

Toward Climate Safe Agriculture

**This crop feeds
more than half the
world's people.
It also accounts for
50% of crop-related
greenhouse gases
(GHGs).**

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**21st century farmers
the world over, big and
small, are at the forefront
of change and challenges:
making a living, feeding
our world and being a
friend to planet Earth.**

Agripower

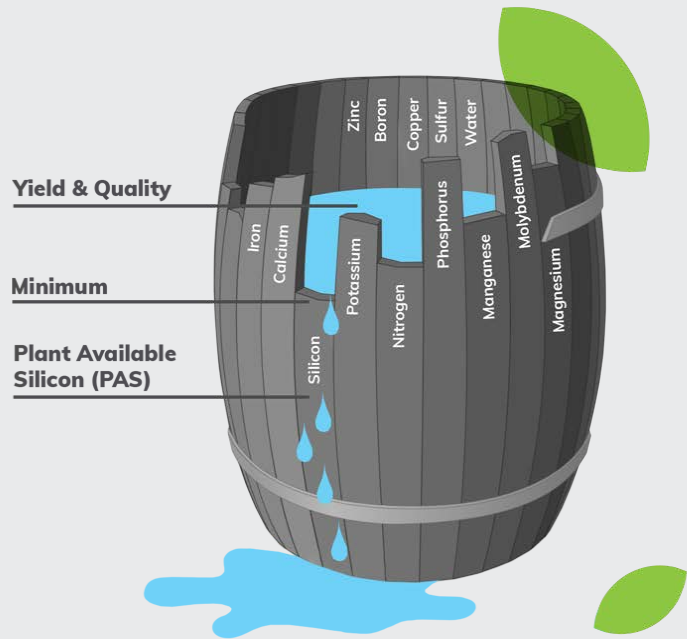
Agripower Australia Limited (Agripower) produces the world’s leading silicon fertiliser, **Agrisilica®**, which contains exceptionally high concentrations of **Plant Available Silicon (PAS)**. Exported internationally, **Agrisilica®** brings the many benefits of PAS to farmers worldwide.

Agripower owns the world’s largest resource of Plant Available Silicon or ‘PAS’ - arguably the most exciting development to fertilisers in decades. With around 2 billion tonnes of ‘amorphous silica’ - the source of PAS, the resource has a life expectancy of 200 years. Agripower is the only commercial bulk producer of PAS worldwide.

In August 2020, the Association of American Plant Food Control Officials (AAPFCO) classified non-calcined amorphous silica (Agrisilica®) as a beneficial substance. AAPFCO’s recognition is significant as it reinforces agriculture’s ‘Law of the Minimum’ whereby crop yield and quality are determined by the nutrient or resource in the least supply. In other words, crop yield and quality are diminished if any beneficial nutrient is limited. Until now, the issues have been first that the removal of naturally occurring PAS has outstripped what has been replenished and secondly, obtaining commercial quantities of supplementary sources of PAS.

This remarkable resource gives growers access to a nutrient recognised and proven in trials around the world to be a significant game-changer in the quest for sustainable agriculture as food security becomes more critical. Agripower is pioneering new approaches to fertiliser management by demonstrating to farmers how they can better optimise both direct and indirect multiplier outcomes using Agrisilica®.

Agrisilica® is not an ‘alternative’ to traditional fertilisers such as NPK, MAP, DAP. Instead, it is complementary, causing increased nutrient uptake. As a direct result, yield is increased, and many environmental issues mitigated. In addition, Agrisilica® has actions and attributes unique to PAS, which produces benefits to both the farmer’s bottom line and our quest for climate smart agriculture. The aggregated outcomes are more crops, better quality crops, safer crops and increased grower income; all achieved more sustainably.



Climate Smart Agriculture (CSA) and Agrisilica®.

Agrisilica® is a natural fertiliser with extraordinary benefits. These benefits can shift thinking and practices, leading to more sustainable intensification of agriculture, supporting the 3 Pillars of CSA.

