Briefing Note

Cost Implications of a Carbon Tax on Fuel Used in Agricultural Production in Ireland

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In this briefing note we examine the cost implications of the tax introduced on green diesel and other auto fuels as provided for in the 2010 Carbon Budget.

A simplified approach to determining the cost would involve applying the tax rate to the volume of green diesel used by farmers in Ireland. However, there is also some green diesel usage associated with agricultural contracting and agriculture also uses fuel which is subject to the full rate of excise duty. Petrol and auto-diesel are used in passenger vehicles associated with the farm business and in the services of hauliers/processors of milk, animals and grain which are provided to farmers.

These additional costs are captured in the Teagasc National Farm Survey (NFS) data. The study draws on historical cost data from the NFS for a number of farm systems. The approach used here also allows us to see the differential impact which the carbon tax has on different farm systems.

The introduction of a carbon tax on fossil fuels will increase other transport costs associated with agriculture such as the cost of milk collection. Other things being equal this will, for example, result in either higher milk collection charges or lower milk prices. To the extent that it is feasible, these costs are considered in this study.

Overall, it is considered that farms will on average experience an increase in production costs of €225 per annum due to the tax. It is estimated that the aggregate cost to the sectors of agriculture covered by the NFS will amount to almost €24 million annually.

Cost Implications of a Carbon Tax on Fuel Used in Agricultural Production in Ireland

James Breen, Daragh Clancy,

Trevor Donnellan and Kevin Hanrahan

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Rural Economy Research Centre
Teagasc
Athenry
Co. Galway

www.teagasc.ie

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1. Executive Summary

- In this briefing paper we examine the implications of the introduction of a carbon tax on fossil fuels on the cost of production in Irish agriculture.
- The purpose of the tax is to correct a market failure by internalising the cost associated with the damage caused to the environment by the use of such fuels.
- This tax applies to, among other things, petrol, auto diesel, and marked or "green" diesel. The tax is levied at €15 per tonne of carbon. Due to differences in fuel densities, this equates to a rate of 4.2c, 4.9c and 4.68c per litre respectively for petrol, auto diesel and green diesel respectively.
- Electricity is not subject to the carbon tax since the generators of electricity are already part of the Emissions Trading Scheme and therefore avail of other mechanisms to manage the environmental costs of the emissions associated with electricity generation and use.
- Green diesel has historically been subject to a lower rate of excise duty than petrol or auto-diesel. This rate has been unchanged at just over 4.7 cent per litre since 1988. As a consequence the price of green diesel is substantially lower than the price of petrol or auto-diesel. It follows that the percentage increase in prices resulting from the carbon tax is higher in the case of green diesel than it is for the other two fuels.
- The carbon tax will impact on farm production costs in Ireland in a number of ways. The carbon tax will impact agricultural production costs directly through an increase in the price paid by the farmer for these fuels. The carbon tax will also impact indirectly through increases in the prices of particular services that are purchased by farmers that are themselves affected by the introduction of a carbon tax. The most notable of these services are silage making, slurry spreading and the transport of milk, animals and grain. For providers of such services fuel represents a significant portion of their costs of production and it can be expected that the increase in fuel costs experienced by these service providers arising from the carbon tax will be passed onto farmers.
- Farmers will be largely unable to substitute away from these fuels by using more electricity and less diesel for example, since the appropriate electric technologies do not exist. The same is true for providers of services to farmers. As such the tax cannot be avoided as demand for fuel inputs is very inelastic. For the purposes of this study the elasticity of demand for fuel is assumed to be zero. In other words the increase in fuel prices associated with the tax is assumed to have no impact on the volume of fuel that is used.
- As price takers, farmers will be unable to offset the increases in production costs associated with the tax by increasing the price of the output they produce. As a result the tax will reduce farm profitability.
- In this briefing note we examine the cost increase associated with the tax using historical cost data from the National Farm Survey (NFS) and estimate the increase in costs associated with the tax based on our estimates of the share of fuel expenditure in various agricultural production cost categories in the NFS.

