Estimating the impact of replacing the ETS with an Emissions Levy

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Background

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Executive Summary

The Green Party of Aotearoa New Zealand is considering a policy of replacing the current Emissions Trading Scheme (ETS) with a levy. Activities within the current ETS would be charged at the rate of $25 per tonne of carbon dioxide equivalent (CO_2-e). The levy would also have a slightly wider coverage than the current ETS by including Dairy farming, which would be subject to a levy at the rate of $12.50 per tonne of CO_2-e. Other parts of Agriculture would not be subject to the levy, but they would continue to have reporting obligations, as they do now.

The analysis in this report was designed to examine:

- What tax revenues might be raised from the levy.
- How the potential revenues from a levy could be used in a fiscally-neutral fashion to reduce the tax burden on households and/or businesses.
- How the profitability of businesses, particularly those in Dairy farming, might be affected by a possible reduction in corporate taxes alongside the imposition of a levy on emissions.
- Whether and to what extent households would be better off after the tax changes, allowing for the likelihood that the prices of consumer goods and services would change because of the imposition of the levy.

In reality, the imposition of an emissions levy would trigger an extremely complex set of reactions and outcomes that would be difficult and very time-consuming to model. BERL, therefore, opted for a simplified analysis that would result in a more transparent and comprehensible narrative, indicating how average households and average Dairy farms might be affected. The focus of the analysis was on three groups of consumer goods and services most likely to be affected by the imposition of a levy: Dairy products; Electricity; and, Petrol and diesel.

This simplified analysis indicates that households would be better off following the introduction of the levy, accompanied by income tax reductions designed to result in a fiscally neutral outcome.

The revenues from the levy would make it possible to make the first $2,000 of an individual's income tax free. Households would pay more for some of the commodities they consume, but the income tax reductions they would enjoy would more than compensate for any price rises. The average household's finances would improve by around 0.6% after the changes.

Summary of the effects of the levy and accompanying tax reductions on the average household (Annual changes. See body of report for underlying assumptions)

Increase in after tax income	$420
% increase	0.8%
Increase in cost of dairy, electricity and fuel	$101
% increase in cost	1.7%
Increase in income less increase in costs	$319
As % original post-tax income	0.6%

Dairy farming would, however, be adversely affected:

- The levy would add an estimated 2.0% to the working expenses of the average dairy farm.
- Combined with a one percentage point reduction in the company tax rate, the levy would reduce the post-tax profits of the average dairy farm by 12.5%.
- However, at the currently projected pay-out for milk solids, even dairy farms in the lowest decile would remain well above breakeven in the face of an emissions levy.

Other greenhouse gas-emitting industries are thought to be less likely to be affected by the introduction of a levy. This is largely because the principal industries in question (electricity and road fuels) are likely to be able to pass-on any production cost increases to households. The companies in these industries are also considered to be sufficiently large and sophisticated to maintain their profitability in the face of an emissions levy.

It is cautioned, however, that these findings should be regarded as indicative of the size and direction of the changes in selected key variables, rather than as precise forecasts.

Caveat

The analysis reported here was undertaken by BERL for the Green Party of Aotearoa New Zealand (the Greens). However, we emphasise that the report should not be taken to indicate endorsement of the possible policy change under consideration. Nor should it be taken to indicate support for any wider political standpoint.

In addition, while BERL designed the overall analytical approach, it was necessary to seek the Greens' guidance on a number of the modelling assumptions. We make it clear in what follows which particular assumptions we were invited to use and which we decided upon ourselves, using relevant evidence.

Contents

1 Introduction

1.1 Purpose and approach

The purpose of this report is to illustrate the potential impact on households and businesses of replacing the current Emissions Trading Scheme (ETS) with a levy, to be charged at the rate $12.50 per tonne of carbon dioxide equivalent (CO_2-e) for Dairy farms and $25 per tonne of CO_2-e for other activities that are already party of the ETS. Currently, Dairy farming, like other parts of the Agriculture sector, is exempt from the requirement to obtain and surrender ETS Units, although Agriculture does have reporting obligations. Agriculture and other activities that are currently exempt account for approximately half of greenhouse gas emissions.

The analysis that follows is designed to examine:

1. What tax revenues might be raised from the levy.
2. How the potential revenues from a levy could be used in a fiscally-neutral fashion to reduce the tax burden on households and/or businesses.
3. How the profitability of Dairy farming, might be affected by a possible reduction in corporate taxes alongside the imposition of a levy on emissions.
4. Whether and to what extent households would be better off after the tax changes, allowing for the likelihood that the prices of consumer goods and services would change because of the imposition of the levy.

