Our Land & Water, 12th August 2019

The New Zealand Institute for Plant & Food Research Limited

New Zealand's Future Landscapes: What's Possible, What's the Impact, & What's Holding us Back?

Brent Clothier & friends

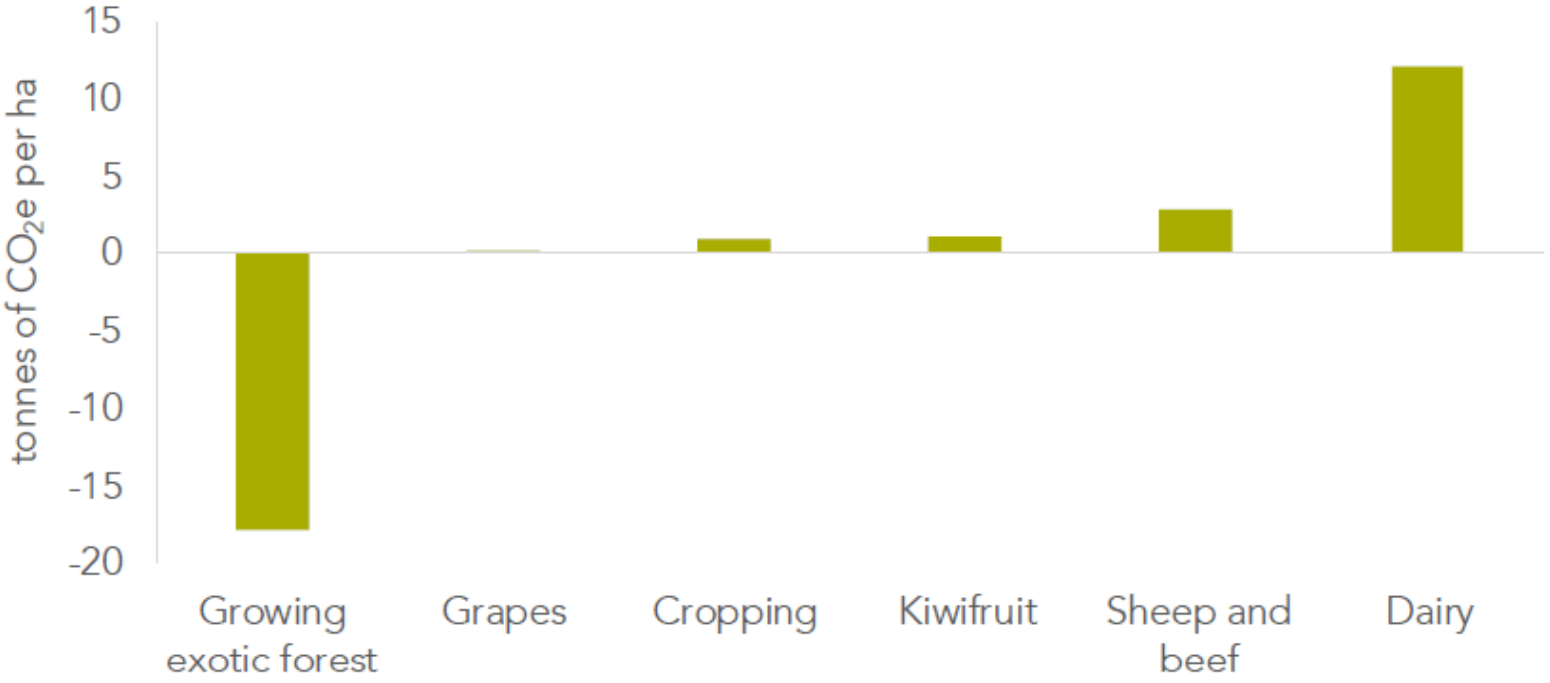
The Productivity Commission on …

"Growth in horticulture will play a significant role in reducing agricultural emissions"

"A well-designed and stable Emissions Trading Scheme (ETS) will incentivise land-use change"

Agricultural Greenhouse Gas Emissions

Figure 11-1 Indicative yearly biological emissions per hectare from different land uses

