POLY4
A SIRIUS MINERALS PRODUCT

TRIAL RESULTS

SUGARCANE

UNIVERSITY OF SÃO PAULO, BRAZIL (2014)

poly4.com

TRIAL OBJECTIVE

To evaluate fertilizer practices by comparing the use of gypsum against POLY4 in conjunction with a liquid feed.

HIGHLIGHTS

9% INCREASE IN YIELD THROUGH BALANCED FERTILIZATION

INCREASE IN ECONOMIC RETURNS FOR THE FARMER

MAINTAINED QUALITY PARAMETERS

IMPROVEMENTS IN SOIL NUTRIENT RETENTION AT DEPTH

INCREASE IN NUTRIENT DELIVERY AT LOWER APPLICATION RATES

TRIAL DESIGN

PARTNER: UNIVERSITY OF SÃO PAULO

LOCATION: SÃO PAULO, BRAZIL

YEAR: 2014

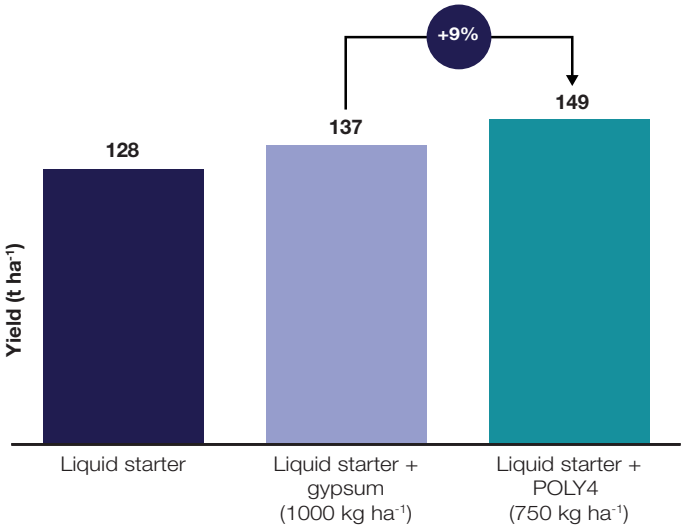
- Sugarcane is an important crop for Brazil, with over 10 million hectares cultivated in 2014[1].
- Renewable energy from sugarcane production accounts for 16% of Brazil's electricity need through biomass burning[2].
- Sugarcane is a perennial crop that produces economic yields for up to seven years.
- Field site trials were established on a low nutrient status soil.
- At the mounting stage (approximately 90 days after planting) gypsum was applied at 1000 kg ha^{-1} and POLY4 at 750 kg ha^{-1}.
- All plots recieved a liquid NPK 6:15:15 as per standard practice for growing sugarcane.

TREATMENT TABLE

FERTILIZER PLAN	NUTRIENT APPLIED (kg ha^{-1})					
	N	P_2O_5	K_2O	CaO	MgO	S
Liquid starter	60	150	150	0	0	0
Liquid starter +gypsum	60	150	150	280	0	240
Liquid starter +POLY4	60	150	255	127	45	143

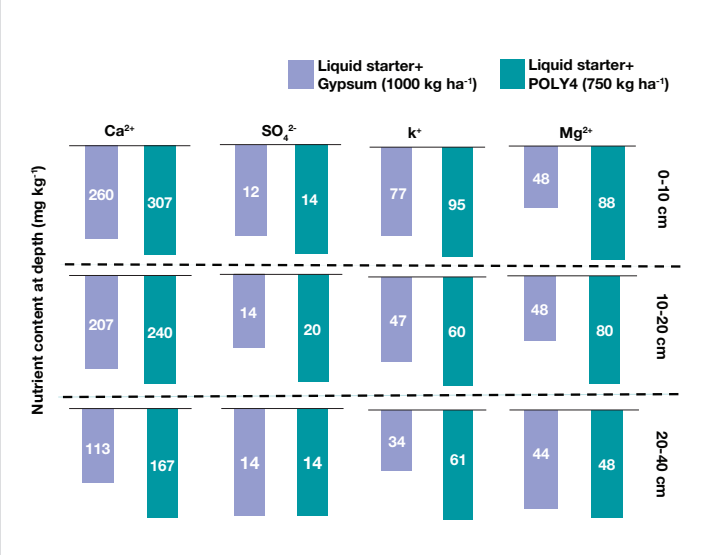
YIELD RESULT (t ha^{-1})[3-6]

- Sugarcane yield, sugar content and quality are essential to determining crop value.
- Gypsum application is commonly used in Brazil to improve soil conditions and supply plant nutrients.
- Like gypsum, POLY4 contains calcium and sulphur but also supplies potassium and magnesium in support of crop production.
- POLY4's multi-nutrient supply delivered a 9% yield increase over gypsum, even at lower sulphur and calcium rates



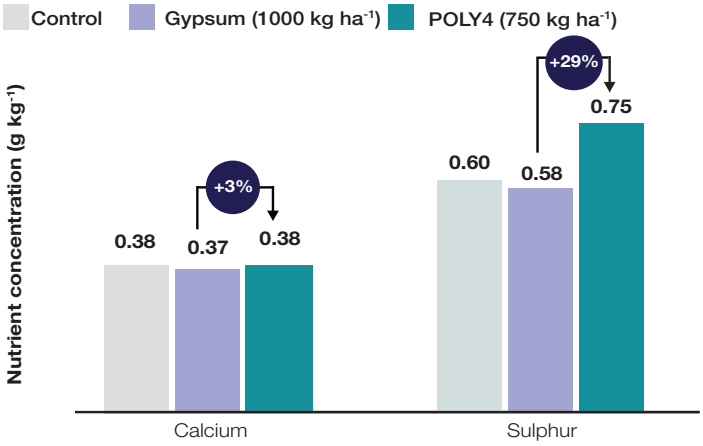
POST-HARVEST NUTRIENT LEGACY (mg kg^{-1})[3-6]

