN MICRO-NUTRIENT UPTAKE

Notes: 1) The results are based on 11 European trials.
Source: Sirius Minerals

POLY4 PERFORMANCE COMPARED TO POTASH SOURCES

YIELD RESULTS FROM 79 FERTILIZER COMPARISON FIELD TRIALS (SEPTEMBER 2017)
GENERATE POWERFUL CONCLUSIONS

Average POLY4 performance against other K sources^{1,2}



Initial soil analysis

Soil Measurement	Value
P (mg kg ⁻¹)	31
K (mg kg ⁻¹)	97
Mg (mg kg ⁻¹)	203
Ca (mg kg ⁻¹)	2344
S (mg kg ⁻¹)	20
OM (g kg ⁻¹)	16

KEY TAKEAWAY:

POLY4 OUTPERFORMED MOP AND SOP

Notes: 1) Average performance based on straight trial results at recommended K₂O application rates; 2) All available field data to September 2017 covering broad-acre (corn, wheat, soybean, barley, oilseed rape, sugarcane, rice) and high-value crops (cabbage, cotton, potatoes, tobacco, tomatoes and tea); 3) Soils were NOT selected against Ca, Mg and S content
Source: Sirius Minerals

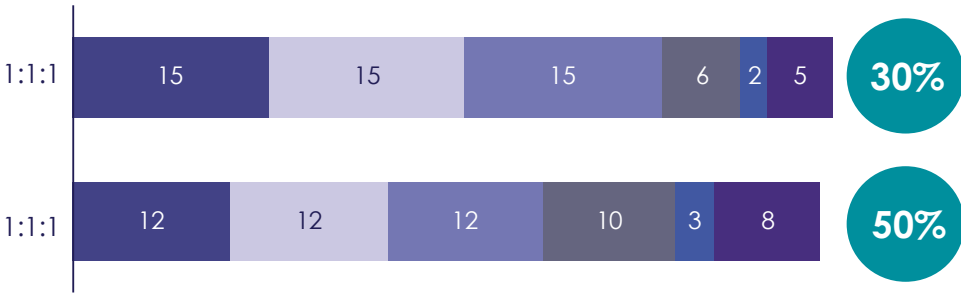
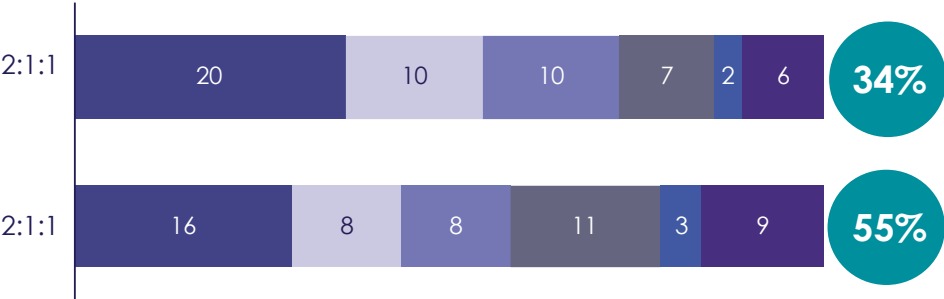
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BLENDING AND COMPATIBILITY