The UN’s Food & Agriculture Organisation (FAO) developed CSA to build resilience to climate change while ensuring global food security. CSA’s ‘3 Pillars’ are:

- 1. Increasing productivity (food security via greater crop yields) and increasing incomes (financial resilience for farmers in particular), often referred to as ‘sustainable intensification’ of agriculture;
- 2. Resilience to climate change through adaptation (revising methodologies); and
- 3. Reducing, mitigating and removing where possible harmful greenhouse gas emissions and environmental pollution.

CSA calls on stakeholders at all levels to participate by identifying, embracing and championing strategies and solutions that fit with each region’s situation. Agrisilica® links directly to a number of these, including:

1: Crop production which seeks to combine traditional knowledge with new technology to produce more from the same area of land, conserve resources and enhance ecosystem services, reduce greenhouse gas emissions and negative environmental impacts, reduce soil compaction and increase carbon sequestration.

2: Land and Water Management which looks to the restoration of degraded lands, increasing soil carbon, enhancing soil nutrients and water retention capacity, and reducing deforestation to make way for agriculture. Put simply, more efficient use of precious resources: land and water.

Global population growth and trends are driving demand for food security and food safety. Shrinking amounts of arable land, crop losses from stress, the need to reduce Heavy Metals uptake and pesticide toxicity, improved shelf-life and mitigating agriculture’s environmental impact are challenges facing farmers worldwide.





Agrisilica® - the most significant change to fertilisers in 90 years.

Agrisilica® is as crucial to the development of agriculture as was the advent of global commercial sources of Urea and Phosphate at the beginning of the 20th century.

Agrisilica® contains 26% Soluble Silicon, a beneficial nutrient available to plants and known as PAS. First identified in the 1800s, Japanese scientists realised the benefits of PAS in the early 1900s while seeking a solution to Rice Blast. Further research and outstanding results saw Japan officially declare PAS an “agronomically essential element” in the 1950s¹. Knowledge of silicon’s benefits to agriculture, recognised for decades, is gaining global attention.

Agrisilica® is a significant game-changer because, for the first time, PAS is available in bulk commercial quantities for worldwide markets. Over the last 100 years, modern farming practices increased food production; today however, side effects of some methodologies and practices are recognised as unsustainable. There are extraordinary benefits to be gained from PAS for farmers, for consumers and, for our environment. Many benefits are immediate and direct, while others have enduring long term environmental benefits, **including carbon sequestration**.

The science supporting PAS is compelling, and because it derives from a natural resource, it is all the more exceptional. From a sustainability perspective, its benefits to agriculture are significant.

For citations, see back cover.

- Agrisilica® gives off no emissions, is non-synthetic and environmentally safe.
- Agrisilica® delivers mitigating and remediating outcomes to agriculture’s past, present, and future footprint.
- Agrisilica® is highly beneficial to field crops, tree crops (e.g. fruits, nuts), vegetables, commercial horticulture (flower production, nurseries), amenity horticulture, lawns, turf, playing fields and golf courses (including remediation).
- Agrisilica® fertilisers come in chip, powder, liquid and granular types, the latter ideal for blending.
- Agrisilica® complements traditional fertilisers (NPK, MAP, DAP etc.), enhancing and optimising outcomes.
- Agrisilica® is a natural water retention agent with high Water Holding - 55%* (i.e., 100kg holds 155kg of water), of which 90% w/w is Plant Available Water. Soil moisture is increased, making water more available to plants as they need it.
- Agrisilica® has a high Cation Exchange Capacity (>30 cmol kg⁻¹)
- Agrisilica® is certified for use in organic farming, reinforcing its quality and safety.



Powered by Agrisilica®

Agrisilica® is well proven. Since 2011 Agripower has conducted more than 600 independent trials, on 46 crops, in major agricultural regions. This rigorous testing continues as we expand our knowledge base to ensure farmers worldwide receive accurate 'best practice' advice.

