

**A revolutionary solution for**

**REDUCING *GHG emissions***

**REDUCING *Carbon Footprint***

**INCREASING *Water-use efficiency (WUE)***

**INCREASING *Nutrient-use efficiency (NUE)***

**INCREASING *Yield for food security***

# **Agrisilica<sup>®</sup>**

**Game-changing solutions  
for global agriculture**

# PAS-rich Agrisilica® is the most revolutionary change to fertilisers in 100 years.

*The availability to agriculture of 'plant available silicon' is as crucial to the viability and development of agriculture as the global commercialisation of Urea was around 1920, over 100 years ago.*

**100% natural Plant Available Silicon (PAS) at scale, has never been available to the global agriculture sector... until now.**



## What is 'PAS'

PAS is Plant Available Silicon. It is the only form of Silicon (Si) available that can be taken up and used by plants.

Soils are often deficient in PAS with insufficient available for optimal plant growth. Sand is 'crystalline' Si and therefore not soluble, so its silicon content is not available to plants.

Silicon has been designated as a 'nutritive element' by the International Plant Nutrition Institute (IPNI), and the Association of American Plant Food Control Officials (AAPFCO) declared Si as a 'beneficial substance' for plants.

## Agripower Australia's PAS

- Agripower controls 86% of the world's known PAS resource in a single location in Queensland, in northern Australia.
- The resource is high-grade, 100% naturally derived and at ~2billion tonnes, has a supply life of some 200-years at 10million tonnes per annum (Mtpa).
- Agripower's PAS-rich Agrisilica® fertiliser comes in granular form (ideal for blending with NPK, DAP, etc), powder and liquid forms.
- Agripower's PAS is 100% safe (non-toxic) to animals, people and importantly water sources.

## How does PAS work

PAS is taken up by plant root and transported throughout the plant by its vascular system via water movement, accumulating in growing points such as leaves, new roots, flowering and fruiting. PAS works in three (3) important ways:

1. **Mechanically - by strengthening plant cells**
2. **As a Biostimulant - optimising plant health**
3. **Nutritionally - boosting plant and biomass growth**
  - PAS increases the uptake of all nutrients including nitrogen, phosphate and potassium (NPK)
  - PAS strengthens plant cells resulting in more erect stems and leaves allowing more sunlight to be captured. Photosynthesis is increased resulting in greater biomass, improved crop size, quality and weight, and increased carbon sequestration
  - PAS, via its three key modes of action in the plant improves resistance to abiotic and biotic stresses. Crop losses due to drought, salinity, pests and diseases are reduced.
  - PAS also works in the soil by increasing soil fertility (increasing availability of P and building soil organic matter), increasing soil water holding capacity, and increasing soil biology.



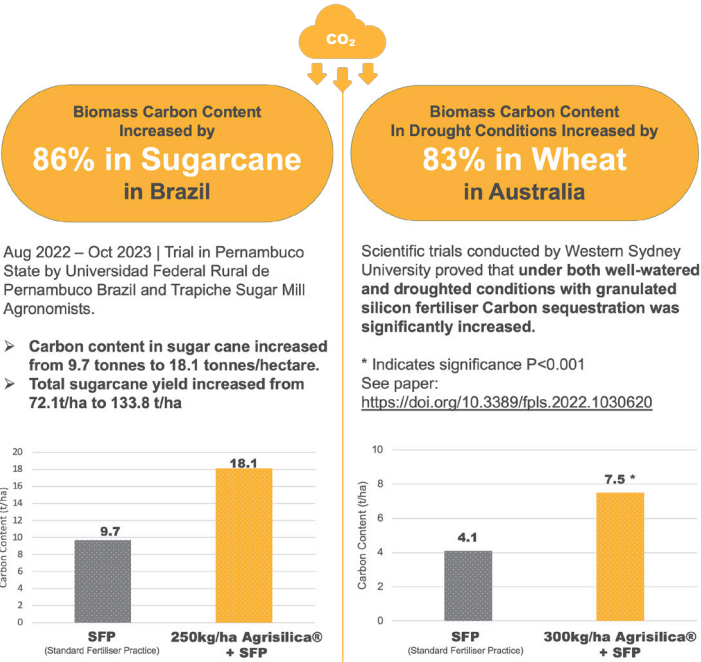
# Reducing Carbon Footprint & Increasing Carbon Sequestration

