



# Data for Estimating GHG Emissions from Mineral Soils

## IPCC Tier 1 Method

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# Structure

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## A. Introduction

- A.1 Approaches and Methods
- A.2 Parameters defining Cropland Management Factors
- A.3 Parameters defining Grazing Land Management Factors

## B. Data Framework

- B.1 Spatial Data
- B.2 Statistical Data
- B.3 Processing Configuration

## C. Data Sources

- C.1 Invariable Data
- C.2 Land Use
- C.3 Management
- C.4 Input

## D. Summary

# A. Introduction

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## 1. Approaches and Methods

- **IPCC Tier 1 Method:**  
changes in C-stocks are based on C-stock after a change in land management relative to the reference condition.
- **Activity-based Accounting** (vs. Land use category-based):  
changes in C-stocks per activity, unit of area and time period.
- **Net-net accounting** (vs. gross-net accounting):  
net emissions in each year minus net emissions in base year.
- **Approach 2:**  
total area and specific transitions between each land management system provided.

# A. Introduction

## 2. Parameters defining CM Factors ( $F_I$ )



Low residues, for example:

- cotton,
- vegetables,
- tobacco,
- no mineral fertilizer or N-fixing crops\*



Enhancing residues, for example:

- cover crops/green manures,
- mixed crop/grass systems,
- irrigation,
- vegetated fallows,
- high residue yielding crops.

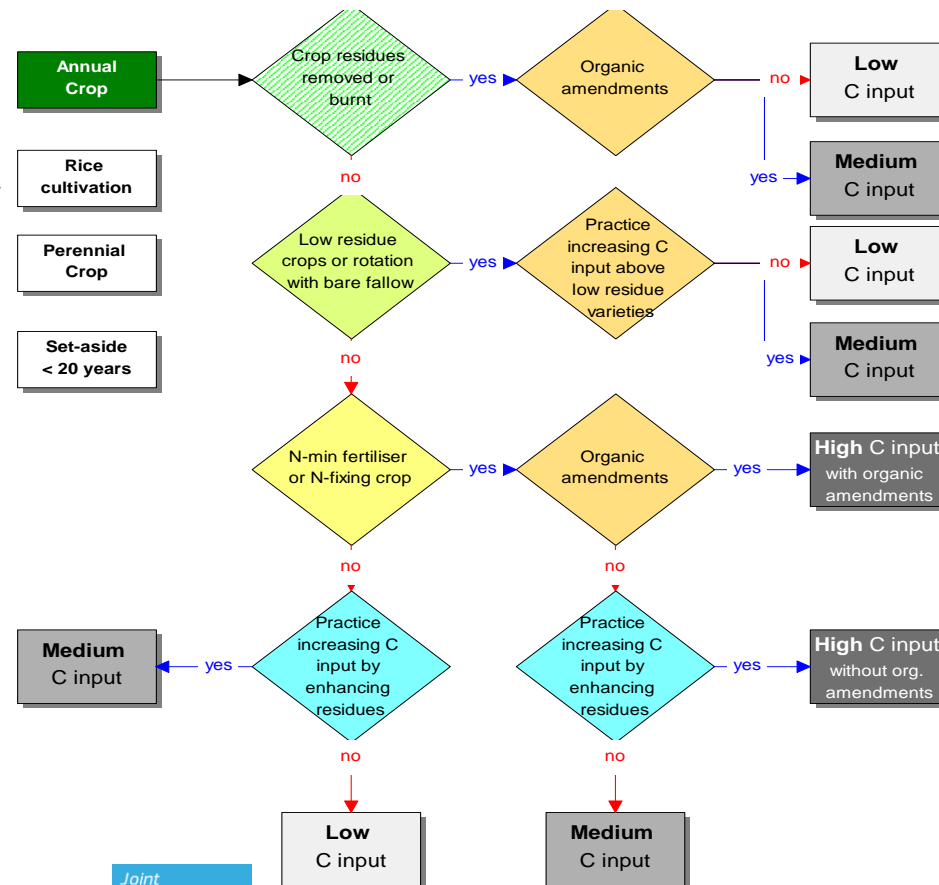


Increase above low residues, for example:

- organic amendments,
- cover crops/green manures,
- mixed crop/grass systems.



Mineral or organic amendments.



\* from Table 5.5, 2006 GNGHGI

# A. Introduction

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## 2. Parameters defining CM Factors

- **Land Use**

Perennial crops, rice, annual crops, set-aside, other managed land use.

- **Management**

Level and frequency of physical soil disturbance (tillage).