In reality, the imposition of an emissions levy would trigger an extremely complex set of reactions and outcomes that would be difficult and very time-consuming to model. One approach would have been to use computable general equilibrium (CGE) modelling to indicate how the economy and its components might eventually settle following the various perturbations that would arise from the "shock" of imposing a levy.

However, it was considered that this would be too much of a "black box" approach that would not greatly assist an understanding of where and how the possible benefits and disbenefits of a levy might be felt. Instead a simplified analysis is presented that results in a more transparent and comprehensible narrative. The focus of the analysis is on three groups of consumer goods and services most likely to be affected by the imposition of a levy: Dairy products; Electricity; and, Petrol and diesel.

2 Potential revenues from the imposition of a levy

2.1 Current pattern of emissions

- Gross emissions in 2012 (i.e. not counting net removals by the forestry sector) were 73.3 million tonnes of CO_2-e. Net emissions, including the net removals by the forestry sector were 58.4 million tonnes of CO_2-e. (Table 1)
- During the last five year period, the trend in total emissions has been more-or-less flat. Emissions from Energy have been falling, but emissions from Agriculture have been increasing.

Table 1: Projections of emissions and removals by sector and by year

	Emissions & removals (millions of tonnes of CO_2 equivalent)					
	2008	**2009**	**2010**	**2011**	**2012**	% change 2008-2012
Energy (including Transport)	34.3	31.6	31.3	31.0	31.7	-7.6
Industrial processes & solvents	4.3	4.3	4.8	5.5	4.4	2.3
Agriculture	33.3	33.5	33.7	34.4	35.2	5.7
Waste	2.1	2.0	2.0	2.0	2.0	-4.8
Forestry						
Net removals	–15.3	–15.5	–15.9	–15.6	–14.9	
Deforestation	2.8	2.7	2.5	2.8	3.5	
Gross removals	–18.1	–18.2	–18.3	–18.4	–18.4	
Total	58.8	56.0	56.0	57.2	58.4	-0.7

Source: Ministry for the Environment[1].

- Within Energy, approximately 20% of emissions are from electricity generation and 42% are from transport[2] . Households consume approximately 35% of electricity generated in New Zealand[3]. Households also consume about 49% of the petrol and diesel used in road transport in New Zealand[4]. Together, these data imply that households are responsible for approximately 21% of energy-related greenhouse gas emissions.
- Within Agriculture, 43% of emissions are directly attributable to dairy farming. Most of the rest is attributable to beef and sheep farming (Table 2). However, it is noteworthy that

[1] http://www.mfe.govt.nz/publications/climate/greenhouse-gas-inventory-2013-snapshot/index.html

[2] http://www.med.govt.nz/sectors-industries/energy/energy-modelling/publications/energy-greenhouse-gas-emissions/energy-greenhouse-gas-emissions.pdf

[3] Electricity in New Zealand 2011, Electricity Authority

[4] http://www.stats.govt.nz/searchresults.aspx?q=household%20energy%20use

emissions form dairy farming appear to be trending upwards, while emissions from sheep and beef farming are trending downwards.

- The figures for Other in Table 2 relate mainly to cropping and minor livestock species. The figures for Fertiliser relate to direct and indirect nitrous oxide emissions from nitrogen fertiliser.

Table 2: Agriculture emissions by sector and year (millions of tonnes of CO_2 equivalent)

	Dairy	Beef	Sheep	Fertiliser	Other	Total
2008	12.6	6.8	11.0	1.9	1.0	33.3
2009	13.3	6.8	10.8	1.6	1.0	33.5
2010	13.8	6.5	10.5	1.9	1.0	33.7
2011	14.6	6.4	10.3	2.1	0.9	34.4
2012 forecast	15.1	6.5	10.6	2.1	0.9	35.2
% of 2012 total	*42.9*	*18.5*	*30.1*	*6.0*	*2.6*	*100.0*

Source: Projected emissions for the agriculture sector for the Kyoto Commitment Period 2008-2012: 2013 Net Position Report – MPI Information Paper No: 2012/02. Ministry for Primary Industries April 2013.

- According to Statistics New Zealand, there were 6,445,681 dairy cattle in New Zealand in 2012 and, in conjunction with Table 2, this implies that the average dairy animal emitted 2.34 tonnes of CO_2-e.
- These figures further imply that the estimated annual levy per animal would be $29.25.

