Climate change can happen without us

By Robin Boom, Agronomist

In my column in the August issue of this magazine, I suggested that thinking humans can change the climate is probably futile. In this issue I discuss some consequences of meeting our obligations under the Paris Agreement on Climate Change.

The news media constantly barrages us with articles and items related to climate change – a politically driven metanarrative which I questioned in last month's column.

Whether or not we humans are having much impact on the weather, New Zealand was a signatory to the Paris Agreement of the United Nations Framework Convention on Climate Change and has a duty to fulfil the demands in the agreement.

One of the guiding principles in this agreement is 'Recognising the fundamental priority of safe-guarding food security and ending hunger, and the particular vulnerabilities of food production systems to the adverse impacts of climate change'. Article 2 (b) states 'Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production'.

As a food producing nation feeding the equivalent of 40 million people through our food exports, it is imperative that any policy implemented on climate change does not affect our food producing ability as per Article 2 (b).

Our meat and milk exports in particular have almost the lowest carbon footprint of any meat and milk produced around the world, so it is imperative for the planet, our current food producing ability is not impaired. Because of our position in the Southern Hemisphere we are also able to seasonally supply and export fresh fruit and vegetable produce into Northern Hemisphere markets which are out of season there.

SOIL CARBON LOSSES

For millennia, humans have been depleting carbon reserves in the soil and adding CO2 into the atmosphere through food production. One way has been through burning or cutting down forests to grow crops or graze livestock. There are significant carbon losses every time soil is turned over and ploughed; mostly generated by soil micro-organisms involved in the break down of organic matter.

In many countries, humans have grown crops for centuries. Organic matter has been depleted as a result of ploughing and inverting the soil. Ploughing historically has been a form of weed control, so that the new crop is not competed out by already established weed plants.

Recent research has shown that leaving the soil surface bare for long periods of time with no plants absorbing CO2 from the atmosphere is a major reason for depletion of soil carbon, as the soil micro-organisms utilise and breakdown any humus material for their own survival. Soils which have been cultivated for decades and centuries often have very poor soil structure and lack oxygen, so mechanical ploughing reintroduces oxygen to the soil and in doing so there is a flush of microbial activity resulting in more CO2 lost into the atmosphere.

This is why there has been a recent focus on minimum tillage, zero tillage and strip tillage techniques to try and minimise carbon losses on arable ground, and keep crop residues on, or incorporated into, the soil to help build organic matter. Crop rotations which include permanent pasture, or crops such as Lucerne, have been a successful means of building humus and rejuvenating soil carbon.

Some of our better intensive horticultural producing soils, such as those around Pukekohe which have been growing vegetable crops for many decades, have little topsoil left, extremely poor soil structure, and have depleted their carbon reserves to the point where they are now growing vegetables on subsoils.

Because of their proximity to large urban areas, some of this land has been swallowed up by housing, forcing growers to buy up pastoral land suitable for vegetable production further afield. This new land usually has good organic matter levels to begin with, but over time these too become depleted through soil inversion, unless organic materials such as composts and animal manures are incorporated into the soil. Carbon losses through soil

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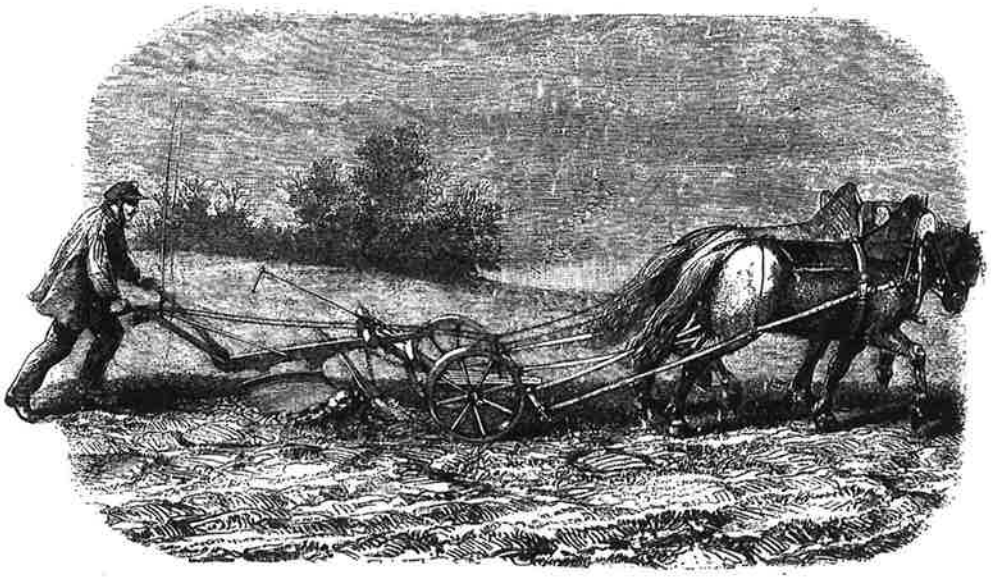

inversion generally exceed enteric methane and nitrous oxide losses from livestock grazing on the same piece of land.

GREENHOUSE GAS INVENTORIES

Permanent horticultural crops such as kiwifruit, grapes, olives, fruit and nut trees et cetera have variable carbon losses/gains depending on the crop itself, management techniques such as whether there is permanent grass cover or bare ground underneath the tree crops, the use of composts, manures or biochar materials, mulching, et cetera. Where tree and vine crops have a lot of bare ground, annual soil carbon losses are on a par with dairy farms; about a tonne of carbon/ha a year, but where mulches/compost type materials are used, or there is understorey grass cover, carbon levels can be built up. Therefore, there is no definitive answer for saying permanent tree and vine crops sequester or deplete soil carbon; these should be determined on a case-by-case basis if greenhouse gas inventories for each property are to become a statutory requirement.

If agriculture and horticulture are going to be included in any Emission Trading Scheme, it should be equitable for all with hard data from each property used to ascertain what the actual carbon losses/gains are, and farmers and growers need to be educated on how to reduce carbon losses, or better still be rewarded for any soil carbon sequestration techniques employed on their land.

It also needs to be borne in mind that intensive horticulture, as well as arable crops, produce a huge quantity of food on a per hectare basis. As the production of food is recognised by the Paris Agreement in Article 2 (b) as essential, vegetable and fruit producers may yet be excluded from having to participate in ETS inventories, particularly when employing practices which minimise soil carbon losses; or conversely get rewarded for net carbon gains, both above and below ground.

Some tree crops such as avocados have significant biomass above ground, but also have high nitrous oxide emissions due to high nitrogen fertiliser use. Other crops such as kiwifruit often have large permanent shelter belts in which the conifer trees used for these will be sequestering significant quantities of CO2 from the atmosphere, so these also could to be included in greenhouse gas inventories if still growing.

Crops produced in glasshouses, such as tomatoes and capsicums, which require additional electrical heating or ventilation, will have higher greenhouse gas inventories compared to seasonal field grown tomatoes and capsicums. Understanding how all of these intricacies work, and measuring these so they can be accurately entered into a model such as Overseer from which greenhouse gas emissions will be determined for each property, will be a challenge for rural professionals working in the environmental space in the future. All of this, of course, depends on what the politicians decide what is and what isn't to be included in on-farm greenhouse gas inventories.

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