- The study provides results for the average farm within each farm system covered in the NFS and provides an aggregate figure for the sectors of agriculture covered by the NFS.
- It should be noted that the NFS does not collect data on certain agricultural enterprises, such as horticulture, poultry and pig farms as well as other micro-farms.
- Based on the analysis it is found that the annual cost increase resulting from the tax amounts to about €225 on average per farm, ranging from €125 for the average sheep farm to €467 for the average tillage farm.
- The total cost to the dairy, drystock and tillage sectors in Ireland is estimated to be almost €24 million per annum.

2. Background

The Renewed Programme for Government contained a commitment to introduce a carbon tax in Budget 2010. Researchers at the Rural Economy Research Centre, Teagasc, have examined the likely impact that a tax on green diesel and other auto fuels would have on production costs and profitability at farm level.

For the purposes of the analysis this tax is imposed by the Irish government and it is assumed that equivalent taxes are not introduced internationally. A supplementary analysis would be required if similar carbon taxes were introduced internationally, as output prices and other input prices (e.g. imported feed and fertilizer) would change as a result of such a tax.

Could farmers substitute between energy sources in order to avoid the tax?

Probably not. The tax on diesel would change the price of diesel relative to electricity but given the nature of agricultural production, the possibility to substitute between diesel and other energy sources is extremely limited.

For the purposes of this study the elasticity of demand for fuel is assumed to be zero. In other words the increase in fuel prices associated with the tax is assumed to have no impact on the volume of fuel that is used.

Can farmers increase output prices to cover the increase in input costs that would arise from the imposition of a carbon tax, and thereby maintain their profitability?

No. Farmers have to bear the cost of these input price increases, as they are price takers. Even if the increase in input prices led to a decrease in domestic production, this would have minimal impact on the price farmers receive since international prices would be unaffected.

How would the imposition of a carbon tax affect the costs of processors?

Processors would also face cost increases as carbon taxes increase fuel costs. This could be particularly important in the case of dairy processors where the transportation cost of raw milk is high relative to its value and there is a recurring requirement to collect the output from dairy farms roughly every two of three days. Costs of this kind arise less frequently or not at all in the case of drystock or cereal farms.

Again, processors are largely price takers and thus will find it difficult to compensate for higher milk collection costs through an increase in the prices they charge customers (foreign and domestic). It is therefore likely that the higher cost of milk collection that will follow from the introduction of a carbon tax on fossil fuels will ultimately be borne either through lower levels of processor profitability, by paying producers lower prices for their raw material costs or by increasing their collection charges.

3. Data and Methodology

Detailed data, for a range of farm systems, were obtained from the Teagasc National Farm Survey (NFS), in order to determine the impact of the carbon tax (as outlined in the Government's 2010 budget) on agriculture's production costs.

There will be some year on year variation in the relative contribution of each cost item to total farm costs due to variations in prices and weather related variations in the volumes of some inputs purchased (e.g. feed) which affect the total cost of production and as a consequence the proportion of total costs associated with each input item. For this exercise we have used data from the 2008 NFS, which is the most recent available. We have examined the same cost data for 2006 and 2007 and have found that using other years would not *significantly* change the results presented below. Within each farm system there are also variations between farms as production systems on individual farms are not identical.

How would the tax feed into production costs on farms?

In this analysis, four constituent elements of the overall fuel related cost on farms have been identified for each of the farm systems using NFS data. The tax on fuel would impact farm costs through:

- Machinery Hire (contractor costs)
- Transport (haulier/processor transport of milk, livestock, grain)
- Fuel & Lubricants (cost of farm diesel etc.)
- Car fuel (passenger vehicle fuel expenditure attributable to the farm business)

The relative share of the four fuel related costs in total costs varies across the principal farm systems of Irish agriculture. The overall fuel related cost component ranges from about 11 percent in the case of dairy to 17 percent in the case of cattle rearing.

In some instances one could expect full reflection of the new tax in particular farm costs. This would be the case with farm fuel and car fuel purchases.