Below, Western Sydney University Wheat Trials demonstrate a reduced carbon footprint, and increased carbon sequestration and crop yields by applying Agrisilica® granular fertilizer

Carbon Footprint Calculations	NPK Without Agrisilica®	NPK With Agrisilica®
Total Fertiliser Application Rate T per Ha	0.14	0.29
Fertiliser t CO <sub>2</sub> e per T Applied	0.364	0.392
Yield per Ha tonnes	5.70	8.50
Carbon Footprint per T of crop produced	0.064	0.046
Carbon Footprint Reduction per T of Wheat Produced %		28
RESULT	49% yield increase 28% carbon footprint reduction 83% carbon sequestration increase	

## PAS-rich Agrisilica® increases carbon sequestration in various ways:

1. Silicon taken up by crops form 'phytoliths' (silicon deposits) in plant cells which capture and store carbon, sometimes for thousands of years.
2. PAS increases photosynthesis and plant biomass so more CO<sub>2</sub> is absorbed per plant, more clean O<sub>2</sub> is released.
3. The more PAS a plant takes up, the more Carbon the plant sequesters. The carbon is converted into carbon-rich carbohydrates (organic C) stored in all plant cell structures.
4. Excess carbon is exuded by roots, becoming soil carbon.
5. Leaf litter during plant life and remaining plant material after harvesting etc., are tilled back into the soil. These all contain phytoliths with captured carbon, further increasing soil carbon sequestration and soil fertility.



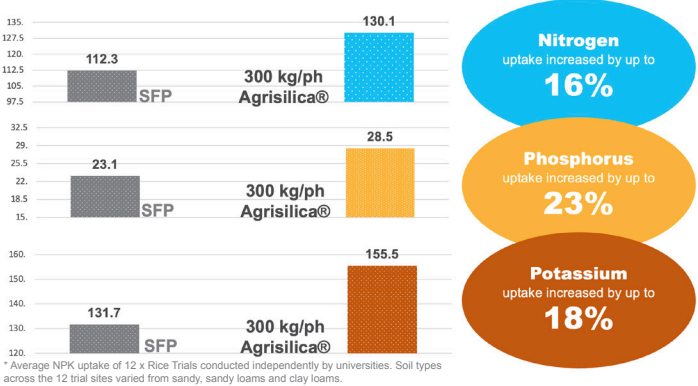
# Reducing GHG Emissions

PAS-rich Agrisilica® can reduce Nitrous Oxides (N<sub>2</sub>O) and Methane (CH<sub>4</sub>) emissions as a direct result of its effect on NUE and WUE.

"... Low nutrient use efficiency results in agriculture being the main source of N<sub>2</sub>O emissions which are predicted to increase as nitrogen fertilizer-use increases to meet global food demand. Such high losses of nutrients also bring an adverse economic cost to farmers". Erisman 2011

1. Agrisilica® when applied, has zero emissions and an extremely low carbon footprint of just 0.18t CO<sub>2</sub>e compared with other fertilisers which can be as high as 30t CO<sub>2</sub>e.
2. It increases uptake of NPK by crops, the outcome being reducing leaching and run-off
3. Potential to reduce nitrogen application rates, thereby lowering N<sub>2</sub>O emissions
4. It alters denitrification pathways, for example crop trials have shown:
  - it alters the crop's primary metabolism which results in increased crop yields and reduced N<sub>2</sub>O emissions. It promotes ammonium assimilation and restrains increases in water soluble nitrogen compounds.<sup>(1,2)</sup>
  - improved nodulation which increases nitrogen fixation.<sup>(3,4)</sup>
  - changes to the N<sub>2</sub>O:N<sub>2</sub> ratio, causing significant reductions of nitrogen emissions.<sup>(5)</sup>
  - the application of Si-rich substances can reduce CH<sub>4</sub> emissions from paddy soils (and)...the use of Si-rich fertilizers can significantly reduce emissions of nitrous oxide.<sup>(5)</sup>

