

Carbon Balance – Dairy Farm

Introduction

This info sheet describes a balance of carbon liabilities and credits for a dairy farm. Using a case study, the potential impacts of Emissions Trading Scheme (ETS) are discussed, along with the possible use of forestry to offset on-farm emissions.

Case study – Dairy Farm

This case study describes a 535-cow dairy farm on 178 ha in the South Waikato. Included in the operation is a 40 ha dairy run-off, 140 yearling heifers and 120 rising two year old heifers. Around 5,000 stock units are farmed in total.

Total annual greenhouse gas emissions

Annual greenhouse gas emissions from the case study farm are described in the table below. A New Zealand Unit (NZU), the standard measure used for carbon accounting in the ETS, is equivalent to 1 tonne of carbon dioxide (CO₂). Emissions from livestock are calculated from milk and meat production. This farm produces 210,000 kg milk solids and 18 tonnes of meat from 100 cull cows (180 kg carcass wt/cow). Note that livestock are the source of 86% of emissions from the case study farm (1,630 of the total 1,900 units). The Carbon Farming Group calculator was used to prepare this table¹.

GREENHOUSE GAS SOURCE (ANNUAL EMISSIONS)			TONNES CO ₂ NZU
Petrol	1,500	litres	4
Diesel	11,000	litres	29
Electricity	62,240	kWh	14
Nitrogen	39	tonnes	221
Milk Solids	210	tonnes	1290
Cull cows	100	head	198
Carcass weight (cull cows)	18	tonnes	142
	Total		1,900

Impact of ETS on farm

Agriculture will be included in the Emissions Trading Scheme from 2015. Initially there will be a 90% free allocation of credits which means that farmers will be liable for 10% of their livestock and nitrogen fertiliser emissions (energy and fuel are paid separately and obligations started in 2010). The 10% obligation for agriculture amounts to 163 NZUs in 2015 for this farm. The meat and milk processors will pay this on behalf of the farmer, at \$25/NZU this will amount to a levy of about 1.5c/kg milk solids and around \$9 per cow culled to the works. The free allocation will reduce by 1.3% per year on year from 2016 onwards. This is shown on the graph over the page.

¹ Based on new regulations for agriculture in the NZ ETS from September 2010. These can be found at http://www.maf.govt.nz/climatechange/agriculture/EmissionsFactors_AgETS.pdf. Note that two calculations are required for sales of livestock to meat processors, number of head killed X emissions factor and carcass weight of livestock X emission factor. Calculator can be found at www.carbonfarming.org.nz

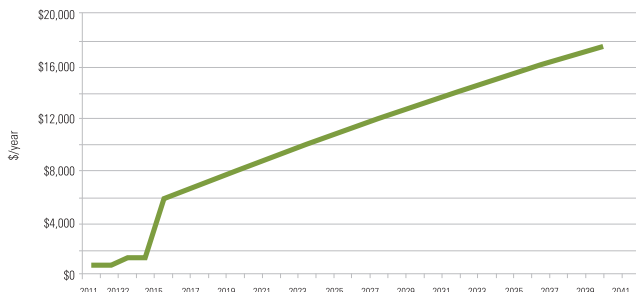
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Total annual cost of ETS from 2010 to 2040 @ \$25/NZU



Carbon price effects

At the moment carbon liabilities will be dealt with at the processor level. Changes in the carbon price will have a direct impact on final costs of any scheme. The market price for carbon is very uncertain and will continuously vary like other commodity prices. However, post-1989 forests provide credits at the farm and national levels. Access to these credits reduces exposure to future increases in carbon price, significantly reducing business risk. This will add carbon to the range of products considered by forest managers (see info sheet 12 for detail).

Potential forestry credits

There is little that can be done immediately to reduce livestock emissions without reducing stock numbers so we have assumed emissions remain constant in the short term, and therefore carbon credits are required to offset emissions. Carbon accumulated by trees can be claimed as carbon credits in the case of forests planted after 1989 on land not previously forested (see info sheet 7 for details).

The rate of carbon accumulation or “sequestration” varies with species, climate, age and management regime. For the case study, we have conservatively estimated that by the year 2040, 400 tons of carbon will be accumulated and stored in a hectare of radiata pine forest. This forest is assumed to be planted and harvested on a continual basis (see mixed age forest, info sheet 12). Total emissions liabilities for the farm from 2015 until 2040 will be 12,411 NZUs. Approximately 30 hectares of new forestry would be required to offset this amount. The table below shows the total cost of emissions liabilities to the farm, the effect of carbon price and the impact forestry could have on addressing those costs.

Carbon (NZU) price	Total Cost to 2040 No Forestry	Total cost to 2040 With 30 ha Forestry
\$25	\$310,270	\$69,000
\$50	\$620,540	\$69,000

At \$25/NZU the total cost to the farm for emission liabilities to 2040 will be \$310,270 or about \$12,500 per year, double this if the price rises to \$50/NZU. However if 30 ha of new forest is established then the cost of liabilities under the ETS will not exceed the costs of establishment and maintenance which will be considerably less (approximately \$69,000 or \$2760 per annum equivalent). The addition of forestry as an offset against emissions could play an important role in reducing the cost of the ETS to the farm by insulating the business from the risk of future increases in the price of carbon.

But I don't have land for trees?

For farms without suitable land, new forests could be established on less productive land purchased in partnership with other livestock owners. This could be done through a joint venture partnership using a forestry right² and Government forestry programs (see info sheets 3 and 4). Professional forestry and legal advice should be sought before carrying out such activities.

Summary

The bulk of agricultural emissions are difficult to mitigate. Forestry, either on or off the farm, offers an opportunity to reduce emission liabilities (and costs) over the medium term (30 to 50 years) while new GHG mitigation technologies are developed and implemented. Consideration should be given to planting new forests now as several government schemes encourage the development of forestry to reduce the potential impact of future obligations (see info sheet 4).

2 Planting in Partnership and Developing an Export Industry (1959 to 1984) <http://www.maf.govt.nz/forestry/publications/impact-of-incentives-on-plantation-forestresources/plantation-forest-resources-06.htm>

Further Reading

Carbon Farming Information Report

www.carbonfarming.org.nz

<http://www.maf.govt.nz/agriculture/agriculture-ets>

Information prepared by P.A.Handford and Associates Ltd in conjunction with the Carbon Farming Group

Go to www.carbonfarming.org.nz for other info sheets on: ➤ Greenhouse Gases and Farming Livestock ➤ International Agreements ➤

Soil Carbon ➤ Carbon Trading ➤ NZ Government Initiatives ➤ Carbon Trading ➤ Voluntary Carbon Market ➤ Managing Emissions from Livestock

➤ Practical Case Studies ➤ Carbon Forest Management ➤ Risks and Liabilities ➤ Native forests in the Emissions Trading Scheme