Grower Benefits - Crops

- increases yield (by up to 120% in some crops)
- reduces the need to clear more land
- increases root mass up to 200%
- increases crop quality: improved appearance, weight, size, taste
- increases crop durability: during harvesting, storage, transport, and shelf-life
- increases crop resilience: crops are optimised to better resist abiotic and biotic stresses:
 1. **Abiotic Stresses** - drought, temperature extremes, Heavy Metals uptake, nutrient imbalance, salinity and poor soils
 2. **Biotic Stresses** - bacterial attack, viral attack, fungal attack and insect attack
- improves soil condition and health:
- improves Cation Exchange Capacity (CEC), enabling higher retention and uptake of nutrients and water
- retains more water/moisture without waterlogging
- boosts organic soil carbon and humic acid
- improves soil oxygen/aeration and texture/structure
- increases soil biodiversity

Grower Benefits - Revenue

- increased revenue via more crop to market (higher yield, lower crops loss)
- increased revenue via higher crop quality
- can reduce overheads by:
 1. reducing water consumption
 2. granular Agrisilica® blends easily with all traditional fertilisers, e.g. NPK, DAP, MAP etc.: it improves their uptake and reduces nutrient losses which can cost farmers up to 25% annual income due to leaching and run-off
- improves farmer income security

Consumer Benefits

- increased food safety (less Heavy Metals uptake, e.g. cadmium and arsenic)
- improved taste and nutritional value

Benefits Overall:

- reduces water consumption
- reduced soil erosion and exhaustion
- 100% natural, non-toxic, non-calcined
- does not pollute groundwater, rivers or marine environments and is not harmful to fish or corals
- lower carbon footprint
- increases and replenishes soil carbon
- 100% safe for pollinators (i.e. bees)
- a fertiliser that enhances results while mitigating environmental impact

Soil Carbon... what is it and can we renew it? It's not magic, it's basic science + PAS.

Soil is a significant carbon warehouse for reducing CO₂ emissions. It's a valuable way for farmers to earn an additional income whilst simultaneously improving farm productivity. PAS-rich Agrisilica® can facilitate the process.

The importance of soil carbon for sustaining Earth's life support systems is becoming more apparent as the world's population heads towards 10 billion by 2050. Soil carbon is affected by soil type and structure, climate, fertiliser management and tillage practices.

For a more precise understanding, the page opposite illustrates how PAS can renew and restore soil carbon while reducing carbon dioxide (CO₂), a significant greenhouse gas. The process is logically simple:

1. Get more plants to absorb more CO₂ through increased photosynthesis.
2. While it lives, a plant will increase soil carbon via natural plant debris, roots and root exudation.
3. When plants are harvested or die, plant residue returns to the soil, further increasing soil carbon levels.

Agrisilica® increases soil carbon by:

- increasing plant and root mass
- increasing plant photosynthesis (CO₂ absorption)
- **increasing carbon sequestration for potentially thousands of years via PAS-generated Phytolith-occluded carbon which is highly stable and resistant to decomposition and therefore crucial to long-term global carbon sequestration.**

"If we treat soil carbon as a renewable source, we change the dynamics."

Thomas J Goreau | Biogeochemist
and expert on carbon and nitrogen cycles



Agrisilica® creates Soil Carbon renewal and reduces CO₂!

Plant A

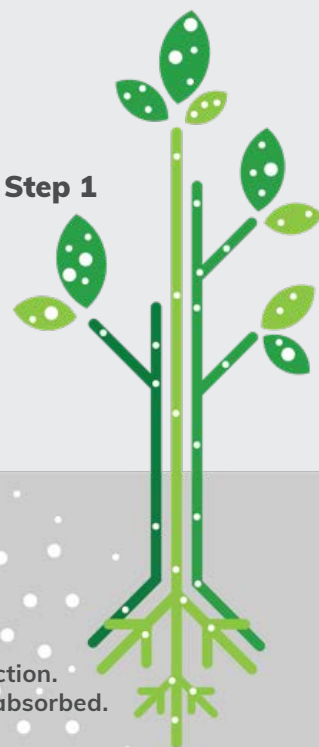
Relies only on what PAS may be naturally available in soil.

Sand is crystalline silicon. It does not provide PAS.



Most soils naturally contain low levels of PAS. Crops return Carbon to the soil through roots and recycling of vegetative matter, however, there is often a net loss of Soil Carbon. More Carbon is exported off-farm as produce or via losses from soil erosion, all contributing to repetitive losses and valuable Soil Carbon reductions.

Plant B - Step 1



PAS is applied via Agrisilica®. Taken up by the plant, PAS lodges in all parts of the crop. The crop is now PAS-nutrient rich.

