Teagasc Submission

to the Public Consultation on the Potential for Domestic Offsetting
of Greenhouse Gas Emissions in Ireland

Prepared by Teagasc's Working Group on Greenhouse Gas Emissions

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Oak Park, Carlow
12 November 2010

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1. PREAMBLE

Teagasc welcomes the opportunity to make a submission to the public consultation on the potential for domestic offsetting of Greenhouse Gas Emissions in Ireland, with specific reference to the use of potential offsetting for the agricultural sector. Teagasc has read the consultation document with great interest. In this submission, Teagasc would like to offer some considerations on the use of domestic offsetting within the agricultural sector. The restricted time-scale of this particular public consultation process did not allow us to conduct in-depth, quantitative analyses of each of the issues raised in the consultation document. Therefore, our considerations below are generic and qualitative, and are the result of many years of experience with research on mitigating GHG emissions from the agricultural sector, and interactions with a wide range of stakeholders. This submission has been prepared by Teagasc's Working Group on GHG emissions, which brings together the organisational expertise from all of Teagasc's research programmes and its advisory and knowledge transfer programmes.

Teagasc is committed to contributing to the ongoing reduction of GHG emissions from agricultural produce (www.teagasc.ie/publications/2010/42/42_TResearch_201008.pdf). It operates a large and ambitious research programme on Greenhouse Gas Emissions across all of its research centres, aimed at developing cost-effective mitigation options to reduce the carbon-footprint of Irish produce. Teagasc is proactive in coordinating international research in this area, and is workpackage leader in the EU Joint Programme Initiative on Food Security and Climate Change. Teagasc is also working closely with DAFF as members of the Global Research Alliance. Teagasc is committed to contributing proactively and constructively to discussions on reducing the carbon footprint of Irish agriculture, and would welcome an opportunity to contribute to discussions on the development of a domestic offsetting scheme in Ireland.

2. Potential benefits of Domestic Offsetting

In principle, Teagasc acknowledges the potential opportunities that domestic offsetting can provide to the agricultural sector, and to contributing to reducing the carbon-footprint of agricultural produce, though not without a number of significant reservations and concerns. Potential benefits include:

1. Domestic offsetting could provide a direct financial incentive for individual farmers to proactively seek to reduce greenhouse gas emissions. Under current conditions, GHG emissions from agriculture are quantified and reported only on a sectoral basis, over which individual farmers have limited to no control.

2. Domestic offsetting could provide a mechanism that incentivises national, rather than international purchase of carbon credits.

3. Domestic offsetting could provide a positive and flexible tool for policy implementation, through incentivisation of low-carbon land use and/or low-carbon land management. Such market-driven stimuli would provide a more flexible and potentially more equitable approach to reducing GHG emissions on individual farms, than the implementation of top-down sectoral policies. Specifically within the context of the ongoing CAP reforms, domestic offsetting could provide a mechanism to verify greenhouse gas emissions as one of the environmental objectives, expected to feature prominently in the new CAP.

4. In addition, domestic offsetting has potential use in the development of a "Brand Ireland" label for Irish produce, as promoted in the recent FoodHarvest 2020 report (www.agriculture.gov.ie/media/migration/agri-foodindustry/agri-foodindustrypublications/2020Foodharvest190710.pdf). This report, commissioned by the Department of Agriculture, Fisheries and Food, and prepared with input from a wide range of stakeholders, sets out a vision of "smart, green growth" of Irish Agriculture.

3. Concerns regarding the implementation of Domestic Offsetting

While Teagasc recognises that, in principle, Domestic Offsetting could provide opportunities to Irish agriculture and to efforts to reduce agricultural greenhouse gas emissions, the effectiveness of domestic offsetting will depend to a large extent on the method of implementation, and choice of metrics. Teagasc is particularly concerned about: 1) choice of metric 2) point-of-obligation 3) carbon-accountancy requirements and 4) requirement to avoid "pollution swapping", each of which will be discussed in more detail below.

