Action on agricultural emissions

Technical appendix 6

Distributional impacts of agricultural climate change policy

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1. Purpose

This Technical Appendix summarises evidence, including results from commissioned reports, on potential distributional impacts of agricultural climate change policy, with a specific focus on potential land-use changes resulting from price signals for carbon sequestration in forests and on agricultural greenhouse gases.

2. Concerns and evidence regarding rural transformational changes

The Committee heard frequent concerns that addressing agricultural greenhouse gases could have wide-ranging negative impacts on rural communities. This is because costs imposed on farmers and/or land-owners would not necessarily be borne by farmers but could trickle down into the wider community through a variety of mechanisms including:

- reduction in spending by farmers on the businesses that service ruminant livestock farming
- lower profits resulting in a reduced ability to service debt, and lower land-values reducing the ability of farmers to raise capital for improvements, or support retirement
- reduced employment, resulting in reduced incomes across the community while raising stress and mental health issues in family farm operations and rural businesses

Potential flow-on effects of those changes include an overall population reduction especially in smaller communities that offer limited alternative employment, and a change in demographics. This can in turn affect the presence of key social institutions such as schools, community facilities and sports clubs. Changes of land-ownership can offer opportunities for farm system changes, but if they erode the social capital represented by established families within small communities, this can also reduce the broader social networks and the ability of communities to deal with stress and change.

These concerns arise particularly where climate change policies could result in land-use change from livestock farming, particularly sheep and beef farms, to scrub and forestry. Forestry offers lower average employment than the average sheep and beef farm per hectare, and new employment tends to be concentrated in places where forest contractors are located, which may not coincide with the location of new forest plantings. Also, the nature of work involved in each sector means that employment is not necessarily substitutable between agriculture and forestry.

More recently, a report by the Parliamentary Commissioner for the Environment broadened concerns about landscape transformations that could occur because of climate change policies, particularly if rising carbon prices lead to unconstrained expansion of the forest sector.[1]

[1] PCE 2019: Farms, forests, and fossil fuels: the next great landscape transformation? Parliamentary Commissioner for the Environment, Wellington. pp189.

The Committee sought to better understand the risk that climate change policies addressing agricultural emissions could result in significant negative impacts on rural communities. It did so by commissioning two reports, one a qualitative review and scoping of social impacts,[2] and one a quantitative study that sought to clarify the scale and location of land-use changes, their correlation with key socio-economic indicators, and their potential impacts on employment.[3]

A review by Taylor (2019) suggests that many of the concerns about the negative impacts of the imposition of additional costs on farmers and consequent land-use changes reflect the experience of rural restructuring in the 1980s. This included rapid cuts to the Supplementary Minimum Price scheme (SMP) and other support programmes for farmers, restructuring of the forestry sector and regulations stopping the harvesting of native timber, and floating of the exchange rate – which led initially to a sharp appreciation thereby harming exporters – combined with broader changes to government provided services.

The wholesale nature and rapid pace of change during the 1980s highlights the potential negative consequences of climate policies if such policies were ramped up equally rapidly. Some of those consequences could be avoided by more nuanced and adaptive policies along with rural and community support programmes.

The review also identifies areas of opportunities and sources of strength and resilience during transformations. These include:

- diversity in land-uses, businesses and incomes ("multi-functionalism") can increase the resilience of families and communities to shocks and support adaptive change management
- strong social and cultural capital in rural communities, which does not necessarily have to rely on traditional families and values as it can also grow through increasing social diversity.

[2] Taylor, N 2019: Potential impacts of price-based climate policies on rural people and communities: a review and scoping of issues for social impact assessment. Report by Nick Taylor and Associates for the Interim Climate Change Committee, Wellington, pp26.

[3] Riggs, Bruce-Brand, Perilla Bohórquez, and Timar 2019: Potential social impacts of land-use changes, 2020-2050. Report by Motu Economic and Social Policy for the Interim Climate Change Committee, Wellington, pp49.

