

EUFASOM
EUropean Forest and Agricultural Optimisation Model
An extremely brief introduction

Primary Objective:	Maximisation of the Producer and Consumer Surplus
Time horizon:	variable, current data allow up to 150 years
Time resolution:	5 years
Geographical coverage:	World
Geographical resolution:	Country level (EU25), Continental Regions (ROW)
IPCC Sectors covered:	Agriculture, Forest, (and Wetland Ecosystems)
GHGs covered:	CO ₂ , N ₂ O, CH ₄ (until now)
Other pollutants:	Nitrogen-phosphor leaching, sediment transport
Features:	Multi-sectoral partial equilibrium, Bottom-up approach, Broad land management adaptation (irrigation, fertilization, tillage, conservation, thinning, forest rotation length, species choice) Land use change between agriculture, forestry, nature reserves, and energy crop plantations, Endogenous prices, supplies, demands, trade Integrates results from EPIC, OSKAR or GTM(forest sector) models
Simulation mode:	Deterministic
Optimization mode:	Dynamic (multi-periodically) Platform: GAMS

EUFASOM is a multi period partial equilibrium model of the European Agricultural and Forestry sectors, which has been developed to analyse changing policies, technologies, resources, and markets. For instance, the introduction of a carbon tax would influence the production on goods, plantation of different species, land use change etc. In addition, the model is well suited to examine the impact of new agricultural and forest technologies, which have not been used on a large scale outside experimental plots. The scientific value of the model also includes its link-ability to other models.

The model is regionalized at the EU country level and runs in 5-year steps from 2005 to a selected terminal period. At the core of the model are agricultural and forest management choices. Technologies require both physically limited resources and other inputs. They yield one or several commodity outputs or growing resource stocks.

Technically, EUFASOM is a mathematical programming model containing millions of individual variables and equations representing a welfare maximizing objective function and technological, resource and market restrictions.

EUFASOM's objective function maximizes total agricultural and forestry sector surplus, subject to a set of constraining equations which define a feasible convex region for all variables.

Solving EUFASOM involves the task of finding the “optimal” level for all endogenous variables subject to compliance with all constraining equations. The optimal variable levels can be interpreted as equilibrium levels for agricultural and forest activities under given economic, political and technological conditions.

EUFASOM is data intensive. Many input data are simulated by other models or are directly taken out of different data bases.

The assessment of environmental impacts from agricultural and forest production, activities as well as political opportunities to mitigate negative impacts, is also a major application for EUFASOM. To meet this task, EUFASOM includes environmental impact accounting equations.

The GHG emissions and emission reductions are accounted for all major sources, sink and offsets from agricultural, forest and ecological activities, for which data were available or could be simulated.

Generally, EUFASOM considers:

- Direct carbon emissions from fossil fuel use in tillage, harvesting, or irrigation water pumping as well as altered soil organic matter (cultivation of forested lands or grassland),
- Indirect carbon emissions from fertilizer and pesticide manufacturing,
- Carbon savings from increases in soil organic matter and from growing trees,
- Carbon emissions from harvested timber products,
- Nitrous oxide emissions from fertilizer usage and livestock,
- Methane emissions from livestock and rice cultivation, and
- Methane savings from changes in livestock management.

Future development of EUFASOM, i.e. within the European Non-Food Agriculture project will add bio-fuel production opportunities and their impact on emission levels.

Further documentation:

- <http://www.iiasa.ac.at/Research/FOR/INSEA/>