

# Balanced diet key to soil health



**DIRTY DEEDS DONE DIRT CHEAP:** Earthworms have been described as nature's cultivators. Worm castings contain high levels of key nutrients.

**Tasmanian farmers have been told that getting healthy and productive soils is all about balance, writes Karolin MacGregor**

THE key to achieving healthy soils is to balance the chemical, physical and biological factors, participants at last week's soil biology day at Longford were told.

The field day was one of a series hosted by NRM North and Southern Farming Systems as part of Soil Health Week.

About 35 farmers attended Friday's field day, which focused on soil biology.

Joel Williams, of Bionette Agriculture, told participants there had been much research and focus on soil chemistry and physical structure, but not as much work had been done on the biology aspect.

"Soil biology has been neglected in the past," he said. "Traditionally most of the gaps are in the biology side."

Mr Williams said soil biology was one of the most diverse ecosystems in the world.

That ecosystem is made up of six different types of organisms: algae; bacteria; fungi; nematodes; arthropods and earthworms; and protozoa.

Organic matter is the key input for the whole soil ecosystem.

Mr Williams said decomposing organic matter was gradually transferred through the food chain and eventually became nutrients available for plant growth.

Algae plays an important role in the food web and good soils contain anywhere between one billion and 10 billion algae in a square metre of soil 15cm deep.

Mr Williams said algae secreted sticky substances that were essential for good soil structure.

Bacteria are also a vital part of soil biology, and together with fungi are the primary decomposers in the system.

There are about 30,000 different types of soil bacteria.

Mr Williams said in every teaspoon of soil there could be one billion bacteria.

"One of the most important things about bacteria is they feed on simple carbon compounds," he said.

Bacteria digest organic matter and make it available for plant growth. They also help protect plants from diseases and recycle, solubilise and retain nutrients.

Fungi also play a vital role in the soil food web. Multi-celled fungi can form long strings called hyphae, which help bind soil particles together and improve structure.

Unlike bacteria, fungi prefer to feed off more complex carbohydrates such as straw stubbles, wood and other fibrous materials. Particularly important are the mycorrhizal fungi, which can form symbiotic relationships with plants and colon-

ise the plant roots. Research has shown this colonisation can increase the plant's access to nutrients by up to 1000 per cent.

Mr Williams said when looking at ratios of bacteria and fungi in the soil, it was important to compare biomass, not just numbers.

"Soils are a highly variable environment," he said. "Changes in things like temperature, pH and moisture levels can all dramatically alter the soil environment."

Mr Williams said because of this, it was essential to have variety in soil biology so there were both active and dormant species, depending on the prevailing conditions.

Protozoa are also vital members of the soil food web and there are three different types.

Bacteria are the protozoas' main source of food and each one can eat up to 10,000 bacteria a day.

Nematodes are microscopic worms and there are about 20,000 different types.

Mr Williams said the predatory nematodes were the ideal bio-control agents and could reproduce very quickly.

Arthropods and earthworms are the group most farmers are familiar with and include invertebrates ranging in size from microscopic through to earthworms.

Mr Williams said their primary role was as shredders, which mix and aerate the soil and help transport the smaller microbes through the soil.

There are about 7000 different types of earthworms.

"They're nature's cultivators," Mr Williams said.

On average worms produce about 300 tonnes of castings per hectare per year.

Worm castings have significantly higher levels of key nutrients such as phosphorus, potassium, magnesium, nitrogen and calcium than the surrounding soil.

Overall, Mr Williams said farmers needed to manage their systems to promote a good balance right through the soil food web.

"The soil is this major ecosystem by which plants obtain their nutrients in a more natural way," he said. "You need maximum activity, diversity and balance between all the micro organism groups."

Mr Williams said it was important not to underestimate the vital role soil biology plays in the globe's overall food chain.

"There are more living organisms in one handful of soil than there are people on Earth," he said.

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