3. Understanding the scale and location of land-use changes

The Committee requested Motu to provide it with detail regarding the scale and location of land-use change that would be expected to occur under policies that either expose only carbon sequestration in forests, or both forests and agriculture to emissions prices. Different assumptions for a possible diversification of high-quality land into horticulture were also evaluated (for detailed results, including key assumptions and limitations, see report and high-resolution maps by Riggs et al 2019).

Several key messages stand out from this analysis:

- The dominant potential land-use changes would be from sheep/beef to scrub/forestry (and from scrub to forestry) and, if development of skills, markets and supply chains enable it, from dairy to horticulture. The pressure on land-use change is illustrated in Figure 1. Actual land-use change would depend on social, environmental and cultural preferences as well as barriers to land-use change that are not captured within the model.[4]
- While the amount of modelled land-use change is substantial, most land used currently for livestock farming would not change use even when exposed to the full cost of emissions.[5]
- The results from the model suggest that non-horticultural land-use change will not be concentrated in a single area or region; the pressure will be spread very broadly across the country. However, land-use change can be more significant and systemic at smaller geographical scales, even at the community level in some locations.
- Most of the land-use change from sheep/beef farming towards scrub/forestry simulated by the model occurs because of the increasing price incentive for forestry, not because of the price imposed on agricultural emitters. This is even when free allocation for agricultural emitters is phased out entirely by 2050. However, planting additional forests on former pasture land results in a significant additional reduction of net emissions. See Figure 2.
- The diversification of 1 million ha of current livestock (mostly dairy) land into horticulture assumes that such an expansion is indeed possible. There is evidence that horticulture expansion is bio-climatically feasible and that it can be profitable in principle. However, there are numerous market and other barriers to expanding horticulture that are not captured by the model and that would need to be overcome to make this a reality.[6]

The geographically diverse spread of modelled land-use change means that the impacts on rural communities is also likely to be variable, reflecting regional and local differences in communities exposed to land-use change pressures.

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[4] See also Dorner, Djanibekov, Soliman, Stroombergen, Kerr, Fleming, Cortes-Acosta, and Greenhalgh 2018: Land-use Change as a Mitigation Option for Climate Change. Report to the Biological Emissions Reference Group (Project No. 18398). Motu Economic and Public Policy Research, Wellington, pp86

[5] For example, the model predicts that sheep/beef land reduces by about 17% in the national total, meaning that 83% of current sheep/beef land would not change land-use. Note, however, that this may be a conservative estimate because the model is unable to capture the potential for cascading social effects and individual decisions that could accelerate land-use change in practice, especially at higher emissions prices and exposure to full costs.

[6] See Riggs et al (2019), also Clothier, Müller, Hall, Thomas, van den Dijssel, Beare, Mason, Green, George 2017: Futures for New Zealand's arable and horticultural industries in relation to their land area, productivity, profitability, greenhouse gas emissions and mitigations. Report prepared for NZAGRC. NZAGRC, Palmerston North, pp66; and Journeaux, van Reenen, Manjala, Pike, Hanmore, Millar 2017: Analysis of drivers and barriers to land use change. Report prepared for Ministry for Primary Industries. MPI, Wellington, pp90.

