Soil & Health Association (Est. 1941)
Healthy Soil, Healthy Food, Healthy People

SUBMISSION TO HE POU A RANGI/THE CLIMATE CHANGE COMMISSION

28 MARCH 2021

Introduction

The Soil & Health Association (Soil & Health) is the largest membership organisation supporting organic food and farming in New Zealand and one of the oldest organic organisations in the world, established in 1941. The Association receives no government nor other official support, nor is it sponsored or supported by any commercial organisation, political party, religion or other vested interest. Soil & Health is the owner of BioGro NZ Ltd., New Zealand's largest organic certifier.

With every year that passes the vision of Soil & Health of an organic New Zealand becomes more relevant, more imperative, and in fact, more mainstream. The maxim of the organisation is "Healthy Soil – Healthy Food – Healthy People/Oranga Nuku – Oranga Kai – Oranga Tāngata". This extends into the sphere of climate change, as healthy, living soil is potentially the most important carbon sink our planet has. Organic and regenerative production methods, which maximise the accumulation of soil organic matter, are key to sequestering atmospheric carbon and keeping global warming within 1.5ºC.

General comment

In general we support the spirit of this first Climate Change Commission (CCC) report, but we want strong and decisive action, and we want it more quickly than the report recommends. We think that the Commission's proposed budgets need to be substantially enhanced to create greater emissions reductions over the next decade, to better align with efforts to keep global warming to 1.5 degrees. The solutions lie before us, and we cannot delay any longer.

Giving effect to the Treaty partnership

The Executive Summary states that:

> *'to give effect to the Treaty Partnership, central and local government need to acknowledge iwi/Māori rights to exercise rangatiratanga and kaitiakitanga in a joint plan to reduce emissions.'*

Soil & Health agrees, but we were unable to identify any structure recommended by the Commission to ensure that this happens. In our view the Commission needs to make clear recommendations to government on the structures required to give effect to the partnership inherent in Te Tiriti o Waitangi and this should be a thread through all the recommendations.

Soil & Health Association (Est. 1941)
Healthy Soil, Healthy Food, Healthy People

Scope of our submission

The CCC has acknowledged that Aotearoa does not need to rely on future technologies to take action to reduce emissions now, but can use present-day techniques to great effect. A current technique that has not received enough attention in the CCC report is organic regenerative agriculture. Nowhere in the report is the word "organic" used, and the proven track record of organic primary producers in NZ has not been acknowledged. This may have been deliberate, or it may have been because the organic sector has always lacked government research and development backing. Our submission focuses on the contribution that reform of agricultural practice in the direction of organic could make.

The CCC report acknowledges that horticulture and arable farming make up only a small amount of our agricultural emissions, and that reductions in those areas can be best achieved by reduced nitrous oxide emissions through lower and better nitrogen (N) inputs. The organic approach uses plants to fix N into the soil, has lower natural N inputs and uses no synthetic N inputs, so it matches exactly what we need to do.

We know that the 90% of NZ's agricultural emissions come from livestock farming, so we will focus our comments on the benefits of organic livestock farming in our submission. Conversion of farms from conventional to organic affords the opportunity of reducing stock numbers while increasing profitability due to demand and market premiums. We believe the international and domestic markets for organics are still very strong, and growing, and we assume this will be confirmed by the OANZ Organic Market Report which is due to come out in April 2021.