## Reduce Nitrous Oxide (N<sub>2</sub>O) and Methane (CH<sub>4</sub>) gas emissions by increasing NUE



1. Agrisilica® increases photosynthesis = the plant's biomass is bigger (so it is hungrier) including its root system: it seeks more nutrients to take up.
2. Agrisilica® binds with some nutrients including Urea and all NPK fertilizers, and alters the form of others, increasing the plant's ability to absorb more nutrients, more easily and faster.
3. Nutrient-use Efficiency (NUE) reduces N<sub>2</sub>O emissions from agriculture and delivers higher crop yields, higher productivity.

# Increasing Nutrient-use Efficiency (NUE)

Applying PAS-rich Agrisilica® results in increased plant uptake of applied nutrients.

This has multiple value-adding benefits including:

## INCREASED CROP YIELD

1. Crops benefit from increased nutrient uptake e.g. nitrogen, phosphorus and potassium (known as NPK), producing more yield per kilogram
2. Agrisilica® applied with NPK fertilisers results in an incremental yield increase

## INCREASED FARMER PROFITABILITY

1. Higher yield
2. Higher crop quality, size, brix levels, shelf life, all generating higher market value
3. Potentially reduced fertiliser and pesticide costs
4. Reduced crop losses from stress (abiotic, biotic)

## INCREASED INDUSTRY SUSTAINABILITY

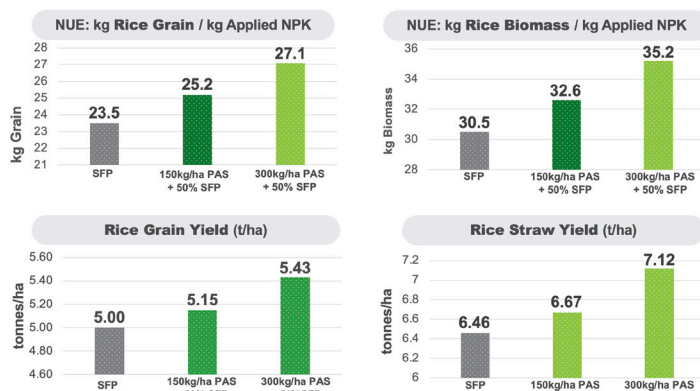
1. Less fertiliser losses from leaching and run-off
2. Less pollution of fresh water/marine environments
3. Less use of pesticides
4. Less food chain toxicity (heavy metals, chemicals)



**Adding Agrisilica® makes a difference:**

- **YIELD:** proven increases by up to 120%
- **PROFITABILITY:** proven increases by up to 40%
- **NITROGEN:** uptake increased by up to 16%
- **POTASSIUM:** uptake increased by up to 18%
- **PHOSPHORUS:** uptake increased by up to 23%

**NUE & YIELD increased in Rice when applied with just 50% Standard Fertiliser Practice (SFP)**



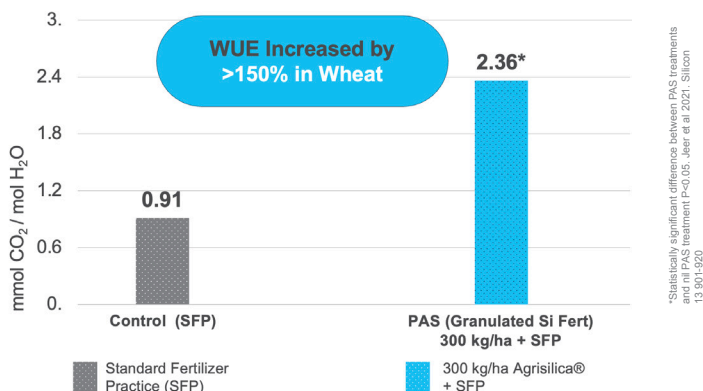
Average of 12 replicated university trials in rice (University of Agricultural Sciences Bangalore, Annamalai University Tamil Nadu). SFP: Standard Fertiliser Practice – 100kg/ha, 50kgP<sub>2</sub>O<sub>5</sub>/ha, 50kgK<sub>2</sub>O/ha

# Increasing Water-use Efficiency (WUE)

Applying PAS-rich Agrisilica® results in increased utilisation of water (irrigation or rainfall).