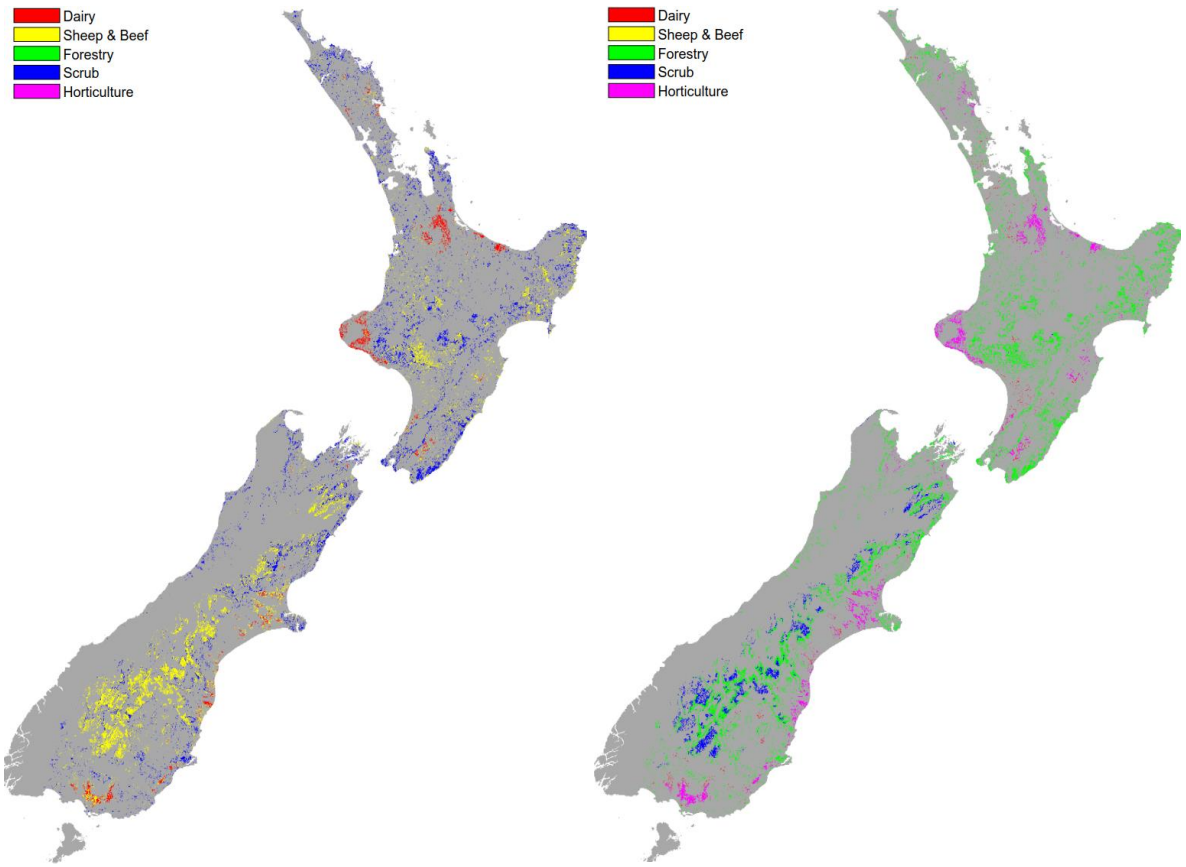

Figure 1. *Maps showing the modelled incentive to change away from a current land use (left), and changes into a new land-use (right), between 2020 and 2050, under a carbon price signal (for details, see text). Note that whether land-use change actually occurs will depend not only on economic incentives but also on whether barriers to change can be overcome as well as broader social and environmental preferences regarding land-use in different regions. Source: Riggs et al (2019).*

