



Inaugural meeting, February 27th 2009. Central Hotel, Exchequer Street, Dublin

Summary

The Carbon Cycle and Sinks Network has been set up to provide research-based policy recommendations to government on reducing greenhouse emissions from land use and from the agricultural sector generally.

Morning Session 9.30-13.00

Facilitated by Corinna Byrne, Network Co-ordinator.

The meeting was held in a workshop-style format, with general introductions to topics followed by in-dept discussion.

1. Introduction.

What form the Network's output might take and how we should work. The funding available. By Richard Douthwaite, Feasta. Project Manager of CCSN.

- Richard gave some background on Feasta, the Foundation for the Economics of Sustainability.
- **Feasta** is ten years in existence and aims to identify the characteristics (economic, cultural and environmental) of a truly sustainable society, articulate how the necessary transition can be effected and promote the implementation of the measures required for this purpose.
- Feasta is very active in the area of climate change. It has a climate change working group and highlights that a twin track approach is needed to tackle climate change. The tracks are:

Track one: Reducing fossil fuel usage

- Cap and share is a tool, developed by Feasta, that can be used to reduce fossil fuel usage.
- The cap in Cap & Share is applied “upstream” by requiring the fossil fuel suppliers to have permits to bring fossil fuels into the economy. The CO₂ tonnage of permits determines the size of the cap. Under C&S, global emissions would be capped at their current level and then brought down rapidly year by year. Each year, the tonnage of

emissions that the world community decided that it could risk releasing over the following twelve months would be shared equally amongst the Earth's entire adult population. Each of us would actually receive a "fossil fuel pollution authorisation permit" (PAP) conveying the right to our individual share of that year's global emissions and making us responsible for it.

- These PAPs would permit fossil fuel production. People would sell them to financial intermediaries such as banks or post offices, who, in turn, would sell them on to oil, coal and gas producers. These producers would need to acquire enough permits to cover the CO₂ emissions from every tonne of fossil fuel they sold and international inspectors would check to ensure they did.
- The tonnage of emissions being distributed would be reduced each year.
- By capping emissions upstream the price of the emissions is built into the price of the fossil fuels which are passed through to the consumer. The consumer therefore has a price incentive to use less fossil fuel. People who use less fossil fuel than the average get more in compensation from the sale of their certificates than their cost of living goes up.
- More information can be found at www.capandshare.org
- One side effect of capping fossil fuel use is that a high price for energy will be established to support investment in renewable, this is especially needed now due to the economic downturn.
- Ireland aims to achieve a 30% reduction in fossil fuel usage by 2020. If the price of carbon goes up, the fossil fuel price will go up. This will increase the use of biomass as a feedstock for biofuel production. Imports of biofuel could result in emissions from land use change overseas which releases more carbon in the medium-term than is saved. Palm oil production has this drawback. The conversion of pasture to arable in Ireland would have a similar effect. This is why a second track is needed to preserve and enhance stocks of carbon held in the soil and in biomass.

Track two: Enhance carbon absorption by the natural carbon cycle in and above the soil by land use changes, by adopting new agricultural practises and new technologies.

- 20% of global emissions are from land use change. It is not just a case of stopping these emissions, it is necessary to turn the soils of the world into a carbon sink because there is already too much CO₂ in the atmosphere. It is estimated that the current level of CO₂ in the atmosphere (385ppmv) is already too high to stabilise the climate. Some people say that it needs to be reduced by 10% to 350ppm but others think a target of 300ppm or less could be required. Only natural sinks such as biomass, soils and deposits of zooplankton shells on the ocean bed seem likely to have the potential to take CO₂ out of the atmosphere. However, if they are to do so within the limited time before the present concentration has caused a damaging warming, these natural sinks will need to be enhanced.
- The CCSN therefore aims to provide research-based policy recommendations to government on reducing greenhouse emissions from land use and from the agricultural sector generally.