3.1 Choice of metric: negating conflicts with targets in Food Harvest 2020

Teagasc is concerned that, depending on the reporting mechanisms, the use of domestic offsetting as a tool to achieve national emission targets may present challenges to achieving the objectives and vision for Irish Agriculture, as stated in the recent Food Harvest 2020 report. One of the main targets is to increase the value of primary agricultural output by 33% by 2020. Teagasc is particularly concerned about the establishment of a "fixed" carbon quota for the agricultural sector. While such fixed sectoral quota may seem attractive in the short term from the perspective of national Kyoto reporting, it has now been well established that curtailing agricultural productivity in Ireland in order to achieve predetermined emission targets, may in the long term lead to *increased* global GHG emissions from agriculture through carbon-leakage. A recent study by the FAO (www.fao.org/docrep/012/k7930e/k7930e00.pdf) has demonstrated that grass-based dairy systems in the temperate regions produce the lowest amount of GHG emissions *per unit product*. This means that, where any reduction in output from these systems is displaced by less efficient systems elsewhere, this is likely to result in higher emissions per unit product, and, assuming no decline in global demand, in increased global GHG from food production. These issues were discussed in detail at Teagasc's recent conference "A Climate for Change – opportunities for carbon-efficient farming": www.teagasc.ie/aclimateforchange/

This carbon-leakage does not necessarily exempt agriculture from the need to contribute to reducing global GHG emissions; however, it is Teagasc's position that the choice of metric is of great importance to ensure that national GHG reductions are not negated by associated increases in global GHG emissions. As the food market is a global market (and Ireland exports the vast majority of its produce), it is of greater importance to reduce the GHG-emissions *per unit of product* (e.g. emissions per kg beef / per kg milk solids) than it is to reduce the national GHG emissions from agriculture per se. Teagasc has a proactive research programme to develop farm, animal and grassland management strategies to reduce this carbon-footprint.

It is worth noting that New Zealand has adopted a similar, per-unit-product approach to domestic offsetting in the agricultural sector, and are proactive in evaluating this approach at global scale through the initiation of the Global Research Alliance (www.globalresearchalliance.org/), to which Ireland is a signatory. It is also worth noting, however, that adoption of a similar approach for Irish agriculture may present challenges to any reconciliation of domestic offsetting with national reporting of GHG emissions and internationally traded credits; solutions to these challenges require further in-depth analyses.

3.2 Point of obligation: sectoral offsetting v. individual farm scale

An important consideration in the development of a domestic offsetting scheme is the spatial scale at which the "point of obligation" is applied; this choice of the "point-of-obligation" will have far-reaching consequences on the implementation and effectiveness of any domestic offsetting scheme. Any of the four approaches outlined below should be given careful consideration, and Teagasc is willing to contribute to these considerations through research and technology transfer.

Option 1: sectoral scale
The benefit of a point of obligation at sectoral level is a considerable reduction in individual carbon-accounting requirements. However, using this approach it would be challenging to provide direct financial incentives for individual farmers to reduce the carbon-footprint of their output. In addition, adoption of this approach has the potential to lead to conflicts of interests between different sectors in view of the allocation of carbon-credits, e.g. the agricultural sector and the energy and transport sectors regarding the credits associated with the production of bioenergy and biofuel crops, respectively.

Option 2: individual farm scale
Such incentives would be readily available using the alternative approach of implementing the point-of-obligation at farm level; however, depending on farm enterprise, this latter approach may be associated with significant carbon-accountancy requirements (see 3.3 below)

Option 3: co-operative scale
A third alternative is to selectively facilitate farm co-operatives to trade carbon credits for shared initiatives such as anaerobic digestion of e.g. slurry.

Option 4: processor level
It is worth noting that New Zealand has adopted an approach in which the point-of-obligation is at primary processor level, where the main processors are allocated a carbon quota that includes the emissions of their suppliers. The potential benefit of

adopting this approach is that it provides a flexible mechanism to align and integrate national government targets with existing consumer and corporate goals. However, the structure of New Zealand's primary processing industry is significantly different from the corresponding industry in Ireland, and the implications of this in an Irish context require further research and analysis.

