

MARKAL MATTER 2.0 module Characterisation for the agriculture and food sector

Matter 2.0

A module characterisation for the agriculture and food sector

Abstract

In recent years, the Western European MARKAL-model has been extended with a materials system module covering the whole life cycle 'from cradle to grave'. This model including energy and materials is called MATTER 1.0 (Gielen, Gerlagh and Bos, 1998). This document describes a further extension with an agricultural module, called MATTER 2.0.

Ten agricultural crop types are considered which cover about 90% of the agricultural land use in Western Europe. The pastures alone cover about 40% of the agricultural land use. Land quality and land productivity has been considered through a split into three regions: North and Middle Europe, Southern Europe high yields and Southern Europe low yield. The split for Southern Europe is important because 50% of the land area in Southern Europe that is characterised as agricultural land has actually a very low productivity because of water availability constraints and mountainous topography. Generally speaking, yields in Middle Europe are higher than the yields in Southern Europe. Three quarters of the land use can be allocated to animal products: meat, dairy products, eggs and wool. Most important agriculture greenhouse gas (GHG) emissions considered within the model are methane (CH₄) and nitrous oxide (N₂O). Total emissions for these gases are around 350 Mton CO₂ equivalents. This equals to 9% of the Western European GHG emissions. The main sources are:

- Methane from enteric fermentation in domestic livestock (160 Mton CO₂ equivalents).
- Methane from manure management (65 Mton CO₂ equivalents).
- Nitrous Oxide emission from fertiliser use (60 Mton CO₂ equivalents).
- Nitrous Oxide emissions from manure use (125 Mton CO₂ equivalents).

Reduction options dealt with are:

- Increase of the conversion efficiency of enteric livestock fermentation or change of the fodder composition,
- Change of the manure storage system,
- Reduction of the nitrogen input into the agriculture,
- Substitution of current meat or fodder products by other protein sources.

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