Organic Regenerative Agriculture (ORA) – What it means

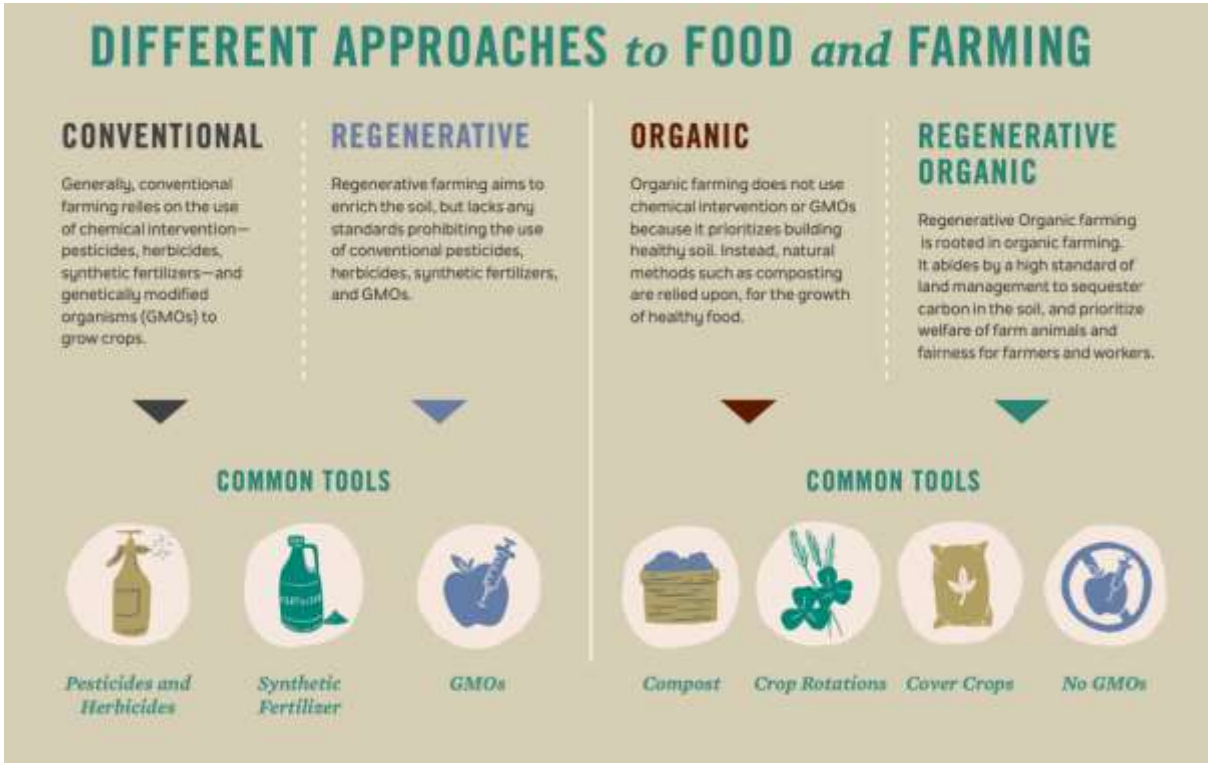
In recent times in New Zealand there has been widespread advocacy for 'regenerative agriculture' as a solution for the climate crisis. Rodale Institute in the USA originally coined the term 'regenerative organic agriculture' in the early 1980s and remains a key institution globally in the research and dissemination of related information. https://rodaleinstitute.org/. At Soil & Health, we prefer to refer to it as 'organic regenerative agriculture', with the acronym ORA, which also has the Māori meaning of well-being, health and life.

The number one priority in organic regenerative agriculture is soil health. Soil health is intrinsically linked to the total health of our food system, and it affects everything from plant health to human wellbeing and the future of our planet.

The following diagram from the Rodale Institute helps to distinguish where regenerative and organic overlap:

Soil & Health Association (Est. 1941)

Healthy Soil, Healthy Food, Healthy People



Soil & Health sees 'regenerative agriculture' as being the best practice within 'organic agriculture'.

Best practice in organics = organic regenerative agriculture

Regenerative agriculture is being embraced overseas, particularly by pastoral farmers in North America and Australia, but is still not widely practiced here. We know that only about 1% of our agricultural land is in the 'certified organic' category, but it is hard to say how much additional land could be classed as 'regenerative' because there is no formal register.

However people choose to define it, there is one thing that organic and regenerative farmers can agree on: continual improvement of soil health is the key aim.