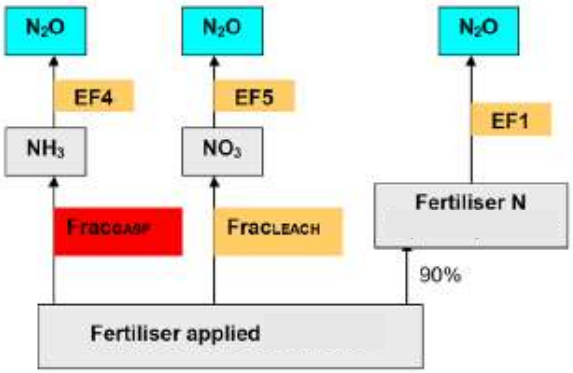


Source: Clothier et al. (2017); Reisinger et al. (2017); Tate et al. (1997).

The Productivity Commission Recommends …

R11.2 Agricultural nitrous oxide emissions should be fully included in the New Zealand Emissions Trading Scheme (NZ ETS). Agricultural methane emissions should be fully included in the NZ ETS if that is the option recommended by the Interim Climate Change Committee in its report to Government due at the end of April 2019.

Direct & Indirect N_2O Emissions from Fertiliser



N_2O Emissions from Prunings

$$N_2O_{direct\ crop\ residue\text{-}N} = TRG_N \times EF_1 \times 44 / 28 \times 10^6$$

TRG_N = Total amount of nitrogen returned to soils from crop residue.

	Kiwifruit	Apples	Grapes
Fertiliser N [kg-N ha^{-1} y^{-1}]	130	40	5
Pruning N [kg-N ha^{-1} y^{-1}]	70	105	30
Biological Emissions [T $CO_{2\text{-}e}$ ha^{-1} y^{-1}]	1.03	0.71	0.17

Profitability (EBIT) of Horticulture.

Kiwifruit: Green \$15-18,000 ha^{-1} Gold ≈ \$50,000 ha^{-1}

Grapes: \$6–10,000 ha^{-1}

Apples: \$15-20,000 ha^{-1}

Let's say for a heuristic exercise that …

… the average EBIT for horticulture is **\$10,000 ha^{-1}**

What's the impact of a putative \$50 $T_{CO2\text{-}e}$ price on horticultural EBIT?

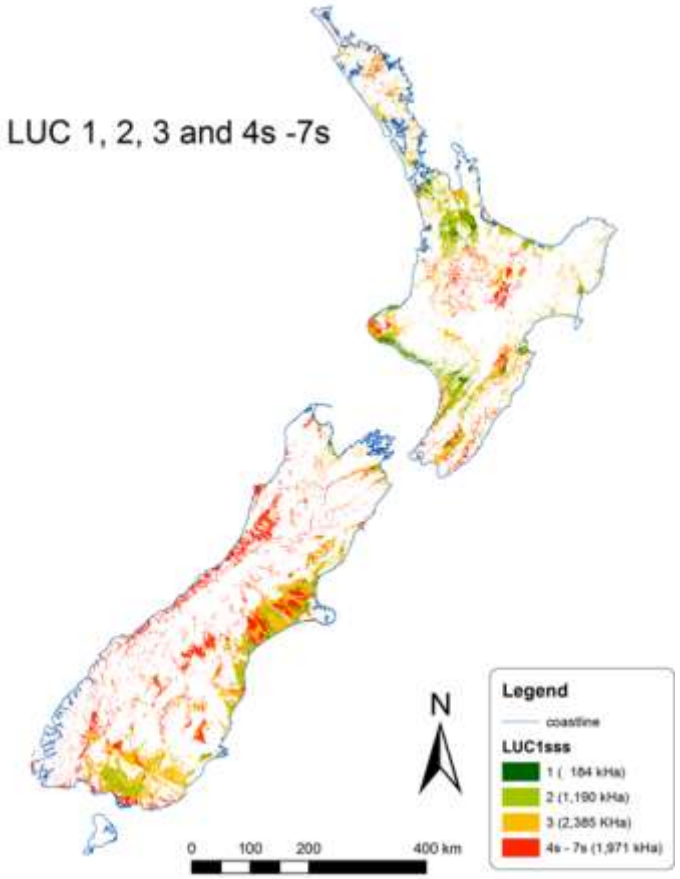
	Biological GHG Emissions [T $CO_{2\text{-}e}$ ha^{-1}]	Areal Cost @ \$50 T $CO_{2\text{-}e}$ [\$ ha^{-1}]	EBIT [\$ ha^{-1}]	**Carbon cost/EBIT [%]**
Kiwifruit	1.03	51.50	10,000	0.51%
Apples	0.71	35.50	10,000	0.36%
Grapes	0.17	8.50	10,000	0.09%