PAS boosts PHOTOSYNTHESIS

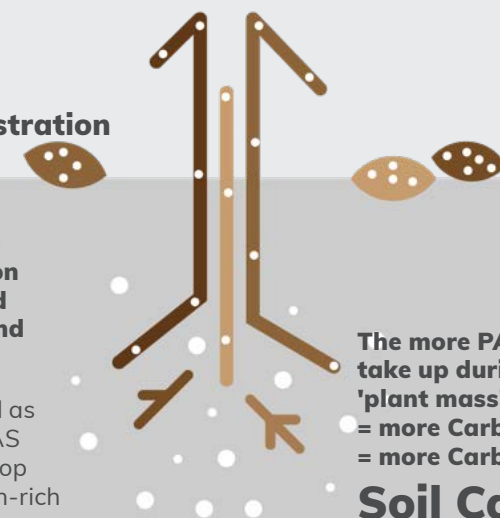
- More CO₂ is absorbed = GHG reduction.
- Plant mass is greater = more CO₂ absorbed.
- Clean O₂ is released
- So, where has all the Carbon gone? It has been converted into carbon rich carbohydrates (organic C) and deposited into the plant's phytoliths (see below Plant B - Step 2).

Plant B – Step 2, Carbon Sequestration

SILICON PHYTOLITHS

Agrisilica's PAS, absorbed by the crop during its lifetime, becomes rigid silicon formations called phytoliths deposited in leaf cell walls. Phytoliths capture and store Carbon.

Plants and crops return Carbon to the soil as roots and vegetative matter. The more PAS the crop takes up, the more Carbon the crop sequesters. It stores this Carbon in carbon-rich carbohydrates and PAS Silicon Phytoliths. Phytoliths can store Carbon for thousands of years.



The more PAS a plant has available to take up during its lifetime, the more 'plant mass' is created, therefore:
= more Carbon is stored in the plant
= more Carbon goes back into the soil...

**Soil Carbon
is created & renewed.**



Who relies on his crops? How can he create crop security and better outcomes? How will the next generation farm?

The UN SDG's and why they matter.



In September 2015, the United Nations General Assembly adopted the 2030 Agenda for Sustainable Development, including 17 Sustainable Development Goals (SDGs).

“The strong connection between inclusive economic growth, especially in rural areas, and rapid reduction of poverty was simply not apparent in the empirical record in the early 1980s. The East Asian Miracle (World Bank 1993) did not appear for another decade. This rapid growth validated the central theme of the ‘macro’-food policy perspective – poverty cannot be reduced without greater economic productivity of unskilled, especially rural, labour. That theme remains powerfully relevant even as the sources of such productivity increases are increasingly elusive.”¹

The last part of the previous sentence above is particularly critical. Farming is hard work. For farmers in developing countries, particularly small-holders, it is even more challenging with their limited resources - finance, water, poor soils and crop stress losses. 75% of the world’s food-insecure population relies on agriculture and natural resources for their livelihoods. The following pages will examine critical issues for farmers and all who depend on them, including our planet. The interconnected effects of sustainable agriculture cannot be overstated. The United Nations 17 SDGs emphasise a holistic approach to achieving sustainable development for all.

Agrisilica® has a role to play in shaping new conversations and practices around the future of farming. Agripower believes the benefits of Agrisilica® can contribute directly and indirectly to Goals 1, 2, 3, 6, 8, 9, 11, 12, 13, 14 and 15 of the UN SDGs.

Food and agriculture are key to achieving the United Nations entire set of SDGs.
FAO, 2030 Agenda, 2015

1. No Poverty
2. Zero Hunger
3. Good Health and Well-Being
4. Quality Education
5. Gender Equality
6. Clean Water and Sanitation
7. Affordable and Clean Energy
8. Decent Work and Economic Growth
9. Industry, Innovation & Infrastructure
10. Reduced Inequalities
11. Sustainable Cities and Communities
12. Responsible Consumption and Production
13. Climate Action
14. Life Below Water
15. Life on Land
16. Peace, Justice and Strong Institutions
17. Partnerships for the Goals

¹ C. Peter Timmer, Professor Emeritus, Thomas D. Cabot Professor of Development Studies, Harvard University in ‘Managing Structural Transformation: A Political Economy Approach’ 2015. key advisors for the World Development Report 2008: Agriculture for Development. He currently serves as an advisor to the Bill and Melinda Gates Foundation on agricultural development and food security issues.



