POMERITE® - THE GLOBAL FOOD SUSTAINABILITY SOLUTION

SafeRock® - Dedicated to Global Food Security, Sustainability, and Environmental Conservation

Pomerite®

SafeRock®

A natural resource to enrich the earth

The Environmental Case

"Soil is vital for carbon sequestration – it is estimated that soil can sequester around 20 Pg C in 25 years, more than 10% of the anthropogenic emissions."

- Food and Agriculture Organization of the United Nations, World Soils Resources Reports 102

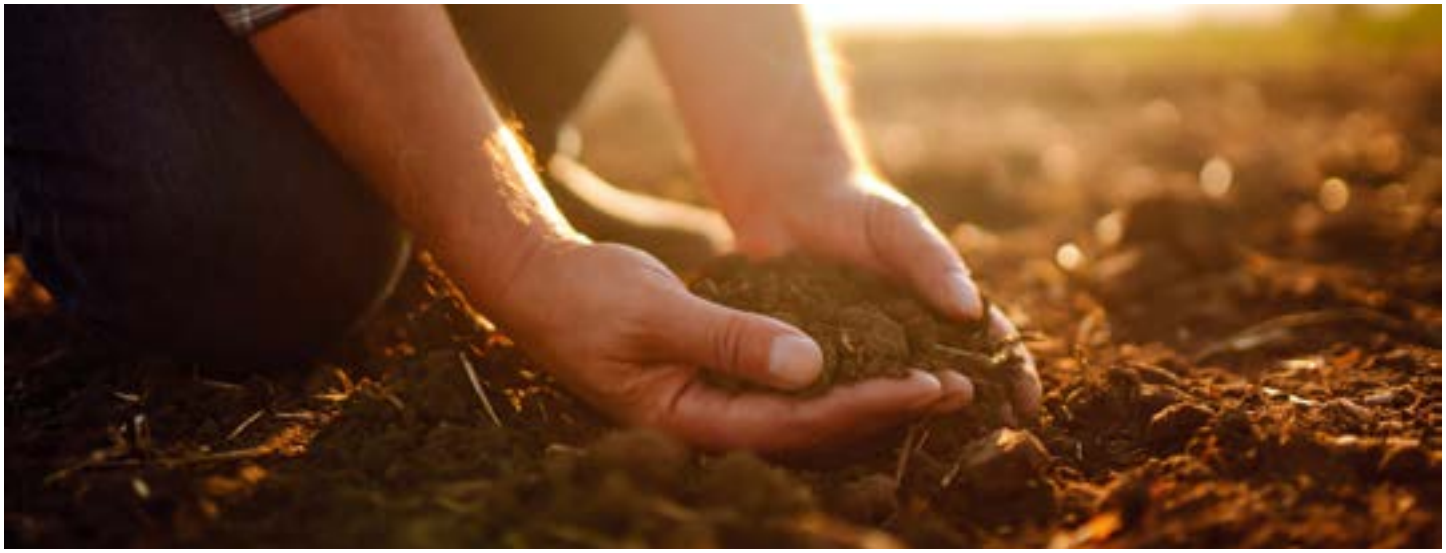
The **SafeRock®** product **Pomerite®**, is a natural inorganic soil enhancer that can play a pivotal role in sustainable agriculture. By incorporating **Pomerite®** into soil management practices, it has been demonstrated that the reliance on nitrogen (N) fertilizers can be reduced by approximately 25%. This reduction is not only economically advantageous but also environmentally sustainable, promoting healthier soil ecosystems and fostering robust plant growth while curtailing the dependence on chemical-based fertilizers.

A recent investigation conducted by GRAIN and disclosed during the COP 26 summit reveals the significant environmental footprint associated with synthetic N fertilizers, which are among the foremost contributors to global emissions. Key findings from the report include:-

- **Synthetic N fertilizer production and utilization are responsible for 2.4% of global emissions, positioning it as one of the primary climate-polluting industrial chemicals.**
- **The emissions attributable to the synthetic N fertilizer supply chain were estimated at 1,250 million tonnes of CO_2 equivalent (CO_2e) in 2018. For context, the global emissions stemming from commercial aviation in the same year amounted to approximately 900 million tonnes of CO_2.**
- **The bulk of emissions linked to synthetic N fertilizers occur post-application, when they are converted into nitrous oxide (N_2O) in the soil and released into the atmosphere. Nitrous oxide is a potent greenhouse gas, with a global warming potential 265 times greater than CO_2.**

A Pathway Towards a Sustainable World

The strategic adoption of **Pomerite®** within agricultural practices offers a pathway towards achieving sustainable food production. By aligning farming methods with the principles of environmental stewardship, it becomes possible to confront and surmount the dual challenges of food security and ecological preservation. Hence, **Pomerite®** stands at the forefront of efforts to transition towards agricultural systems that are not only productive but also harmonious with the natural world.



