# The Soilsmart Newsletter

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**As the drought continues and the scientific community predict that this already well known feature of Australian agriculture, is likely to increase both in terms of severity and regularity, we are at last beginning to recognise water as the truly precious resource that it is, on the worlds driest continent.**

Similarly as we contemplate the prospect of permanent water restrictions becoming part of our agricultural and domestic landscapes into the future, it is timely to remind ourselves of the need, and potential to increase the overall efficiency of water use from rehabilitating our tired soils.

Improving soil health has direct and tangible benefits in terms of improving the efficient use of irrigation or rain water. So when considering the overall management of any water catchment, we need to look at more than simply restricting access and reducing farmer allocations, because although this may temporarily increase water flows, it does little to help maximise the efficiency of water use.

The Murray Darling catchment represents approx 40% of Australia's agricultural production, and approx 70% of all the water used for agriculture in this country. It has a diverse range of climates and soils, many of which are showing signs of decline. Salinity is but one of the many impacts that have occurred as a result of farming activities since settlement. More widespread, but possibly less understood is the wholesale depletion of both soil Organic Carbon (OC) levels and the soils natural biological communities.

The impacts or symptoms that result from the decline in soil OC levels and benevolent biology are many, and are quite often bundled together and discussed under the banner of 'a lack of sustainability' a term which has crept into our everyday language over the past decade r more.

There are many natural processes that can have a detrimental effect on OC and soil biology, however in a truly natural system the effects of drought, flood and fire are short-lived, because the soil contains sufficient numbers and diversity of beneficial organisms to buffer the system, maintaining soil structure and enabling effective recovery.

Biologically rich soils have higher moisture infiltration rates (making better use of limited rainfall events and reducing the amount of irrigation needed), and they also hold water against evaporation and gravitation forces, again reducing the quantity of water needed to grow crops etc.

The addition of high quality, biologically active products such as vermicompost, which contain high levels of biodiversity and complex, stable OC, can be used to repair and rehabilitate soils.

As soil biology recovers soil structure improves, fungal and bacterial populations create billions of micro-pores in the soil to trap capillary water (the most available water supply in the soil, for plants to access). This structural improvement also helps to retain more of the gravitational water in the soil (that which moves quickly through the profile) and ends up, along with the nutrients it carries, in the sub soil and eventually the water table.

Our own work in Australia confirms that soil structural improvement and soil moisture retention are both examples of the potential benefits of rejuvenating soil biology, through the use of vermicompost. Based on work with farmers over several decades in the

USA, scientists have demonstrated (on a commercial scale), that rebuilding OC levels and soil biology, the improving soil structure has resulted in a reduction in the need for watering by as much as 50% in only 1 – 2 years.

There are other benefits to improving soil biology, because as soil structure improves, a commensurate decrease in the use of chemicals and fertilizers is evident, and at the same time nutrient run off , leaching and erosion are also reduced.

In Australian studies, attempts have been made to quantify the loss of soil Organic Carbon and its impact on crop production. At Werribee in Victoria, research confirms the negative shift in Organic Carbon levels from an average of 5% or more 30 years ago, to 1% or less today. This is a common trend across the breadth of our agricultural production regions.

The Grains Research and Development Council commissioned a study to quantify the financial impact of declining soil organic matter (OM). This work, conducted around Wagga, revealed that, for each 0.1% decline in soil OM, farmer returns decline by $23.00 per hectare per annum. Not surprisingly it also identified that the reduction in OM has a negative impact on the capital value of the land, which reduced by $150.00 per hectare for each 0.1% reduction in OM.

The University of New England at Armidale, conducted a study to asses the economics of adding quality organic material to irrigated crops, and demonstrated that a 20% reduction in water use was achievable over 3 years, which equated to a saving of $900 per hectare in water costs alone.

The quality of organic materials has a significant impact on the rehabilitation process, and of course not all organic materials are created equal. Vermicompost (OziVerm & GranoVerm) is commonly regarded as the King of Organic products, and is easily differentiated from other organic products by virtue of the intervention of worms.

Vermicompost is a biological active granule containing thousands of bacteria, fungi (Microbes), Enzymes, Minerals and Nutrients, and Organic Carbon. Whilst other organic products contain varying levels of Organic Matter, Nutrients and Minerals, it is the active populations of beneficial soil microbes, their interaction with the minerals, and a complex and extremely stable supply of Organic Carbon, which makes vermicompost uniquely different.

In a recent paper Atiyeh, R.M., Lee, S., Edwards, C.A., Arancon, J.D., Metzger, J.D., 2002. ‘The influence of humic acids derived from earthworm processed organic wastes on plant growth’. Bioresource Technology 84, (2002) 7-14, researchers demonstrated the potential for vermicompost to not only enhance plant development and production, but they also identified its potential to replenish humic substances, the vital component of soil Organic Carbon.

In our own work we have confirmed the ability of OziVerm & GranoVerm to economically increase Cation Exchange Capacity (CEC) and Organic Carbon reserves, using very light rates (3t – 5t per ha). We have also been able to measure structural improvements and significant increases in soil depth following applications.

**For more information please contact.**

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