There is today a silicon deficiency in many arable soils. Acid soils, which by nature have high levels of soluble aluminium, make up about 40% of the world’s arable land. Because of the relative toxicity of aluminium to plants, acid soils are no longer productive. Silicon in a great antagonist to soluble aluminium and many other heavy metals and its application has the potential to become a fundamental tool in support of sustainable agriculture, biological/organic production and in safeguarding the environment. It can also render intensive agriculture more sustainable.

The effects of silicon on plant growth and development cannot be considered separately from its influence on the dynamics of plant stress, soil structure, microorganisms and fertility - because silicon has beneficial effects in ALL of these areas in the short, medium and long term. The only plant available, bioactive molecule is monosillicic acid.

Bioactive silicon acts as an anti-stress molecule that strengthens plant tissues and its positive functions in metabolism and disease response mechanisms allow plants to address more of their energy and resources to build yield and quality rather than combatting stresses. The implications are that wherever plants meet stressful conditions, silicon can be beneficial, for example: on marginal land and saline soils, in conditions of shortage or pollution of irrigation water, strong winds, extremes of temperature, insect infestation and plant disease.

Experiments that test the effects of silicon often finish by measuring only one or two external quality parameters such as weight, uniformity, grades, appearance of produce. This is insufficient since silicon can have a positive effect on the internal quality of fruits, vegetables and other crops, having the potential to increase nutritional values (vitamin, mineral and sugar contents) and reduce chemical residues (where crops are treated with fungicides and pesticides) and make plants more efficient in their use of water. It can also improve postharvest characteristics such as resistance to transport and handling, longer shelf-life and better extraction and processing (e.g. from fruit to juice). Finally silicon amendments improve the biodiversity and activity of soil microorganisms, soil structure and fertility, they help depurate soils of heavy metals and reduce the leaching of minerals.

**It is therefore necessary to institute a more holistic vision and multidisciplinary approach to experimental trials with silicon amendments over several production cycles with commonly grown greenhouse and field crops.**See attached diagram ‘The Big Picture’.

The promotion of the use of silicon in agriculture should start with consumer education to increase general awareness of its effects on human and animal health and its value to the food chain. The fresh fruit and vegetable distribution and processing industries should fund research to validate these claims.

*Experimental stations* should undertake more trials to ascertain the extent to which silicon amendments can reduce the need to apply fertilizers, plant chemicals and irrigation water thereby reducing chemical residues in food and making it safer for the consumer.

In parallel, comparative studies by growers and experimental stations are required to discover the cost-effectiveness of applying different categories of silicon amendments: concentrated monosillicic acid, silicates (including DE – Diatomaceous Earth) and silicon-rich organic plant extracts. There is relatively little comparative information available to the grower on types, methods, dose rates, timing and frequency of application.

*Plant scientists* are called upon to answer questions raised by commercial trials as we continue to further our understanding of how silicon is involved in enhancing plant metabolism, photosynthesis, growth and development, plant defence mechanisms and the regulation of mineral uptake.

Finally, every year, growers are faced with a plethora of new products from which to choose. They have also become conditioned to eradicating pests and diseases after they appear using curative plant chemicals backed by the powerful agrochemical industry. Instead, silicon has an important anti-stress function ‘helping plants to help themselves’. Preventative products are more difficult and more expensive to market according to agrochemical companies.

It does not help that silicon is excluded from the registered list of fertilizers and essential elements resulting in limited interest (or scepticism) to routinely use silicon amendments. Recently, silicon has been registered as a *biostimulant* with the European Biostimulants Industry Council (EBIC) for its effect on mitigating abiotic stress, but not (yet) against biotic stress.

The above arguments are considered in the book ‘Silicon Solutions’ published by Sestante Edizioni, Bergamo, Italy.

*Edward Bent, 01.07.2015*