- It is hoped that the CCSN will become a useful tool not only to develop solutions and policy advice, but to allow information and idea exchange. Ideally the CCSN would be the place to come when seeking advice on reduction of land-use change emissions in Ireland. Feasta hopes that CCSN members will drive it and eventually it will take on an independent life of its own.
- The CCSN is funded by the Dept of Environment, Heritage and Local Government (DoEHLG) with funds from the plastic bag levy. The project began in November 2008. The funding is for 3 years but is subject to renewal on a yearly basis, depending on work done/progress made. €80,000 funding is from the DoEHLG and €20,000 worth of work will be donated by Feasta on a voluntary basis. €20,000 is available for research in the first year.
- It was suggested that the CCSN should prepare a report this year dealing with all aspects of the emissions from Ireland's land and the possibilities of reducing these and of turning the land into a sink. It would be written for government and the general public, not an academic audience. The report will be circulated among the group in draft so that it can be critiqued. The target publication date is September so that it can inform Irish negotiations in run up to the Copenhagen climate talks at the end of the year. Individuals in the group will be asked to prepare initial drafts of the chapters which will be written, as far as possible, to a standard formula. This is envisaged as being:
 1. A statement of the particular problem the chapter is addressing.
 2. A review of the relevant research.
 3. Policy recommendations in the light of the research
 4. An outline of any additional research required.
- Demonstration of the website www.carboncyclesandsinks.org, see other document.

2. Cars or cows? The problem from a policy perspective:

2.1 Overview of the sources and relative sizes of land-based emissions in Ireland. By Dr. Gary Lanigan, Teagasc.

Presentation available on the website.

- Basic background on emissions in agriculture and the EU process towards Copenhagen and emissions targets.
- Overview
 - Current state of national emissions
 - EU 20/2020 proposals
 - Impacts on the agricultural sector
 - The Future: Mitigation options
- Ireland has a third world emissions profile, similar to New Zealand as agriculture is responsible for 27% of Ireland's GHG emissions. The main sources of these emissions are Enteric fermentation, Manure management & Agricultural soils.
- GHG emissions from Agriculture in Ireland have been declining. Populations of livestock, peaked in 1998, but have been declining ever since (sheep in particular). However the dairy herd population hasn't changed in the last 100 years.
- EU 2020 proposal timeline GHG burden sharing proposals
 - Non ETS sector (agriculture, transport, residential, some industry)
 - Must drop by 10% across EU
 - Ireland given a higher target of -20% because of high GDP
 - Flexible mechanisms limited to 3% of non ETS sector (now 4%)
 - C sinks now included with or without a global agreement
 - Non-ETS allowances may be traded across member states
 - Agricultural issues to be investigated (esp. leakage and inventory inclusion obstacles)

Climate Change is a GLOBAL problem

- Agriculture and Food production needs to be seen in **international** context and not **national** context
- Agricultural production decreases in efficient countries with high ratio of product per unit GHG

- Replaced with production in countries with lower ratio of product per unit GHG eg less GHG from beef production in Ireland than Brazil (even with land use change excluded).
- Issue 90% Beef export quota –issue of leakage.
- If we reduce beef production – non annex one countries will fill in the market – like Brazil,
- Leakage issue if not everyone signed up. Regions rather than nations
- GHG Emissions should be looked at per unit product consumed.
- Labelling of products will be a major consumer driver, Tesco emissions labels, but consumers looking for value for money.

Teagasc looks at mitigation strategies by examining:

1. Cost-benefit (Value of Carbon): Cost of strategy vs cost benefit of strategy.
2. Monitoring & Verification (Measuring): Can it be measured?
3. Permanence: is it permanent?
4. Additionality and Leakage

Mitigation Strategies being examined by Teagasc

Methane emissions from livestock

Nitrous oxide emissions

C sequestration

Agriculture needs to gain credit to agriculture for biomass replacement of fossil fuels.

- Question about the tier system: Tier 1: emissions factors supplied, Tier 2: country specific model, Tier 3: full scale model system. Using a tier 2 would mean a worse situation in term of GHG from Agriculture in Ireland.
- Is there a conflict between AD feedstock from animal waste, and extending the grazing period?
- 30% by 2015 – biomass will not grow over night. Intermediate targets – primary production targets are needed. 55, 000 Ha needed for co-firing. 100, 000 Ha needed to meet CHP target.
- Needs fundamental change in farming practice. E.g. Permaculture – productions levels same.
- Agroforestry: Need classifications of what is called forestry or farming - Are we sequestering any carbon – how we qualify? COFORD researching intensively in this area. Teagasc looking at short rotation coppice. AFOLU will bring more focus on this.

