



**urban
agriculture**
AUSTRALIA



What governs the health and fertility of soils?

Healthy people depend on health food from healthy soils. The health of soils depends primarily on their organic matter status. Urban agriculture can play a significant role in returning organic matter to soils, helping them to hold more water and make more nutrients available for plant growth.

What is soil?

Soils to some are what we walk on: a mixture of rock fragments and organic detritus under our feet.

But there is a more profound dimension to soil, as the crucible for life on land. It was soil that enabled the formation of most terrestrial bio-systems, and it is soil on which those communities – including us – still depend.

Sunshine, CO₂ and nitrogen are abundant and freely available from the air to plants, which transform them into sugars via photosynthesis. But the ability of plants to carry out photosynthesis is limited by the availability of water and specific mineral nutrients – both of which can only be provided via soils. Therefore the health of the soil, which governs the availability of water and nutrients, is very important.

What governs the health of soils?

The health of a soil is substantially governed by its physical structure: how the matrix of mineral particles, organic detritus, air and water is arranged in 3 dimensional space. This arrangement dictates the soil's ability to:

- Absorb, retain and make available rainfalls.
- Provide exposed mineral and organic surfaces on which essential plant nutrients are held.
- Create the physical and gaseous conditions for the proliferation of roots to depth.
- Create the habitat for the microbial life that drives most soil processes, which synergistically –
- Enable the productive growth of healthy resilient plants.

Each of these factors is directly and synergistically enhanced by increasing soil organic matter up to very high levels.

Thus the health of the soil can in turn be degraded or enhanced, depending on the amount of organic matter that can be sequestered from the plants growing in it. Specific soil fungi are able to bio-sequester carbon from plant exudates and detritus (biomass) into the humates and globalin that make up stable soil organic matter.

Bio-sequestration is the only known process in the universe that fails to comply with the second law of thermodynamics. Instead of being dissipated into states of higher entropy, the solar energy stored by plants is converted into stable organic matter.

These processes have underpinned **pedogenesis**, the formation of soils, and provided the mechanism for the evolution and extension of terrestrial bio-systems over the past 420 million years. The fertility, productivity and resilience of soil increased as their microbes built up high levels of organic matter.

We can improve the fertility and productivity of our soils and their resilience to climatic extremes by enhancing their organic matter status.

How can we enhance the organic matter status of our soils?

This is where urban agriculture plays an important role. Vast quantities of organic wastes are produced in most households and other urban areas from food wastes, packaging, dirty waste paper and garden debris. All of these wastes can be safely and easily composted to produce organic matter, which in turn can be added to most soil to enhance its structure and health.

Urban areas are a 'sink' for massive inflows of organic nutrients from the wider landscape, via food and bio-materials. As a result, they have a unique capacity to mimic pedogenesis and create their own substantial, ever-expanding healthy soil/healthy food production cycles.

Well-managed urban agriculture should enable most communities to sustain healthy populations with minimal external inputs in perpetuity.

A person or domestic animal who eats 1kg of food will produce some 300g of waste:

- which mixed and safely incubated with 6kg of organic waste matter should in time produce some 4kg of active healthy compost –
- which if mixed with 30kg of degraded subsoil should create more than 30kg of healthy garden soil –
- which with the addition of sunshine, CO₂ and water can be used to grow up to 10kg of food plants over time –
- those food plants producing 2-3kg of food and 7-8kg of organic waste –
- which fed to people or animals and used to produce more compost should enable this cycle to be perpetuated indefinitely and feed even more people.

Provided we don't run out of sunshine, CO₂, water, waste organic matter, degraded subsoils, time and people to continue the cycle, it can sustain healthy communities with healthy food forever. It is this simple natural cycle that has supported all communities and civilizations that have survived on relatively finite land and nutrient resources.

Not only is this cycle highly effective in urban settings with their importation of nutrients, it is critical to prevent those additional wastes from breeding pests and diseases.

Suggestions for further reading

Soils, an Australian Viewpoint (CSIRO 1983)

Australian Soils and Landscapes, by N. McKenzie et al (CSIRO, 2004)

Permaculture: A Designer's Manual, by Bill Mollison (Tagari Publications, 1988).

Soils for Life: www.soilsforlife.org.au
