

The future of fertilizer.



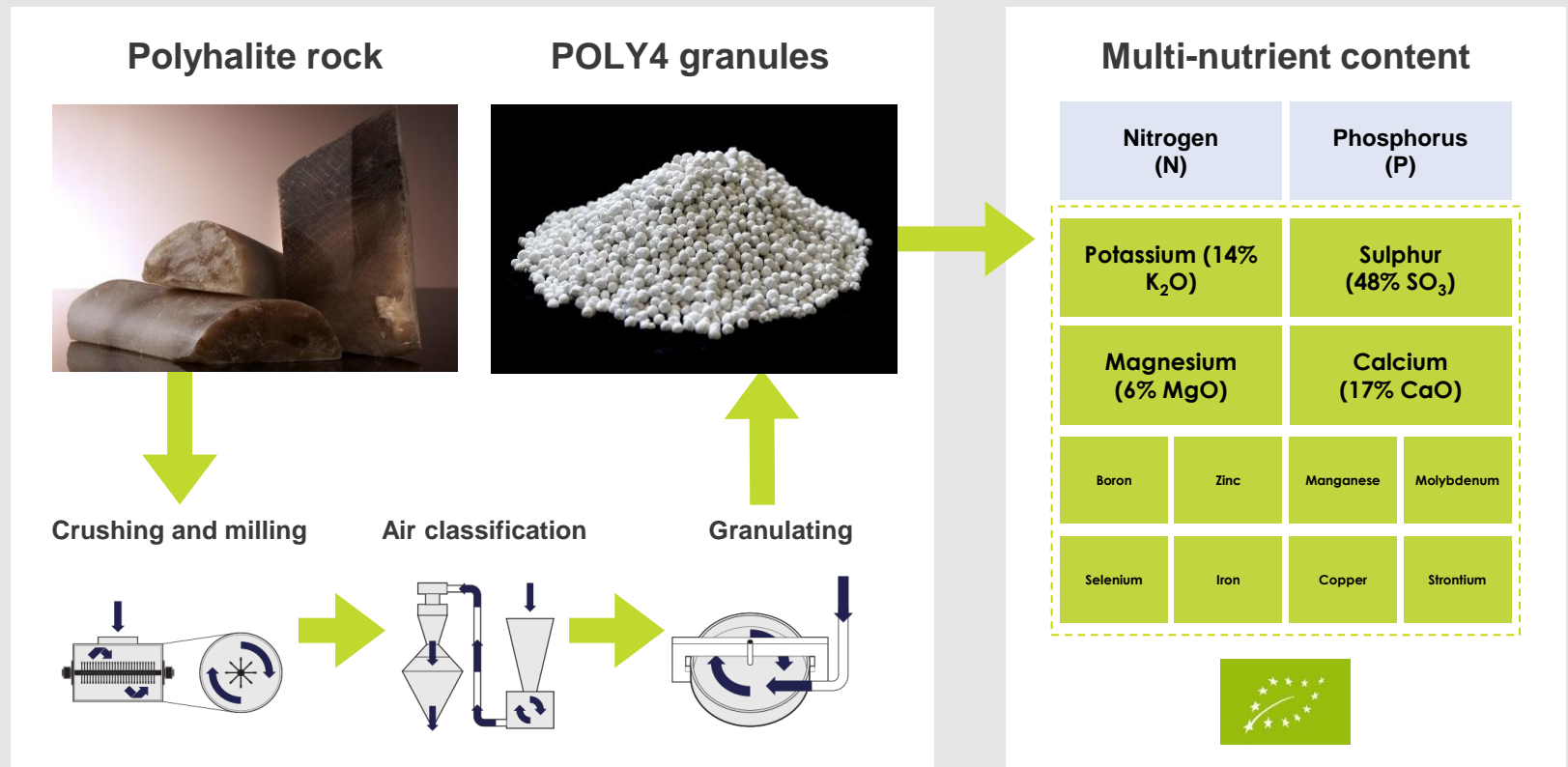
WE'RE ABOUT GROWTH

Polyhalite effectiveness as an
alternative potash source in Tanzania
June 2016



WHAT IS POLY4?

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



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

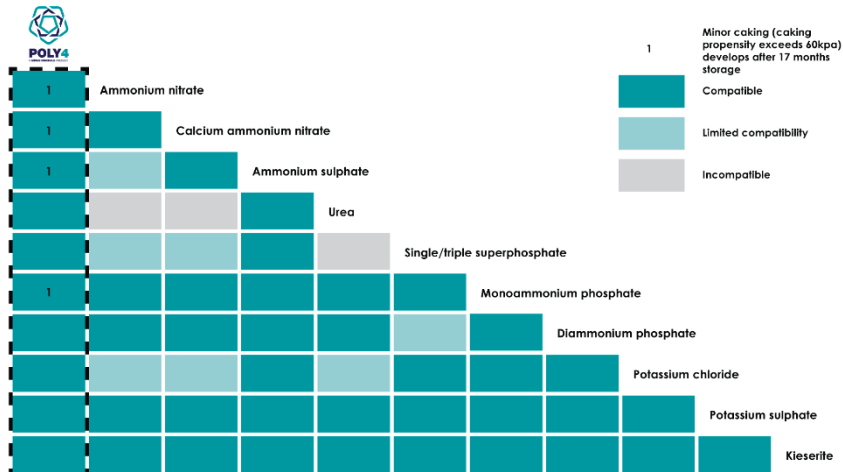
Notes: 1) Based on 90% polyhalite grade. Remaining content consists of Halite, Anhydrite, Magnesite, Kieserite, Hexahydrate, Szabelyite, Gypsum, Synenite, Mica; 2) POLY4 is the trademark name for Sirius Mineral's flagship polyhalite product.

