RUNOFF, REEF, REGULATION... and reality checks

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STORMWATER QUEENSLAND

IECA International Erosion Control Association AUSTRALASIA

Rebuilding soil health naturally complimenting soil biology providing a long term self-sustaining outcome.

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Biography:
Mr Paul Storer B.Sc. M.Sc.
Paul is a Senior Soil Microbiologist, Plant Physiologist, Agricultural Consultant and Researcher.

With more than 30 years' research, publications and field experience investigating the link between soil biology and mineral nutrition in plants - Paul has been instrumental in helping investigate and develop innovative mineral/microbe programs. Key to the success of this approach is the increase in Nutrient Use Efficiency, Water Use Efficiency and improvement in Soil Carbon (driven primarily through growing soil microbial biomass).

Paul continues to assist the revegetation industry with practical ways to enhance project successes and increase economic and environmental sustainability - through improving soil health, soil nutrition and increasing beneficial microbe levels.

Paul is passionate about innovation in revegetation, and takes a "whole of systems" approach - which includes mineral nutrition, biological enhancement and use of biologically-compatible Ag chemicals. This all adds up to risk mitigation and to successful project outcomes.

ARC-Linkage Grants:

LP140100046 - Whiteley, Abbott, Hashem, Storer - Characterisation of soil microbial interactions for increased efficacy of herbicides using novel fertiliser management practices.

LP150101111 - Whiteley, Dixon, Storer, Miller - Mine-site rehabilitation through novel plant and microbe interactions.

Abstract:
The Erosion Control and Rehabilitation industry faces numerous challenges in order to remain economically and environmentally sustainable and relevant, including the high cost of implementation, actual success, and continual scrutiny of its practices due to potential runoff and adverse impact on sensitive ecosystems, such as the Great Barrier Reef (GBR). We will discuss potential solutions that reside in new management practices that increasingly rely on ecosystem services delivered by biological processes and that are directly linked to improving Soil Health. A promising approach is to harness soil-plant-microbial-nutrient interactions to optimise long-term self-sustainability, soil carbon, plant productivity and nutrient use efficiency (NUE), but with minimal financial cost.

To date, Conventional practices are based largely on the use of water-soluble leachable chemical fertilisers particularly nitrogen (N) and phosphorus (P) to achieve an outcome. These can negatively impact Soil Health including the physical and chemical environment as well as the beneficial

microbial community. These impacts can reduce the soil's capacity to store and exchange nutrients with plants leading to poor NUE, reductions in productivity and ultimately leaching and runoff. Additional conventional fertiliser applications as compensation may increase soil acidity, further impacting soil biology and root architecture, resulting in even poorer NUE – and then further nutrification of the environment.

However, the recent introduction of the latest cutting-edge technology harnessing microorganism-mediated processes can promote better nutrient efficiency and self-sustainability. For example, utilising specific arbuscular mycorrhizal (AM) fungi can form an extensive mycelial system within the soil that is many times larger than the plant root system, and therefore can efficiently acquire substantially more nutrients (such as P and N) and water than normally accessible by the root system alone. This in turn leads to increases in soil organic carbon and soil stabilisation. In addition, atmospheric nitrogen-fixing diazotrophs (free living and endophytic bacteria) can be used successfully to reduce the application of excessive amounts of soluble nitrogen (N) to the soil.

Approaches that use controlled release non-leaching fertilisers (CRF) such as specifically designed novel mineral fertilisers (coupled with beneficial multispecies microbial inoculum) show great potential for conditioning and stabilizing disturbed soils, preventing leaching and for long-term self-sustaining outcomes. This Microbial Carbon system is the development of a holistic system designed to produce more efficient healthy carbon rich soils and will be discussed in more detail.