Few risks, it would seem, from the Zero Carbon Bill …

…. & an effective ETS.

Where are the Natural Capital Assets that could support Horticulture?

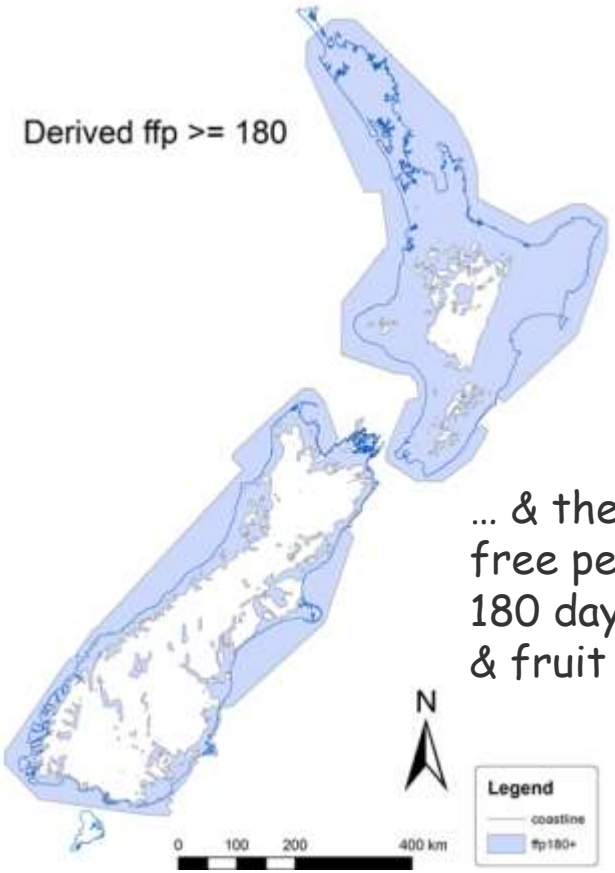
Horticulture requires 'flat' land (<5°)