Organic regenerative agriculture (ORA) has a greater potential for mitigating climate change than conventional agriculture, due to its greater ability to reduce emissions of greenhouse gases (GHGs), and its greater carbon sequestration in soils (Goh 2011). Many farming practices commonly adopted in ORA such as rotation with leguminous crops, minimal or no tillage, and the return of crop residues to soil favour the reduction of GHGs and the enhancement of soil carbon sequestration.

How can we determine which are the best practices for sequestering carbon within organic systems?

A very recent study directed by the University of Maryland in collaboration with The Organic Center (Crystal-Ornelas et al. 2021) analysed over 4,000 scientific articles to quantify the soil carbon-building techniques that organic farmers use, and to identify the best strategies for carbon sequestration. The results of this meta-analysis show that by adopting certain best management practices, organic growers can increase microbial biomass carbon by an average of 30 percent and

soil organic carbon by an average of 18 percent above the normal carbon storage for organic farms. Using organic amendments (such as compost) is one of the most impactful strategies to quickly replenish carbon back into the soil, and practices such as conservation tillage and cover cropping are also important. The authors concluded that worldwide, more work is still needed to pinpoint specific practices that will maximise soil organic carbon capture in organic systems.

In New Zealand the discussion around what value ORA can contribute to our economy and to our emissions reduction goals has often been reduced to conjecture and ideology, because we do not have well-funded institutional research into this area. There has been some research conducted by parts of some scientific institutions, but it has generally not been consistently funded, and has often faded into the background. At the present time there is widespread interest in regenerative agriculture from farmers who are conducting their own trial and error research, with anecdotal results spread in farmer-led events, by word of mouth, on the internet or via NGO webinars.

For this reason Soil & Health welcomes the Grelet and Lang et al. (2021) white paper on regenerative agriculture that has just come out. It provides a scientific framework for guiding regenerative agriculture research in New Zealand. A quote from this report:

> *"One of RA's distinguishing features is the holistic pursuit of continuous improvement, not only on environmental but also on social, economic, and cultural outcomes, both within and beyond the farm gate."*

We would like to see the CCC recommending to government to increase its focus on organic regenerative research, and to give it the same weight as the agri-tech approaches.

The role of agricultural soils in capturing soil organic carbon

As the CCC well knows, agricultural emissions make up almost half of NZ's greenhouse gas emissions. These emissions grew 17.1% between 1990 and 2018 (MfE 2020), largely due to an 87% increase in the national dairy herd (Stats NZ 2019) and a more than 6.7-fold increase in nitrogen-containing fertiliser (MfE 2020). Synthetic fertiliser use is out of control in this country. Its use needs to be sharply reduced within the few years, on a pathway to complete elimination from our farming systems.

Eighty percent of the organic part of the climate Earth's terrestrial carbon is stored in soils, and while agriculture is one of the main causes of carbon depletion in the soil and increased carbon dioxide gas in our atmosphere, a number of studies suggest that organic practices actually increase the carbon pool in our soils while reducing greenhouse gas emissions – making change solution.

Recent peer-reviewed science from the U.S. (Ghabbour et al. 2017) confirms that organic farms not only store more soil carbon in general, but they also store more of the type of carbon that stays in the ground for longer periods of time (humic acids).

Regenerative soil consultant Phyllis Tichinin estimates that between 1 and 3 tonnes of carbon could be sequestered per hectare of NZ pasture per year. A conservative amount of 1.5 t C/ha/yr would pull 61.1 Mt CO2-e out of the atmosphere. Our 2018 net emissions were 55.5 Mt CO2-e. This means that the pastoral sector alone could help NZ achieve carbon neutrality quickly.