Agriculture is necessary. Now we need to address its impact.



Agriculture faces 6 key challenges:

1. Food Security
2. Crop Loss
3. Soil Health

4. Ecosystem Damage
5. Toxicity
6. GHG Emissions

To feed around 10 billion by 2050, we need somewhere between 51-110% more food and fodder.

- Agriculture is estimated to be the direct driver for around 80% of deforestation worldwide.¹
- Biodiversity for food and agriculture is indispensable to food security, sustainable development and the supply of many vital ecosystem services.²
- 70% of global water consumption is used by agriculture.³
- 78% of global ocean and freshwater pollution is caused by agriculture.⁴
- Food is responsible for approximately 26% of global GHG emissions.⁵
- In 2017, agriculture accounted for 42% of total CH₄ and 75% of total N₂O emissions.⁶
- About 51–82% of crop yield in world agriculture is lost annually due to abiotic stress.⁷
- 75% of the world's soils are degraded.⁸
- On average, 200,000 people die annually from toxic exposure to pesticides.⁹
- Agriculture is the most significant contributor of non-CO₂ GHGs at 56%¹⁰

Fertiliser Management is fundamental to each of the six key challenges facing agriculture.

Recognising the many issues and competing criteria around sustainable food production, the FAO has developed a Code of Conduct for the Sustainable Use and Management of Fertilisers which came into being in 2019.

If crop production collapses, the outcomes predicted include mass migration in the hundreds of millions and starvation. We need sustainable intensification of agriculture to deliver food security. The challenge is meeting the needs of the present without compromising the ability of future generations to meet their needs.

Many of us take food for granted, yet according to the FAO, the combined levels of moderate and severe food insecurity brings the estimated current total to 26.4% or about 2 billion people.

Every person on the planet relies on agriculture one way or another. Long term stewardship of natural and human resources is just as important as short-term gains.

For citations, see back cover.

How does he safeguard the next crop, food for his table, secure his income?

Economic growth must be inclusive to provide sustainable jobs and promote equality.

The food and agriculture sector offer key solutions for development and is central for hunger and poverty eradication.

Sustained & inclusive economic growth can drive progress, create decent jobs for all and improve living standards.

Investments in infrastructure are crucial to achieving sustainable development.

A future in which cities provide opportunities for all, with access to basic services, energy, housing, transportation and more.



Problem #1 Food security

Solution: Increase crop yield, quality, resilience and grower income, sustainably.

Agriculture stimulates economic development and resilience beyond its sector, benefitting growers, communities, regions and nations.

Historically, the UN has noted that almost no country has reduced poverty and achieved growth without first increasing agricultural productivity.

Many communities depend on income from agriculture to sustain them. Many are farming naturally poor land. If crops fail due the outcome is a lack of food supply and income.

Agripower's Agrisilica® contributes to CSA's 3 Pillars, and directly and indirectly via long-term economic growth outcomes, support Goals 1, 8, 9 & 11 of the UN by:

- Increasing yield - farmers gain more crop tonnage per same land area;
- Increasing income - farmers get more crops to market, netting more profit;
- Improving crop quality (size, weight, shelf-life and appearance) achieving better prices for premium quality crops;
- Reducing crop losses from abiotic and biotic stress by naturally increasing crop resilience and boosting defence systems;
- It is 100% naturally derived and will not harm roots or leaves (does not burn), soil biodiversity or vital ecology systems, water resources - including potable water or livestock;

- Being approved for organic farming input;
- Reducing chemical run-off and leaching of costly fertilisers into their waterways. Nitrogen loss can cost farmers up to 25% of their annual income¹;
- Delivering value for money because **the farmer gets '4 products in 1' with Agrisilica® which:**
 1. has its own unique 'fertiliser' actions
 2. boosts uptake and performance of traditional fertilisers (NPK, DAP etc.)
 3. reduces crop losses
 4. reduces irrigation usage

Through education at every level on Agrisilica®'s benefits, we provide a significant game-changer to agriculture globally. Farmers can work with Agrisilica® and, through revised management programmes, see improved crop outcomes and enjoy increased financial resilience. The positive multiplier effects to communities, regional, even national economic growth increase while contributing to Climate Smart Agriculture and the UN SDGs: the sustainable intensification of agriculture.