BLENDING POTENTIAL IN POPULAR EUROPEAN NPK BLENDS



■ N ■ P₂O₅ ■ K₂O ■ S ■ MgO ■ CaO

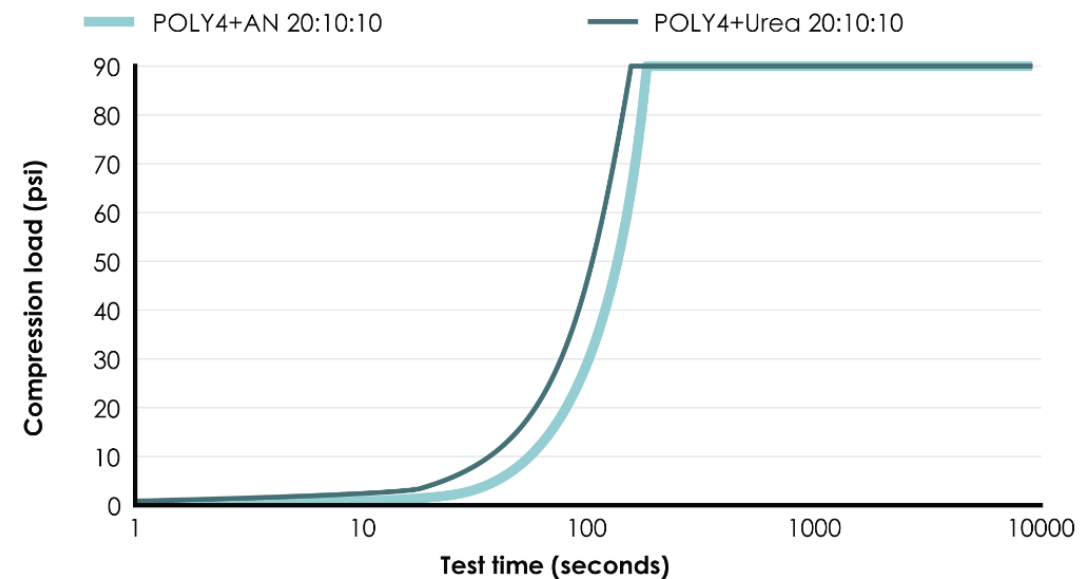
POLY4 ACCELERATED CAKING TEST

VARIOUS CHARACTERISTICS SHOW POLY4's COMPATIBILITY AND PRACTICALITY

- 500 N load cell and a displacement transducer
- The time delay, until 90 psi is reached, indicates the delay until a cake is formed
- The ejection pressure of the cake is an indication of the caking propensity



Shelf life



KEY TAKEAWAY:

POLY4 unique characteristics result in practical usage for the NPK blenders/farmer

IFDC RATIFICATION

Granulation



Screening



Compaction



NPK product
validation



NPK CHEMICAL COMPATIBILITY IFDC TESTING MATRIX

DETERMINE THE CHEMICAL COMPATIBILITY WHEN PRODUCING THE FOLLOWING GRADES

Option 1

with urea-DAP-KCI-POLY4:

- 27.3 – 13.6 – 13.6 with 0% POLY4
- 24.4 – 12.2 – 12.2 with 14% POLY4
- 19.7 – 9.9 – 9.9 with 36% POLY4
- 16.5 – 8.3 – 8.3 with 51% POLY4

Nutrient ratio	Grade	Material (g)			
		Urea	DAP	KCI	POLY4
2:1:1	27.3-13.6-13.6	47.57	29.51	22.92	0.00
	24.4-12.2-12.2	42.49	26.36	17.34	13.81
	19.7-9.9-9.9	34.39	21.34	8.44	35.83
	16.5-8.3-8.3	28.86	17.91	2.36	50.87

Option 2

with AN-phosphate rock-KCI-POLY4:

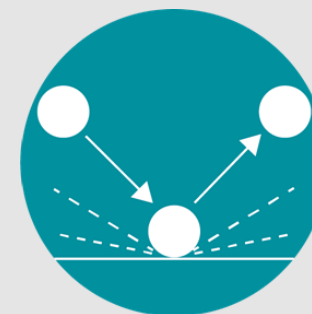
- 12.5 – 12.5 – 12.5 with 0% POLY4
- 12.1 – 12.1 – 12.1 with 4% POLY4
- 10.0 – 10.0 – 10.0 with 26% POLY4
- 7.4 – 7.4 – 7.4 with 53% POLY4

Nutrient ratio	Grade	Material (g)			
		AN	Phosphate Rock	KCI	POLY4
1:1:1	12.5-12.5-12.5	36.80	42.29	20.91	0.00
	12.1-12.1-12.1	35.68	41.00	19.38	3.95
	10.0-10.0-10.0	29.44	33.83	10.85	25.88
	7.4-7.4-7.4	21.83	25.08	0.46	52.63

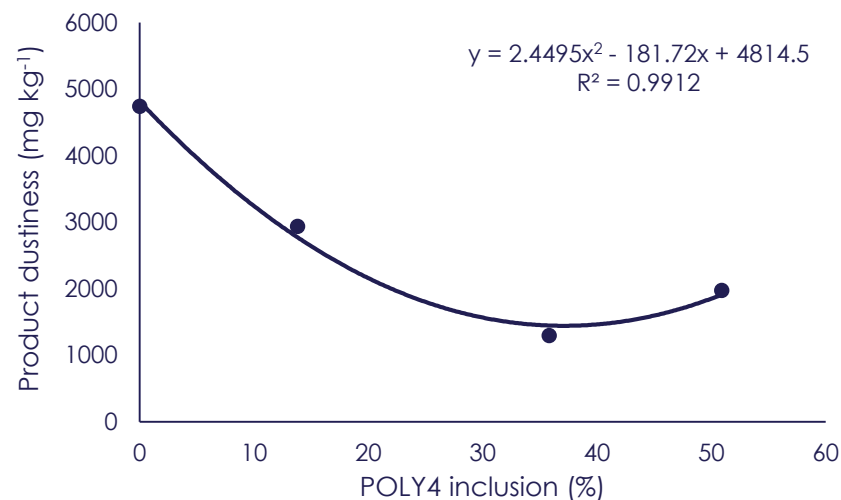
STEAM GRANULATION – NPK COMPOUND RESULTS