The science of using agricultural soils to capture atmospheric carbon is still not well developed in NZ. McNally et al. (2017) looked into the carbon sequestration potential of different types of agricultural soils, concluding that 'Brown soils' had the largest capacity to sequester C with an estimated 50.9 Mt C able to be stored, as these soils covered the largest land area under high producing grassland in New Zealand (2.7 M ha). Overall, they estimate that NZ's soils could store a total of 124 Mt C. In response to the need to benchmark soil carbon, in 2020 Landcare Research – Manaaki Whenua commenced a detailed soil carbon monitoring study across 500 sites in NZ[1]. Unfortunately this study is stratified by land use (orchards, arable, drystock, dairy etc.), but not by management type (conventional vs. organic), so it will be not be possible to compare how management affects soil carbon over time. This is an example of how we are failing to design the types of research that we need, and which would support decision-making about best practice. Soil & Health recommends that this study be amended to include a comparison between conventional and organic.

Due to the lack of overall focus that it receives nationally, we think that the carbon sequestration potential that lies in organic regenerative agriculture has escaped the full attention of the Climate Change Commission.

Organic dairy is win-win: better for the environment and more profitable

We know from NZ data that stocking rates on organic dairy farms are typically lower than on conventional farms, because they rely on pasture only, without supplementary palm kernel. We have data from the Organic Dairy Hub (a North Island collective of around 30 dairy farms) of between 1.8 to 2.5 cows per hectare. Compare that with 3-4 cows per hectare on conventional farms. This represents 15% to 45% lower cow numbers on organic farms, which we can assume would translate to at least 10% lower methane emissions, probably greater.

Data from a 10 year organic vs. conventional dairy farm trial at Massey University (Shadbolt et al. 2011) show that grass growth and milk solids production are usually slightly lower on organic farms, but they leach a lot less nitrogen from soils than conventional dairy farms, largely due to lack of synthetic N addition. In the final year of the study, organic cows produced 2% higher milk solids/kg, but due to the lower stocking rate, the production on the organic farm overall was 7% lower than for the conventional farm. Despite this lower production, the organic dairy farm was 15% more profitable due to the premium offered for organic milk products and the lower operating costs.

NZ should be moving towards low input, low intensity dairying which maximises sustainability over production. Organic regenerative dairying systems fit this goal.

Organic systems are more climate change resilient

Another potent argument for the NZ government to support and promote the widespread adoption of organic regenerative farming systems in NZ is that they appear to have greater adaptive potential than many conventional systems, and organic production outperforms conventional under difficult

[1] https://www.landcareresearch.co.nz/news/a-new-national-soil-carbon-monitoring-system-for-agricultural-land/

weather conditions (McRae 2009). As we know, the climate crisis is one in which weather extremes will increase, and we need the protective buffer of higher soil organic matter, better soil structure and water-holding capacity, and better soil coverage that organic agri-systems provide.

We need to research and consider natural solutions

The "techniques"[2] and the "technologies"[3] for reducing agricultural emissions referenced in the CCC report, from NZARC funded work, leave out research into some recognised methods of organic regenerative agricultural practice, such as high diversity, multi-species pasture mixes which have the potential to be more N efficient (no or little N inputs needed), reduce nitrous oxide emissions, reduce nitrate leaching, and lower methane emissions.

For example, DairyNZ studies have shown that that milk production on dairy farms with mixed species pastures was equal to that of farms with the conventional two species (ryegrass and white clover), yet the mixed pasture farms offered better forage in summer, and were therefore less risky and more stable (Woodward et al. 2013). Also, cows on mixed pastures convert more of the N in the grass they eat into milk, which means lower N leaching from urine patches, and therefore lower nitrous oxide emissions (Woodward et al. 2012).

The CCC report focuses instead on some new and risky biological introductions, for example genetically engineered (GE) ryegrass. Soil & Health is wary of and opposed to "silver bullet"-type solutions that involve genetic engineering, because of potential unintended consequences of genetically modified organism (GMO) releases. Also, New Zealand stands to lose its internationally recognised GE free status, which would harm our overseas market potential. It makes economic and environmental sense to explore and evaluate all natural options for GHG emissions reductions in pastoral systems. We support holistic thinking and a precautionary approach, therefore we oppose GM/GE technologies being used in our open environments.

