UMR Herbivores

Team Design, Modelling and Evaluation of Herbivore farming Systems (COMETE)

Strategies and costs of reducing greenhouse gases in French dairy production

This study compared greenhouse gas (GHG) mitigation strategies for dairy production across bio-economic models. Three supply models (AROPAj, ORFEE and FARMDYN) and the partial equilibrium model GLOBIOM were used to shed light on the potential for reducing emissions, their costs and related uncertainties. The results suggested that up to 15% reductions GHG emissions can be achieved with productive animals fed low-input forages and by reallocating milk production to areas less favourable to field crops. Between 1% and 6% reductions in GHG emission can be achieved at the current EU allowance price (≈20€/tCO2) without reducing production. Models incorporating more flexibility to adapt systems often simulate less costly strategies.

The French dairy sector has to address the challenge of mitigating GHG emissions to curb climate change. Deciding the economically optimal mitigation level and mix of abatement strategies requires knowledge on the cost of reducing GHG emissions. This study compares the mitigation strategies and dairy production reduction costs simulated in three bio-economic supply models (AROPAj, ORFEE and FARMDYN), and the global partial equilibrium model GLOBIOM to shed light on the potential to reduce emissions, their costs and related uncertainties.

This study highlights the benefits of using different economic models together to better understand the different adjustment factors and to cover a wider range of mitigation strategies. The results reflect the structure of the model and the parameters used. The marginal abatement cost is generally lower when more flexibility is left to the model to reduce GHG emissions. Overall, the model results suggest that up to 15% reduction in GHG emissions can be achieved with the following strategies: (1) allowing animals to reach their milk production and reproductive potential, (2) feeding them low-input forages such as grasslands or legumes, and (3) reallocating milk production to areas less favourable for field crops. It was also simulated that between 1% and 6% reduction in GHG emissions could be achieved at a marginal cost of 20 €/tCO2e, a value close to the current EU carbon quota price, without substantially reducing milk production or outsourcing the production of feed and herd renewal inputs. This abatement varies between 4% and 15% for a tax of €100/tCO2e. We concluded that milk production is not a sector where integration into the EU Emissions Trading Scheme is advantageous. Streamlining climate change policies with other Common Agricultural Policies, such as green direct payments, agri-environmental climate measures or the Nitrates Directive, seems more effective.

Both the supply-side and partial equilibrium models highlight key aspects for policy making. On the one hand, a considerable drop in farmer profits is simulated for a high level of carbon tax, highlighting the risk that some farmers will stop producing. On the other hand, the results of the partial equilibrium model show that, in a situation where the trade balance is preserved, the taxes induce a decrease in milk production and an increase in milk prices and thus raise food security concerns.

Publication

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