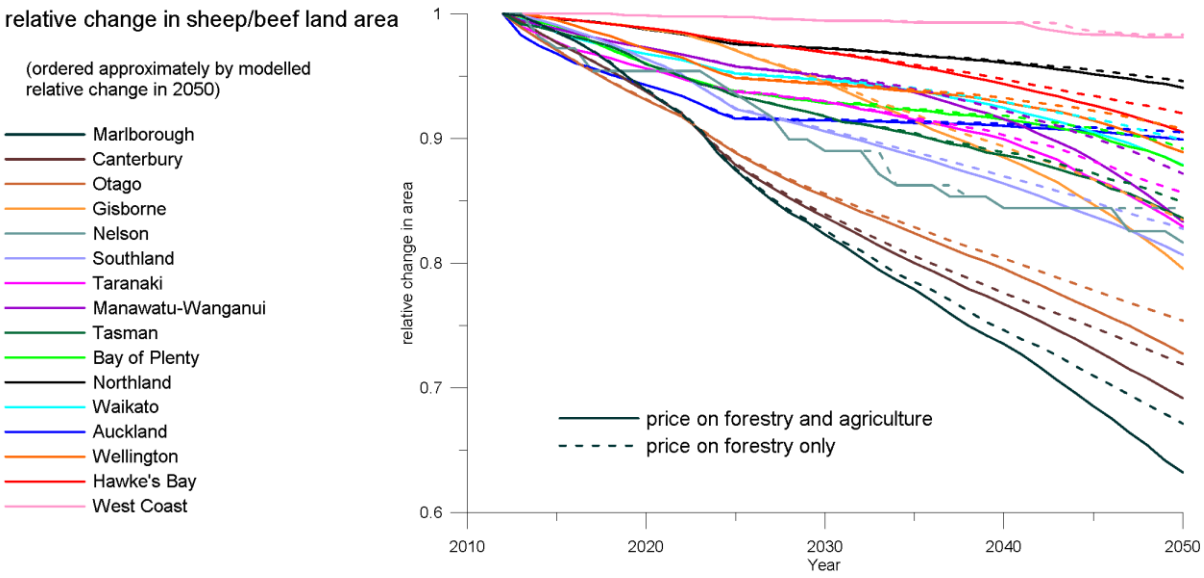

Figure 2. *Modelled relative regional changes in the area of sheep and beef land. Simulations include a price on both carbon sequestration in forests and agricultural greenhouse gas emissions (solid lines), and on carbon sequestration only (dashed lines). Adapted from Riggs et al (2019).*

4. Correlations of pressure points for land-use change with socio-economic characteristics

Overlaying modelled land-use change with current socio-economic characteristics reveals some key patterns:

- Areas predicted to experience land-use change in the South Island generally currently have low levels of deprivation. The picture is mixed in the North Island, with some areas having relatively low levels of deprivation (e.g. Wairarapa, Hawke's Bay, Waikato) but others high levels (e.g. Manawatu-Whanganui, East Cape, and the far North). In the latter regions, the locations expected to experience land-use change also tend to have higher rates of unemployment than the national average.
- Some of those areas with high social deprivation also have high percentages of the population identifying as Māori. Some of the modelled land-use change in the Manawatu-Whanganui, Central Plateau and Gisborne/East Cape is on Māori free-hold land. However, the modelled land-use change is based purely on econometric relationships and does not take Māori ownership and decision-making structures and goals into account.
- Land-use change is correlated with both ends of the distribution of land-values. The land that is modelled to convert from sheep/beef to forestry (and from scrub to forestry) tends to have lower than average value (less than about $5,000/ha). The land that is modelled to convert from dairy to horticulture is much more valuable land (more than about $18,000/ha). It was not possible within the time frames of this study to explore the potential impacts of emissions pricing on future changes in land values.
- Impacts on direct employment from land-use change are expected to be small at national level but could have more significant implications at regional and local scales.
    - The impact is expected to be positive if conversion of land into horticulture is feasible, due to the much higher employment rates per hectare of land. However, the seasonal nature of some horticultural work could result in other social pressures.
    - If land-use diversification into horticulture (or non-farming activities such as tourism and recreation) is not feasible, then the net impact on employment is modelled to be negative on average, based on the lower employment rates in forestry than in sheep and beef farming. However, the employment rates per hectare of extensive hill country will be significantly lower than that of more intensive sheep and beef production systems. It is mostly extensive hill country that is modelled to change land-use. Those more detailed employment changes could not be captured by the current model.
    - Even where employment losses from drystock farming numerically equal or are outweighed by employment gains in forestry, this does not necessarily mean that workers, skills and employment patterns could be transferred.
    - Flow-on impacts on employment in service industries and processing associated with specific sectors has not been investigated for this report. Impacts will vary across locations and will depend on the location of current and future processing operations.

Previous studies also indicated that net impacts on communities from losses of specific sources of employment depend on proximity to larger centres as well as the diversity of employment.[7] Hence the assessment reported here can only be considered indicative, as it shows the primary impact rather than the ability for subsequent adjustment.