In other instances there would only be a partial reflection of the tax increase in production costs, where fuel is one of several elements making up a particular cost. For instance the cost increase in fuel used by contractors would be passed on to producers, but since fuel costs are only one of several determinants of contractor costs (others costs include labour, capital depreciation and insurance) one would not, other things being equal, expect a given percentage increase in fuel costs to lead to an equivalent percentage increase in overall contractor costs.

While no official data exist, it is estimated that fuel costs on average represent about 25% of total contractor costs. The share of contractor costs that are accounted for by capital depreciation can be expected to be significantly higher for those contactors engaged in capital intensive activities such as silage making, tilling, sowing and harvesting of cereals. Contractors engaged in activities such as slurry spreading and hay making, where machinery costs are lower, will have a higher share of costs

related to fuel. In the case of the transport costs heading, again fuel would only be an element of the total transport costs. In this analysis we have assumed that fuel accounts for 25% of the Machinery Hire and Transport Cost.

There will be instances where farm operators also provide services, such as slurry spreading or silage making, to other farmers. Fuel usage associated with these services represents a fuel cost for the service provider and also forms part of the expenditure by the farmer purchasing these services. In order to avoid double counting of these activities and the associated increase in costs arising from the carbon tax, the NFS data has been adjusted to remove a portion of the fuel expenditures of farmers who provide these services, leaving only their own farm cost liable for the increase resulting from the tax.

Assessing the extent to which the tax will lead to an increase in the transportation costs category presents a particular difficulty. This is because there is a wide variation in these costs across farms. In part this variation is due to differing ways in which transport costs are recovered from farmers. In some cases transport costs are specifically identified, while in other cases transport costs are incorporated in the price paid by the buyer for the output of the farm (e.g. milk collection costs).

In the case of the Fuel & Lubricants cost category, some of the expenditure incurred will be on items other than fuel (e.g. lubricants). However, detailed analysis of the NFS data reveals that the non-fuel expenditures within this category are relatively small amounting to no more than 5% of this expenditure category.

Table 1 summarises the percentage impact on these cost expenditure arising from the carbon tax.

Table 1: Percentage increase in costs associated with the carbon tax

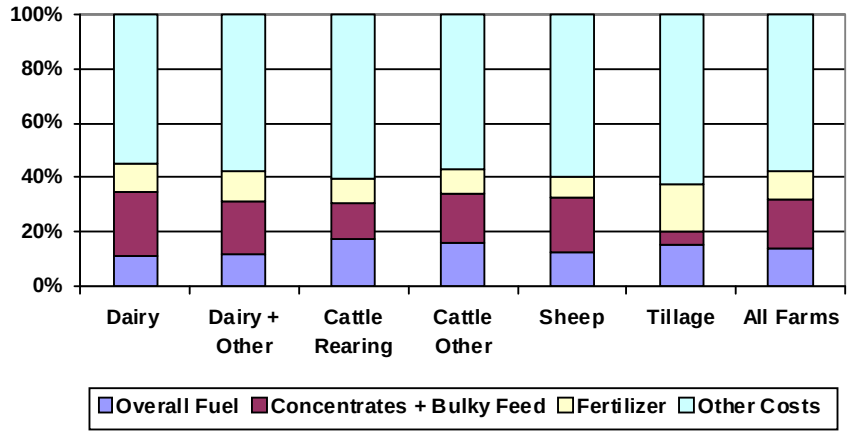
Cost Item	Carbon Tax Percentage Rate* (A)	Percentage of Cost Item Subject to Tax (B)	Percentage Change in Cost Item Due to Tax (A) X (B)
Machinery Hire (contractor costs)	8.7	25	2.2
Transport (haulier based transport of milk, livestock and grain)	4.4	25	1.1
Fuel & Lubricants (cost of farm diesel etc.)	8.7	95	8.27
Car fuel (passenger vehicle fuel expenditure attributable to the farm business)	4.4	100	4.4

Source: Authors' Calculations
* See Table A1 of Appendix A for a full listing of the carbon tax rates by fuel type.

