



# POLY4

A SIRIUS MINERALS PRODUCT

## BALANCED FERTILIZATION WITH POLY4



[poly4.com](http://poly4.com)

Sustaining the future.

**SIRIUS**  
MINERALS PLC



# BEYOND THE NUTRIENT VALUE

Adopting POLY4 into the fertilizer plans provides farmers with an innovative approach for best fertilizer management practices.

Naturally occurring POLY4 delivers a package of plant-available nutrients in one product, which are the right source and can be applied at the right rate. It performs well as a straight fertilizer, where a base or starter material is needed, or as part of an NPK blend.

Although yield is the key criteria for farmers to support greater economic returns, a fertilizer choice is also important as it improves the quality of crops and provides the right mix of nutrients to ensure the plants are strong and less susceptible to disease. POLY4 has been proven to improve the yield and quality of a wide spectrum of broad-acre and high-value crops.



# SECONDARY FERTILIZER NUTRIENTS

Deficiency of sulphur and magnesium, as essential secondary plant nutrients, is growing across the world. Sulphur is widely deficient – according to The Sulphur Institute, the ten million tonnes applied per annum meet less than half of the identified need for sulphur. Magnesium deliveries in comparison are much lower. However, these are growing at a fast rate – around 1.6% each year. A driver of the magnesium deficiency growth is the process of soil acidification. 30-40% of arable soils in the world are currently acidic.

## GLOBAL DELIVERIES OF PRIMARY AND SECONDARY NUTRIENTS IN MILLION TONNES PER ANNUM



### Deliveries of primary nutrients



### Deliveries of secondary nutrients



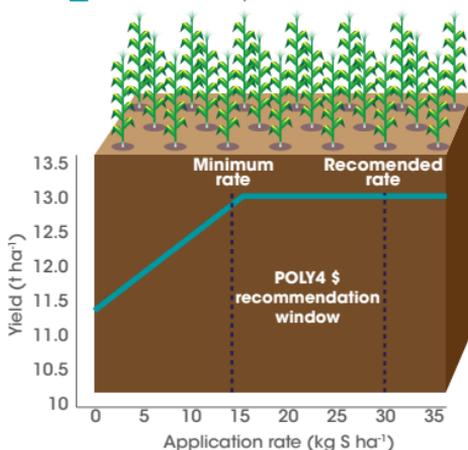
# SUSTAINABILITY SUPPORTED BY SULPHUR

In sulphur-deficient soils, even a relatively modest sulphur application is both an immediate and extremely cost-effective way to produce more food, feed and fibre, with gains typically realized within one growing season. University research in India has documented average economic returns for rice farmers at levels of US\$37 for every US\$1 invested in sulphur fertilizer at only 15 kg S/ha a rate (Ming Xian FAN, The Sulphur Institute, IFA Crossroads Asia Pacific 2007).

POLY4 is an effective source of sulphur. During our corn trial, yields across two sites were increased by 5% and 15% when compared to MOP. At both sites the soil sulphur levels were very low indicating the need for a broad-spectrum fertilization strategy. POLY4's inclusion offers flexibility in S application without yield compromises. In this trial the results illustrate a sulphur recommendation window: whether the farmer applies the minimum crop offtake or applies the recommended rate, their yield is supported by POLY4.

