# Extended Abstract
## Please do not add your name or affiliation

| Paper/Poster Title | Policies to reduce GHG emissions from agriculture, their implications for agricultural activity levels and land use decisions in Ireland |
|---|---|

**Abstract prepared for presentation at the 97th Annual Conference of the Agricultural Economics Society, The University of Warwick, United Kingdom**

**27th – 29th March 2023**

| Abstract | 200 words max |
|---|---|

To prevent the most damaging effects of climate change, the Intergovernmental Panel on Climate Change (IPCC) have identified the need to limit the rise in the global average temperature to 1.5°C above pre-industrial levels. In support of the goal of climate change mitigation, Ireland's Climate Action Plan has set a goal of reducing overall greenhouse gas emissions by 2030 and setting us on a path to reach net-zero emissions by 2050. As part of the plan the agriculture sector has been set of 25% reduction target relative to 2018. This paper utilises the CAPRI model to evaluate the effect of a hypothetical €100 carbon tax on non-CO2 emissions for agricultural. Results revealed that under a €100 carbon tax, overall GHG emissions would decrease in large part due to a decrease in beef meat activities, which is along with the dairy sector the dominant source of methane emissions in Irish agriculture. Average agricultural income would be projected to increase due to less profitable production exiting under carbon tax and price. A significant increase in the area of set aside and fallow land is also observed, which leads to a reduction in agricultural land and can be used for an increase in afforestation.

| Keywords | Carbon Tax, Afforestation, GHG emissions, CAPRI model, Ireland |
|---|---|
| JEL Code | Q00, Q1, Q540, Q580<br>see: www.aeaweb.org/jel/guide/jel.php?class=Q) |

| Introduction | 100 – 250 words |
|---|---|

Agriculture is an important contributor to GHG emissions both globally (12%), and in the EU (10%) (Fellmann et al., 2018; Duffy et al., 2020), while agriculture in Ireland is the single largest source accounting for 37.5% of national GHG emissions (EPA, 2021). Despite the growing awareness of the need to reduce GHG emissions, emissions from agriculture in Ireland have been increasing largely- due to expansion in the national dairy herd as part of a national strategy to capitalise on the opportunities presented by the abolition of the EU milk quota regime. Therefore, Ireland faces a significant challenge to meet its national sectoral target of a 25% (5.75 Mt) reduction in GHG emissions by 2030 relative to 2018 (Climate Action Plan 2021).

Ireland introduced a scheme of afforestation grants and premia in the 1980s to incentivise private afforestation. This was largely motivated by a desire to diversify and improve farm incomes, however since the early 2000s actual afforestation levels have consistently fallen below national targets. The challenge to reduce GHG emissions and the potential of forestry to sequester carbon provides a renewed justification for the continued provision of state financial support to private afforestation, in order to expand the planted area in Ireland. As afforestation is an important contributor to Ireland meeting its net emission targets there is a need in forecasting the potential effects of carbon tax on afforestation rates. The current paper aims to evaluate the possible impacts of a carbon tax on agricultural non-$CO_2$ emissions in the EU.

| Methodology | 100 – 250 words |
|---|---|

The Common Agricultural Policy Regional Impacts (CAPRI) model is used to evaluate the potential effect of a hypothetical carbon tax on agricultural land use. CAPRI is a large-scale, comparative-static, agricultural sector model, which consists of two interacting modules. The supply module, a highly detailed, disaggregated, and non-linear programming model, optimizes policies and technologies based on farm models. In this module, farming decisions are depicted in detail at the NUTS 2 and farm type levels for about 280 European regions (within the 2500 farms in the EU, covering 55 farm inputs and 60 activities). The market module embraces a spatial, global multi-commodity model covering 77 countries in 40 trade blocks for 47 primary and processed agricultural products. The two modules are linked through an iterative procedure.

A carbon tax scenario is implemented where a tax of 100 €/t of CO2eq on GHG emissions in the agricultural sector is levied for all EU countries under the market module. Then the impact of the carbon tax will be quantified relative to a reference scenario by 2030, which assumes no change from those agricultural, environmental and trade policies that are already ratified based on the available information (e.g., abolition of the EU milk and sugar quotas). Under the policy scenario, we investigate the possible impacts of a €100 per ton carbon tax on methane and nitrous oxide emissions from agricultural activities. Therefore, carbon tax is rather a subsidy and applied only to additional emissions, where the baseline emissions are granted free.

| Results | 100 – 250 words |
|---|---|

In the following, some key results are reported quantifying the impact on EU production and related GHG emissions as a result of the carbon tax compared to the reference scenario in 2030. Results show that the introduction of a carbon tax would significantly alter agricultural production in Ireland. The reduction in the total Utilized agricultural area (UAA) in Ireland is small at 0.72% (UAA in the EU decreased by 1.25%) and is mostly due to a 1.12% decrease in cereals land. On the other hand, set aside area and fallow land increased by 17.5%, reflecting a further reduction of arable land. The increase in set aside area and fallow land in Ireland is significantly higher than in the EU countries (12.3%). In contrast, the carbon tax is projected to have a significant impact on the animal sector in Ireland, with beef meat activities projected to undergo a substantial decrease in herd size (16%), which is higher than the EU (-13.4%). However, the projected reduction in dairy cow numbers is not as

large (6%), but this still reflects a larger decrease than for the EU (4.5%). Because of higher costs and reduced production activities for the producers under the carbon tax, consumer and producer prices are projected to increase for all animal products. Despite a reduction in animal herd size and crop hectares, Agricultural income in Ireland is projected to increase by 17% under the policy scenario, which is substantially higher than the average increase at the EU level (10%).

| **Discussion and Conclusion** | *100 – 250 words* |

Although the carbon tax successfully reduces emissions, this does not come without cost. Under the carbon tax scenario, the cost burden of complying with any emission reduction policy will fall largely on the agricultural producers. Therefore, the producer is subject to the tax and they in turn adjusts production decisions resulting in reduced agricultural output. The introduction of a €100 carbon tax in the EU is projected to reduce agricultural emissions in Ireland by 11% compared with a reduction of 6% in EU as a whole. This result implies that the animal sector, which is the major source of emissions in Ireland, responds through a reduction in production and evident in a reduction in its herd size. Despite this, the farm income will increase as less profitable farms can substantially reduce herd sizes and get €100 income per reduced tone of CO2eq. Emissions reduction is increasingly achieved through a reduction in production levels under the €100-carbon tax scenario, which affects regional food consumption levels, in particular, animal-based consumption. Generally, ruminants are identified as a key sector for climate change mitigation, contributing across models and carbon tax scenarios. Finally, the reduction of the animal sector in herd size follows by an increase in set aside area and fallow land, which potentially provides a chance for agriculture lands conversion to afforestation area in Ireland. It offers farmers a higher level of income through the financial support provided by grant and premium payments currently in place under the national afforestation scheme.