- **Input**

Residues

- residue yield from crops (classification in low and high residue yield)
- use of residues (collection, burning)

Practice increasing C-stock

- green manure, cover crops, vegetated fallow, irrigation, grass in crop rotation, N-fixing crops

Additions

- mineral fertiliser application rate
- manure application rate
- use of organic amendments

## A. Introduction

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### 2. Parameters defining GM Factors

- **Land Use**

Continuous herbaceous cover where the primary land use is grazing.

- **Management**

Degradation status = C input to soil < native:

- long-term heavy grazing,
- planting less productive plants.

- **Input**

Increase C-input to soil > native

- fertilization and/or organic amendment,
- irrigation,
- planting more productive varieties,
- liming,
- seeding legumes.

## B. Data Framework

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### 1. Spatial Data

Also for Tier 1 geographic stratification of national regions by:

- Soil type
  - Climate Region
  - Land use category ( $F_{LU}$ )
- } Default Reference Soil Organic C-stocks ( $C_{REF}$ )

### 2. Statistical Data

For NUTS\* Levels 0, 1 and 2

- Changes in Land use category ( $F_{LU}$ )
- Management ( $F_{MG}$ )
- Input ( $F_I$ )

Estimates for NUTS 2: basic regions for the application of regional policies.

## B. Data Framework

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### 3. Processing Configuration

Emissions and removals of CO<sub>2</sub> are estimated from changes in soil organic C-stocks per activity, administrative region and as annual variations:

- activities are grouped by land management systems;
- NUTS 2 data are from aggregated raster data (100m and 1km);
- C-stocks are computed for each activity, grid cell and year, starting 1990.

Spatial and attribute data are processed in a GIS in raster format.

- The spatial land use is based on Corine LC.
- Information on land management and input is provided by Eurostat data.
- The allocation of land use changes, management and input is based on:
  - transition potential for land use types;
  - suitability for key crops and associated management and input.

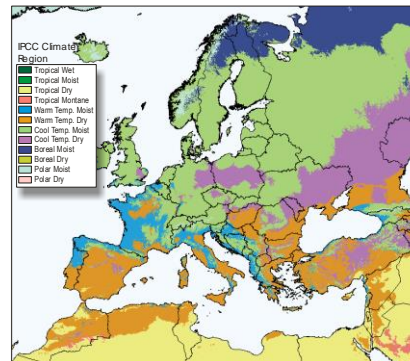


## C. Data Sources

### 1. Invariable Data

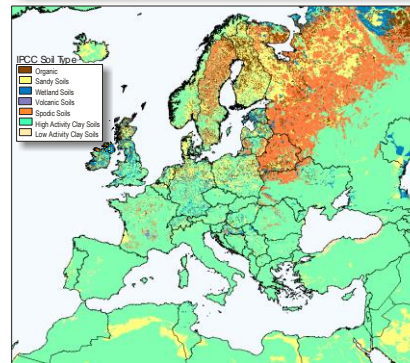
#### Climate Regions

*Processed WorldClim\** data 1960–1990.  
The monthly data were combined to annual indicators of the

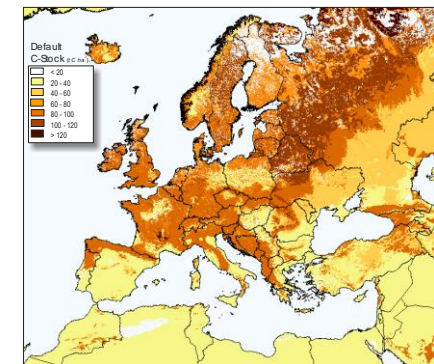


#### Soil Type

*European Soil Database and Harmonized World Soil Database \*\**



Default Reference SOC  
**Combined** *Climate Regions x Soil Type.*



\* <http://www.worldclim.org/current>

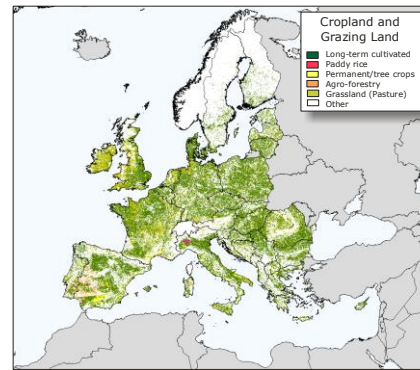
\*\* [http://eussoils.jrc.ec.europa.eu/ESDB\\_Archive/ESDB\\_Data\\_Distribution/derived\\_data.html](http://eussoils.jrc.ec.europa.eu/ESDB_Archive/ESDB_Data_Distribution/derived_data.html)