¹Nitrogen pollution: the forgotten element of climate change, The Conversation, Dec 5, 2016

Drought, pests or frost, the outcome's the same. No crop, no income. No food.

Economic growth must be inclusive to provide sustainable jobs and promote equality.



The food and agriculture sector offer key solutions for development and is central for hunger and poverty eradication.

Problem #2 Crop loss

Solution: Increasing crop resilience to biotic-abiotic stressors increases crop productivity and farmers economic resilience.

51-82% of crops are lost annually around the world due to crop 'stress'. Conversely, we need to find 70-110% more food to feed 10 billion people by 2050. Fixing annual crop loss would go a long way to closing the food gap.

Abiotic stress, such as climatic conditions, nutrient deficiencies or toxicity, and biotic stress, such as pests and pathogens, can wipe out an entire crop, a year's income and anticipated food supplies.

The UN has set a 2030 target of doubling agricultural productivity and incomes of small-scale producers. How will all that happen while protecting ecosystems, adapting to climate change and extreme conditions and somehow progressively improving land and soil quality?

The UN also sees mitigation of extreme food price volatility caused by crop losses as essential to achieving zero hunger.

Educating fertiliser producers, distributors, agronomists, governments and growers worldwide on the potential of Agrisilica® and how it contributes to the UN's goals is part of what we do at Agripower.

Agripower's Agrisilica® directly and indirectly contributes to UN Goals # 1 & 2:

- It increases the strength of plants epidermal layers (plant support and less susceptible to herbivorous pest attack).
- It increases resilience of crops against insects and disease.
- It increases plant cell strength from root to leaf, improving photosynthesis and water and nutrient use within the plant.
- It increases crop tolerances to temperature change via lower transpiration rates (less water loss).
- It reduces crop lodging.
- It reduces crop uptake of Heavy Metals and Sodium (toxicity and salinity stress).
- It increases cation exchange capacity (CEC) enabling higher retention and uptake of nutrients (NPK) and water.
- The above benefits lead to less crop losses, delivering higher and healthier yields, more crops to market and improved farmer income stability.



It takes 3,000 years to make 1mm of fertile soil. We can't wait that long.

Economic growth must be inclusive to provide sustainable jobs and promote equality.



Responsible Consumption and Production



Sustainably manage forests, combat desertification, halt and remediate land degradation and halt further biodiversity loss.



Problem #3 Soil health

Solution: Increase soil health, water holding capability and soil carbon.

75% of the world's soils are degraded. Around 70% of stored soil carbon has been lost, and 24 billion tonnes of fertile soil is lost annually through deforestation and tillage.

95% of the world's soil will be degraded by 2050 if we don't change the way we farm. According to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), more than 75% of the Earth's land areas have lost some, or most, of their functions. Poor soils undermine the well-being of the 3.2 billion people relying on soils to produce food crops, provide clean water, control flooding and more. Once-productive lands have either become deserts, are polluted, or have been deforested and converted for unsustainable agricultural production, becoming significant contributors to increased conflict and mass human migration. Left unchecked, this could force as many as 700 million to migrate by 2050. Soil is a finite resource, and when exposed (e.g. deforestation, erosion, tillage), it oxidizes, essentially burning soil carbon.

Global soils contain 2 to 3 times more carbon than the atmosphere.

According to the globally recognized “**4 per 1000 initiative**” launched in France in December 2015, of which Agripower is an active member, if carbon levels increased by 0.4% or 4 ‰ per year across the first 30-40 cm of soil, it would significantly reduce CO₂ concentrations in the atmosphere related to human activities.

How Agrisilica® can renew Soil Carbon.

- Agrisilica® creates and increases Soil Carbon because it is high in PAS. Please refer to page 11 for a full explanation.