4. Fuel Associated Costs on Irish Farms

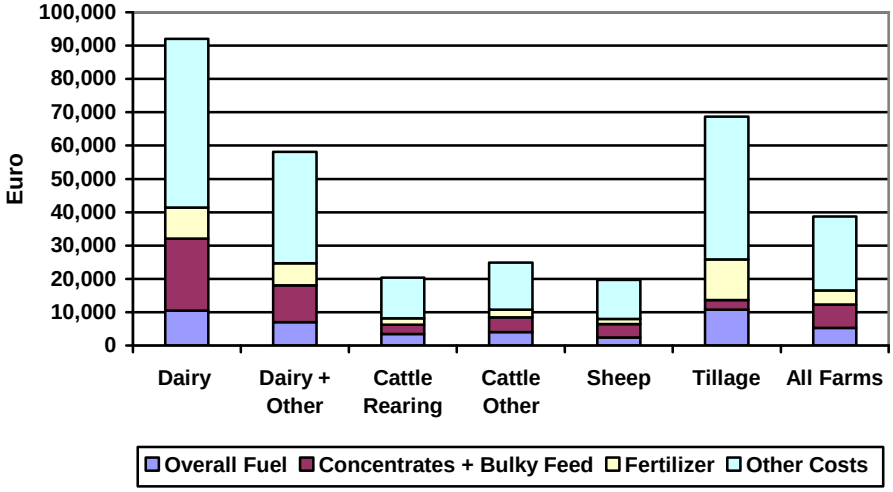
Figure 1 illustrates the distribution of costs on farms by farm system in percentage terms, while Figure 2 presents these costs in absolute terms. It is clear that the fuel related cost element (overall fuel – the sum of the four cost categories identified in Section 3) varies both in percentage and absolute terms by farm system. It should be noted that the NFS does not collect data on certain agricultural enterprises, such as horticulture, poultry and pig farms as well as other micro-farms and hence these are excluded from the analysis.

Figure 1: Percentage composition of production costs by system in 2008



Source: NFS

Figure 2: Composition of production costs by system in 2008



Source: NFS

Table 2 decomposes the "Overall Fuel" costs illustrated in Figure 2. A wide variation in these costs by farm system is evident. This variation arises due to the differing requirements for fuel and contracting services across the various production systems and the differences in the average size of farms across the farm system categories. These costs have been estimated using NFS data and the approach detailed in Section 3 above.

Table 2: Fuel Related Production Costs by Farm System in 2008

	Dairy	Dairy + Other	Cattle Rearing	Cattle Other	Sheep	Tillage
	Euro					
Machinery Hire	6,264	3,759	2,008	2,289	960	6,510
Transport	456	157	52	160	58	201
Fuel & Lubricants	3,123	2,531	1,045	1,147	1,038	3,693
Car Fuel	610	590	394	397	384	360
Total	10,453	7,038	3,500	3,993	2,440	10,764

Source: NFS and Authors' Calculations

5. Implications of a Carbon Tax for Irish Farm Production Costs

Table 3 presents the fuel related costs on farms after the imposition of the fossil fuel carbon tax for each of the farm systems in the NFS. These figures are based on the costs detailed in Table adjusted by the percentage change in each cost item due to the tax (final column of Table 1).

Table 3: Fuel Related Costs by Farm System following Carbon Tax

	Dairy	Dairy + Other	Cattle Rearing	Cattle Other	Sheep	Tillage
	Euro					
Machinery Hire	6,402	3,841	2,053	2,340	981	6,653
Transport	461	159	52	162	58	204
Fuel & Lubricants	3,382	2,741	1,131	1,242	1,124	3,998
Car Fuel	636	616	412	415	400	376
Total	10,881	7,357	3,648	4,157	2,564	11,231

Source: Authors' Calculations

Table 4 presents the increase in production costs associated with the introduction of a fossil fuel carbon tax by farm system. The average increase in the costs of production across all farms is €225. However, there is a considerable variation in the increase in costs by farm system. The increase in the costs of production arising from the tax ranges from an average of €125 per farm for mainly sheep farms to an average of €467 per farm for mainly tillage farms.