- The POLY4 plan resulted in an average of 23% more calcium and 24% more sulphur than the gypsum plan in the 0–40 cm soil profile, post cropping.
- Applying beneficial calcium ions removes detrimental aluminium and hydrogen ions. Mean post trial levels of aluminium and hydrogen ions were 19 mmol$_c$ dm^{-3} with gypsum compared to 18.2 mmol$_c$ dm^{-3} with POLY4.
- The benefits of replacing gypsum as the calcium source with POLY4 is also additional potassium and magnesium supply.
- In this trial, the additional potassium and magnesium from POLY4 made a contribution to all of the soil horizons.
- The POLY4 plan resulted in an average of 37% more potassium and significantly, 54% more magnesium than the gypsum plan in the 0–40 cm soil profile, post cropping.



CANE TOTAL NUTRIENT CONCENTRATION (g kg^{-1})[3-6]

- Calcium and sulphur uptake were 3% and 29% higher with POLY4 respectively compared to gypsum.
- Calcium is important for cell division and stabilising and strengthening cell walls.
- Sulphur plays a vital role in plant metabolism and is required for photosynthesis.
- POLY4 also delivers additional micro-nutrients that are beneficial to sugarcane growth.



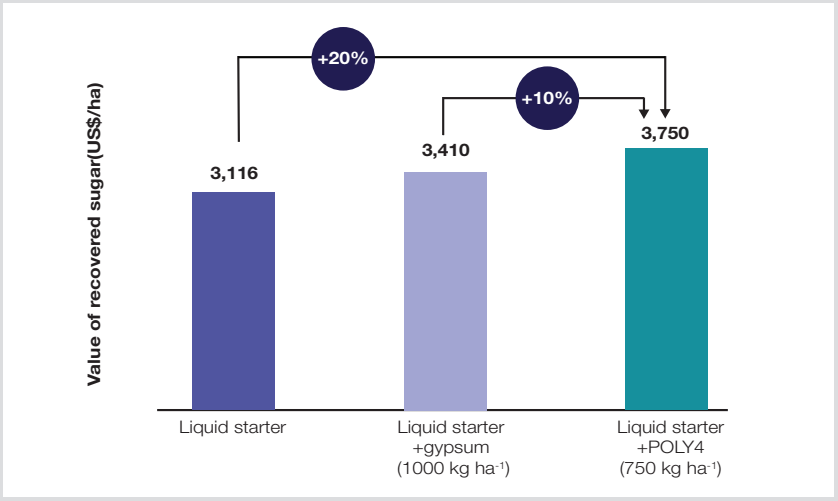
QUALITY SUMMARY [3-6]

- Application of fertilizer showed no adverse effects on quality when compared to the control.
- Switching to POLY4 showed inprovements over gypsum due to balanced fertilization

PARAMETER	CONTROL AND S-BASED FERTILIZER		
	Control	Liquid starter+ Gypsum (1000kg ha^{-1})	Liquid starter+ POLY4 (750kg ha^{-1})
Brix (%)	18	18	18
Sugar recovery (kg t^{-1} of cane)	127	128	130
Purity (%)	85	85	86

ECONOMIC SUMMARY (US$ ha^{-1})[1–8]

- Local standard practice is to apply 1 t ha^{-1} of gypsum after the liquid starter, generating an additional 10% revenue over the starter alone.
- The POLY4 option utilises 750 kg of product, generating a 20% increase in revenue over the liquid starter.
- The addition of magnesium and potassium from POLY4 differentiates it from the gypsum option.
- The POLY4 option generates an additional US$340 per hectare by applying a more appropriate balance of nutrients compared to the gypsum option.
- Further benefits of the POLY4 option include less material to store on-farm, guarentee sugar content plus variable soil amendments.



Notes: 1) FAO 2017; 2) Nunes et al (2016); 3) GENSTAT means; 4) Liquid NPK 6:15:15 was applied to all treatments with fertilizer added during mounting except control; 5) Gypsum plots received 60 kg N ha^{-1}, 150 kg P_2O_5 ha^{-1}, 150 kg K_2O ha^{-1}, 280 kg CaO ha^{-1}, 240 kg S ha^{-1}; 6) POLY4 plots received 60 kg N ha^{-1}, 150 kg P_2O_5 ha^{-1}, 255 kg K_2O ha^{-1}, 127 kg CaO ha^{-1}, 45 kg MgO ha$^{-1,}$ 143 kg S ha^{-1}; 7) Price of sugar is US$194.19/t. Initial soil analysis (0-10cm): pH 4.3; P 4 mg kg^{-1}; K 59 mg kg^{-1}; Ca 140 mg kg^{-1}; Mg 60 mg kg^{-1}; CEC 38 meq 100g^{-1}.

Sources: University of São Paulo (2014), USDA Foreign Agricultural Service. 4000-USP-4013-14

siriusminerals.com | +44 1723 470 010 | commercial@siriusminerals.com

Registered Address: 3rd Floor Greener House, 66–68 Haymarket, London SW1Y 4RF, UK

Company Registered Number: 4948435

SIRIUS MINERALS PLC