The results are increased crop yields and reduced costs:

1. **INCREASED ROOT SIZE** enables increased water uptake, which enables crops to better manage stress (e.g. drought and salinity), and produce higher yields
2. **INCREASED SOIL ORGANIC MATTER** increases soil water holding capacity
3. **WATER STORED IN AGRISILICA®** can benefit seedling crop survival
4. **IRRIGATION COSTS CAN BE REDUCED** because crops are better able to utilise applied irrigation



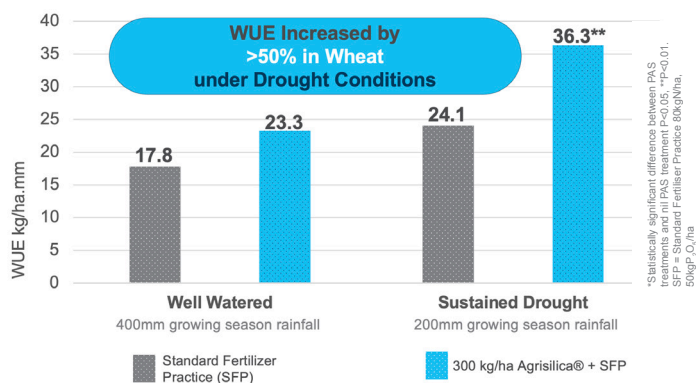
\*Statistically significant difference between PAS treatments and nil PAS treatment (P<0.05, t-test at 2021, Silicon 13 901-920)

Field trial carried out by ICAR National Institute of Stress Management, India.

Improved WUE was due to significantly\*

1. **Increased photosynthesis (+98%)**
2. **reduced transpiration rate (-7%)**
3. **reduced white ear damage (-45%)**
4. **and increased yield (+61%)**

Silicon content in plant stem tissue at harvest significantly\* increased (>160%)



\*Statistically significant difference between PAS treatments and nil PAS treatment (P<0.05, \*\*P<0.01, SFP = Standard Fertiliser Practice 80kgN/ha, 50kgP<sub>2</sub>O<sub>5</sub>/ha)

Field trials conducted by University of Western Sydney Australia (Johnson S.N. et al 2022) under Sustained Drought Conditions using Si Fertilizer (Agrisilica®)

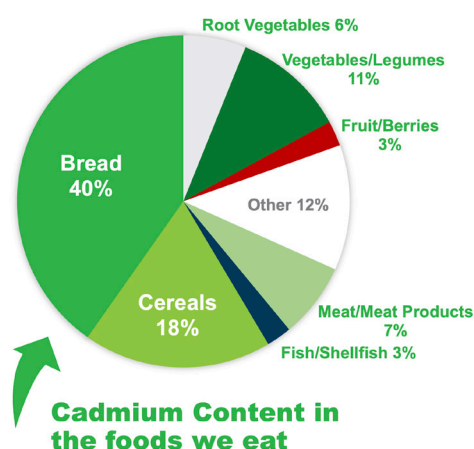
1. **WUE increased significantly by up to 51%** (kg grain produced per mm irrigated)
2. **Shoot mass increased significantly by up to 72%**
3. **Yield increased significantly by up to 49%**