2.2 The revenue effect of a levy

- The revenue from an emissions levy at $12.50 per tonne of CO_2-e on dairy farm emissions and $25.00 per tonne of CO_2-e on emissions from other activities within the current ETS would be $1,141 million[5].
- However, based on the Green Party's assumption that net removals by forestry would be rewarded at the rate of $12.50 per tonne of CO_2-e, the revenue available for tax cuts would be $955 million.
- By comparison, the ETS puts a market-based price on carbon and is designed to be cost-neutral over time. It is not a tax because it doesn't raise revenue for the Government. All revenues from an emissions levy would, therefore, be available for compensatory tax reductions.

[5] The assumption here is that there would be no exemptions for trade-exposed industries and other activities. If trade-exposed industries were exempt, the revenues would be much lower because a large proportion of dairy production is exported. Alternatively, if trade-exposed industries are to receive compensatory subsidies, the effect would be the same, i.e. the net revenue available for tax cuts would be reduced.

- The estimates above may be slight under-estimates because they do not allocate any of the 6% of agricultural emissions that come from fertilisers (see Table 2) to dairy farming. It is not known how much of the 6% is attributable to the use of fertilisers in different types of livestock and arable farming.

2.3 How production might respond to the imposition of a levy

- The revenue estimates above are short-term and assume that production patterns and, hence, the volume of emissions do not change.
- The short-term corresponds roughly with the term of a Parliament: assuming one year for the design of, and consultation on, the operational policy; one year's notice before the levy comes into force; and a one year period before any adjustments in production take place. This also implies that revenues from the levy do not start flowing until year 3 of a Parliament.
- However, production patterns and the volume of emissions are likely to change in the longer-term, and any reduction in production would reduce the revenues from a levy.
- The extent to which production volumes will change will depend to large extent on the ability of producers to pass on cost increases to consumers. In turn, the ability to pass on cost increases depends on the price elasticities of demand of the goods in question.
- The evidence suggests that demand for petrol/diesel and electricity relatively price inelastic, which implies that producers will be able to pass on increases to a large extent and that production will not change much. On the other hand, demand for dairy products is more price elastic, which means that producers will not be able to pass on all the cost increases and that production will drop – see section 5 below.
- Predicting how export-orientated production of dairy products might respond is more difficult because it depends on whether exports are subsidised, how world commodity prices move, what the price elasticities in export markets are, and how the exchange rate moves.

3 Possible personal and business tax reductions

- Using the projected $955 million full-year revenue from an emissions levy, it would be possible to fund many different combinations of tax cuts. However, in this section we indicate the cost of introducing a tax-free income band, and a cut in the company tax rate. These options were suggested by the Green Party.
- The illustrations are based on Treasury estimates of the effect of small changes to tax rates and base changes[6].
- It should be emphasised here that the illustrations are indicative, and that the Treasury advises that the tax tables on which the estimates are based should only be used to show the effect of small tax changes.

3.1 Introducing a tax-free income band

- Using the $955 million revenue from the levy, it would be possible to make the first $2,000 of an individual's income tax-free and still leave room for a cut in the company tax rate.
- According to the Treasury, the full year cost of introducing this tax free-band would be $641 million.

3.1.1 How the changes would affect the average household

- The Household Economic Survey indicates that the average annual income for all households from wages and salaries in the year to June 2013 was $64,016. We used average (i.e. mean) household income, rather than the median, because the corresponding data on household expenditure only shows data for the average.
- For the purposes of illustrating the effect of making the first $2,000 of an individual's income a tax-free, we assume that the average household had one full-time wage of $48,012 and one part-time wage of $16,004.
- Table 3 indicates that the tax-free band would increase the household's income by $420. Each worker's post-tax income would increase by the same amount, but the numbers imply that the part-time (i.e. lower income) worker would have their post-tax income increased by more in percentage terms.

[6] http://www.treasury.govt.nz/government/revenue/estimatesrevenueeffects

Table 3: Effect of tax cuts on the average household

	Full-time worker on $48,012 pa.		Part-time worker on $16,004 pa.		Both workers combined		Both workers combined	
	Tax paid	Post-tax income	Tax paid	Post-tax income	Tax paid	Post-tax income	Increase in post-tax income, $	Increase as % of current post-tax income
Baseline: current tax rates and bands	7,424	40,588	1,821	14,183	9,244	54,772	-	-
Scenario: Make first $2,000 of income tax-free (i.e. introduce a 0% tax band) and leave other rates unchanged	7,214	40,798	1,611	14,393	8,825	55,192	420	0.8

Source: BERL estimates, using Treasury and Household Economic Survey data.