From the perspective of iwi/Māori, a key challenge will be the availability of skilled or experienced employees to facilitate and support land-use change. This includes the need to find good local employees with the skills needed and willingness to fulfil the job, but for many managers and owners on farm, it may be that they too need to upskill and learn either a completely new field of farming or on farm practices to support their land use or practice change. Being able to teach new staff themselves may be a very real impediment, particularly through the transitional phases.[8]

Even though a shift towards horticulture would entail a significant increase in employment within the sector overall, there would be significant movement across and within industries. The availability of skilled workers in emerging markets will challenge Māori farming enterprises and whānau. Rural Māori tend to be less mobile as a workforce given connections to the land. Retraining is therefore even more essential, to enable re-employment within a changing local work environment rather than moving where their skills are needed.

5. Conclusions and recommendations

The analysis commissioned in support of this report and summarised in this technical appendix can only be viewed as the beginning of a more detailed analysis that is needed for a full understanding of the distributional impacts of land-based climate policies on rural communities (for possible recommendations and case study approaches, see Taylor 2019).

However, despite the preliminary nature of the analysis, the following conclusions can be made about the distributional impacts of the policy package recommended by the Committee overall:

- A price on agricultural emissions, especially at current emissions prices and with 95% free allocation, appears unlikely to be a key driver for rural land-use change or have major distributional impacts on rural communities. In any case, the main driver for land-use change, especially from sheep/beef or scrub land into forestry, seems to be the price reward for carbon sequestration by forests rather than the cost on agricultural emissions.[9]
- Any future decisions to revisit the level of free allocation to agriculture emitters should depend on additional work to better understand the likely consequences on rural land-values and profits, and to obtain a more nuanced understanding of the consequences for rural employment, demographics, social services and community resilience.

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7 See e.g. Grimes and Young 2009: Spatial effects of 'mill' closures: does distance matter? Motu Economic and Social Research, Wellington. pp59; and Taylor, N 2019: Potential impacts of price-based climate policies on rural people and communities: a review and scoping of issues for social impact assessment. Report by Nick Taylor and Associates for the Interim Climate Change Committee, Wellington, pp26.

8 Whetu Consultancy Group 2019: An analysis of impacts for Māori of proposed policy options for the Interim Climate Change Committee. ICCC, Wellington, pp135.

9 This relationship is derived from historical relationships. Additional research is needed to better understand how land use could change with shifts in profitability outside of those that previously been experienced.

- The preliminary analysis suggests that where relatively low-value sheep and beef land is converted into forestry, the absolute impact on employment may not be large. However, in some regions it could have a disproportionate impact on populations that already have lower than average employment levels and suffer higher levels of deprivation. Government should identify the communities and population groups most vulnerable to rural change in response to climate policies, and design programmes in conjunction with these communities to strengthen resilience and support diversification of land-based activities.
- The Government should undertake additional work to better understand the impacts that rising forestry carbon prices and increased forest plantings have on the well-being of rural communities and ecosystem services, including a focus on Māori whanau especially in remote communities. Targeted programmes should be designed to protect those who could be disproportionately negatively affected by such changes.

These high-level conclusions should in the Committee's view not stand in the way of implementing the policy package for agricultural greenhouse gases as outlined in the Committee's report. Rather, targeted monitoring of the effects of the initial implementation of a farm level policy on community wellbeing will gather crucial data to better understand, predict and manage future social impacts and maximise opportunities.

Outcomes from the recommended more detailed analysis would ensure that future land-use change is consistent with development aspirations of communities, and that landscapes can provide a broad range of ecosystem services. This would be consistent with the concerns expressed by the Parliamentary Commissioner for the Environment (PCE 2019).

Overall, this analysis also suggests that free allocation methods for agricultural emissions pricing of sheep and beef farmers should help manage the pace and scale of adjustment toward forests, at least until the consequences of more wide-spread land-use change are better understood.

The situation is different where land-use change could occur from dairy to horticulture because of the positive consequences for employment, provided that the effects of an increase in labour demand, its seasonality, and potential migration can be managed locally. Ensuring sufficient incentives for land-use change and support for experimentation with land-use diversification on high-quality land and development of the supply chains to support it would be desirable.