

# SOIL HEALTH

## FACT SHEET



Bellinger  
**Landcare**  
Inc.



*Australia loses millions of tonnes of topsoil per year to water erosion due to poor soil health. Yet soil health is key to farming, and we now have techniques to restore it- increasing resilience in the face of both heavy rain events, and drought.*

### **What is soil health?**

Soil is complex. In a healthy soil, the chemistry, microbiology, and physics are all functioning well. We still have so much to learn about soil, with major discoveries such as glomalin only occurring in the last 30 years.

Historically, western science took a reductionist approach and focussed on a small number of key nutrients, especially Nitrogen, Phosphorous, and Potassium, leading to the ubiquitous NPK fertiliser. Initially spectacular results eventually declined as this simplified approach destroyed soil's microbiology and all the related aspects of soil health, explored below. The degraded soil was more prone to erosion and less able to store water, making it more drought susceptible.

The new soil revolution is an holistic one, where producers focus on improving soil health as the key to restoring plant health.

### **Glomalin**

Discovered in 1996 by scientist Sara F. Wright, glomalin is produced by soil fungi and, as the 'glue' that holds clay, silt, sand and organic matter together, it is a significant contributor to storing soil carbon.

### **Aspects of soil health**

Through funding from the National Landcare Program, Local Land Services is producing detailed soil health resources for North Coast landholders, some of which is summarised here.

#### **Photosynthesis**

Photosynthesis happens above ground, but many of the products are exuded underground, and are vital for feeding microbes, and thus the soil web. Keeping soil covered with growing plants instead of leaving it bare therefore enhances soil health.

#### **Soil Carbon**

All soil carbon ultimately comes from photosynthesis, even as it is transformed into all forms of organic matter, living and non-living. Organic matter provides trace elements and increases the rate of chemical processes.

#### **Soil Biology**

The more roots present, the more microbes will be able to thrive, in turn increasing plant uptake of nutrients. This especially true of the mycorrhizal fungi, which are especially prone to soil disturbance. If the ecology is left intact, succession to larger predatory microbes occurs, which opens up larger channels through the soil, increasing permeability.

#### **Soil Physics and Water**

High levels of organic matter and biological activity improve soil structure, and vice-versa. Leaving soil largely undisturbed and uncompacted enhances this

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reciprocal process. Leaving soil covered also protects the crust both from dying out, and from being eroded by wind and rain. Plants dissipate the energy from the rain which would otherwise compact the soil structure. High levels of organic matter also aid water retention once it does permeate the soil.

### Soil Chemistry

Artificial fertilisers may need to be slowly reduced during a transition to healthy soil, and even organic growers use some supplements. However, maximising photosynthesis to maximise soil carbon storage, and therefore increase root biomass and microbiology, allowing the more effective uptake of other nutrients, should be the focus. This is not only cheaper, but reduces or eliminates the reliance on non-renewable inputs, especially phosphorous.

### Biodiversity

Healthy soils in productive climates like the Bellinger Shire contain billions of organisms per gram, and a multitude of species, most of which are as yet unnamed. Biodiversity also applies to the diversity of plant life- a diverse pasture comprised of grasses and flowering plants will have many different root types, and is likely to have several species which can withstand any particular pest or climate challenge.

A healthy mix of native plant species contributes to the protection of our unique biodiversity as explained in our Pasture Diversity fact sheet. A mixture of winter and summer active, and annual and perennial plants

ensures that photosynthesis, and therefore carbon storage, is happening throughout the year. Measuring the biodiversity below the soil is difficult, but a diverse plant community, especially if its root system is left largely undisturbed, is a good indicator of a diverse and therefore healthy, resilient soil.

### Benefits of healthy soil

Soil with a good physical structure, chemical availability and biodiversity is more permeable and therefore not only drought resistant, but able to absorb, rather than be eroded by, heavy rains. The greater nutrient availability produces more vigorous plants, which are less susceptible to disease and more able to recover from insect attack. The contents of some of these nutrient dense plants then pass to herbivores, and then to the omnivores like us. Healthy soil means healthy plants, which eventually means healthy humans.

This fact sheet was produced as part of Landcare's *Building the Bellinger Shire Regenerative Farming Network* project, with support from the Federal Government's *Future Drought Fund*. For more information and other fact sheets visit: [bellingerlandcare.org.au](http://bellingerlandcare.org.au)



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