3.2 Changes in the company tax rate

- The Treasury states if there are no accompanying changes in personal tax rates, a one percentage point change in the company tax rate would cost $250 million[7].
- Treasury also cautions that the effect of a larger cut in the company tax rate would need to be modelled separately, e.g. because a cut of, say three percentage points would cause changes in behaviour by taxpayers, i.e. the way in which they organise their income and expenditure.

3.3 Total cost of the tax changes

- In combination, the two tax changes outlined above would cost $891 million: that is, $64 million less than the estimated revenue from the levy.

[7] In this situation, the company tax change would trigger an imputation credits offset. In the absence of an offset, the cost would be $370 million.

4 Effect on businesses

4.1 Effect on the viability of dairy farms

- Table 4 is based on data from the Ministry for Primary Industry's Farm Monitoring Report for National Dairy in 2012[8].
- The 2011/12 data are based on a herd of 430 cows. The data for the 2012/13 budget are based on a herd of 435 cows.
- The 2011/12 data are based on a pay-out of $6.05 per kg of milk solids. The data for the 2012/13 budget are based on a pay-out of $5.50 per kg of milk solids.
- The table shows how sensitive dairy farm revenues and profits are to the size of the pay-out.
- The top half of the table is a condensed version of the National Dairy Model Budget from the Farm Monitoring Report. In essence, it represents the status quo. More detailed information is included in Appendix A to this report. A link to the original source is also included in the Appendix.

- The numbers in the bottom half of Table 4 are intended to illustrate what might happen if an emissions levy of $29.25 per cow is imposed and the effective rate of company tax paid is reduced by one percentage point.
- It is assumed that the levy is treated as a business expense. Accordingly, profits before tax fall. At the same time, the profit after tax is slightly greater than it would have been if there was no offsetting tax rate cut.
- Importantly, it is also assumed that no other variables shown in the National Dairy Model Budget change. In other words, farm working expenses other than the levy do not change.
- The table implies that, if the levy had been in place in 2012/13, farm working expenses would have increased by 2.0%.
- It also implies that in combination with a cut in the company tax rate, the levy would have reduced farm after-tax profits by 12.5%.

[8] The report presents weighted average data from a set of regional models. The Farm Monitoring Programme was put on hold for the 2013 year to investigate alternative data sources and to design a monitoring programme that better meets user information needs. As such, there are no published outputs for 2013. However, the various 2012 reports for different sectors within agriculture include budgets for 2013.

Table 4: Extracts from Farm Monitoring Report for Dairy, 2012 (data for the average farm)

	2011/12 (pay-out = $6.05/kg milk solids)		2012/13 budget (pay-out $5.50/kg milk solids)	
	Whole farm, $	Per cow, $	Whole farm, $	Per cow, $
Status quo				
Net cash income	1,161,690	2,702	949,378	2,182
Farm working expenses	644,634	1,499	624,829	1,436
Profit before tax	319,519	743	137,589	316
Profit after tax	208,390	485	105,844	243
With a levy at $12.50 per tonne of CO_2-e				
Net cash income	1,161,690	2,702	949,378	2,182
Farm working expenses	657,212	1,528	637,553	1,466
Profit before tax	306,942	714	124,865	287
Profit after tax	203,195	473	92,650	213

Source: Farm Monitoring 2012: National Dairy, MPI

- Table 5 is also from the MPI Farm Monitoring report for Dairy. It implies that median farms were operating just below breakeven at the $5.50 pay-out used in the 2012/13 budget.
- The breakeven point covers farm working expenditure, debt servicing, depreciation and drawings. However, breakeven is not sustainable because it does not allow for any reinvestment, which includes principal repayments, amongst other things.
- Farms are ranked in terms of the surplus they generate, rather than herd size. However, there is a rough correlation between herd size and size of surplus.

Table 5: Current breakeven point for dairy farms

	Pay-out breakeven point ($ per kg of milk solids)
Bottom 10% of farms	$6.96
Median farm	$5.64
Top 10% of farms	$4.79

Source: Farm Monitoring 2012: National dairy, MPI

- The effect of the levy and tax cut would be to raise the breakeven points shown in Table 5.
- Table 6 presents BERL's estimates of how the breakeven point for the average farm would change in the face of the levy and the reduction in company tax.