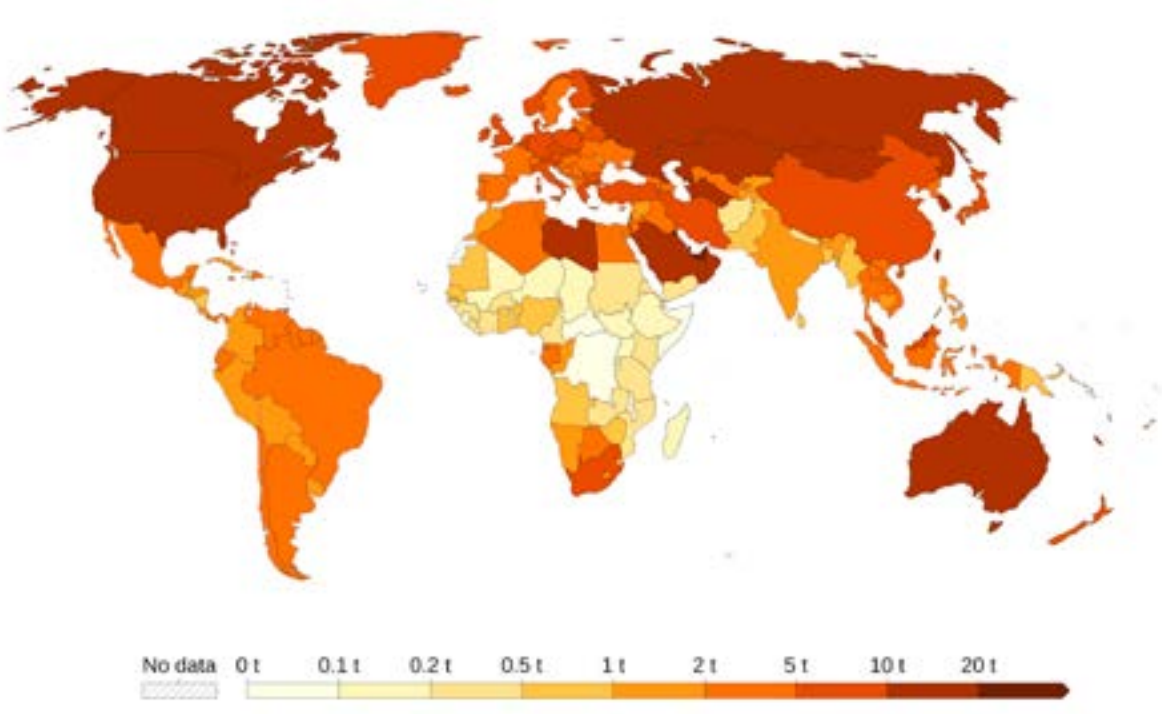
Nitrous Oxide (N_2O) Basics - According to Global Carbon Project

- N_2O is both a powerful greenhouse gas (GHG) and an ozone-depleting substance.
- Per unit of mass, N_2O is considered 298 times as effective as a greenhouse gas as CO_2 when integrating over 100-years.
- Once emitted, N_2O stays in the atmosphere for longer than a human life, about 116 ±9 years.
- N_2O is the third most important GHG contributing to human-induced global warming, after carbon dioxide (CO_2) and methane (CH_4).
- N_2O is responsible for 6.5% of the global warming due to three most important GHGs (CO_2, CH_4 and N_2O). [Updated to 2019 from Etminan et al. 2016, GRL]
- N_2O concentration in the atmosphere reached 331 parts per billion (ppb) in 2018 (WMO 2020, United in Science), about 22% above levels around the year 1750, before the industrial era began.

Synthetic N Fertilizer Carbon Footprint per Capita (tCO_2e/capita)

Nature, Aug 2022, Scientific Reports 12(1):14490

The adoption of **Pomerite®** on a global scale harbours the potential to significantly mitigate these environmental impacts. Specifically, the widespread use of **Pomerite®** could lead to a reduction in annual emissions by up to 313 million tonnes of CO_2e. Furthermore, as an essential component of organic fertilization strategies, **Pomerite®** presents an opportunity to substantially decrease the annual emissions associated with synthetic N fertilizers, currently estimated at 1,250 million tonnes of CO_2e. This underscores the critical role of innovative soil enhancers like **Pomerite®** in achieving sustainable agricultural practices and reducing the environmental footprint of food production.