# Reducing Cadmium, Arsenic & Heavy Metal Toxicity in the Food Chain

## PAS-rich Agrisilica® can reduce the uptake by crops of toxic Heavy Metals

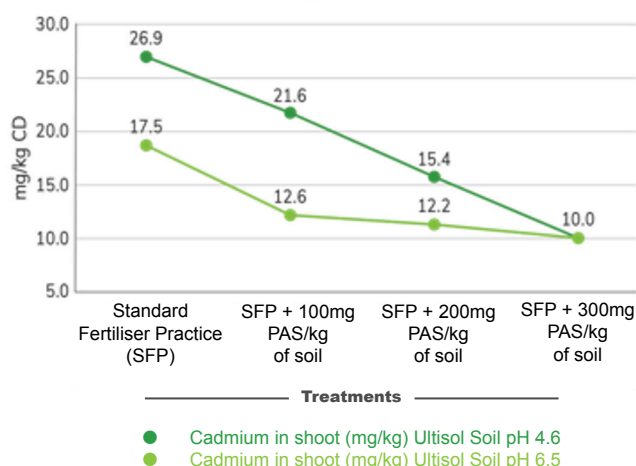
This assists the health of the crop and greatly improves food chain safety in relation to human health. Cadmium and arsenic - found mostly in cereals and vegetables - are highly toxic to humans.

This is particularly pertinent given the average content of Cadmium in fertilisers marketed in the EU is estimated to be 45mg Cd/kg P2O5. The limit of 60mg Cd/kg P2O5 will exclude from the market about 21% of currently sold fertilisers.



**Agrisilica® is proven to reduce Cadmium and Arsenic accumulation in edible plant parts by up to 40%.**

## Cadmium concentration in Maize shoots declined in two different soil PH's with increasing rates of PAS (Si fertilizer)



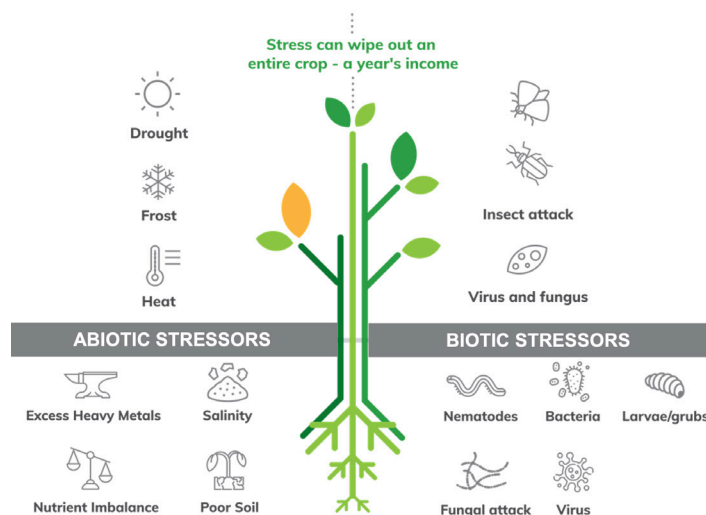
**Agrisilica® is non-toxic and 100% safe for humans, livestock and fresh water sources.**

# Reducing Crop Losses from Stress (Abiotic & Biotic)

## PAS-rich Agrisilica® can reduce crop losses from stress (drought, pests, disease etc.)

Annually global agriculture losses from crop stress range from 51% to 82% every year. The impact on small holdings, rural communities and economies can be severe because farmers lose their entire annual income. The domino effects of crop losses range from poverty, disease and starvation in developing nations, to increased costs of food, natural fibres and biofuels in developed countries can be severe.