- Organic reduces emissions on a hectare basis – but does it on a product basis.

2.2 National Inventory Report Methodology- Bernard Hyde, EPA.

Presentation available on the website.

General introduction to inventory methodology and challenges.

IPCC guidelines 2006. Countries will use these, post 2012.

Research is being done to move to Tier 2/3 systems which will allow better quantification of reductions/increases.

There has been a decrease in livestock population and fertiliser usage.

More soil data needed as only 44% of the soil has been surveyed. CH₄ emissions estimates are accurate, however N₂O emissions are not accurate as vital soil data is missing, and e.g. clay soils emit one-third more emissions.

2.3 To what extent are land-based emissions equivalent to those from the combustion of fossil fuel? By Richard Douthwaite.

The two sources of emissions are not comparable and should not be taken as equivalent in reporting...CO₂ emissions from cars are net additions to the stock of carbon in the atmosphere because they come from fossil carbon. The carbon in the methane released by cattle comes from the food they ate and was extracted from the atmosphere by plants. The methane breaks down quite quickly – its half-life is about 8 years – and releases the carbon as CO₂ back into the atmosphere. This cattle are part of the natural carbon cycle and do not increase the amount of carbon in the biosphere. Nevertheless, while the carbon is in its methane form, it does have a more powerful warming effect than it does as CO₂. But this warming is not cumulative, as is the CO₂ released from fossil fuels. An increase in the national herd will merely lead to a once-off increase in atmospheric methane levels not a continuously increasing one.

Comments: Agricultural GHG emissions are 7% below 1990 levels while Transport GHG emissions are up by 200%. Therefore it may be more important to tackle transport.

However, the atmosphere doesn't care where the GHG comes from. If human activities generated the GHG, then this activity should be accounted for.

There are anthropogenic emissions in agriculture e.g. fertiliser, animal husbandry issues, stocking issues.

(Technical note from P O'Brien, EPA: The Global Warming Potential, GWP, of CH₄ over 100years is 25 (AR4). That is to say the climate impact, integrated over 100year, of one molecule of CH₄ released to the atmosphere today is equivalent the release of 25 CO₂

molecules. It is important to realise that the choice integration period is very important. For methane, a shorter integration means a higher GWP, for 20 years the GWP is 70. Just considering the direct impact of methane over its 10 year or so lifetime in the atmosphere would increase the GWP again. This would lead to a greater emphasis on methane mitigation as a way to achieve emissions targets. Given the lack of alternative mitigation options, reduction in animal numbers would be the only effective path to achieve this. New Zealand is arguing that a longer time period be considered (500 years) for exactly this reason).

3. What the government would like to receive. By David Healy, special adviser to the Minister for the Environment.

Government were pleased to get applications for funding for projects like this. Involvement of different groups is essential. There is a lot of overlap in the policy areas....climate change, waste, energy, rural economy.

It is vital that information from this project is communicated to land-owners. REPS may have a role to play?

Specifics: carbon sequestration on forestry only. COFORD.

Information is needed on all aspects of Carbon sinks.

Work is being carried out at academic levels. The CCSN will allow the development of a network for information exchange.

UL-working on second generation biofuels. Bord na Mona moving on this track too.

RD: the network is looking towards Copenhagen as the first goal post. It aims to have a solid picture of the non-forestry sinks.

4. Solutions to the problem

In some areas, we already have a fairly good idea of what our policy prescriptions will be. In others, we know that more research will be required. This session is envisaged as a triage process in which we quickly assess each area on which we will be expected to give advice and decide what we need to do if we are to publish a preliminary report in September. These areas include:

4.1 Peatlands

- Full protection of intact peatlands.
- Restoration of degraded peatlands e.g. rewetting to raise the water table.

The Irish Peatland Conservation Council (www.ippc.ie) is formulating a new Peatland Conservation Plan for Ireland due to be published shortly.

Sarah Malone presented the actions needed to halt the loss of peatland biodiversity and combat the predicted impact of climate change on peatlands. Presentation available on the website.