The Environmental Impact of Chemical Fertilizers

The environmental impact of nitrous oxide (N_2O) emissions, particularly from the agricultural sector, has become a focal point of global concern regarding climate change. Nitrous oxide, a potent greenhouse gas, is responsible for 6.5% of global warming, highlighting the critical need for targeted interventions to mitigate its release. The use of chemical fertilizers, which constitutes 2.4% of global emissions, plays a significant role in the anthropogenic contributions to N_2O emissions. The insights into this issue are as follows:

- **Global Warming Contribution: Nitrous oxide is a significant contributor to global warming, accounting for 6.5% of its effect. This underscores the urgency of addressing N_2O emissions within climate change mitigation strategies.**
- **Chemical Fertilizers' Role: Chemical fertilizers are identified as a major source of global anthropogenic N_2O emissions, representing 2.4% of global emissions. Their widespread use in agriculture intensifies the challenge of reducing greenhouse gas emissions.**
- **Rising Nitrous Oxide Emissions: The increased application of nitrogen-based fertilizers is a key driver behind the surge in global N_2O emissions. This trend poses considerable obstacles to global efforts aimed at curtailing climate change.**
- **Accelerating Atmospheric Concentration: The concentration of N_2O in the atmosphere is not only increasing but doing so at a rate that exceeds many projections. Given its potency—265 times more powerful than CO_2 at trapping heat over a century—this acceleration is alarming.**
- **Long-term Climate Impact: As a climate pollutant, N_2O has a lengthy atmospheric lifetime, remaining for decades and trapping heat far more efficiently than CO_2. This characteristic amplifies its impact on global warming.**
- **Health and Environmental Risks: The leaching of nitrate chemical fertilizers into water tables presents serious risks to human health, including thyroid disease, colorectal cancer, and renal failure. Additionally, this leaching contributes to the pollution of water systems, exacerbating environmental degradation.**
- **Regulatory Response: In response to these significant environmental and health challenges, the European Union has introduced directives mandating an increased use of organic fertilizers. This legislative move aims to mitigate the negative environmental impacts associated with traditional fertilizers, particularly the pollution of water systems through run-off and leaching.**

These points illustrate the complex challenges posed by the use of chemical fertilizers and the associated emissions of nitrous oxide. Addressing these challenges requires concerted efforts to promote the adoption of sustainable agricultural practices, including the increased use of organic fertilizers, to reduce the environmental footprint of food production and the protection of human health.

Case for Pomerite® in the Agricultural Industry

The **SafeRock®** micronized **Pomerite®** product, when applied at a rate of around 50 kg per hectare, offers a transformative approach to agricultural practices, particularly in the context of European dairy farming. This innovative solution not only addresses the pressing environmental concerns associated with conventional farming methods but also delivers tangible economic benefits to farmers. The key advantages of incorporating **Pomerite®** into farming practices are outlined as follows:

- **It significantly reduces the dependency on chemical fertilizers, with an average reduction of 25% and potential reductions reaching up to 50%.**
- **Crop yields are enhanced by around 25%, marking a substantial improvement in agricultural productivity.**
- **Additional benefits include the cultivation of healthier, more disease-resistant crops, which in turn leads to export-quality produce, reduced atmospheric pollution and environmental runoff, and increased soil biological activity promoting long-term soil fertility and health.**

Considering the typical usage patterns of a dairy farmer in Europe, who might apply 125 kg of chemical fertilizer per hectare two to three times annually, the environmental and economic implications become evident:

- **The carbon footprint associated with nitrogen (N) fertilizer usage is approximately 5.6 kg CO_2e per kg of applied nitrogen, translating to a carbon footprint of 1.34 kg CO_2 per kg for NPK 24-1-1 fertilizers.**
- **Consequently, the carbon footprint from fertilizer usage by a typical dairy farmer ranges between 335 kg and 503 kg CO_2e per hectare each year.**

The adoption of the SafeRock® product Pomerite® brings forth significant environmental and economic benefits:-