POLY4 COMPATIBLE CHARACTERISTICS

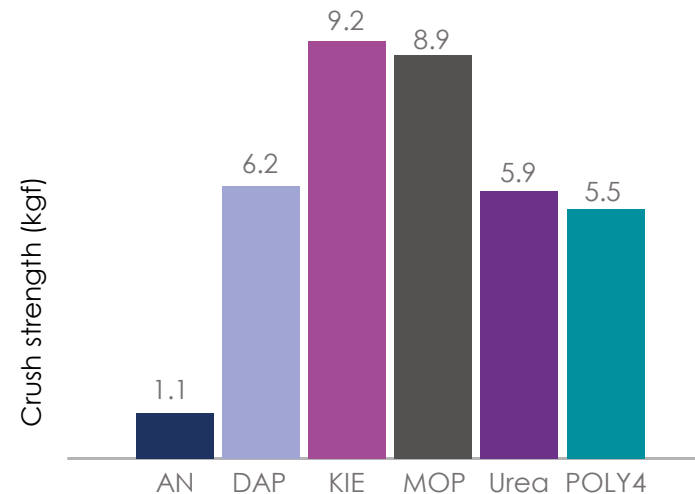


Various characteristics shows POLY4 compatibility and practicality

1 Compatibility



2 Strength



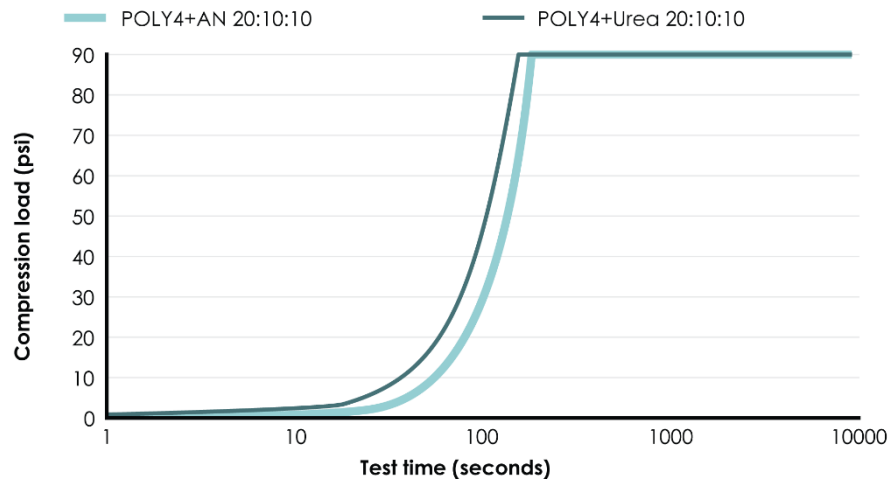
KEY TAKEAWAY: POLY4's unique characteristics result in practical usage benefits for the NPK blenders/farmer

POLY4 COMPATIBLE CHARACTERISTICS

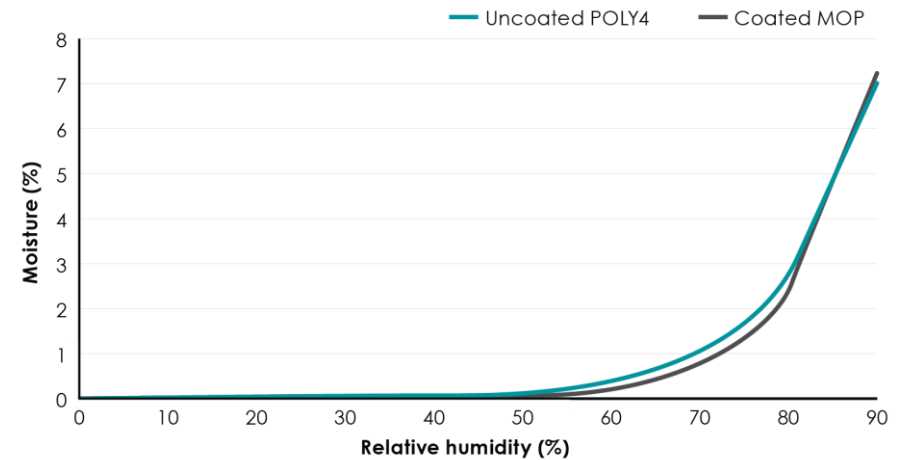


Various characteristics shows POLY4's compatibility and practicality

3 Shelf life



4 CRH



KEY TAKEAWAY: POLY4's unique characteristics result in practical usage benefits for the NPK blenders/farmer

POLY4 PRODUCT CHARACTERISTICS

Various characteristics shows POLY4's compatibility and practicality

1 Solubility



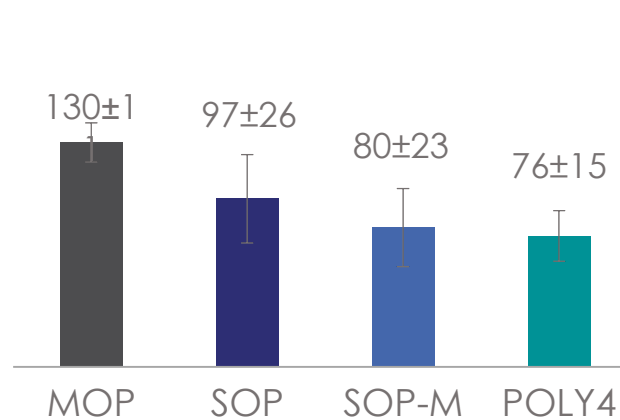
Fully soluble and delivers nutrients effectively

