Carbon Balance – Arable Farm

Introduction

This info sheet describes a balance of carbon liabilities and credits for an arable 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 – Arable Farm

This case study has been based on a Canterbury arable model from MAF monitoring report[1] and from published data from studies on the arable industry[2]. Farm size is 290 ha with 214 ha used for crop production and is assumed to be irrigated. A flock of 860 ewes are the only livestock in the operation.

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. Emissions from livestock are calculated from sheep meat production (slaughter records). This farm produces 24.5 tonnes of sheep meat from 940 lambs and 260 cull ewes. Note that livestock are the source of 60% of emissions from the case study farm (487 of the total 809 units). Fuel use is based on 85l/ha diesel and 23 l/ha petrol for the cropped area. Nitrogen fertiliser use is assumed to be 130 kg N /ha and analysis does not include agrichemicals. The Carbon Farming Group calculator was used to prepare this table[3].

GREENHOUSE GAS SOURCE (ANNUAL EMISSIONS)			TONNES CO_2 NZU
Petrol	4,922	litres	12
Diesel	18,190	litres	49
Electricity	428,000	kWh	98
Nitrogen	28	tonne	160
Sheep	1200	head	360
Carcass weight (sheep meat)	24.5	tonne	127
		Total	806

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 49 NZUs in 2015 for this farm. The meat processor will pay this on behalf of the farmer. At $25/NZU this could amount to a levy of about $1 per head for sheep at slaughter. 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 Horticulture and arable monitoring report 2008. Ministry of Agriculture and Forestry, MAF Policy, ISSN 1178-2757 pg 79-91

2 Seven Case Study Farms: Total Energy & Carbon Indicators for New Zealand Arable & Outdoor Vegetable Production. Andrew Barber, AgriLINK New Zealand Ltd, February 2004 http://www.agrilink.co.nz/Files/Arable_vegetable_energy_use_main_report.pdf

3. 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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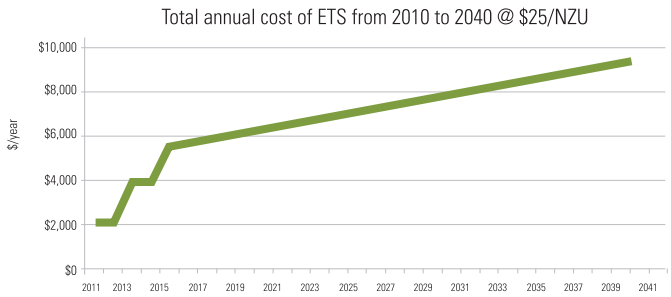

Carbon price effects

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 8,030 NZUs. Twenty 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 20 ha Forestry
$25	$200,800	$46,000
$50	$401,600	$46,000

At $25/NZU the total cost to the farm for emission liabilities to 2040 will be $200,800 or about $8,030 per year, double this if the price rises to $50/NZU. However if 20 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 $46,000 or $1840 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 right[4] 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).

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

Further Reading

Carbon Farming Information Report
www.carbonfarming.org.nz
http://www.maf.govt.nz/climatechange

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