3.3 Carbon-accountancy requirements

Teagasc has concerns about the significant carbon-accountancy requirements that may be associated with a domestic offsetting initiative at farm level, depending on farm enterprise type. Teagasc expects that for *some* farm enterprises, particularly bioenergy and biofuel production, the accountancy requirements may well be justified by the scale and scope for carbon offsetting and the associated contribution to reducing national greenhouse gas emissions. However, Teagasc expects that for other farm enterprises, particularly the livestock sector, the accountancy requirements will be significantly more complex, impractical, or inequitable, as outlined below.

Biofuel and bioenergy
For bioenergy and biofuel enterprises, Teagasc expects that the carbon-accountancy requirements will be relatively low and straight-forward. These will mainly involve the areas of bioenergy and biofuel crops on farms, and the associated coefficients for carbon-sequestration by these crops, as derived from ongoing empirical research by Teagasc and the Universities. As a result, Teagasc anticipates that the ratio between tradable carbon-credits and carbon-accountancy requirements will be favourable for these enterprises.

Farm forestry
For farm forestry, Teagasc expects that the carbon-accountancy requirements will be higher, as carbon-offsetting processes by forestry operate at decadal, rather than annual time-scales. Therefore, any accountancy schemes for farm forestry are likely to have to account for, among other factors, the age-profile of forestry stands.

Tillage and livestock enterprises
For other enterprises, particularly the livestock industry, Teagasc is concerned that the carbon-accountancy requirements will be exponentially more complex, and that the ratio between accountancy requirements and incentivisation of carbon-reducing farm management practices may be unfavourable.

It has been well established that there is no single "silver bullet" to reduce GHG emissions from tillage and livestock enterprises, and that reductions can only be achieved through an integrated suite of simultaneous farm management options. In

isolation, the impact of each of these options will be subtle, and moreover, in many cases specific to soil type, farm type, and local climatic conditions. For example, reductions in nitrogen fertiliser use through increases efficiency may reduce nitrous oxide emissions on individual farms; however, the extent of such nitrous oxide reductions may differ by orders of magnitude between individual farms, as this is dependent on soil drainage, which may vary between individual fields. A second significant factor that adds complexity to the establishment of carbon quota and credits on these farms is movement of livestock and feedstuffs between farms; this would require a temporal partitioning of any lifecycle analysis associated with these animals and/or feedstuffs. It is paramount that an equitable carbon-accounting scheme for the livestock sector would require that such subtle between-farm differences are accurately and verifiably accounted for.

Teagasc, in conjunction with Bord Bia, is piloting a within-farm LCA on 200 beef farms (Crosson *et al*., 2010). While this approach is appropriate at pilot scale, the accounting requirements for full "role-out" of such an LCA is likely to be cost-prohibitive. This "role-out" could only be considered on the basis of a much simplified approach of using partial LCAs (see 4.2 below).

Therefore it is Teagasc's view that there is an inherent risk that the resource requirements for a detailed accountancy scheme may well prove to compete with resource requirements of the actual mitigation actions that are required. In other words, in the case of livestock enterprises, time spent counting carbon may well compete with time spent on cutting carbon.

3.4 Requirement to avoid "pollution swapping"

As with all environmental policies, any domestic offsetting scheme should a priori negate the potential for "pollution swapping", where reductions in GHG emissions from agriculture would be associated with other, negative environmental side-effects. Examples include manure management measures such as aeration which may significantly reduce methane emissions while increasing ammonia and/or nitrous oxide emissions (Amon *et al*. 2005; Chadwick 2005). At the same time, synergistic mitigation measures have also been reported, both for nitrous oxide and ammonia, such as reduction in dietary crude protein (Meade *et al*. 2010; Bourdin *et al*. 2010) and for nitrous oxide and nitrate leaching (Di & Cameron 2004; Dennis *et al*., 2009). Other examples include the conversion of land-use to biofuel production, which is subject of ongoing Teagasc research.