2 Spreadable

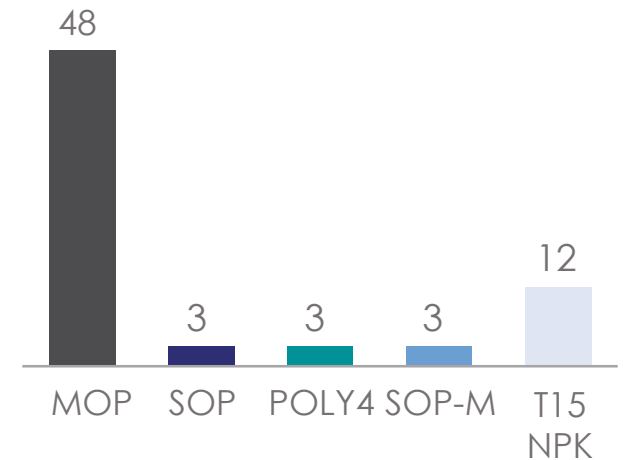


Suitable for spreading up to 36m

3 Salt Index



4 Low chloride



KEY TAKEAWAY: POLY4's unique characteristics result in practical usage benefits for the NPK blenders/farmer

Notes: 1) Test was conducted by adding 1 gram of fertilizer to 100ml of deionised water, agitated at 25°C.
Sources: University of Florida 2013, Sirius Minerals.

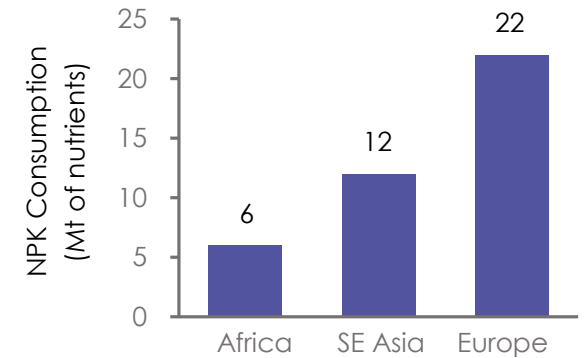
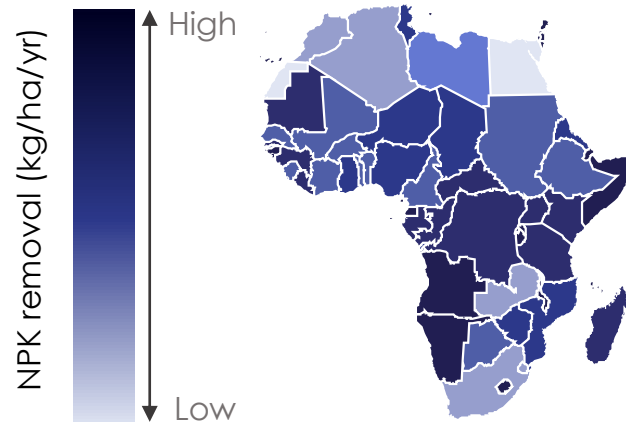
AFRICAN FOOD SECURITY

Fertilizer consumption must increase to support Africa's food security

1 Nutrient security



2 Fertilizer need



KEY TAKEAWAY: Soils must be replenished to maximise and maintain yield

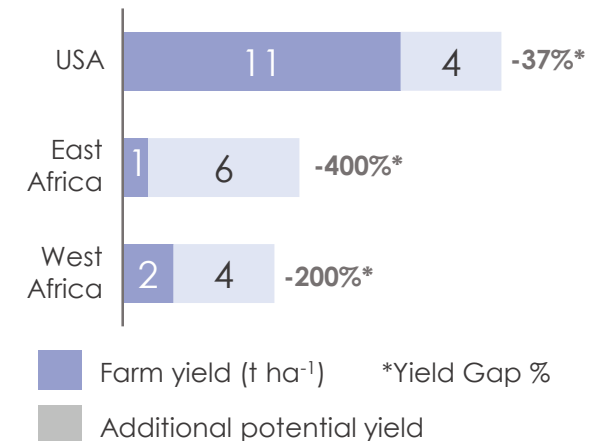
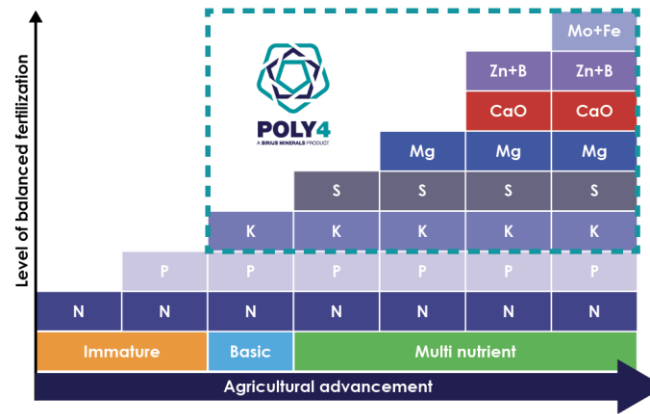
AFRICAN FOOD SECURITY

Fertilizer consumption must increase to support Africa's food security

3 Balanced fertilization



4 Higher yields



KEY TAKEAWAY: Soils must be replenished to maximise and maintain yield

Notes: 1) Baanate 2006, FAO; 2) Farm yield is calculated as the mean of on farm yield observations, additional potential yield is calculated as the highest observed yield. Sources: GRDC, Sirius Minerals.

