Results of decades long, world-wide scientific research.

Australian Government Research – *"Strategic organic matter throughput helps to build soil carbon and boost crop yields."* Dr Peter Fisher, 24 December 2008. 2

Based on *'Managing Soil Organic Matter'* – DPI Vic. October 2007

Australian Government
Grains Research and Development Corporation

GRDC Grains Research & Development Corporation

Potential improvement in crop yields and reduced greenhouse gas emissions were among the benefits of increased soil organic matter throughput, according to the findings of a project funded by growers and the Australian Government through the Grains Research and Development Corporation (GRDC) and the Victorian Department of Primary Industries (DPI) and headed by Dr Peter Fisher.

Soil health - Calculating carbon for better soil.

Dr Fisher says the project's tests show a carbon level of about two per cent is the threshold at which soil starts to degrade or remains structurally sound. "A level of two per cent or above prevents soil degradation on most soils, and if you're above that threshold you get other benefits, such as increased nutrients, soil resilience and water-holding capacity - the value of soil carbon can explain about 60 per cent of the variation in soil structure."
(See pages 16–19)

Although Dr Fisher says it is difficult to put a dollar figure on carbon benefits, research shows production gains can be achieved in systems that have higher organic-matter inputs. Using average yield data over a number of seasons across 14 irrigated wheat, canola, rice and maize paired sites in northern Victoria and southern NSW, he found most high-organic-matter paddocks outperformed their paired site. (See page 14)

Looking at crop rotations and practices undertaken at the paired sites for the past 10 to 20 years and analysing soil samples at various depths, researchers found that if organic matter is increased by two tonnes a hectare each year for 10 years, organic carbon levels will be 0.4 per cent higher than if the extra organic matter had not been added. "If you are at one per cent and you went up to 1.4 per cent in 10 years, you would be increasing your soil aggregates' water stability from 20 per cent to 50 or 60 per cent," Dr Fisher says. (See page14)

Soil in paddocks with perennial pasture maintained the highest carbon levels. Maintaining stubbles, increasing pasture in rotations, growing higher-yielding crops or plants with larger, more active root systems would all boost organic matter and consequent carbon levels.

Strategic organic matter throughput helps to build soil carbon and boost crop yields.
(24 December 2008)

The results showed that in most of the paired paddocks the system with higher organic matter throughput produced yields equal to or higher than its adjacent paddock with lower throughput.

Adding organic matter through green manuring.

Dr Fisher said the project aimed to address growers' concerns about declining soil structure resulting from continuous cropping. "Soil structural decline under cropping systems is something that many farmers are familiar with," he said. "Soil structural degradation probably remains, after salinity, the major threat to the sustainability of agricultural production." "It is commonly associated with soil hardness, poor germination, restricted root growth,

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poor water infiltration, reduced water holding capacity and inevitably, reduced yields."

"This project has developed a better understanding of how varying organic matter inputs influences soil organic carbon, and how soil organic carbon influences other soil properties and ultimately crop performance," he said.

A key finding from the paired paddocks trial was that for every extra tonne per hectare of above-ground and below-ground organic matter – maintained on average for 10 years – the soil carbon percentage was found to be more than 0.2% higher.

"This increase is greater than most carbon modelling suggests," Dr Fisher said. "Most carbon modelling indicates that increasing soil carbon is a very slow process, taking many decades to achieve significant changes. For example, modelling a 2 t/ha increase in organic matter input for the same conditions, results in a change in soil carbon value of about 0.13% after 20 years.

"In contrast, the relationship developed between change in organic matter input and change in soil carbon at the 13 paired paddocks in the trial, suggested that a 2 t/ha increase in soil organic matter might result in approximately a 0.4% change in carbon level, after only 10 years."

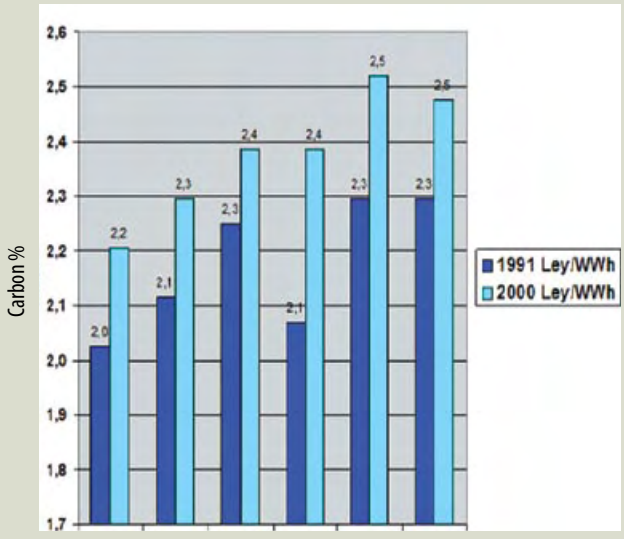
Bio-Agricultural practices. See pages 3–5, 21.
See below: Similar data from the Biodynamic Research Institute, Sweden

Long Term Field Trials over 30 years, testing soil carbon sequestration, water retention, erosion and degradation.

Bio-Agriculture increases Soil Organic Carbon

Skilleby 1991-2000. K-experiment. See pages 29, 30 5, 6, 31

Bio-Agricultural farming methods increase soil fertility and biodiversity, reversing soil erosion and degradation.



THE BIODYNAMIC RESEARCH INSTITUTE SWEDEN

This study showed an increase of 1.8 tonnes CO_2-e/ hectare/year over 9 years.

Average soil organic carbon increased by 9% from 2.18% - 2.38% = an increase of 0.2%, which coincides with recent Australian measurements by GRCD VIC Department of Primary Industries. See above

This study measured soil organic carbon content in topsoil (0-20 cm) in long-term trials on Skilleby experimental farm 1991-2000.

K1 (12.5) tonnes, K2 25 tonnes and K3 50 tonnes composted farmyard manure with (+) and without (-) biodynamic treatments to winter wheat. The average increase in the 20 cm of topsoil was calculated at 4,450kg C from a level of 47,850 increasing to 52,300.