

Perennial grasses key to soil health

by Gill Fry

According to Christine Jones at the Soil Health Group seminar in Hamilton in April, the soil building process is currently not working as it should. And if we don't understand the fundamentals of soil and rebuilding soil, soil function and soil structure will deteriorate.

Key Points

- **Fungi and microbes drive your soil.**
- **100% groundcover all the year through is vital for building soil health.**
- **Perennial C4 plants are preferable over annual species as they maintain ground cover over summer.**
- **Perennials have extensive root systems which improves soil health and soil structure.**
- **Grazing management of the perennial grasses is very important.**

Soil Health fundamentals

Dr Jones explained how the soil building process is intrinsically linked to soil biology, including fungi (eg Mycorrhizal fungi) and beneficial bacteria.

"The plant roots and the fungi have a mutually beneficial symbiotic relationship. That is; the fungi cannot live without the plant roots, and the plant benefits by the increased nutrients the fungi provide to the plant", she said.

The fungi takes sugar from the plants and in return brings nutrients and water to the plant. This assists plant survival, especially in dry conditions.

"Beneficial microbes are integral to building soil, disease protection, nutrient availability, nutrient immobilization, plant growth hormones, vitamins and enzymes, water holding capacity, decomposition and detoxification and more...", she said.

A typical soil has 5000 species, while a good soil can have 25,000 species in just one teaspoon.

"Fungi and microbes are what drives your soil", Christine said.

Sustainable agriculture

According to Australian Bureau of Statistics, soil loss through wind and water erosion is greater than agricultural production. The average soil loss from wheat farms is 15t/ha/year. The average wheat yield is 1.2t/ha/year. Most of the soil lost from the land ends up choking our river systems with sediment.

"Agriculture is about food, but there is something fundamentally wrong", Dr Jones said. According to the UK Ministry of Agriculture there has been significant mineral depletion in vegetables and meat between 1940 and 1991. For example: in vegetables the level of calcium has decreased by 46% and the level of iron by 27%. Similarly for meat; the level of calcium has dropped by 41% and the level of iron by 54%.

Table 1. Mineral depletion in vegetables and meat between 1940 and 1991

		1948	1991	Percentage change
Potatoes	calcium	27mg	3mg	Loss of 89%
Broccoli	magnesium	160mg	29mg	Loss of 82%
Carrots	Vitamin A	25000iu	91iu	Loss of 99.6%

Source: CSIRO

This research has been backed up with Australia data as shown in Table 1.

Christine challenged the audience by asking, “How can it be we are applying more and more high analysis fertiliser and getting fewer nutrients in our food?”

She explained how research had shown when water-soluble phosphorus is applied, plants do not signal to mycorrhizal fungi to form symbiotic relationships. “However, biologically friendly fertilisers will not inhibit the microbes”, she said.

Christine advocates that maintaining 100% groundcover all the year through is vital for building soil health. “The land should never be bare”, she said.

Soil health can be improved by the kinds of plants grown. Perennial plants are preferable over annual species as they maintain ground cover over summer. They have more extensive root systems which improves soil health and soil structure.

Perennial C4 grasses

In particular, Christine advocates perennial C4 (summer active) grasses. This is because they respond to summer rainfall and provide green fodder over summer, which not only channels carbon to the soil, but also increases agricultural production. These perennial grasses maintain good ground cover, decrease erosion, increase soil organic matter, keep the ground cooler (which creates a better environment for soil biology), increase rain infiltration and improve moisture-holding capacity.

However, Christine warns that management of the perennial grasses is very important.

If the grasses are continually grazed, they will have short root systems. “Generally, what you can see above the ground provides a good indication of what is below the ground”, she said. It is important to give the grass a spell from grazing and let the top grow, which also lets the plant send down its roots. When the grass is grazed after having been rested, the roots slough off and go into the soil which fertilises the soil with organic matter.

The plant immediately detects when it has been grazed. The roots become inactive within two minutes of the leaves being removed. Then they drop off (like a lizards tail) providing valuable organic matter, enriching the soil.

“Grass grows best when it is grazed intermittently”, said Christine. “Grazing must be quick and mobs should not be grazing the pasture for more than a week at a time”, she added. “Then the grasses must be rested sufficiently for their solar panels to recover, so that photosynthesis kicks in again. Bare ground and over-grazed grasses result in the deterioration of the soil. Appropriately managed perennial grasses are the key to improving soil health”, she said.

Examples of C4 grasses in SW Victoria

- Bambatsi panic
- Consol lover grass
- Digit grass
- Kikuyu grass
- Panic grasses
- Rhodes grass
- Setaria
- Signal grass

Native C4 Grasses

- Kangaroo grass
- Redlegged grass



Panic



L to R: Bill Stonnill, Jeff Schurmann, Ian Fry, Richard Murphy, Christine Jones, John Kane, Gary Gebert, Peter Ham. Front: Gill Fry