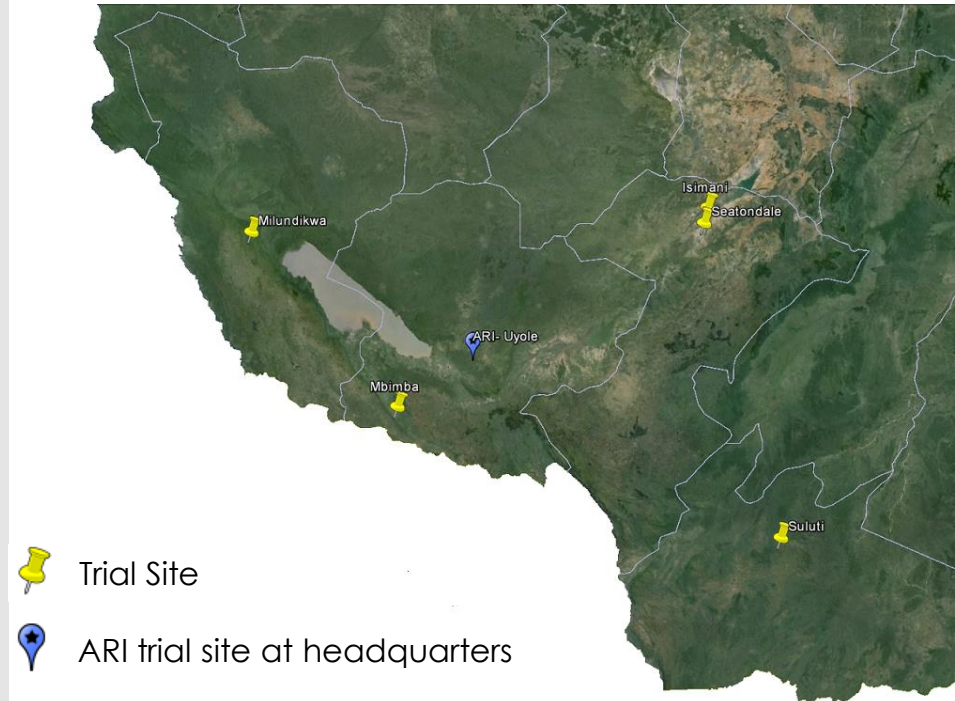
REGIONAL SCALE TRIAL PROGRAMME

Fertilizer consumption must increase to support Africa's food security

Key comments

- Corn is the largest crop grown in Tanzania with 6.7 Mt produced, accounting for 24% of all crops grown.
- Around 80% of corn production is from small scale farmers with 65 - 80% of produced corn consumed within the household¹.
- The Southern Highlands produces approximately half of all corn in Tanzania¹.
- Although soil is fertile, fertilizer is required to prevent nutrient mining that would cause widening of the yield gap in the long term.
- Six trials across the Southern Highlands were established with the Uyole Agricultural Research Institute to assess POLY4's performance.

Map of trial locations



KEY TAKEAWAY: Multiple trial sites produces robust data across different environments

SOUTHERN HIGHLAND INITIAL SOIL ANALYSIS

Soil analysis from six sites in the Southern Highlands region

Initial soil analysis

Site	Soil parameter			Nutrient content (mg kg ⁻¹)					
	pH	Organic Content (g kg ⁻¹)	CEC (cmol kg ⁻¹)	N	P	K	Ca	Mg	S
ARI - Uyole	5.6	20	17.66	1650	2.06	917	1240	149	13.04
Ismani	5.6	8.4	14.86	2400	4.16	234	774	403	36
Mbimba	5.2	18.4	15.84	2200	5.22	246	394	149	15.73
Milundikwa	5.5	25.5	16.3	2530	5.17	445	944	257	9.18
Seatondale	5.5	6.1	4.88	1770	13.33	117	356	192	20.18
Suluti	5.3	6.2	12.08	2070	10.05	230	270	210	12.03

KEY TAKEAWAY: Soils are slightly acidic, low in organic matter and high in potassium content