- In combination, the two changes would increase the breakeven point by just 8 cents.
- The table also shows BERL's estimates of the "sustainability" point, before and after the levy and company tax change. The sustainability point is defined as the pay-out which achieves breakeven and covers principal repayments and other expenditure on reinvestment.
- In combination, the two changes would also increase the sustainability point by 8 cents.

Table 6: Effect of the levy on the breakeven point and sustainability point for the average dairy farm

	Pay-out required for breakeven, $/per kg of milk solids	**Pay-out required for sustainability, $/per kg of milk solids**
Status quo	5.65	6.09
With a levy at $12.50 per tonne of CO_2-e	5.73	6.17

Source: BERL estimates, using Farm Monitoring data

- Table 7 suggests that the bottom 10% of farms would have been above breakeven in only two out the last five years shown. However, their cost structure and breakeven point might have been different in the past (e.g. because of less gearing).
- The latest forecast pay-out by Fonterra in 2013/14 is $8.75.

Table 7: Trend in prices received for milk solids, average for all dairy companies

Season	**Average pay-out, $ per kg of milk solids**	**Average pay-out adjusted for inflation**
2000/01	5.01	6.68
2001/02	5.35	6.94
2002/03	3.66	4.68
2003/04	4.25	5.31
2004/05	4.58	5.56
2005/06	4.10	4.79
2006/07	4.46	5.11
2007/08	7.67	8.45
2008/09	5.14	5.55
2009/10	6.37	6.77
2010/11	7.89	7.97
2011/12	6.40	6.40

- Source: DairyNZ

- Table 8 illustrates, using farm monitoring data from 2010/11, what might have happened to the farm cash surplus in a year when the pay-out was higher. It can be compared with Table 4, which was based on pay-outs of $6.05 in 2011/12 and $5.50 in 2012/13.
- The table implies that in combination with a cut in the company tax rate, the levy would have reduced farm after-tax profits by 5.8%.
- It should be cautioned that Table 8 is only broadly indicative, but it suggests that, at a pay-out of $7.15, the average farm was generating a significant cash surplus.
- Dairy farms operating today with a pay-out of $7.15 would not necessarily generate the same cash surplus because they might be more highly geared (i.e. needing to spend more on servicing debt) than they were even three or four years ago.

Table 8: Illustration of the effect of modelling on the basis of higher milk solids pay-out

	2010/11 (pay-out = $7.15/kg milk solids)	
	Whole farm, $	Per cow, $
Status quo		
Net cash income	1,146,118	2,768
Profit before tax	345,352	834
Profit after tax	271,398	656
With a levy at $12.50 per tonne of CO_2-e		
Net cash income	1,146,118	2,768
Profit before tax	321,133	776
Profit after tax	255,622	617

4.2 Conclusions on the effect on the viability of dairy farming

- These conclusions are tentative because so many factors are likely to influence the viability of farm businesses.
- At the currently projected pay-out for milk solids, even the bottom decile dairy farms would remain well above breakeven in the face of an emissions levy.
- However, as Table 7 showed, the pay-out has been variable from year to year.
- Dairy farmers would be able to pass on some of their cost increases to domestic consumers (see section 5), but domestic consumers represent only a small part of the market for dairy products.
- Farmers might be able to adjust their cost structures a little, but a significant number (e.g. the bottom 10 percent) would become vulnerable at a pay-out of around $7 per kg of milk solids.

4.3 Effect on the profitability of other businesses

- It is emphasised that, extending the coverage of the levy to include sheep and beef farms, which also account for significant greenhouse gas emissions (see Table 2), is not being considered. However, Appendix B illustrates how sheep and beef farms might be affected, if they were covered by the levy.
- The other industries of interest, residential power and road fuels, already face costs as part of the ETS. However, open market price of ETS units is very low (i.e. approximately $5). Therefore, even for those industries that are currently required to buy and surrender units, their costs will change.
- However, we assume for the purposes of this report that the power and fuel companies are large and sophisticated enough to adapt to a levy and leave their profitability unchanged. In any case the evidence on price elasticities of demand (see Table 12 in section 5) suggests that they are likely to be able to pass on most of their cost increases to households.

5 Effect on households

5.1 How expenditure might change in the short-term

- We assume here that, in the short-term, households will not change their consumption patterns if prices change. This implies that producers will simply pass-on all their additional costs associated with the imposition of an emissions levy.
- The Household Economic Survey shows how much households spend on different commodities, i.e. we can show how much the average household spends on the three key commodities: Dairy; Electricity; and Petrol and diesel. (Table 9).