- **A reduction in carbon footprint by 84 kg to 126 kg CO_2e per hectare is achieved.**
- **The cost for the SafeRock® product Pomerite® is set at £75 per hectare, based on the current market price of £1,500 per tonne.**
- **Financial savings on fertilizers range between £250 and £375 per hectare.**
- **Approximately 25% improvement in grass quality and yield is observed, alongside all other significant benefits.**

It is noteworthy that grass, being a relatively simple crop, may allow **Pomerite®** to demonstrate even greater benefits in more intensive crop production, potentially realizing even greater savings, both environmentally and economically. Moreover, the increasing regulatory focus on sustainable farming practices, exemplified by the European Union Directive advocating for the enhanced use of organic fertilizers, underscores the potential for products like **Pomerite®** to become a legal mandate in the agricultural sector. This directive aims to mitigate the adverse environmental impacts of traditional fertilizers, such as water system pollution through runoff and leaching, further emphasizing the critical role of organic soil enhancers in modern agriculture. Visit - New EU rules prepare the ground for more use of organic and waste-based fertilizers - European Commission (europa.eu). > CLICK HERE

Independent Trials over a Decade of R&D

India

The comprehensive trials conducted by the Indian Agricultural Research Institute (IARI), an institution under the Indian Council of Agricultural Research (ICAR), on staple crops such as wheat, rice, and maize during the 2015/16 period, provided compelling evidence in favor of adopting innovative agricultural practices. The key outcomes of these trials included:-

- **Wheat: The application of advanced agricultural techniques resulted in a remarkable yield increase of 28%.**
- **Rice: Yield enhancements of 20.3% average were observed across 20 trial sites, underscoring the effectiveness and versatility of Pomerite®.**
- **Maize: An impressive yield boost of 53.4% demonstrates the significant potential for agricultural productivity improvements with N fertilizer programmes.**

Furthermore, these and subsequent trials, highlighted several additional benefits pivotal for the long-term sustainability of agricultural practices:-

- **Soil Quality: In 2016-17, Pomerite® was extensively trialled within an agronomic and microbiological study in the rice-wheat cropping system by the Division of Microbiology, Indian Agricultural Research Institute (IARI), New Delhi, India. In every single case within the rice and wheat trials, increasing the applied dose of Pomerite® led to significant increases in soil microbiological content and activity, as well as producing impressive increases in soil nutrient availability, nutrient uptake, and increased yields.**
- **Produce Nutrient Density: The quality and nutritional value of produce saw significant improvements. Specifically, the wheat trial revealed:**

  An increase in calcium content by 29%, enriching the nutritional profile of the wheat grain.

  Magnesium levels were boosted by 63%, further enhancing the health benefits of the crop.

  There were also increases in numerous trace minerals, contributing to the overall nutritional value of the wheat produced.
- **Cost Savings: A notable reduction in the need for chemical fertilizer inputs was recorded, leading to substantial cost savings for farmers. This reduction not only lowers the financial burden on the agricultural sector but also contributes to environmental sustainability by decreasing the reliance on chemical fertilizers.**

These findings from the Indian Ministry of Agriculture underscore the transformative potential of adopting advanced agricultural practices. The significant increases in yield, alongside improvements in soil quality, nutritional value, and cost savings, present a compelling case for the broader application of these methods across India's agricultural landscape.

Vietnam

The Centre of Research & Development of Dragon Fruit, Ministry of Agriculture & Rural Development of Binh Thuan, Government of Vietnam, ran trials on dragon fruit between 2018-19. Binh Thuan province has more than 29,000 ha of dragon fruit, one of the most competitive agricultural crops in the region that has significantly contributed to the transformation of farmers lives and profitability.

In response to a single application of Pomerite®, results included:-

- **An average increase in yield of 46% across two harvests**
- **Brix values increased from 15.00% (control) to 16.67% in the 1st harvest, and from 13.61% (control) to 15.50% in the 2nd harvest**
- **Average fruit weight increased from 0.61kg (control) to 0.72kg in the 1st harvest, and from 0.6kg (control) to 0.71kg in the 2nd harvest**
- **Export crop quality achieved – improvements in skin colour, thickness of peel, flesh firmness, fruit size & weight, and sweetness (Brix) led to export grade produce (10x more profitable than the domestic market)**

Indonesia

In February 2020, SafeRock Ltd partnered with CROWDE, an agriculture-focused financial & technology company with a proven track record of supporting local communities throughout Indonesia. In the Sukabumi area, West Java, CROWDE has focussed on developing Chilli Pepper production (Capsicum annuum L.) – an important local cash crop – and has around 100 local farmers and 100 hectares under Chilli cultivation.

