

Title

The cost-effectiveness of greenhouse gas mitigation measures in Danish agriculture

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Abstract

In Denmark, agriculture accounts for 31 per cent of non-ETS emissions mainly in terms of methane (CH₄) and nitrous oxide (N₂O). Consequently, the contribution from agriculture to the non-ETS emissions reductions required by the EU might be substantial. In this paper, we analyse 7 agriculture-related GHG reduction measures: biogas from slurry; slurry acidification in stables; higher energy diet for dairy cows; higher fat level in diet for dairy young stock; nitrification inhibitors in mineral nitrogen fertilizers; nitrification inhibitors in slurry; conversion of arable organogenic land to permanent grass with and without termination of drainage. The cost-effectiveness of these measures is compared based on calculated social cost per ton of reduced CO₂-eq – with and without LULUCF effects and with and without the value of ancillary benefits (mainly reduced nitrate leaching and ammonia evaporation). The social cost calculations incorporate deadweight losses associated with the use of different policy implementation instruments. Estimated social abatement costs range from net benefits of EUR 140/ton CO₂-eq to costs of EUR 190/ton CO₂-eq including LULUCF and ancillary benefits. Changed feed composition for dairy young stock (having negative social costs) is identified as the most cost-effective measure followed by slurry acidification in stables provided that ancillary benefits are included. The analysis also shows that production of biogas from slurry is economically beneficial for the agriculture sector – due to considerable subsidies – but entails medium to high social costs. Furthermore, the paper considers the GHG reduction potentials of the different measures and the choice of policy instruments to ensure the implementation of the measures analysed. The estimated abatement costs for agriculture-related measures can then be compared to abatement costs in other non-ETS sectors (in a MACC diagram) to identify a cost-effective realization of the abatement target for the entire non-ETS area in Denmark.