Agripower's Agrisilica® has unique soil benefits boosting CSA pillars and supporting SDG's 1, 12 & 15 as it:

- Increases 'silicon phytolith' production
- Optimises plant intake of CO₂ which
- Reduces atmospheric CO₂
- Increases plant growth
- Increases plant storage of carbon
- Improves soil texture and structure
- Improves soil porosity
- Increases water retention and transmission
- Increases aeration (oxygenation)
- Increases CEC (cation exchange capacity)
- Increases nutrient reserves
- Improves elemental balance
- Increases soil biodiversity
- Increases organic soil pool
- Increases microbial biomass
- Increases carbon sequestration

Of 28,000 species on the IUCN* Red List threatened with extinction, agriculture is listed as a threat to 24,000 of them.

Careful management of this essential global resource is a key feature of a sustainable future.



Sustainably manage forests, combat desertification, halt and remediate land degradation and halt further biodiversity loss.



Problem #4 Ecosystem damage. Solution: A fertiliser that does no harm, only helps.

78% of global ocean and freshwater pollution is caused by agriculture, and pollinators are at risk. Failure to protect biodiversity undermines our capacity to produce food.

Scientists have identified 415 dead zones worldwide, 213 areas of concern and only 13 coastal systems in recovery.¹ Toxicity and pollution from agriculture can directly impact life on land and in the water. Agriculture is not the sole contributor to water pollution, but it is one of the largest. Ecosystems are fragile. An example is Australia's Great Barrier Reef, where spikes in ocean nutrients caused by coastal and agricultural run-off are linked to ongoing outbreaks of the devastating crown-of-thorns starfish. Eutrophication caused by N and P run-off from sugarcane farming is another threat to this unique World Heritage area.

Pollinators affect 35% of global agricultural land, supporting the production of 87 leading food crops worldwide.² The protection of bees and other pollinators is essential to successful and sustainable agriculture. Climate change, chemicals, monocultures, pests, disease and changes in land use can all impact these fragile but essential creatures.

Agrisilica® directly contributes to the CSA pillars & support SDG's 14 & 15 by:

- Optimising crop uptake of chemical fertilisers (e.g. NPK) reduces leaching

and run-off, thereby mitigating pollution of water and marine systems (e.g. eutrophication and acidification).

- PAS increases crops natural physiological processes including photosynthesis, the metabolisation of carbohydrates and proteins, enzyme activation and increases cell strength, thereby reducing or preventing pest attack and disease incidence. Cell strength assists crops by:
 1. Increasing epidermal layer strength (less palatable to herbivorous pests)
 2. Increasing water availability (keeps crops in better health during dry conditions, supporting physiological processes and activities)
- Agrisilica® is non-poisonous: used to top dress crops, it can reduce pest burdens because it acts mechanically (rather than chemically) while remaining 100% safe to pollinators, all air- and land-borne, and water and marine life;
- Agrisilica® increases yield. This can reduce the need for further land clearance, deforestation and ecosystem destruction.
- Increasing soil condition, health and soil carbon promotes soil biodiversity, protecting ecosystems above and below the ground.

*International Union for Conservation of Nature

For citations, see back cover.



You'd like to know the food she's eating is safe.

Ensuring healthy lives and promoting the well-being for all at all ages is essential to sustainable development.



Ensuring availability and sustainable management of water and sanitation for all



Responsible Consumption and Production



Careful management of this essential global resource is a key feature of a sustainable future.



Problem #5 Toxicity.

Solution: A fertiliser that can mitigate and reduce agri-toxicity.

The UN estimates ~200,000 people die annually from exposure to pesticides while Cadmium and Arsenic are in our food chain, most notably cereals and vegetables, our dietary staples. We need to find ways to mitigate agri-toxicity.

Agriculture is the primary source of Heavy Metals in our foods. Human health impacts include respiratory, skin conditions, cancers, bone fractures, cardiovascular issues, kidney failure, neurological impairment (including neo and post-natal), even death. Toxicity contaminates our soils, drinking water, inland water systems, oceans and our food basket and consequently, is one of the most pressing concerns in the global debate about food security and safety.