DUST GENERATION

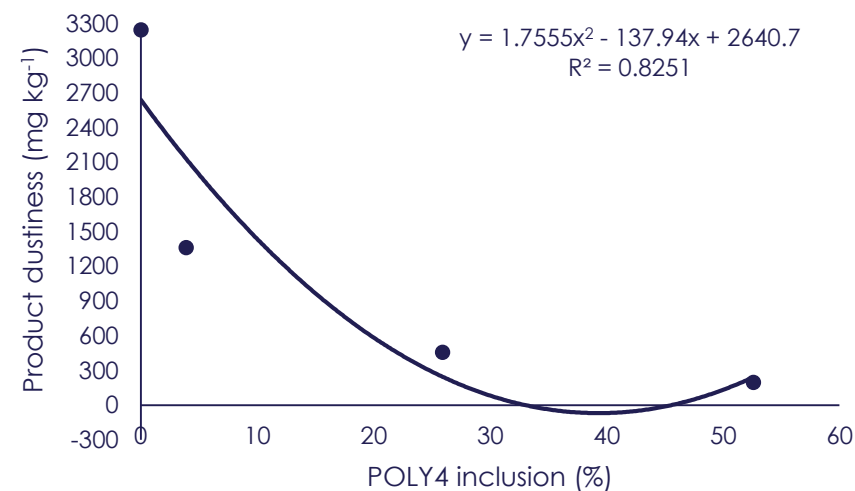
- Inclusion of POLY4 in steam-granulated NPK compounds dramatically reduces dust generation



Urea



AN



KEY TAKEAWAY:

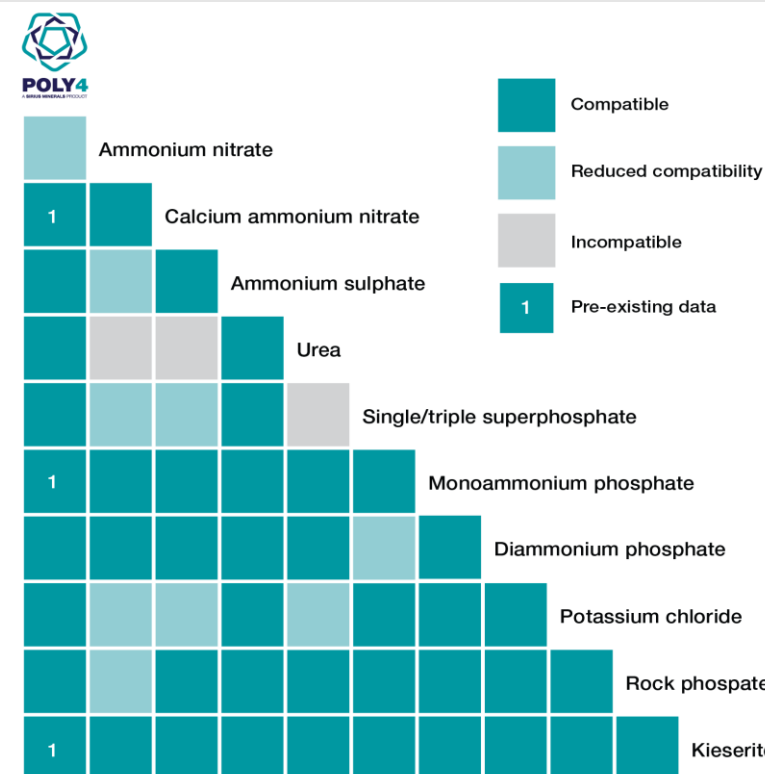
POLY4 inclusion has a positive impact on abrasion resistance of granule

SUMMARY OF FINDINGS

DRY BLEND	Influence up to 50% (w/w) POLY4 composition		
	Compatibility		
AN-RP-KCI-POLY4	Slightly improved ~ AN-RP dominated		
Urea-DAP-KCI-POLY4	Slightly improved		

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

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



KEY TAKEAWAY:

POLY4 has a positive impact on dry blends, compacted and steam-granulated complexes

HIGHLIGHTS

- POLY4 is a multi-nutrient fertilizer containing potassium, calcium, magnesium and sulphur
- Europe's drive towards sustainable agriculture fits with POLY4
- POLY4's agronomic validation demonstrates value
- Accelerated caking tests demonstrated compatibility for blenders
- IFDC ratification of dry blend compatibility
- Compaction and steam granulation using POLY4 improve compound fertilizers



2011 - 2015
Resource definition,
minerals rights and
approvals

Nov 2016
Stage 1 financing
complete

2017 – 2021
Construction and
development

2021
First polyhalite

2024
10 Mtpa ramp-up

THANK YOU

Any questions please contact:

ross.mitchell@siriusminerals.com

siriusminerals.com
poly4.com