Table 4: Calculated Increase in Fuel Related Costs following Carbon Tax

	Dairy	Dairy + Other	Cattle Rearing	Cattle Other	Sheep	Tillage
	Euro					
Machinery Hire	138	83	44	50	21	143
Transport	5	2	1	2	1	2
Fuel & Lubricants	258	209	86	95	86	305
Car Fuel	27	26	17	17	17	16
Total	428	320	149	164	125	467

Source: Authors' Calculations

In order to arrive at an estimate of the aggregate cost of the introduction of the tax the average cost per farm system is weighted by the NFS population weights presented in Table 5.

Table 5: National Farm Survey Population and Population Weights

	Dairy	Dairy + Other	Cattle Rearing	Cattle Other	Sheep	Tillage	All
NFS Pop. Weights	0.151	0.076	0.188	0.358	0.161	0.063	1.00
NFS Pop (No. Farms)	15,822	7,963	19,699	37,512	16,870	6,601	104,781

Source: NFS

Table 6 presents the aggregate cost of the carbon tax, which is estimated to be close to € 24 million.

Table 6: Aggregate Cost of the Carbon Tax

	Dairy	Dairy + Other	Cattle Rearing	Cattle Other	Sheep	Tillage	All Farms
	Euro million						
Machinery Hire	2.2	0.7	0.9	1.9	0.4	1.0	6.9
Transport	0.1	0.0	0.0	0.1	0.0	0.0	0.2
Fuel & lubricants	4.1	1.7	1.7	3.6	1.5	2.0	14.5
Car Fuel	0.4	0.2	0.3	0.7	0.3	0.1	2.0
Total	6.8	2.6	2.9	6.2	2.1	3.1	23.7

Source: Authors' Calculations

Are there other sources of cost inflation arising from the imposition of a carbon tax not accounted for in this analysis?

Yes. The introduction of a carbon tax on fossil fuels used in agriculture will increase other transports costs associated with agricultural production, such as the cost of milk collection, which due to data limitations are only partially captured in this analysis.

Furthermore, the tax is likely to impact on transport costs associated with inputs. These impacts have not been analysed here. An examination of such costs was outside of the scope of this analysis. While some of these costs are not agricultural production costs, the incidence of the tax levied on these fuel users may ultimately fall on farmers.

6. Conclusion

The analysis presented here indicates that the introduction of a carbon tax on fossil fuels will increase agricultural production costs in Ireland and this will result in a reduction in the profitability of Irish agriculture. Farmers will be largely unable to avoid the impact of the tax since the nature of agricultural production means that opportunities to reduce fossil fuel usage are very limited at present and the cost increase associated with the tax cannot be passed onto the purchasers of farm output.

There is substantial variation in the average cost increase by farm system arising from the tax. The cost of the tax will be greater than the increase in the costs of green diesel purchases by farmers. Expenditure on other fuels and on contractor and transport services will also increase following the introduction of the carbon tax.

Based on our analysis the cost of the carbon tax to the agricultural sector will be in the region of €24 million per annum.

APPENDIX A

Table A1: Impact of fossil fuel carbon tax on individual fuels

Fuel Type	Unit	Price (December 2009)	Carbon Tax @ €15 / tonne (VAT incl.)	% change in price
		€	€	%
Petrol	Litre	1.19	0.042	3.5
Auto-diesel	Litre	1.10	0.049	4.4
Kerosene	1000 Litres	516	43.14	8.4
Marked Gas Oil *	1000 Litres	539	46.87	8.7
LPG	1000 Litres	720	27.97	3.9
Fuel Oil	1000 Litres	600	52.15	8.7
Natural Gas	13750kwh	800	47.86	6.0
Peat Briquettes	Bale	3.85	0.39	10.1
Coal	40kg	16.20	1.79	11.1

Source: Department of Agriculture, Fisheries and Food

* Commonly referred to as Green Diesel