**PAS-rich Agrisilica® has proven effective against crop losses. Because it is a 100% natural, non-toxic nutrient, it cannot - in high contrast to pesticides and fungicides - harm people, livestock or pollute water sources.**

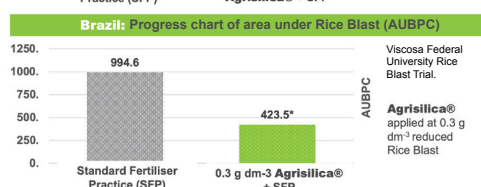
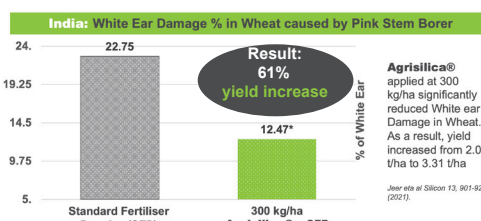


### Agrisilica® helps plants fight abiotic stress

- Increases photosynthesis
- Reduces transpiration
- Increase water use efficiency
- Increases nutrient uptake
- Increases nutrient assimilation
- Increases nutrient use efficiency
- Reduces effects of salinity
- Reduces heavy metal uptake & toxicity
- Improves soil health

### Agrisilica® helps plants fight biotic stress

- Primes plants defence mechanisms
- Increases cell wall strength
- Improves crop resilience to insect pests
- Improves crop resilience to fungal disease



Stalk borer damage in sugarcane reduced by 57%\*



White ear damage in wheat reduced 45%\*



Fungal blast in rice reduced by 18%\*\*\*



# Agrisilica® and Farmer Return on Investment (ROI)

CROP EXAMPLES	COUNTRY	Agrisilica® Application Rate	Agrisilica® Increased Yield	Additional Grower Profit Difference	Number of Times Cost of Agrisilica® Recovered
				WITH Agrisilica®	
		Kg / Ha	%	A\$	
Apple (high yielding)	Morocco	800	50	15,200	30.7
Apple (low yielding)	Russia	400	102	23,100	91.2
Avocado	Australia	600	27	20,870	55.3
Banana (field)	India	750	20	2,300	5.8
Banana (greenhouse)	Morocco	800	26	8,600	17.8
Barley	Australia	150	92	371	4.9
Blueberry	Morocco	400	6	4,100	17.0
Capsicum	Austria	400	5	2,360	10.2
Cherry	Australia	250	20	17,300	109.1
Chilli	Australia	400	59	58,730	230.4
Mandarin	Spain	250	23	3,800	24.8
Coffee	India	200	34	800	7.3
Cotton	India	100	21	290	5.5
Cucumber	Australia	400	34	31,400	123.7
Date Palm	Saudi Arabia	300	8	5,060	27.4
Grape	Spain	300	30	4,000	21.8
Hazelnut	Turkey	600	70	34,000	89.5
Macadamia	Australia	300	30	5,390	29.1
Maize	Spain	300	20	430	3.2
Melon	Brazil	400	34	10,800	43.2
Nectarine	Morocco	900	41	3,800	7.6
Olive	Spain	150	19	880	10.2
Onion	Australia	250	63	2,200	14.8
Pear	Spain	280	68	6,250	35.9
Peas	Spain	150	13	2,100	22.9
Pomegranate	India	300	31	3,560	19.5
Potato	Turkey	300	36	1,500	8.8
Raspberry	Morocco	300	23	16,000	84.3
Rice	Turkey	300	26	1,500	8.8
Silage	Turkey	250	4	500	4.1
Soybean	India	100	17	300	5.7
Strawberry	Australia	750	21	35,000	73.9
Sweet Potato	Australia	200	47	13,000	102.6
Sugar Beet	Morocco	300	62	2,200	12.5
Sugar cane	Australia	350	11	1,000	5.5
Tea	India	300	16	1,300	7.8
Tomato	Morocco	600	44	2,900	8.6
Wheat	Morocco	150	49	400	5.2
Zucchini	Spain	500	20	16,830	53.6



The table above shows increased profitability via increased yield. Further financial benefits can also come from increased crop quality (e.g. size, Brix levels, appearance, flavour, shelf-life), and reduced overheads (e.g. less water, less pesticides). It's a win-win for agriculture and for the planet.

Agrisilica® PAS-rich fertiliser makes farming more productive (higher yields), more sustainable and more profitable.

Farmer return on investment (ROI) significantly justifies additional cost of Agripower's Agrisilica® Granular Silicon Fertiliser.

**Farmers can gain from  
3x up to >100x cost outlay**