

Are we carbon neutral?

DairyNZ farm systems specialist Chris Glassey tackles the commonly held belief that pastoral dairy farming is carbon neutral.



We know that methane and carbon dioxide (CO₂) released into the atmosphere by grazing animals eventually returns to be absorbed as CO₂ by pasture plants. Also, soils under pasture store considerably more tonnes of carbon per hectare than the pasture plants. So, why isn't pastoral farming carbon neutral?

Unfortunately, it's the conversion of the pasture carbon digested by cows to methane that causes the challenge. It means pastoral farming releases some carbon from the cycle that contributes to warming.

Although methane remains in the atmosphere for only a relatively short time before it becomes CO₂ again, it's about 25 times more potent for warming the planet than CO₂.

This is above the warming that would have otherwise been caused by release as CO₂ alone. So, methane emissions can be 'carbon neutral' while also increasing warming.

But isn't the carbon stored in the soil under pastures counted to offset carbon emissions from grazing?

I spoke to Professor Louis Schipper from University of Waikato about this. He says it's true that soils store a lot more carbon than the plants above them. New Zealand soils under pasture have higher soil carbon levels than the world average, but there appears to be little change over time in levels under well-managed grazing systems.

This is because soil carbon reaches an equilibrium under different land uses. CO₂ absorbed from the atmosphere by grass in the process of photosynthesis is either returned to the atmosphere via plant and soil respiration, methane (via animals), or when exported product (e.g. milk) is digested. Carbon enters the soil through decaying plant material (leaves and roots) and dung, but this is also slowly converted to CO₂.

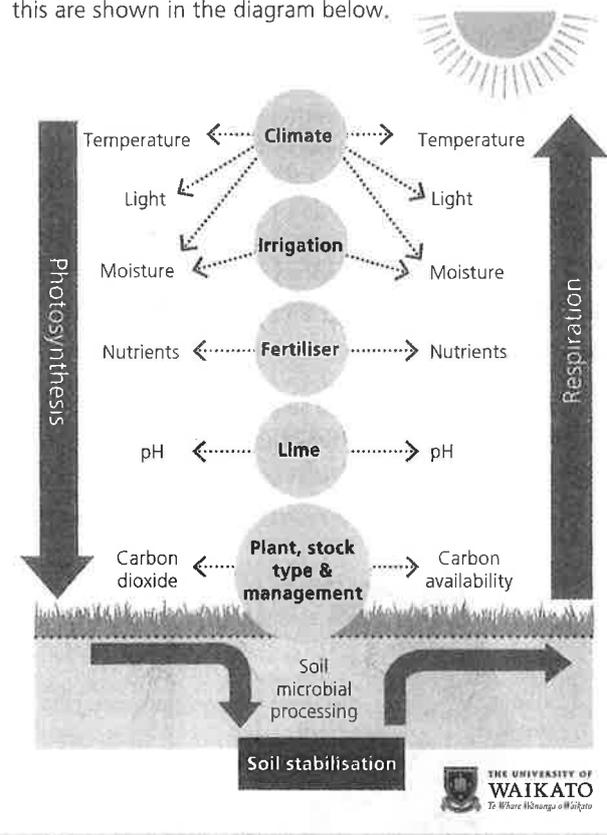
It's also difficult to monitor and measure carbon in soil at a national level, but this is now being done – see agmatters.nz/topics/measuring-soil-carbon

Professor Schipper says soil carbon takes a long time to build but is lost quickly through soil management practices such as tillage, which leave soils bare, stopping photosynthetic inputs and increasing soil erosion and exposure to drought. This suggests it may be challenging to achieve substantial carbon sequestration in New Zealand soils, but it remains an active area of research.

The loss of carbon from soil potentially adds to our greenhouse gas emissions and it's critical as part of wise farm management to hold onto the soil carbon we have.

Carbon movement into and out of soil under pasture

Soil carbon under pasture is increased or decreased when there are small differences between photosynthesis and respiration. The amount also depends on the microbial processing of different soils. The processes that control this are shown in the diagram below.



Myth Pastoral dairy farming is carbon neutral because carbon gets stored in soils and captured in pasture growth.

BUSTED

Carbon released from farms as methane contributes to warming before returning to the carbon cycle. Wise farm management will hold onto current soil carbon levels.