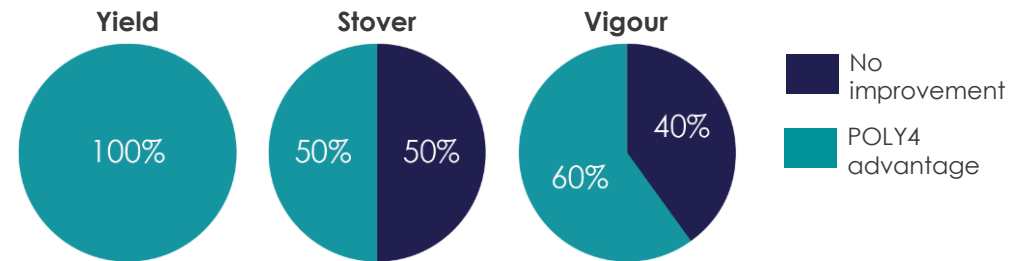
POLY4'S PERFORMANCE IN THE SOUTHERN HIGHLAND

Yield enhancement through POLY4 as a straight fertilizer

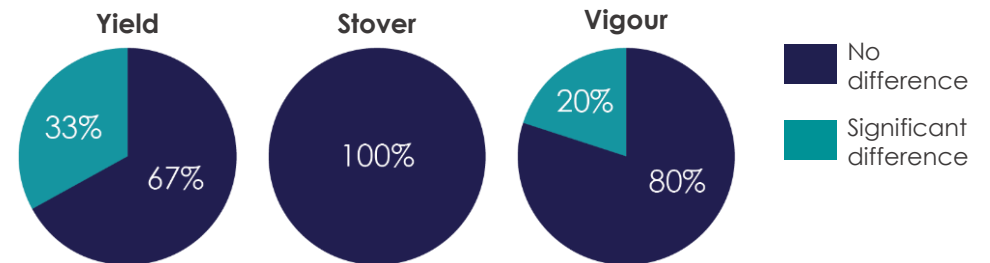
Key comments

- Straight trials allow the effectiveness of potassium fertilizers to be demonstrated at recommended nitrogen and phosphorus applications.
- POLY4 increased yield, outperforming MOP in 100% of the trials.
- Crop stover and vigour were higher in 50% and 60% of trials respectively, which indicates better plant health
- In two instances, POLY4 also showed a clear statistically significant yield advantage over MOP.
- This regional trial programme demonstrates POLY4's effectiveness as a potassium fertilizer in comparison to MOP.

Numerical difference of POLY4 over MOP^{1,2}



Statistical difference of POLY4 over MOP¹⁻³



KEY TAKEAWAY: POLY4 shows significant improvements in corn yields over MOP

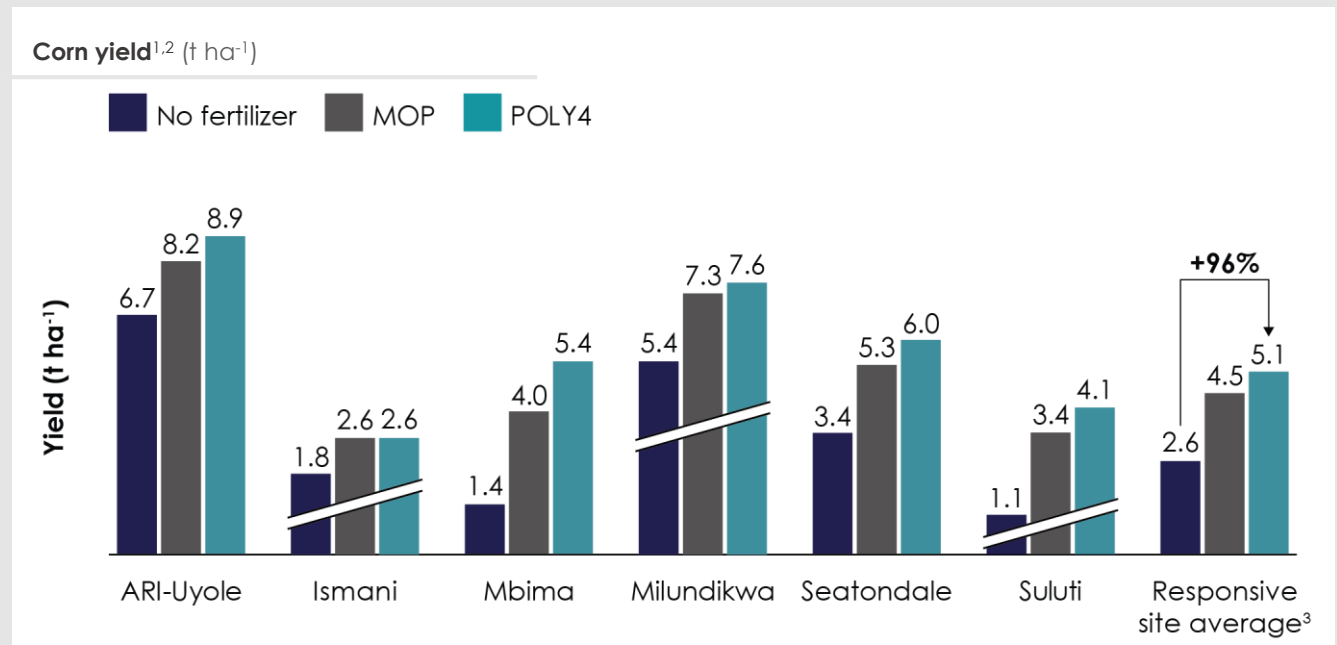
Notes: 1) GENSTAT statistical analysis; 2) Vigour from based on five trial results; 3) Statistical significant at p<0.1. Source: Agricultural Research Institute – Uyole (2015).

YIELD RESPONSE TO NPK FERTILIZER PLANS

Broad spectrum fertilization with POLY4 supports corn yield

Key comments

- Application of potassium-based fertilizers prevents nutrient mining in the long term and aids crop growth.
- Across all locations in the Southern Highland region, corn responded positively to a multi-nutrient fertilizer plan.
- On average, POLY4 recorded a 14% higher grain yield than MOP.