Chilli Crop

A single application of **Pomerite®** resulted in:-

- **Average chilli plant height with Pomerite® was 112.2cm vs 65.6cm without Pomerite® (+71% height)**
- **Average number of chilli fruit per plant with Pomerite® was 82.3 vs 64.1 without Pomerite® (+28% yield)**
- **Chilli crops with Pomerite® are more stable, healthier, have good growth and are much more resistant to pests and fungus. The plots without Pomerite® suffered fungus damage (Phytophthora capsici) and lost 90% of the crop and needed replanting. Pomerite® plots were not affected.**

Rice Crop

Paddy rice is one of the world's most important staple food products, and although Indonesia is the third largest country in terms of global rice production (FAOSTAT:2019), it still has to import rice almost every year due to high domestic consumption. It is a fundamental crop when looking at national food security strategy.

Rice production in Indonesia is dominated by smallholder farmers, which account for around 90% of Indonesia's rice production. This made CROWDE a perfect partner for a paddy rice field trial. Using **Pomerite®** they found:-

- **The Pomerite® plot produced rice granules 15 days earlier than the control plot, and was ready for harvest early, demonstrating faster crop growth and development.**
- **Achieved a staggering 60% increase in yield! Based on land production history, the farmers land was only ever capable of producing a maximum of 250kg rice grain in 500m². The trial plot with Pomerite® produced 400kg rice grain vs control of 250kg – the highest yield ever achieved upon the farmers land – 60% higher than without Pomerite®**

Turkey

Cotton Crop

Cotton is an enormously important commodity throughout the world. It provides livelihoods for up to 1 billion people, including 100 million smallholder farmers who cultivate cotton. Turkey is the seventh-largest cotton producer globally, and most of domestic production is used to support the significant textile industry within Turkey. Indeed, Turkey is the 4th largest cotton importer globally.

In May 2019, a field trial was undertaken by Aydin Adnan Menderes University - situated within one of the main cotton growing regions of Turkey - to evaluate the effectiveness of Pomerite® upon cotton production.

Results included:-

- **At harvest: plant height within the Pomerite® plot was 20.2% taller than control, and had 40.6% more cotton bolls than control.**
- **The measured seed yield from the Pomerite® plot also produced 15.7% more cotton seed than control.**
- **Higher quality cotton crop – ginning efficiency of control crop was 39% (basic uses), whereas Pomerite® crop was 42% (quality textile use) achieving a 100% increase in sales revenue upon quality improvements alone!v**
- **The trial staff commented upon how easy it was to harvest the Pomerite® cotton bolls. The normal crop was harder to separate from their leaves and took twice as long to harvest.**

Strawberry Crop

Strawberry production within Turkey has undergone massive growth within the last 20 years - almost tripling national production and becoming the fourth largest producer of strawberries worldwide (FAOSTAT, 2019).

The strawberry trial applied **Pomerite®** at different dosages via fertigation lines to gauge response. They found:-

- **Even at 10 days after seedling planting ALL Pomerite® plots showed faster growth & development – more & larger lush green leaves, & more flowering**
- **At 56 days, an early harvest of 50kg premium-grade strawberries was obtained from the Pomerite® plots. The control plot had produced no harvestable crop yet!**
- **Highest yield increase of 37% over control was obtained in the 40 kg/ha Pomerite® plot. All Pomerite® treated plots outperformed control (+33% +25% +16%)**
- **Export crop quality achieved – early harvest achieved a 25% higher price than normal due to excellent quality produce (10.5 Turkish Lira per kg, vs normal 8.5 Lira per kg)**
- **The trial was affected by disease (mould), pests (red spider mites) and extreme temperatures (-5.5O0C to +440C). Pomerite® treated areas were more resilient to the stresses.**

Philippines

A papaya trial was initiated using **Pomerite®** in May 2022 in South Cotabato, Mindanao. This was run and monitored by Dole Philippines Inc. as papaya is one of several fruits grown and processed by Dole in this region. Following a single application of **Pomerite®** they found:-

- **Fruit production in Pomerite® plots developed around two months earlier than untreated control areas, showing faster plant growth and development.**
- **Reduced papaya nitrate content by 3.5 to 11.5 ppm vs control, reducing cannery rejections significantly & improving canned fruit shelf-life.**
- **Increased flesh firmness, again reducing rejections due to mashy fruits, resulting in more useable fruits & higher profitability.**
- **Dole Philippines Inc. have confirmed that Pomerite® has been put on their Approved Inputs List and notified their purchasing team.**