In a recent MBIE report referenced by the CCC[4], "genetically synthesised foods" have been presented as a potential competition threat to our NZ-based agriculturally produced foods. Soil & Health acknowledges this market threat and suggests that conventional products will not be sufficient to counter it. We need, instead, to focus on the market for certified organic regenerative food, which is ethically-grown with respect for te ao Māori.

Farmers need independent advice and support

One of the major barriers to adopting best practice in farming in New Zealand is that farmers have often obtained management advice and support from agri-chemical and fertiliser companies, because there is an absence of good, independent advice available. This is perhaps why the huge interest in regenerative farming has been largely led by farmers and grassroots organisations that do

[2] https://www.mpi.govt.nz/dmsdocument/32158-berg-current-mitigaiton-potential-final
[3] https://www.nzagrc.org.nz/strategic-documents.html
[4] https://www.mbie.govt.nz/dmsdocument/11572-growing-innovative-industries-in-new-zealand-agritech-industry-transformation-plan-july-2020-pdf

not have a vested financial interest in selling products. Farmers are waking up to the fact that the constant addition of more inputs has led to the long-term degradation of the land and water. Soil & Health recommends that organic, regenerative farmer extension services become a general offering to the primary production sector, and that this advice be free from vested interests, funded by the government as part of the support offered to farmers as they move away from current intensive practices.

Localisation of the food system within Aotearoa

The recommendations in the report do not address the system design problem we have in Aotearoa with much of our food being produced far from where it is consumed. The recommendations need to address the overlapping areas of transport and agriculture. Many communities are not "food secure"; they are dependent on trucking of produce and supplies from outside regional borders. The transport recommendations state: "There needs to be much more walking, cycling and use of public and shared transport." Along with this there needs to be much more production of food local to where people live, so that transportation of food can be minimised and freshness and nutritional value of food can be maximised. This also minimises storage, especially energy intensive forms, like cool-storage. The solution here is smaller farms, dealing directly with consumers, i.e. community supported agriculture. We are referring to the slow food revolution, to farmers' markets, to the empowerment of local communities, marae and whānau to feed themselves and efficiently distribute food to others nearby. Small farms can be more profitable when using organic regenerative techniques and minimising inputs from long distances. Small, organic and local all fit together well in a new imagining of Aotearoa New Zealand's food system.

Let us put organic front and centre, like Europe

Europe has just launched an ambitious Farm to Fork strategy as part of the European Green Deal 2019-2024, striving to be the first climate-neutral continent. In this strategy organic agriculture is a centrepiece in tackling the climate crisis[5]. The list of 2030 European agriculture targets are clear, succinct and all moving in the direction of organic. The European Commission will:

- take action to reduce the use and risk of chemical and more hazardous pesticides by 50%
- act to reduce nutrient losses by at least 50%, while ensuring no deterioration on soil fertility, and to reduce [synthetic] fertilizer use by at least 20%
- reduce the sale of antimicrobials for farmed animals and in aquaculture by 50%.
- help the EU's organic farming sector to grow, with the goal of 25% of total farmland being used for organic farming by 2030.

[5] https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/actions-being-taken-eu/farm-fork_en#:~:text=2030%20targets&text=Organic%20farming%20is%20an%20environmentally,for%20organic%20farming%20by%202030.

We find it therefore very surprising that the CCC advice to the government makes no mention of organic farming and we wish to reiterate that it should be a cornerstone of the new agricultural policy for Aotearoa New Zealand.

