

# Carbon Balance – Sheep and Beef Farm

## Introduction

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

## Case study – Sheep and Beef Farm

This case study describes a traditional sheep and beef operation with around 5,300 stock units. The effective grazing area is 600 rolling hectares and the production base is 2,200 ewes plus 140 beef cows.

## 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 (CO<sub>2</sub>). Emissions from livestock are calculated from meat production (slaughter records). This farm produces 45 tonnes of beef from 156 cattle and 56 tonnes sheep meat from 3178 sheep. Note that livestock are the source of 97% of emissions from the case study farm (2,040 of the total 2,098 units). The Carbon Farming Group calculator was used to prepare this table<sup>1</sup>.

GREENHOUSE GAS SOURCE (ANNUAL EMISSIONS)			TONNES CO <sub>2</sub> NZU
Petrol	2,540	litres	6
Diesel	52	litres	0
Electricity	19,660	kWh	5
Nitrogen	8	tonne	46
Cattle	156	head	309
Carcass weight (beef)	45	tonne	451
Sheep	3178	head	953
Carcass weight (sheep)	56	tonne	328
Total			2,098

## Impact of ETS on farm

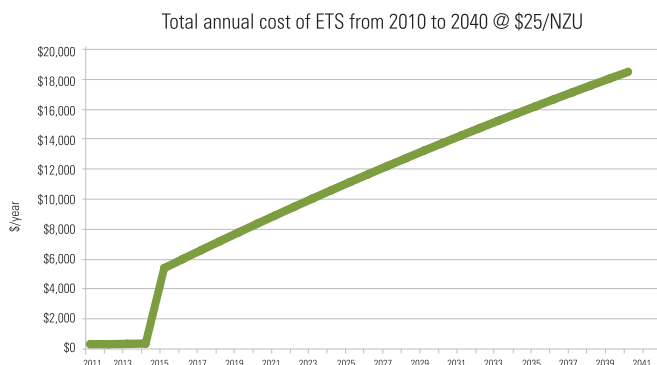
Agriculture will be included in the Emissions Trading Scheme from 2015. Initially there will be a 90% free allocation of credits which means that farmers will be liable for 10% of their livestock emissions (energy and fertiliser will be paid separately). This amounts to 204 NZUs in 2015 for this farm. The meat processor will pay this on behalf of the farmer. At \$25/NZU this will amount to a levy of about \$11 per head of cattle and \$1 per head of sheep at slaughter. The free allocation of credits will reduce by 1.3% 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](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](http://www.carbonfarming.org.nz)

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### 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 12,873 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	\$321,820	\$69,000
\$50	\$643,640	\$69,000

At \$25/NZU the total cost to the farm for emission liabilities to 2040 will be \$321,820 or about \$12,900 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.

### 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).

### Further Reading

Carbon Farming Information Report  
[www.carbonfarming.org.nz](http://www.carbonfarming.org.nz)  
<http://www.maf.govt.nz/climatechange>

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