Table 9: Average household expenditure, 2012/13 (pre-levy)

Commodity group	Average weekly expenditure	Average annual expenditure
Milk cheese and eggs	$16.10	$837.20
Electricity and other household fuels	$46.00^	$2,392.00
Petrol and other fuels and lubricants	$53.40#	$2,776.80
Total for three commodity groups	**$115.50**	**$6,006.00**

^ Of which, electricity is $40.00

Of which, petrol is $49.00

Source: Household Economic Survey

5.1.1 Change in dairy prices

- If milk cheese and egg prices rise in line with the costs that the levy would add to dairy farm working expenses (see table 4), the average weekly household expenditure on this group of commodities would increase by 2.0% to $16.47: an increase of $0.37 per week or $19.24 a year.

5.1.2 Change in electricity prices

- According to MBIE[9], electricity consumption in 2012 was associated with 0.18 kt of CO_2-e per GWh. And according to the Electricity Authority[10], the average household consumes around 8,000 kWh a year.

  Together, these two pieces of information imply that the average household is responsible for around 1.44 tonnes of CO_2-e a year.

  Further, if households are, in effect, already being charged a $5 per tonne of CO_2-e, based on the current market price for carbon credits, their annual electricity bill will rise by $28.80 (i.e. $20 x 1.44) a year, or $0.55 a week.

5.1.3 Change in petrol prices

- According to the AA[11], the ETS is currently adding around 1 cent per litre to the average $2.14 per litre pump price of petrol. Based on the knowledge that carbon credits are currently traded at around $5, the imposition of an emissions levy at $25 would add

[9] http://www.med.govt.nz/sectors-industries/energy/energy-modelling/data/greenhouse-gas-emissions

[10] https://www.ea.govt.nz/dmsdocument/12292

[11] http://www.aa.co.nz/cars/maintenance/fuel-prices-and-types/how-petrol-prices-are-calculated/

approximately 4 cents per litre more to the pump price: an increase of 1.9%. Further assuming that a similar increase would apply to other fuels and lubricants, the average household's expenditure on this commodity group would increase by $1.01 per week, or $52.52 a year.

5.1.4 Overall increase in expenditure

- Table 10 shows the effect of applying the expenditure increases estimated in 5.1.1 to 5.1.3 above to current average annual household expenditure on the three commodity groups taken from Table 9.
- The overall effect is to increase expenditure by $101.00 a year, an increase of 1.7%.

Table 10: Average annual household expenditure, before and after the levy

Commodity group	Average annual expenditure pre-levy	Average annual expenditure post-levy	Increase in average annual expenditure due to levy
Milk cheese and eggs	$837.20	$856.44	$19.24
Electricity and other household fuels	$2,392.00	$2,420.80	$28.80
Petrol and other fuels and lubricants	$2,776.80	$2,829.32	$52.52
Total for three commodity groups	**$6,006.00**	**$6,107.00**	**$101.00**

5.1.5 Combined effect of tax changes and price rises

- Table 11 shows the short-term net effect on the average household of the increase in post-tax income resulting from the tax cut funded by the levy, less the increase in expenditure the household would be faced with as the result of the cost of the levy being passed on by producers.
- The table indicates that the average household would be better off by between $319. This is equivalent to around 0.6% of the household's baseline (pre-levy) post-tax income.

Table 11: Net short-term effect of tax cuts and the levy on households

	Annual post-tax income	Annual expenditure on dairy, electricity and road fuels	Change in household's net position (increased post-tax income less increased expenditure)
Baseline (Pre-levy)	54,772	6,006	-
Post tax cut and price increases	55,192	6,107	$319
Percentage change from baseline	**0.8**	**1.7**	**0.6**

5.2 How expenditure might change in the longer-term

- In the longer-term, there are likely to be complex and subtle changes in the "basket of goods" consumed by the average household, both because post-tax income will have changed and because relative prices of commodities will have changed.
- The extent to which the basket of goods consumed will change will depend in part on the price elasticities of demand for the commodities being analysed.
- The implicit assumption in section 5.1 was that the elasticities of demand for the three commodities are zero in the short term, meaning that their consumption does not change at all when their prices rise. However, in the medium- to longer-terms, the assumption is unlikely to be valid.
- Table 12 indicates what the longer-term elasticities for the four commodities are likely to be.
- An elasticity of -0.14 for electricity indicates that a 1% increase in the price will decrease demand by 0.14%. At the other end of the scale, an elasticity of -0.42 for dairy products that a 1% price increase will reduce demand by 0.42%.
- These elasticities imply that households will cut back on their milk and dairy purchases somewhat. But they will only reduce their consumption of electricity and petrol a little. Moreover, by switching some of their consumption away from dairy to other, cheaper foodstuffs, the households will be insulating themselves from the effect of price increases on their budgets.