## STAPLES CORN SULPHUR RESPONSE

■ MOP+POLY4 corn yield



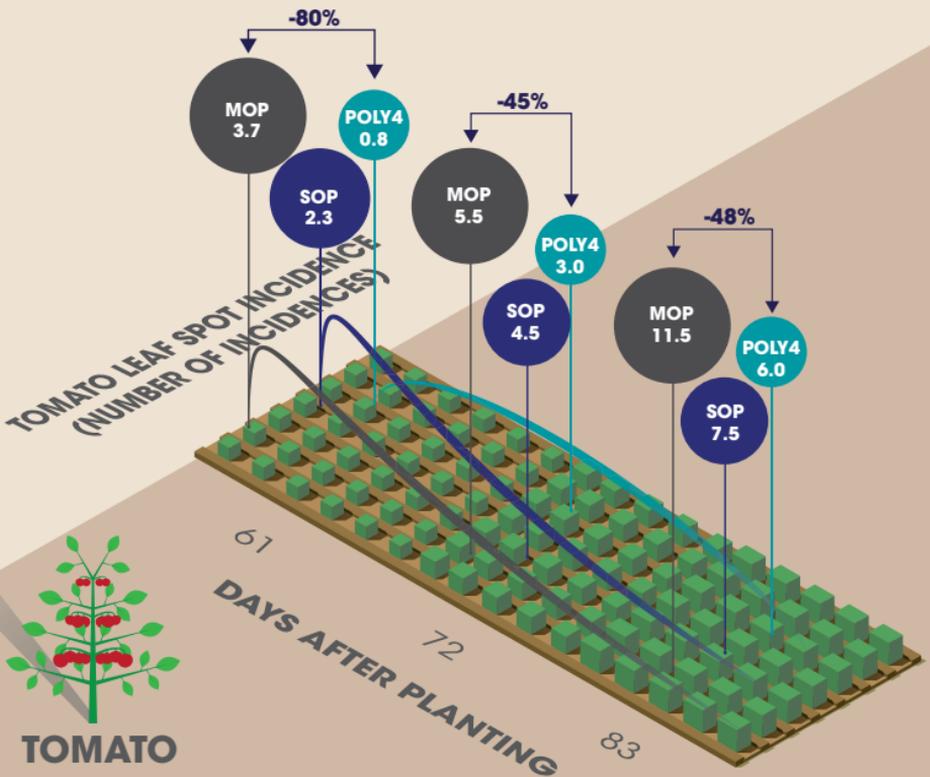
## POLY4 OPTIONS WITH RECOMMENDATIONS (kg ha<sup>-1</sup>)

Nutrient	Recommended rate <sup>4</sup>	At recommended rates of 28 kg S ha <sup>-1</sup> MOP+POLY4 option	Minimum S rate 14 kg S ha <sup>-1</sup> MOP+POLY4 option
N	200	224	224
P <sub>2</sub> O <sub>5</sub>	70	70	70
K <sub>2</sub> O	90	90	90
CaO	0	25	13
MgO	0	9	5
S	28	28	14

# PLANT HEALTH AND RESILIENCE TO DISEASE

Crop quality is a reflection of plant's health. Good nutritional health of a plant is essential in the battle against disease.

Tomato bacterial spot presents a challenge for six of the top ten producers in the world. The disease causes necrotic lesions on leaves and fruits. Affected fruit is classified as unmarketable and this results in yield losses. POLY4 demonstrates both a reduction in bacterial spot infection and spread.



# HIDDEN HUNGER

Increasing crop yields deplete soil micro nutrient levels and can limit the growth and development of subsequent crops. Whilst visual plant symptoms are very useful for identifying most nutrient deficiencies, plant growth and yields are often limited by a lack of nutrients before symptoms become evident. For a plant a healthy 'meal' is a complex cocktail of macro and micro nutrients.

Deficiencies in micro-nutrient uptake often contribute to disease vulnerability. POLY4 significantly improves uptake of a range of micro-nutrients as demonstrated in one of our European barley field trials in 2014 (Sirius Minerals, 8000-WCC-8010-14).

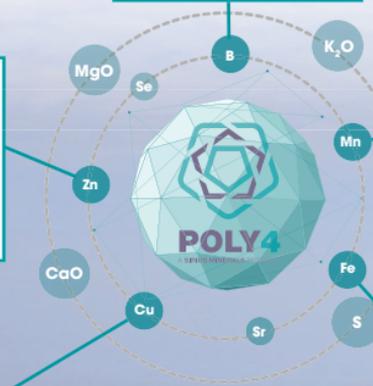
**BORON** functions in cell wall metabolics plus protein synthesis, sugar translocation and cell division.

**ZINC** is a component of enzymes involved in a photosynthesis, sugar and protein formation, DNA synthesis and gene regulation.

**MANGANESE** is essential for nitrate reduction and is involved in the regulation of photosynthetic enzymes.

**COPPER** is important for pollen tube production, cell wall structure and function as well as photosynthetic and respiratory pathways.