KEY TAKEAWAY: POLY4 consistently outperformed MOP as a straight potassium fertilizer

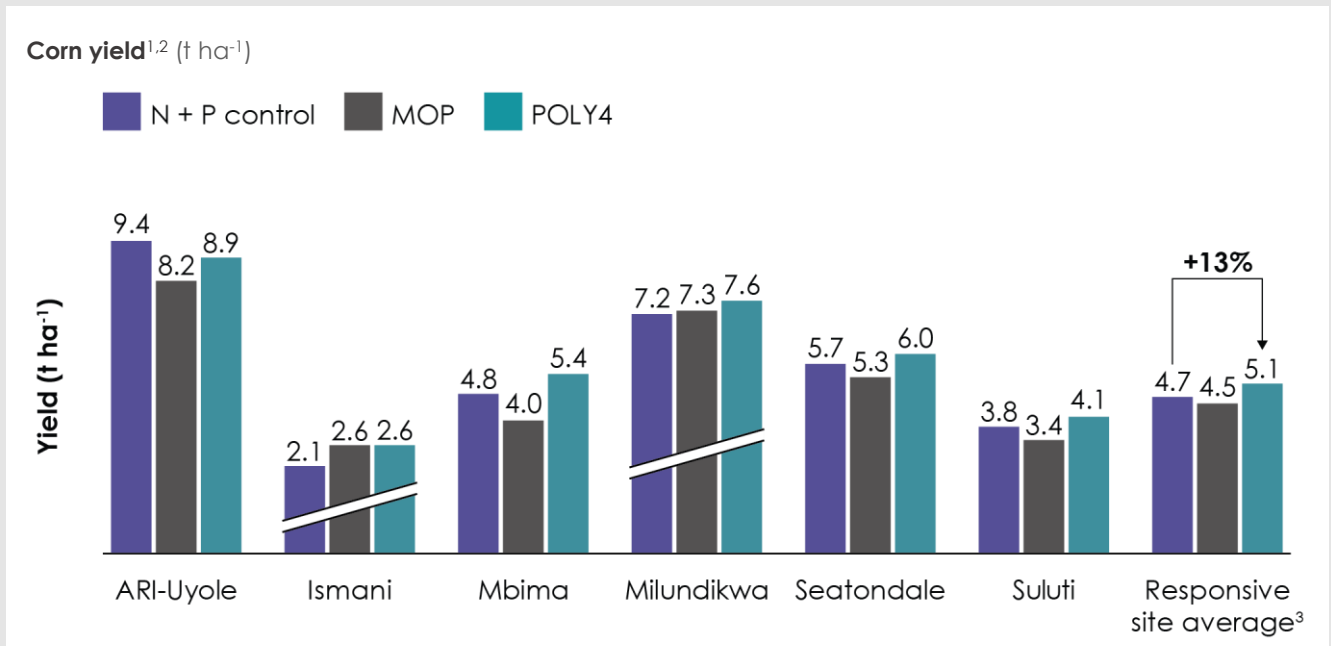
Notes: 1) GENSTAT means; 2) The recommended rate of 120 kg N ha⁻¹ and 30 kg P₂O₅ ha⁻¹ from Urea and DAP with 20 kg K₂O ha⁻¹ supplied from MOP or POLY4 to all plots except "No Fertilizer" plots. 3) ARI – Uyole excluded from average due to high initial soil K. Source: Agricultural Research Institute – Uyole (2015).

THE EFFECT OF POTASH COMPARED TO N+P

POLY4 improves yield compared to local practice

Key comments

- Nitrogen and phosphorus are recommended in Tanzania due to the high soil potassium content.
- Application of potassium fertilizer is valid in high proportion of the region.
- On average³, the POLY4 option improved yield by 9% compared to N+P and 13% compared to MOP.
- At 67% of sites, MOP resulted in lower yields than the N+P control.



KEY TAKEAWAY:

POLY4 consistently outperformed MOP as a straight potassium fertilizer

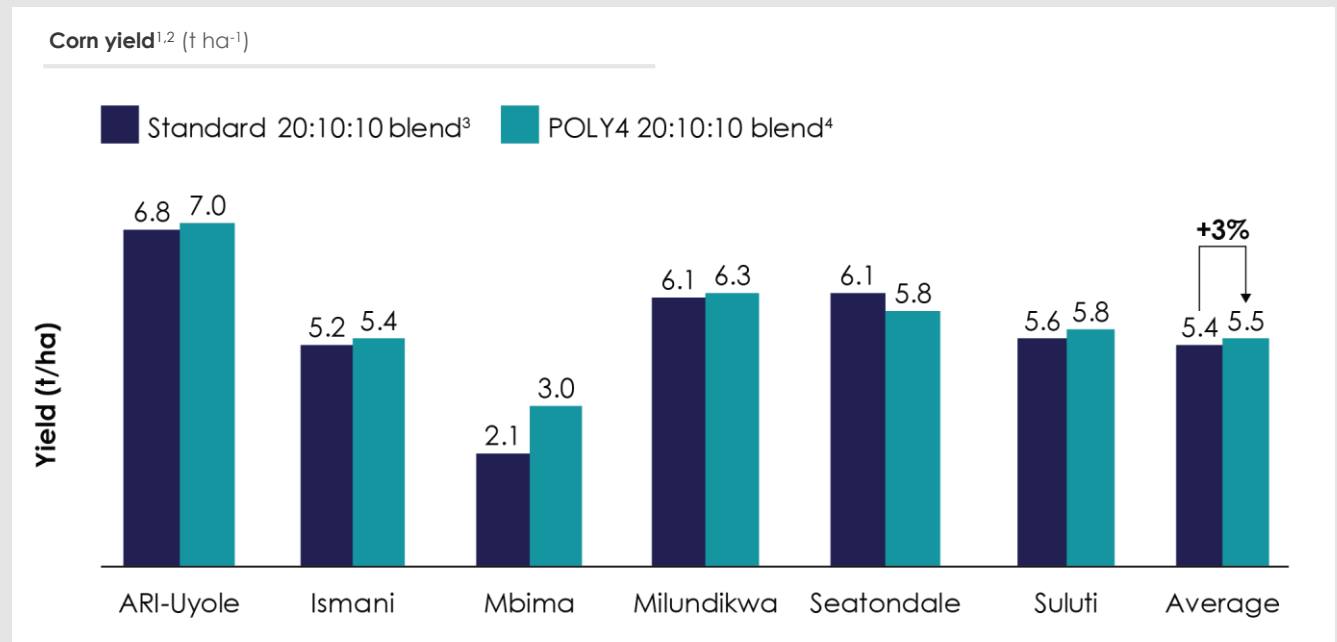
Notes: 1) GENSTAT means; 2) All plots were supplied with the recommended rate of 120 kg N ha⁻¹ and 30 kg P₂O₅ ha⁻¹ from Urea and DAP with 20 kg K₂O ha⁻¹ supplied from MOP or POLY4; 3) ARI – Uyole excluded from average due to high initial soil K.
Source: Agricultural Research Institute – Uyole (2015).