4. PROPOSED SOLUTIONS AND SUGGESTIONS

While, at this point in time, Teagasc has no in-depth view on the optimum design or operation of a carbon-accountancy system for domestic offsetting, it would like to offer the following elements for consideration:

4.1 Phased roll-out of domestic offsetting across the agricultural sector

As outlined in Section 3.3, agricultural systems differ in complexity, and also in the extent to which they could meaningfully contribute to a domestic offsetting scheme. As a result, Teagasc expects that, across agricultural enterprises, there will be considerable variation in the ratio between the potential for carbon-trading and accountancy requirements. Therefore, Teagasc advises that any domestic offsetting schemes is rolled out on a phased basis, starting with agricultural sectors for which carbon life-cycle analyses have been well-established, and that have the highest potential for carbon offsetting. At this point, Teagasc has not conducted a full quantitative analysis of the aforementioned ratio between the potential for carbon-trading and accountancy requirements, but expects that this ratio will be highest for enterprises that include the production of biofuel and/or bio-energy crops, farm-forestry, and progressively reduced for the tillage and livestock sectors.

4.2 Partial vs. full LCAs

It is Teagasc's view that any domestic offsetting scheme can only be practical if it is based on partial, rather than full carbon Life Cycle Analyses. LCAs for individual farms are extremely complex, and subject to very large uncertainties, due to between-farm variations in soil type, animal breeds, farm management and farm facilities and uncertainties with regard to emission factors. Therefore, the establishment of full LCAs for individual farms will be laborious, time-consuming, subject to large uncertainties, and therefore difficult to verify. Moreover, full LCAs may incur issues surrounding equitability, since local geoclimatic conditions may inherently invoke different levels of GHG emissions between individual farms that are outside the farmer's control.

Therefore, Teagasc recommends that any domestic offsetting scheme is based on partial LCA, that aims to quantify and account for a selective number of *changes* in GHG emissions only, and that carbon credits are based on changes in farm practices / landuse, rather than on absolute and full carbon quota for each individual farm. However, this approach is not without pitfalls either, and requires careful selection of mitigation options that are included in a partial LCA. Selection of these measures requires an *a priori* system analysis, to ensure that individual mitigation measures are not negated by "negative side-effects". For example, any N-based emissions avoided during manure storage may subsequently be emitted during landspreading of the same manure (Amon *et al*. 2005).

4.3 Careful selection of mitigation options to be included

While reduction in agricultural GHG emissions per unit product requires a mosaic of solutions, there is wide variation in the extent to which individual mitigation options can individually contribute to this reduction. Moreover, there is wide variation in the potential costs, or, in selected cases, potential cost-saving, associated with individual mitigation options. It is paramount that any domestic offsetting scheme, based on a partial LCA (as discussed in 4.2 above) should prioritise the accounting of mitigation options that:

a) have the largest potential to reduce GHG emissions per unit product
b) are cost-effective or cost-beneficial
c) are readily verifiable using farm management data that is readily available and does not require additional measurements on individual farms
d) do not have negative "side-effects" elsewhere within the agricultural system that are not accounted for (for example, see Section 4.2)

Preliminary analyses by Teagasc suggest that options potentially fulfilling each of these requirements may include (though not exclusively): biofuel and bioenergy crops, use of anaerobic digestion, use of clover, manure management options, extended grazing and tillage management options (in no particular order).

In this light, it is worth highlighting the potential role of advice and training and education in any domestic offsetting scheme. Teagasc has experience with cost-effectiveness analysis of environmental measures in general, e.g. for GHG mitigation options and for water quality mitigation options (Schulte *et al.*, 2009). In our experience, mitigation options aimed at increasing resource efficiency are the most cost effective options, as they simultaneously reduce requirements for external inputs (and therefore reduce costs), and emissions to the environment. As each farm differs in its external resource requirements, education and direct advice are often the most effective tools to maximise efficiency on individual farms. While the impact of education and advice *per se* may be difficult to quantify, Teagasc recommends that this should be considered as a mitigation measure in its own right in any domestic offsetting scheme.

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