USA

In an endeavour to assess the efficacy of the **SafeRock®** product **Pomerite®** on Hemp and CBD crops, Murray State University's Hutson School of Agriculture in Kentucky undertook independent trials in the year 2020. These trials aimed to determine the potential benefits of utilizing **Pomerite®** in the cultivation of these crops. The results from these trials highlighted significant improvements in both Hemp Fibre and CBD plants, outlined as follows:

Hemp Fibre:

- **A notable increase of 37% was observed in the height of the plants, indicating enhanced growth vigour.**
- **The circumference of the stems saw a 27% increase, suggesting stronger and potentially more resilient plant structures.**
- **Most remarkably, there was a 65% increase in the Bud Count, pointing towards a significant boost in the potential yield and quality of the Hemp Fibre.**

CBD Plants:

- **The trials recorded a 16% increase in the height of the CBD plants, demonstrating improved growth performance.**
- **A 27% increase in the circumference of the plants was noted, reflecting enhanced plant robustness.**
- **The Bud Count for CBD plants experienced a 55% increase, indicating a considerable enhancement in yield potential and quality.**

These findings from the Murray State University's Hutson School of Agriculture underscore the transformative impact of incorporating the **SafeRock®** product **Pomerite®** into the cultivation practices of Hemp and CBD crops. The marked improvements in plant height, stem circumference, and bud count not only signify potential increases in yield and quality but also suggest a promising avenue for optimizing the cultivation of these economically important crops.

Key Food Security, Sustainability & Environmental Benefits

The utilization of the **SafeRock®** product **Pomerite®**, enhances agricultural productivity and environmental sustainability, demonstrates significant benefits in the realm of agriculture. This product not only aims to reduce the dependency on chemical fertilizers but also addresses several critical issues facing modern farming practices. The key advantages of incorporating this product into agricultural systems include:

- **Reduction in Chemical Fertilizer Usage: It effectively decreases the use of chemical fertilizers by around 25%, offering a sustainable alternative to conventional agricultural inputs.**
- **Soil Health Restoration: By minimizing the reliance on chemical fertilizers, which are known to deplete soil nutrients, it plays a crucial role in reversing soil degradation and promoting the restoration of soil health and thriving soil microbiology.**
- **Support for Crop Rotation: It supports the practice of crop rotation, a vital technique for maintaining soil health, preventing soil erosion, and reducing pest and weed pressure.**
- **Energy and Emission Reduction: Approximately 2% of the world's energy consumption is attributed to the production of synthetic nitrogen fertilizers, which resulted in the generation of 465 million tonnes of CO_2 in 2007. By reducing the need for synthetic nitrogen fertilizers, it contributes to lowering energy consumption and greenhouse gas emissions.**
- **Increased Crop Yield: On average, crop yields are increased by around 25%, depending on the type of crop, thus enhancing food security and agricultural productivity.**
- **Nutritional Enhancement: The nutritional value of crops is significantly improved, benefiting animal and human health, and elevating certain crops to 'Export Grade' quality, which can command higher prices on the international market.**
- **Crop Resistance: Notably, strawberry trials in Türkiye with this product resulted in plants that exhibited resistance to extreme temperature fluctuations, ranging from -5 to +40 degrees Centigrade, highlighting the potential for increased crop resilience.**
- **Pesticide Reduction: By enhancing the innate resilience of crops to diseases and insect pests, the product reduces the reliance on pesticides, further contributing to the environmental sustainability of farming practices.**

These comprehensive benefits underscore the potential of the **SafeRock®** product **Pomerite®** in revolutionising agricultural practices, making them more sustainable, productive, and environmentally friendly.

Addresses UN's Sustainable Development Goals (SDGs)

We believe the **SafeRock®** product **Pomerite®** will assist in meeting 4 of the 17 UN's Sustainable Development Goals.

- **SDG 2.4 – "By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, which strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality."**

- **SDG 3.9 "By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water, and soil pollution and contamination."**

- **SDG 14.4 "By 2030, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics."**

- **SDG 15.3 "By 2030, combat desertification, restore degraded land and soil, including land affected by Vdesertification, drought and floods, and strive to achieve a land degradation-neutral world**

POMERITE® 100% NATURAL SOIL IMPROVER

A nation that destroys its soil, destroys itself.

26 February 1937, President Franklin D Roosevelt

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