YIELD RESULTS USING 20:10:10 BLENDS

83% of sites showed improved yield with POLY4 20:10:10 blends

Key comments

- 20:10:10 blends can be an efficient way to meet nitrogen recommendations without excess phosphorus and potassium application.
- The POLY4 blend showed a higher yield than the standard blend at five out of six locations.
- On average, the POLY4 blend resulted in a 3% increase in corn yield compared to the standard blend.



KEY TAKEAWAY: POLY4 20:10:10 blends can improve yield

Notes: 1) GENSTAT means; 2) Blends were applied at 120 kg N ha⁻¹, 60 kg P₂O₅ ha⁻¹ and 60 kg K₂O ha⁻¹; 3) Standard 20:10:10 blend made with Urea, DAP and MOP; 4) POLY4 20:10:10 blend made with Urea, DAP, MOP and POLY4.
Source: Agricultural Research Institute – Uyole (2015).

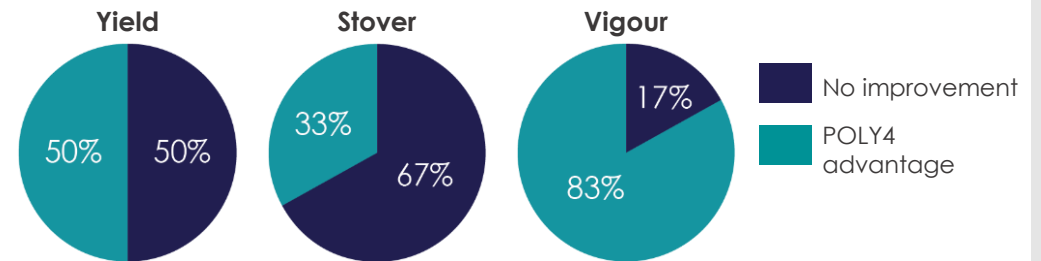
17:17:17 BLEND PERFORMANCE

17:17:17 blend proves inappropriate for Tanzanian corn production

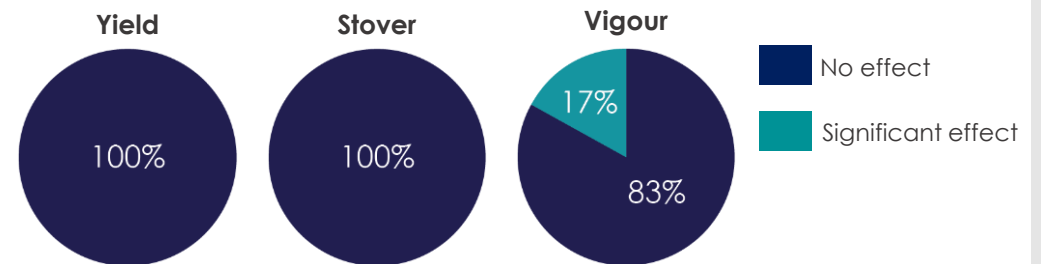
Key comments

- At the recommended nitrogen rate of 120 kg N/ha, 17:17:17 blends supply equal rates of phosphorus and potassium².
- Oversupply of nutrients to crops incurs financial costs for no real gains compared to appropriate fertilizer application.
- Construction of standard and POLY4 17:17:17 blends results in high chloride application compared to the 20:10:10 option.
- Standard and POLY4 blends were evaluated at this rate for grain and stover yields and crop vigour.
- The POLY4 NPK blend statistically improved vigour rating over the commercial standard.

Numerical difference of POLY4 blend over standard blend¹⁻⁴



Statistical difference of POLY4 blend over standard blend¹⁻⁵



KEY TAKEAWAY:

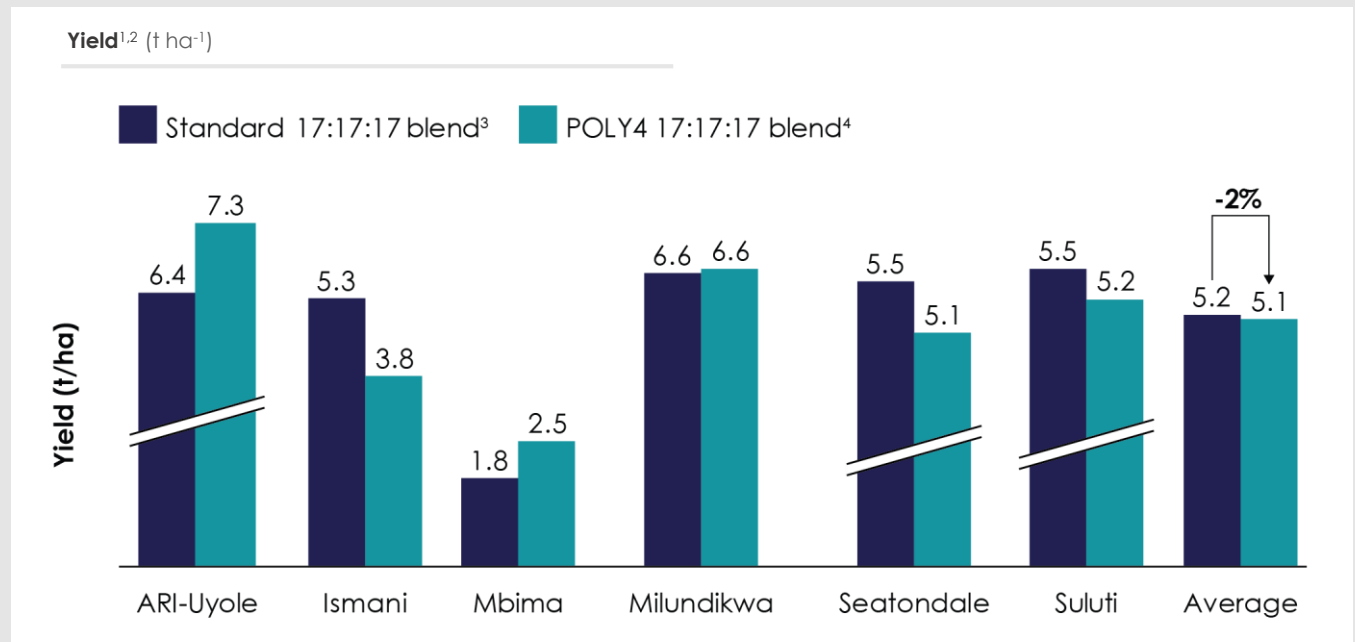
Under high K and Cl loading both blends perform similarly

YIELD RESULTS USING 17:17:17 BLENDS

POLY4 can deliver yield improvements in blends

Key comments

- POLY4 17:17:17 blends supply additional magnesium, sulphur and calcium that is not contained within the standard 17:17:17 blend.
- 50% of trials showed POLY4 17:17:17 offered yield improvements.
- On average the yields were similar for both POLY4 and standard 20:10:10 blends.



KEY TAKEAWAY:

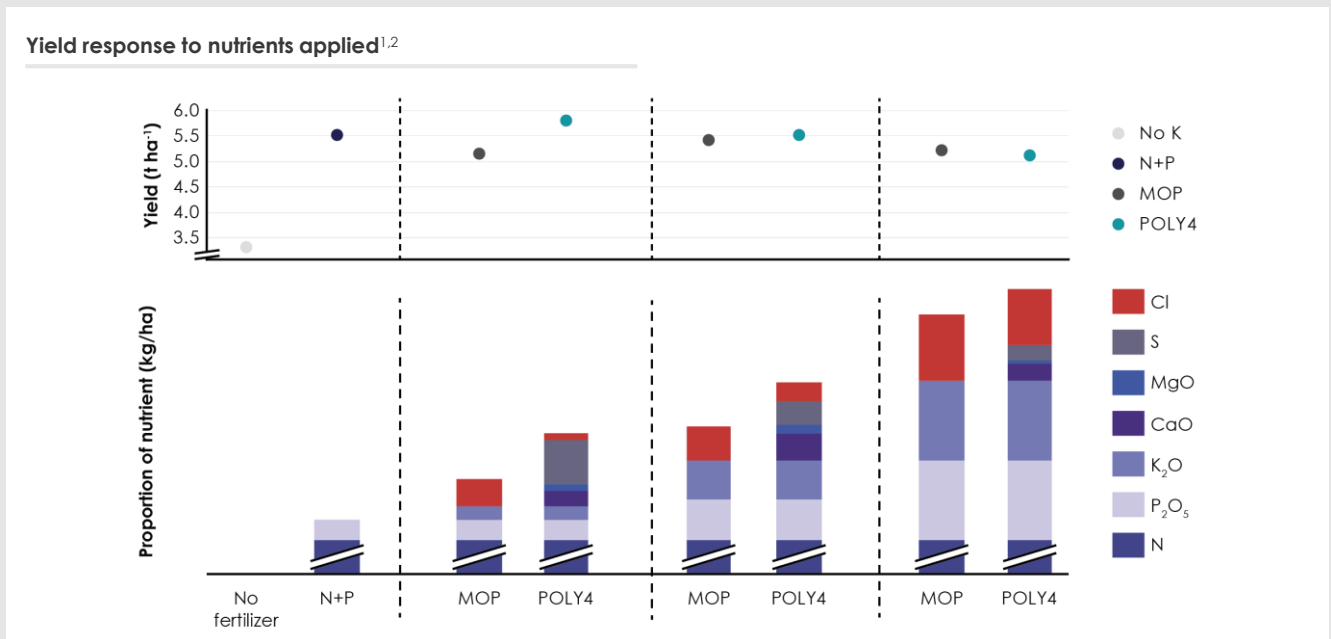
Standard and POLY4 17:17:17 blends showed similar yields at recommended N rates

CORN FERTILIZER APPLICATION

POLY4 delivers improved yield at low application rates

Summary comments

- Potassium is not currently recommended in the Southern Highland region of Tanzania for corn.
- Soil nutrient mining is not sustainable.
- Without fertilizer, nutrient depletion threatens food security and widens the yield gap.
- 20:10:10 and 17:17:17 blends prove unsuitable in these regions due to increasing chloride content that hinders crop performance.
- POLY4 offers a route to replace potassium and elevate yield through straight application.



KEY TAKEAWAY: POLY4 improves yields above current recommendations of N and P