

**Management and Impacts of Climate Change Programme
GICC
CRP 2001**

1/01 – Spatialization of the impact of economic regulation of the agriculture-related greenhouse effect

Summary of Final Report

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This report deals with the spatial dimension of questions related to the impacts of the economic regulation of farm-generated greenhouse gas emissions. The overall objective is to strike a balance between aggregated macroeconomic approaches – unable to reflect the geographic variability of sources and abatement costs - and physical models that operate on limited scales in space.

Research carried out within the framework of this project mainly focuses on the use of a microeconomic sectoral model of the European agricultural supply system based on mathematical programming and optimization. The spatial dimension is taken into account through Geographic Information Systems (GIS) that make it possible to integrate spatially the results of the economic models employed.

The research work draws on a complete evaluation of the balances of methane and nitrous oxide agriculture-related emissions for the whole of the European Union on the scale of the FADN areas (the scale on which the data entered in the agricultural supply model are available). These evaluations make it possible to measure the emission reduction capacity of the agricultural sector, and thus the marginal abatement costs in a first-tier context (simulation of an emission tax). The heterogeneity of these costs is explored both at the regional level (spatialized) and at the individual level (non-spatialized). Our findings show that the heterogeneity of abatement costs should be taken into account when defining public policies, since instruments such as uniform quotas (non tradeable) induce a supplementary cost that increases with the heterogeneity of abatement costs. Our results enable us to assess this supplementary cost in the case of agriculture-generated greenhouse gas emissions.

Analysis on the sub-regional scale involves intersecting simulations obtained with the economic model with GIS-processed georeferenced databases. This makes it possible to distribute on a finer scale information that is available at an aggregated level (FADN area). Analyses for this purpose within the framework of this project were carried out on a test region by crossing land use data from Corine Land Cover and typology from FADN data.

Carbon sequestration was also dealt with on the sub-regional scale through the simultaneous integration of the spatial and dynamic dimensions. This analysis is based on the use of a microeconomic dynamic land-use model, crossed with a georeferenced database of soil characteristics and with a carbon accounting model. Estimates are given of the cost of carbon sequestration determined by the transition from annual crops to pluriannual energy crops, which allow larger quantities of carbon to be stored for longer periods.