

Waikato Regional Council Integrated Catchment Management Newsletter

Welcome to the winter issue of Integrated Catchment Management News.

In this issue we'll:

- look at progress in the ICM project and some initial findings from recent revisits made by the ICM team
- consider the importance and benefits of carbon in soil
- talk to one farmer who has taken a stronger focus on carbon than most.

ICM pilot project progress

The ICM pilot project has now been running for four years and most farmers who have been approached in the catchment have become involved in it. We have recently finished revisiting all those farmers for whom the ICM team had completed farm plans and it has been exciting to see the progress that has been made. Some of the initial trends we have observed are:

- increased effluent area
- reduced use of fertiliser nitrogen in the winter
- less reliance on supplementary feeding
- greater strategic use of fertiliser nitrogen
- greater awareness around the importance of storage for dairy shed effluent
- increased interest in low rate effluent irrigation
- a move away from high stocking rates
- a swing towards a greater focus on per cow production.

Three quite abnormal and difficult to manage seasons have influenced these trends. Some now appear to be building more resilience into their farming operations.

We have seen Fonterra take a stronger role in environmental issues with its 'every farm every year' programme. DairyNZ has held a number of effluent field days and most farmers in the ICM catchment have used DairyNZ's Enviro Walk material.

Fertiliser companies are now working towards completing environmental farm plans for all their clients. Research work also continues to explore ways in which farmers can reduce their environmental footprint on farm and become more nutrient efficient in the process.

In the next ICM newsletter we will report on the results of our ICM catchment survey and in the summer we plan to hold a special event to thank farmers for their involvement in the pilot project to date, and give you more detail on our findings.

Carbon in soil

Carbon is one of the foundation blocks to life and is essential to good farming practices. It is a key to good soil structure and plays an important role in nitrogen cycling and nitrogen leaching.

Recent preliminary studies from the University of Waikato suggest that New Zealand dairy farms are losing carbon from their soils at the rate of between 700 and 1000 kg of carbon per year/ha.



Note the organic matter providing a dark colour to the soil from a sample under a fenceline.

There is about twice as much carbon in soil organic matter as there is in plant life growing on the soil. Most of the soil carbon is found in soil organic matter (soil humus). Pasture transforms atmospheric carbon dioxide into plant material by photosynthesis and this eventually ends up as plant and animal remains in the soil.

Soil organisms, such as earthworms, bacteria, fungi and algae, use the plant and animal remains as a source of food and the carbon component is returned to the atmosphere as carbon dioxide. These organisms die and release nutrients available for plant growth.

One of the major functions of soil organic matter is to supply nutrients to the plants. It does this by releasing nutrients, like nitrogen, sulphur and phosphorus, when decomposition and degradation of humus occurs. Trace elements, such as iron, copper, zinc and boron, are also released in small amounts during degradation.

Some benefits of carbon (soil organic matter) in the soil:

- A reservoir for holding and releasing nutrients, especially nitrogen, for pasture growth.
- Some nutrients, such as calcium, magnesium and potassium, are held on the surface of soil organic matter (adsorption) and are released by a different process for plant uptake.

- Building organic matter in the soil improves soil structure. Good soil structure allows air to circulate freely within the soil, providing life to the soil organisms and soil microbes.
- Improved water holding capacity is associated with improved soil organic matter, thereby making more water available for plant growth and reducing runoff to streams.
- The dark colouration produced by the organic matter in the topsoil increases the absorption of solar radiation, thereby increasing soil temperatures, a useful property during winter and early spring.
- Humic substances derived from humus provide active sites for the deactivation of a number of applied organic chemicals, particularly herbicides.
- Improving the carbon levels in the soil has an environmental benefit, as it holds more nitrogen by a process called immobilisation, and thus reduces nitrogen leaching to groundwater.

In general, allophanic soil will have a higher carbon content than pumice soil. This is because organic matter appears to break down more slowly in allophanic soils.

Farming can alter the soil organic matter and its loss can be quite rapid over the first few years when land is cultivated. By replacing relatively unproductive native pasture with productive grass species and adding appropriate fertilisers, substantial increases in soil organic matter can be obtained. If soils are well-aerated, roots can breathe and plants can fix carbon. Pugged soils prevent this from happening. Maintaining optimum soil test levels will help build carbon both directly and indirectly.

Let's now look over the fence at one farmer in the catchment, whose farm sits on the boundary between allophanic and pumice soils and who has focussed on building carbon in the soil.

Over the fence

Maurice McGregor was brought up on a dairy farm and has been farming all of his working life. He arrived on his present Waotu property four years ago and has always been interested in soils.



Maurice in a paddock with the milking cows.

In the first spring at Waotu, Maurice remembers many cows going down with grass staggers and milk fever. At the end of that first season the empty rate was 18 per cent. He used many CIDRs the following season and added a mineral supplement to his water supply. The problems were not resolved and the empty rate the following season climbed to 22 per cent.

While growing up on a family town milk farm, Maurice remembers his dad emphasising the importance of the soil and earthworms. So it was no surprise that Maurice turned his attention to the soils for a possible solution. He cut the farm in half, applying a carbon-rich compost source of fertiliser to one half of the farm and a low carbon source of fertiliser on the other half.

On the carbon rich half of the farm, carbon was measured each year to one metre depth. Maurice has seen an improvement from 128 to 202 tonnes of carbon/ha over three years. He has cut back on nitrogen fertiliser, as Maurice believes this is also assisting in building carbon. One strange result of applying carbon is increasing Olsen phosphorus soil test levels on this one half of the farm, under a less than maintenance fertiliser regime – a result difficult to explain.

Maintaining healthy soils leads to healthy pasture growth rates and this provides a sound platform for healthy stock. One noticeable farm improvement has been a significant drop in animal health costs. Maurice has his empty rate down to 10 per cent and is targeting 5 per cent. He now has no downer cows. Last year he only had to calve two cows and had no retained after-births. His vet bill has taken a tumble and this has lifted profits which is a prime driver because to make his small, low stocked, low input unit profitable, Maurice needs good control over costs.

At 25 kg N/ha Maurice has a very low nitrogen leaching level, and this places his nitrogen efficiency at the top end of the scale at 40 per cent. This dairy unit is an example of a low stocked unit looking to find efficiencies in the management of the soil and unexpectedly finding added benefits in such things as animal health. Only time will tell if this will lead to further improved grass growth and increased milk production, but Maurice will not be surprised if it does, for he knows that lifting the organic matter in his soil will bring additional benefits associated with improved soil health.