Other co-benefits of moving quickly to organic regenerative agriculture

Human health co-benefits include:

- a better diet for New Zealanders,
- better water quality for human health (e.g. lower nitrate pollution)
- fewer health problems in farmers and livestock (e.g. due to less exposure to toxins in herbicides, fungicides, pesticides)
- more employment in physically active professions, such as horticulture and organic livestock farming
- better social cohesion because people are connected directly with those who grow their food

Land/water co-benefits:

- Greater riparian protection and no synthetic fertilisers leading to better water quality
- Greater wetland protection
- Increased biodiversity
- Reduced erosion due to enhanced soil structure

Conclusion

We thank you for the opportunity to submit and we urge you to recommend to the NZ government an authentic change of direction in its agricultural policy towards organic regenerative agriculture. This would mean quite a large change from where the primary production sector is currently, with difficult transitions and hard choices to be made. However it is what is needed.

> *"We cannot solve our problems with the same thinking we used when we created them."*
>
> - *Albert Einstein*

References:

Crystal-Ornelas R., Thapa R., Tully K. L. 2021. Soil organic carbon is affected by organic amendments, conservation tillage, and cover cropping in organic farming systems: A meta-analysis, *Agriculture, Ecosystems & Environment*, Volume 312, 2021, 107356, ISSN 0167-8809, https://doi.org/10.1016/j.agee.2021.107356.

Ghabbour EA, Davies G, Misiewicz T, Alami RA, Askounis EM, Cuozzo NP, Filice AJ, Haskell JM, Moy AK, Roach AC, Shade J, Chapter One - National Comparison of the Total and Sequestered Organic Matter Contents of Conventional and Organic Farm Soils, Editor(s): Donald L. Sparks, Advances in

Agronomy, Academic Press, Volume 146, 2017, Pages 1-35, ISSN 0065-2113, ISBN 9780128124154, https://doi.org/10.1016/bs.agron.2017.07.003

Goh KM. 2011. Greater Mitigation of Climate Change by Organic than Conventional Agriculture: A Review. *Biological Agriculture and Horticulture*, 2011, Vol. 27, pp. 205–230.

Grelet G, Lang S et al. 2021. Regenerative agriculture in Aotearoa New Zealand– research pathways to build science-based evidence and national narratives. New Zealand National Science Challenge Our Land and Water, The NEXT Foundation, Manaaki Whenua – Landcare Research. https://ourlandandwater.nz/wp-content/uploads/2021/02/Grelet_Lang_Feb-2021_Regen_Ag_NZ_White_ePaper.pdf

Macrae R. 2009. Comparing energy use and GHG mitigation potentials in organic vs. conventional farming systems. Discussion paper for the Organic Agriculture Centre of Canada, Truro, NS.

McNally SR, Beare MH, Curtin D, et al. Soil carbon sequestration potential of permanent pasture and continuous cropping soils in New Zealand. *Glob Change Biol.* 2017; 23:4544–4555. https://doi.org/10.1111/gcb.13720

Ministry for the Environment. 2020. New Zealand's greenhouse gas inventory: 1990—2018. Ministry for the Environment. https://www.mfe.govt.nz/sites/default/files/media/Climate%20Change/new-zealands-greenhouse-gas-inventory-1990-2018-vol-1.pdf

Shadbolt N., Thatcher A., Horne D., Kemp P., Harrington K., Palmer A., Martin N.. June 2011. Massey University Organic-Conventional Dairy Systems Trial: Report after the seventh season of full certification. https://www.massey.ac.nz/massey/fms/DCRU10/Annual%20Reports/DairyNZ%20Report%20June%2011.pdf

Statistics New Zealand. 2019 https://www.stats.govt.nz/news/dairy-cattle-numbers-dip-again

Woodward SL, Waugh CD, Roach CG, Fynn D, Phillips J. 2013. Are diverse species mixtures better pastures for dairy farming? Proceedings of the New Zealand Grassland Association 75: 79-84 (2013).

Woodward SL, Waghorn GC, Bryant MA, Benton A. 2012. Can diverse pasture mixtures reduce nitrogen losses? Proceedings of the 5th Australasian Dairy Science Symposium. pp. 463-464.