**IRON** is an essential co-factor in a range of cellular redox reactions. Primarily iron is important in energy transport metabolic pathways of the mitochondria and chloroplast.



# CROP QUALITY

## APPEARANCE

The size and colour of produce affect its ability to meet market requirements.

## PROCESSING

The ability for crops to be processed and produce satisfactory finished products e.g. sufficient protein for bread-making.

## NUTRITION

Crops form the basis of nutritional value for the human diet. A crop that has received a balanced amount of nutrients will improve the entire food chain.

## QUALITY

Mineral fertilizers play a crucial role not in just maximising crop yields but also in ensuring crop quality that is required and expected by the market. Any nutrient deficiency will limit the crop to grow to its full potential in turn affecting the yield and leading to reduced farmer returns.

A high value crop such as potatoes is a good example to demonstrate the importance of quality across the key indicators. Tuber quality, whether it is a dry matter content, starch content or cooking ability, is critical for the end user.

Correct and balanced nutrition of the crop prior to harvest will influence the storage and cooking quality of potato tubers. Potassium, magnesium and calcium all have a positive effect on potato storage and cooking quality, reducing tuber bruising and discolouration when frying.

DRY MATTER  
**+29%**

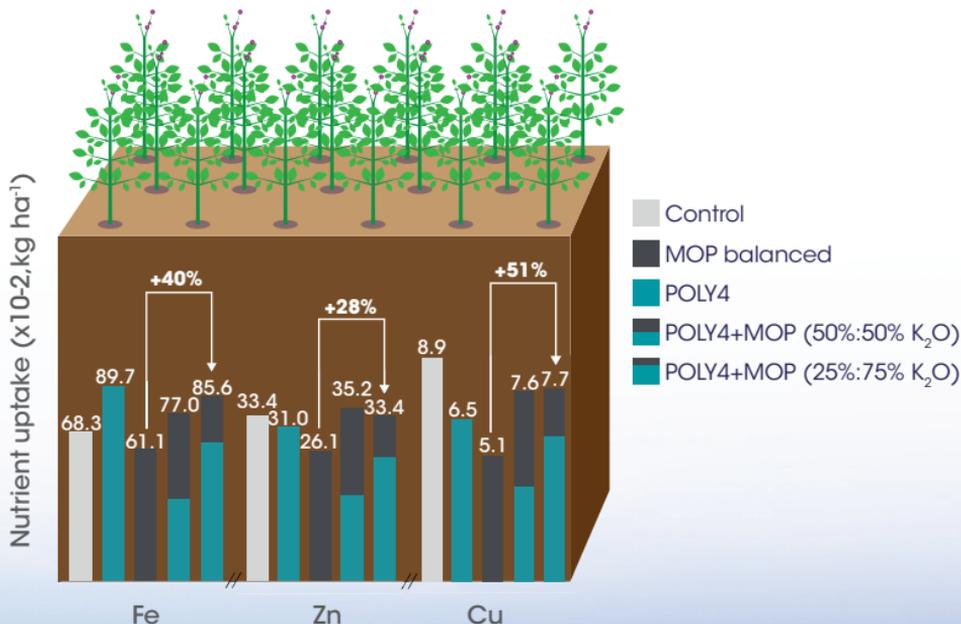
TUBER  
DRY MATTER  
**+9%**

BUD END  
GLUCOSE  
**+36%**

## POTATO QUALITY

# TUBER MICRO-NUTRIENT UPTAKE

(x 10<sup>-2</sup>, kg ha<sup>-1</sup>)



A lack of iron is the most common nutritional disorder in humans worldwide and is most prevalent in the developing world. Symptoms of iron deficiency include anemia, poor growth and labored breathing after mild exercise.

23%

Deficiency weakens the immune system. Due to the central role of zinc in cell division, protein synthesis and growth, zinc is particularly important for young children, adolescents and pregnant women.

49%

An antioxidant for humans, copper is essential for the immune and nervous system, skeletal health, for iron metabolism and for the formation of red blood cells. Deficiencies lead to anaemia.

14%

\*% of soil deficient in each nutrient (IFA)