- There is no peatland policy in Ireland. Policy needs to incorporate the value of peatlands as carbon-sinks. ~17% of the land is made up of peatlands and they contain 1.2 billion tonnes of carbon.
- Peat protection and restoration. Blanket bog is easier to restore.
- REPS may have a role to play in peatland protection/restoration.
- Coillte have been involved in an EU-LIFE funded restoration project, involving the restoration of previously forested peatland.
- Carbon flux measurements are very limited, more are needed. These types of measurements should be incorporated into all studies in order to glean as much information on CO₂ fluxes as possible.
- Kerry – Kiely group (UCC) – long term measurements on blanket bog.
- Single farm payment should have reduced the number of sheep on upland heaths and peatlands in order to allow some recovery. This needs to be assessed. More data is needed on the extent and quality of these shallow peats. Certain areas are very recoverable, others are not.

Dr. David Wilson, UCD, Peatland Expert. Peatlands in Ireland.

Presentation on the website.

Peatlands cover around 16% of the land in Ireland and store an estimated 1.2 billion tonnes of carbon. The key controller of carbon cycling in peatlands is the position of the water table. In intact or undamaged peatlands, the water table remains at or close to the surface. Decomposition rates are very slow and as a result, more carbon enters the peatland than exits. However, when hydrological functioning is impaired through drainage the peatland quickly switches from being a small net carbon sink to a large net carbon source. Less than 20% of Ireland's peatlands remain in an intact form. The remainder have mainly been converted to agricultural use, utilised for their fuel/horticultural resource or afforested. Each land use change significantly impacts on carbon dynamics within the peatland and has major implications for future policy decisions.

- No peatland policy.
- Climate change is one of the greatest threats to peatland as damaged peatlands are the most vulnerable to climate change.
- Research priority: montane blanket bogs and fens.
- Intact peatlands tend to be a net sink, but it is a fine balance, and can switch from a sink to a source from one year to the next.
- Overgrazing is the worst impact of agriculture: has a number of cumulative effects.
- Difficulty in restoring peatland.
- Policy issues:
- Public service obligation: electricity generation using peat is subsidised. The money may be better spent elsewhere.

- Turbary rights: Cessation of peat harvesting in SACs has not happened. Strong lobby group in the IFA. The full nature and extent of the turbary/horticulture non-Bord na Mona peat extraction is unknown.
- Peat for horticulture: Huge trade in peat in agriculture: professional grade peat will always be in demand. However, domestic products may not include peat in the future. BnM is to reduce the peat content of its horticulture products by 90%.
- Afforestation: 2,300 ha of forestry planted on peatlands per year (30% of total planted) Forest Service, 2007. This should not continue. Forestry on cutaway peatlands are small sources, forestry on intact peatlands, not sure.
- Wind turbines: More work is needed on peat loss and loss of the carbon sequestered, due to construction, which disrupts the stability and functioning of the peat and can result in Bog slides.
- Losses of peat are not factored into planning applications. There is a lack of enforcement of mitigation measures by the local authority, and a lack of planning control. There is a disconnect between the Dept. of Trade and Enterprise and Environmental concerns. Gave an example of threat to the Red Grouse as a result of the construction of Wind turbines. Access roads mean that previously inaccessible habitats are now being used by dog walkers, boy-racers, quad bikers etc with massive knock on effects. These are not considered in planning applications.
- There are guidelines for wind turbines on peat that say that where the peat is 50 cm or more deep investigations need to be carried out, but these are only guidelines.
- Technical note: Phillip O'Brien, EPA. In NIR 2009 to be published shortly, the methodology to estimate the emissions due to extraction of peat for domestic combustion has been revised. Previously an estimate of 1million tonnes per annual was used based on expert opinion in BnM. In the latest estimate, the energy consumption data (based on SEI analysis of household survey) has been used. The estimate is still quite rough, but now reflects the trend over the last few decades to less domestic usage of sod peat for residential energy. The estimate of area of peatland used by non-BnM extraction of peat for horticulture remains based on BnM assessment of their competitors' share of the market.

4.2 Arable land

- Reduction of CO₂ emissions from tillage, e.g. incorporation of minimum till/conservation agriculture practices?
- Reduction of emissions from fertilisers?
- Cropping with carbon sequestering energy crops?
- Ireland has the capacity to increase its tillage production by 15%.