Some fertilisers have been identified as significant sources of Cadmium contamination of soil. There is a clear link between water pollution and food chain cross-contamination¹. Arsenic in irrigation water reduces crop yields long term whilst contaminating crops such as rice, food staple to over 50% of the world's population.

Heavy Metals can potentially not only harm food consumers, they can cause crop losses. Agrisilica® can reduce the uptake by plants of Heavy Metals, and also salinity, protecting crops from toxicity stress, protecting farmer incomes and mitigating potential harm to our health.

Agrisilica®, with its high PAS content, can reduce toxicity in soils, water resources and food chains, contributing to the CSA pillars and UN SDG's 3, 6, 12 & 14:

- PAS is a non-chemical, non-poisonous fertiliser.
- PAS reduces plant uptake of certain Heavy Metals by causing 'immobilisation.'
- PAS stimulates plant antioxidant enzyme production, reducing or eliminating Heavy Metals damage to plants.
- PAS reduces fertiliser leaching and run-off entering freshwater sources (including drinking water), and marine systems (causing eutrophication leading to acidification and fish kills).
- PAS has been proven to reduce Arsenic (As) and Cadmium (Cd) levels in the edible parts of potatoes, wheat, onion and carrots by up to 40%².

¹Ebbs and others 2006. ²Greger and Landbert (2015).



Rice paddy farming is one of the biggest contributors to N₂O emissions.

Ensuring healthy lives and promoting the well-being for all at all ages is essential to sustainable development.



Responsible Consumption and Production



Careful management of this essential global resource is a key feature of a sustainable future.



Climate change is a global challenge that affects everyone, everywhere.



Problem #6 Emissions.

Solution: Use a fertiliser proven to reduce emissions notably N₂O and CO₂.

Agriculture is the largest contributor of non-CO₂ GHGs at 56%¹. With a lifespan of 114 years, Nitrous Oxide (N₂O) is 300 times more potent than CO₂. Nitrogen (N) is essential to agriculture and food security. The challenge is considerable.

Climate change is a global challenge that affects everyone, everywhere.

With global populations projected to reach close to 10 billion by 2050, agriculture's challenge meeting food security demands while protecting resources. The UN calls for education, mitigation, adaptation and impact reduction. Let's consider a few facts concerning Greenhouse Gases (GHGs) and agriculture:

1. Of global anthropogenic emissions in 2005, agriculture accounts for ~60% of N₂O and ~50% of CH₄, with projected increases of 35-60% by 2030 (FAO, 2003)²;
2. More than 50% of applied Nitrogen is lost via leaching, volatilisation and run-off. Nitrogen losses can cost farmers up to 25% of their annual income³;
3. Sugar production (~176.5mmt p/a) is one of agriculture's highest emitters of CH₄ and N₂O and a major contributor to fresh water and oceanic eutrophication;
4. Rice production (staple diet to over 50% of the world's population) produces 50% crop-induced GHGs. Twenty years of rice production GHG's could equate to 1,200 coal plant emissions⁴.

Agrisilica® reduces greenhouse gas emissions, supporting CSA pillars and the 13th UN SDG:

Agrisilica® & N₂O

- increases nitrogen fixation in legumes;
- reduces nitrogen volatilisation;
- increases soil nitrogen mineralisation;
- promotes ammonium assimilation;
- increases nitrogen denitrification;
- reduces nitrogen leaching and run-off by up to 40%.

Agrisilica® & CO₂

- increases plant photosynthesis activity which increases CO₂ absorption and carbon capture;
- increases soil organic carbon content;
- increases carbon sequestration for potentially thousands of years via PAS-based Phytolith-occluded carbon, which is highly stable and resistant to decomposition, thereby being critical to long-term global carbon sequestration⁵.

For citations, see back cover.

Citation Page 7:

¹Refer to Soil, Fertilizer and Plant Silicon Research in Japan – August 2002 - Jian Fen Ma, Faculty of Agriculture, Kagawa University and Eiichi Takahashi, Kyoto University.

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Agripower Australia Limited
ABN 21 132 823 226
L 13, 20 Bridge Street,
Sydney NSW 2000
agripower.com.au
info@agripower.com.au
+ 61 2 9251 8884