Table 12: Estimated price elasticities of demand

Commodity group	**Price elasticity of demand**
Milk and dairy	-0.42
Petrol	-0.20
Electricity	-0.14

- In broad terms, these elasticities also imply that electricity and petrol producers would be able to pass on most of their cost increases to consumers following the imposition of a levy. Milk and dairy producers would be able to pass on a bit more than half of their cost increases.

6 Conclusions

This simplified analysis indicates that households would be better off following the introduction of a comprehensive emissions levy accompanied by income tax reductions designed to result in a fiscally neutral outcome.

Households would pay more for some of the commodities they consume, but income tax reductions would more than compensate for any price rises.

On the other hand, Dairy farms would be adversely affected. The levy would increase their working expenses by around 2.0% and their profits would decrease. However, at the currently projected pay-out for milk solids, even the bottom decile dairy farms would remain well above breakeven in the face of an emissions levy.

Other greenhouse gas-emitting industries are thought to be less likely to be affected by the introduction of a levy. This is largely because the principal industries in question (electricity and road fuels) are likely to be able to pass-on any production cost increases to households. The companies in these industries are also considered to be sufficiently large and sophisticated to maintain their profitability in the face of an emissions levy.

Again, however, it is cautioned that these findings should be regarded as indicative of the size and direction of the changes in selected key variables, rather than as precise forecasts.

It should also be noted that the findings are sensitive to the assumptions that underpin the modelling used.

Lastly, it should be recognised that other factors and policy changes have the potential to influence the findings presented.

Appendix A National dairy model budget

	2011/12			2012/13 budget		
	Whole farm ($)	Per cow ($)	Per kg of milksolids ($)	Whole farm ($)	Per cow ($)	Per kg of milksolids ($)
Revenue						
Milksolids	1 050 566	2 443	6.51	836 459	1 923	5.26
Dividend on wet shares	47 880	111	0.30	50 649	116	0.32
Cattle	63 602	148	0.39	61 932	142	0.39
Other farm income	4 713	11	0.03	4 965	11	0.03
Less:	0	0	0.00	0	0	0.00
Cattle purchases	5 070	12	0.03	4 627	11	0.03
Net cash income	**1 161 690**	**2 702**	**7.20**	**949 378**	**2 182**	**5.97**
Farm working expenses	**644 634**	**1 499**	**3.99**	**624 829**	**1 436**	**3.93**
Cash operating surplus	**517 056**	**1 202**	**3.20**	**324 549**	**746**	**2.04**
Interest	185 469	431	1.15	168 589	388	1.06
Rent and/or leases	0	0	0.00	0	0	0.00
Stock value adjustment	17 270	40	0.11	5 419	12	0.03
Minus depreciation	29 338	68	0.18	23 791	55	0.15
Farm profit before tax	**319 519**	**743**	**1.98**	**137 589**	**316**	**0.87**
Income equalisation	0	0	0.00	- 5 103	- 12	-0.03
Taxation	111 129	258	0.69	36 847	85	0.23
Farm profit after tax	**208 390**	**485**	**1.29**	**105 844**	**243**	**0.67**

Note this is an extract from Table 1 in Farm Monitoring 2012: National Dairy (MPI).

The full original can be found by following this link:

http://www.mpi.govt.nz/news-resources/publications?title=farm%20monitoring%20report

Appendix B National sheep and beef model budget

As was noted in the body of the report, there are no plans to extend the coverage of the levy to include sheep and beef farms, which also account for significant greenhouse gas emissions (see Table 2). However, this Appendix illustrates how these farms might be affected, if they were covered by the levy.

- The MPI's Farm Monitoring presents reports for beef and sheep combined.
- Much of the data is expressed in terms of stock units, rather than per ewe or per steer. A sheep is roughly one stock unit and a cattle beast is five stock units.
- Based on the average emissions form sheep and beef cattle, a levy at the rate of $12.50 per tonne of CO_2-e would equate to $4.25 per stock unit.
- The table below is the beef and sheep equivalent of Table 4 (which looked at dairy farms).
- The 2011/12 data are based on 4,904 stock units. The data for the 2012/13 budget are based on 4,997 stock units.