- Arable land: Minimum tillage/conservation tillage, issues with N₂O emissions. Yield reductions, need stricter weed control, decrease in fuel consumption but an increase in herbicide usage.
- Reduction of C losses from the soil could involve reduction of winter fallow, replacement with a cover crop, e.g. mustard, but added cost of €200/ha to farmer. Cheaper, efficient alternative is to scrap the soil after harvesting. This stimulates plant growth without the need for a cover crop. Still involves costs: farmer's time, fuel costs.
- It may be better to grow carbon-sequestering energy crops. Perennial energy crops e.g. Miscanthus, which has a large rhizome root system, which sequesters C in the soil. It is effective in holding nitrogen and locking it up in the system. There are issues with establishment of Miscanthus as it takes 5-6yrs to establish which is a long time for the farmers to commit their land to a crop, particularly if they are using con-acre.
- Biochar: more research needed. UL: Pot trials showing effect on plant growth and chemical characterisation of the Biochar.

4.3 Grassland

- Reduction of methane emissions from ruminant animals?
- Reduction of N₂O emissions from nitrogenous fertilisers?
- Reduction of methane emissions from slurry storage?

Much of this is covered above in section 2.1.

If grasslands are ploughed up, the C stored in them is lost and it can take up to 20 years before this C is regained.

Teagasc is examining ways to reduce emissions from livestock, by looking at keeping cattle out on grass for as long as possible, using wintering pads, reducing finishing times of cattle. Intensity vs efficiency.

Slurry spreading equipment is being examined: trailing shoe is more efficient than the commonly-used splash plate method as the nitrogen in the slurry is not volatilised to NH₄, so there are less emissions going up into the atmosphere.

There is a move away from CAN towards Urea, which has a more sustained, slow release of nitrogen.

Dairying is to increase in Ireland. Any quota that becomes available in the EU will be taken up by Ireland.

4.4 Others

- Forestry
 - increase the carbon content of forests through management practices
 - hedgerows: account for 1.2% of land area of Ireland. Important to consider increasing the amount of CO₂ that they can take up.

- Biochar
 - Use of biochar to increase the carbon content of soils.
- Reward systems

5. Presenting our ideas.

If we agree that, besides the website, a publication is the best way to present an overview of the problem and the possible solutions to civil servants, ministerial advisers, TDs and senators and the general public, we could proceed on the following lines:

- Prepare a list of chapter headings- possible topics to be circulated by email to advisory panel in order to select the ones that we will focus on. We need to decide what areas can be targeted immediately, what are the easiest options etc. Conservation needs to be very strongly incorporated because we need to keep the CO₂ that is sequestered already locked up.
- Agree the overall style and the structure of each chapter. –ideas to be circulated by email to the advisory panel. The document is for policy makers and therefore must use suitable language.
- Look for volunteers to draft each chapter and to circulate the draft before the next meeting of the Network.- will be done by email.
- Identify those topics for which an unusual amount of work will be required and which should therefore be considered as a possible use of some of the available research funds.
- Agree the date of the meeting at which the drafts will be discussed.

Changes in Land Carbon Stocks in Ireland.

Prof. Mark Maslin, University College London.

Old photographs show that many places in rural Ireland have more trees and scrub today than they did a century or so ago. This “greening” is continuing at a rapid pace according to satellite data. This means, of course, that carbon dioxide is being extracted from the atmosphere and locked up in above- and below-ground biomass and in the soil. Until now, however, there has been no way of measuring how many tonnes of carbon are being removed this way with the result that Ireland cannot use a removals figure to offset its fossil-fuel and land-based greenhouse emissions in the returns it makes to the EU and the UN.

Prof. Maslin believes he has overcome this problem and that he could use satellite data to calculate with reasonable accuracy how much carbon is being locked away if measurements are available to establish the base-line levels in sample areas. He will describe how the system works and how it might be applied in Ireland.

Measurement of Carbon stocks using satellite data.

There is a need for a global standardisation of carbon measurements.

Heterotrophic respiration is a missing factor in the IPCC guidelines.

Ground truthing of measurements is important.

Question: Who owns the carbon credit? At present both company and government can claim the credit. A danger that large companies and global financial institutes will oust small scale farmers, or simply exploit their efforts.

Question: Do you have faith in Carbon Trading? Pragmatically, carbon trading is the only game in town; there are no other systems on the table. Regulation and enforcement is vital.

Use of alternative satellite data to get to higher resolution (LANDSAT)