Scientist sees opportunity in losses from farm soil

Anne Lee

The loss from New Zealand dairy farm soils of 0.7t of carbon (C)/ha/year over the past 30 years is not necessarily bad, according to University of Waikato Associate Professor Louis Schipper.

Speaking at the International Dairy Federation (IDF) World Dairy Summit, Schipper said soils reach a saturation point or upper limit of how much C they can hold. If intensive pastureland had lost C over the period, there could be opportunities for dairy farmers to reverse the trend and sequester more C to bring it back to its saturation point.

A joint project between the University of Waikato and Landcare Research identified sites where levels in New Zealand soils had been measured between 1960-1980. These sites, re-measured in 2005-2010, include 29 dairying pastures, 15 hill country pastures, nine tussock grasslands and 28 flat drystock farms.

The research team found that while dairy pastures had lost C, tussock and drystock farms had been unchanged and hill country had gained 0.5t C/ha/year.

Schipper and his team are now carrying out trials at DairyNZ's Scott Farm to investigate what causes both soil C losses and gains, so farmers can respond.

He's using high-tech sensing equipment that makes continuous measurements of the air carbon dioxide (CO_2) concentrations (20 measurements/second) along with recording air movements. The readings are then fed back to a computer base via telemetery with other climate data also recorded.

The information tells whether the element is increasing or decreasing in the soil when other aspects of C exchange are included, such as milk production and feed imports and exports.

So far, the data collection has told scientists that pugging at one site caused no apparent increase in C loss.

Cultivation during drought when the soil was dry resulted in 0.6t C/ha loss, while cultivation during a normal year when soil moisture was higher led to large losses of 2.8-3.6t C/ha depending on the soil type. So reducing cultivation could be a significant management tool to help slow down C losses from intensive pastoral systems and might even build levels.

Strip grazing caused 0.3t C/ha loss from the soil. Many of these studies need to be repeated at other sites to determine differences between soils in different climates.

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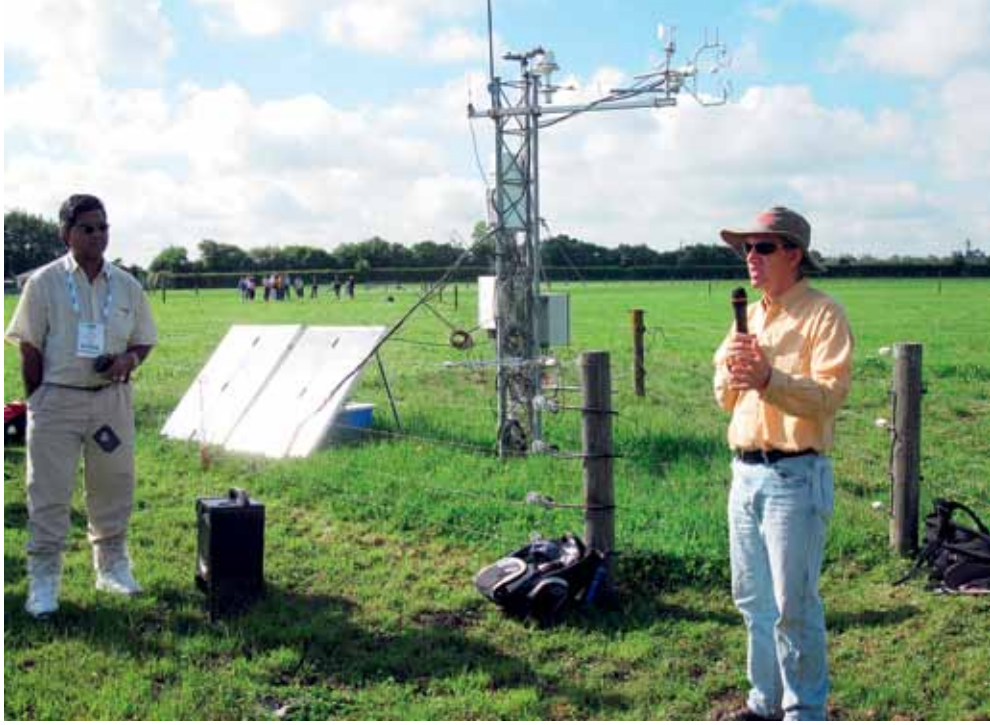
Schipper warned that dairy cow urine apparently had the ability to dissolve soil organic matter, but more work was needed to determine the effects in the field rather than the laboratory.

Surprisingly, scientists have found that some unirrigated pastures can have more soil C than irrigated paddocks, possibly due to greater root mass in dryland pastures.

Just because there's more biomass above ground it doesn't necessarily follow that the soil C levels below ground will be greater, he said. Farmers may be able to exploit this and use plants with a greater root mass within the pasture mix and this is currently under investigation.



Louis Schipper explains to international visitors how changes in soil carbon levels are being measured at DairyNZ's Scott farm.

But increased plant diversity in the sward may mean changes to grazing management which in turn could have other detrimental effects.

"That's why there's a need for a full systems approach to investigating these possible methods to lift soil carbon," he said.

Over-drainage of soils can decrease the level of C held in the soil, while results have shown that going from forestry to pasture increases soil C at some sites by around 5-10t C/ha within 20 years from sowing.