- The numbers in the bottom half of the table are intended to illustrate what might happen if an emissions levy of $4.25 per stock unit is imposed and the effective rate of tax paid is reduced by one percentage point[12].
- It is again assumed that the levy is charged as a business expense. Accordingly, profits before tax fall. At the same time, the profit after tax is slightly greater than it would have been if there was no offsetting tax rate cut.
- Importantly, it is also again assumed that no other variables shown in the National Sheep and Beef Model Budget change. In other words, farm working expenses other than the levy do not change.
- The table implies that, if the levy had been in place in 2012/13, farm working expenses would have increased by 7.9%.
- It also implies that in combination with a cut in the company tax rate, the levy would have reduced farm after-tax profits by 10.4%.

- Even before the levy and tax cut, the budget for 2012/13 in the table indicates a significant decline in after-tax profits.
- The Farm monitoring Report for Sheep and Beef for 2012 described 2011/12 as an exceptionally good year, mainly because of good weather and high prices. However, the data in the table 12 suggests that, with a levy of $4.25 per stock unit, the average farm would be only marginally viable in a good year, bearing in mind that after-tax profits are before drawing and reinvestment.

[12] Note, the implicit assumption is that the additional revenue from a levy sheep and beef farms is recycled through personal income tax changes. So the change in the company tax rate in this scenario remains the same as in the body of the report.

Table 12: Extracts from Farm Monitoring Report for Sheep and Beef, 2012 (data for the average farm)

	2011/12		2012/13 budget	
	Whole farm, $	Per stock unit, $	Whole farm, $	Per stock unit, $
Status quo				
Net cash income	542,965	110.72	510,533	102.17
Farm working expenses	268,369	54.73	269,475	53.93
Profit before tax	213,841	43.61	181,305	36.28
Profit after tax	165,481	33.75	126,525	25.32
With a levy at $12.50 per tonne of CO_2-e				
Net cash income	542,965	110.72	510,533	102.17
Farm working expenses	289,211	58.97	290,712	58.18
Profit before tax	192,999	39.36	160,068	32.03
Profit after tax	151,311	30.85	113,328	22.68

Source: Ministry for Primary Industries

- These farmers have enjoyed less prosperity than dairy farmers in the past few years, and this is why many have converted to dairy.
- They are also exposed to fluctuations in world prices, and they are unlikely to be able to pass on much, if any, of their cost increases to domestic consumers because the price elasticity of demand for meat is around -1.0 (implying that a 1% price increase would result in a 1% reduction in demand).
- After the imposition of an emissions levy, some sheep and beef farms would become unviable, if prices per stock unit fall much below $100.

The table below is an extract from Table 2 in Farm Monitoring 2012: National Sheep and Beef (MPI).

The full original can be found by following this link:

http://www.mpi.govt.nz/news-resources/publications?title=farm%20monitoring%20report

	2011/12			2012/13 budget		
	Whole farm ($)	Per hectare ($)	Per stock unit[1] ($)	Whole farm ($)	Per hectare ($)	Per stock unit[1] ($)
Revenue						
Sheep	350 099	453	103.76	318 685	412	92.93
Wool	67 927	88	20.13	58 384	76	17.02
Cattle	157 431	204	103.61	159 778	207	102.58
Grazing income (including hay and silage sales)	25 930	34	5.29	30 099	39	6.02
Other farm income	22 548	29	4.60	21 807	28	4.36
Less:						
Sheep purchases	26 396	34	7.82	25 591	33	7.46
Cattle purchases	54 575	71	35.92	52 631	68	33.79
Net cash income	**542 965**	**703**	**110.72**	**510 533**	**661**	**102.17**
Farm working expenses	**268 369**	**348**	**54.73**	**269 475**	**349**	**53.93**
Cash operating surplus	**274 595**	**356**	**56.0**	**241 058**	**312**	**48.24**
Interest	45 350	59	9.25	43 023	56	8.61
Rent and/or leases	6 048	8	1.23	6 202	8	1.24
Stock value adjustment	10 200	13	2.08	10 402	13	2.08
Minus depreciation	19 556	25	3.99	20 930	27	4.19
Farm profit before tax	**213 841**	**277**	**43.61**	**181 305**	**235**	**36.28**
Income equalisation	0	0	0.00	876	1	0.18
Taxation	48 361	63	9.86	54 780	71	10.96
Farm profit after tax	**165 481**	**214**	**33.75**	**126 525**	**164**	**25.32**