… and relies on the better Land Use Capability (LUC) classes

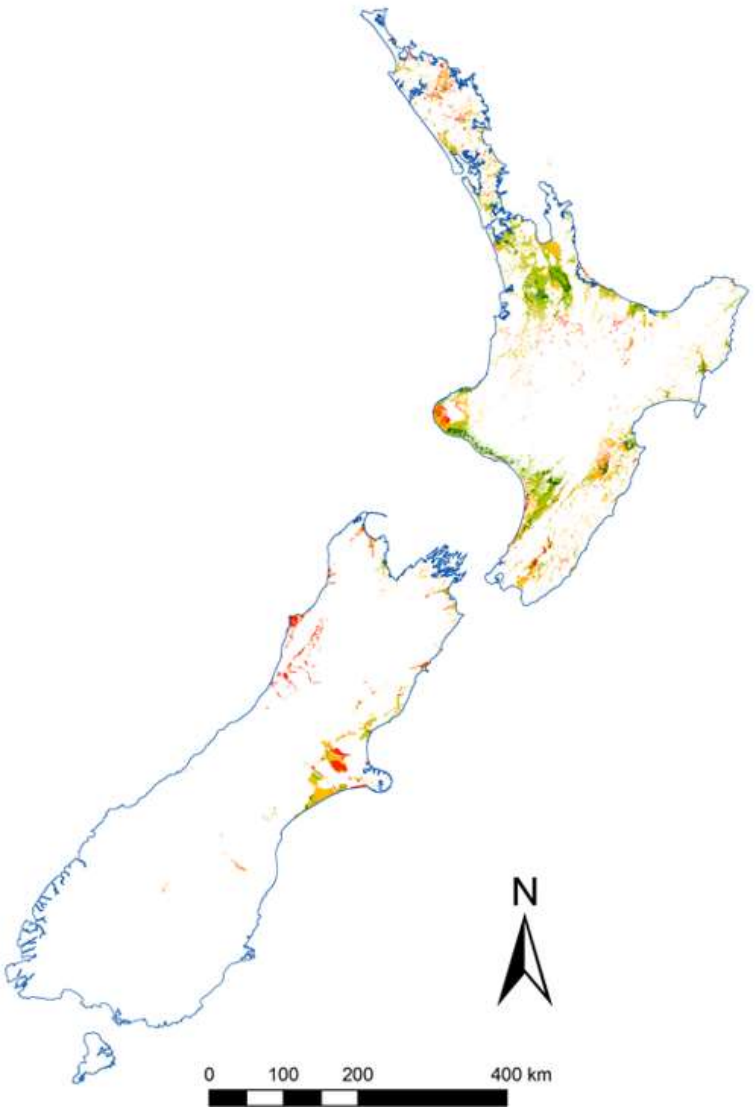
Horticulture Requires an Equable Climate

For fruit maturation, growing degree days (base 10) GDD_{10} should exceed 800



… & there should be a frost-free period (ffp) of over 180 days to enable flowering & fruit maturation

The Intersection is the Potential Area for Horticulture in the Future

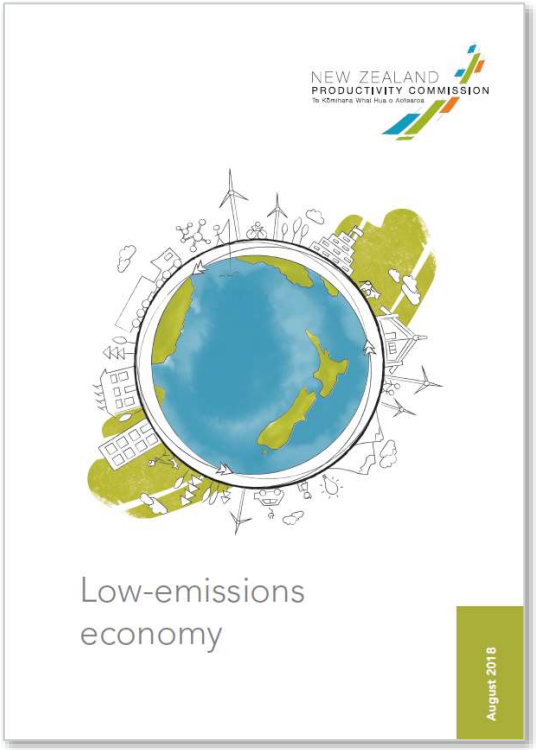


LUC 1, 2, 3 & 4s-7s
Slope < 5 °
GDD_{10} > 800 degree days
FFP > 180 days

In sum, that's 2,097,000 ha.

That's over 17 times the current horticultural area.

Barriers to Land-Use Change



Box 10.1

Ample land is available that is biophysically suitable for horticulture, though economic suitability would depend on a combination of commodity prices, water resources, market capacity, and availability of skills. (Clothier et al. 2017)

[&] … Lack of information was a barrier for Maori landowners changing (Tanira Kingi).

Some questions for starters …

- Why do New Zealand's landscapes look like they do?
- What are the barriers to land-use change?
- What might New Zealand's landscapes look like in the future?
- What new knowledge is needed to understand land-use changes?
- What will be the impacts on NZ's terms-of-trade, farm profitabilities, water quantity, water quality, GHG emissions, & climate-change mitigations?