## C. Data Sources

### 2. Land Use $F_{LU}$

#### Land Cover

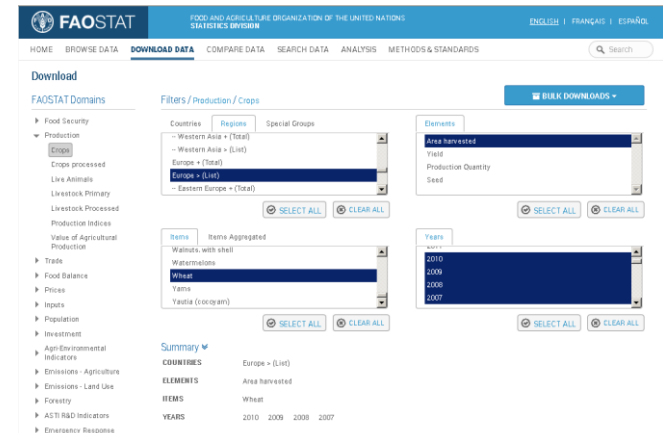
Raster data resampled to 1km grid.  
INSPIRE compliant equal area projection.  
EU28 plus enlargement coverage.  
1990, 2000, 2006 and 2012 with  
different national cover for each data  
set.



#### FAOSTAT

Domain *Production - Crops*  
Only national data (NUTS 0)

<http://faostat3.fao.org/download/Q/QC/>



FAOSTAT  
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS  
STATISTICS DIVISION

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FAOSTAT Domains

- Food Security
- Production
  - Crops
  - Crops processed
  - Live Animals
  - Livestock Primary
  - Livestock Processed
  - Production Indices
  - Value of Agricultural Production
- Trade
- Food Balance
- Prices
- Population
- Investment
- Agri-Environmental Indicators
- Emissions - Agriculture
- Emissions - Land Use
- Forestry
- AGRI-IMP Indicators
- Emergency Response

Filters / Production / Crops

Countries: Western Asia + (Total), Western Asia + (List), Europe + (Total), Eastern Europe + (Total)

Regions: Europe + (Total)

Special Groups

Elements: Area harvested, Yield, Production Quantity, Seed

Years: 2010, 2009, 2008, 2007

Summary

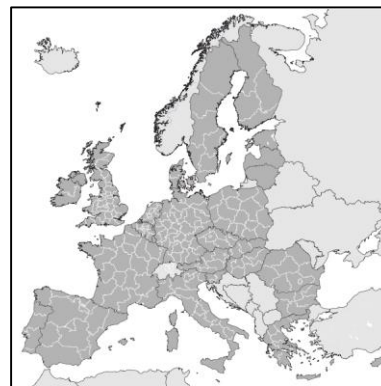
COUNTRIES	Europe + (List)
ELEMENTS	Area harvested
ITEMS	Wheat
YEARS	2010 2009 2008 2007

#### Eurostat NUTS Level 0, 1 and 2

*Eurostat Reference Data\**.

Statistical data from various surveys  
covering different NUTS levels and years  
or periods.

- ef\_oluft
- apro\_cpp\_crop
- agr\_r\_crops, agr\_r\_landuse



Corine LC

<http://www.eea.europa.eu/data-and-maps/data/corine-land-cover-1990-raster-3>  
<http://www.eea.europa.eu/data-and-maps/data/corine-land-cover-2000-raster-3>  
<http://www.eea.europa.eu/data-and-maps/data/corine-land-cover-2006-raster-3>  
<http://land.copernicus.eu/pan-european/corine-land-cover/clc-2012>

Eurostat NUTS

<http://ec.europa.eu/eurostat/web/gisco/geodata/reference-data/administrative-units-statistical-units>

## C. Data Sources

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### 3. Management $F_{MG}$

#### CM $F_{MG}$ Tillage

- Eurostat  
Farm Structure Survey  
Survey on Agricultural Production Methods (SAPM)  
[ef\_pmtilaa]
- European Conservation Agriculture Federation (ECAAF)  
<http://geraghtyconsulting.ie/wp-content/uploads/2011/11/No-Tillage-in-Europe-State-of-the-Art.pdf>
- FAO Aquastat  
<http://www.fao.org/nr/water/aquastat/data/query/index.html?lang=en>

#### GM $F_{MG}$ Degradation

- Eurostat  
Farm Structure Survey  
Survey on Agricultural Production Methods (SAPM)  
Tables on grazing animals

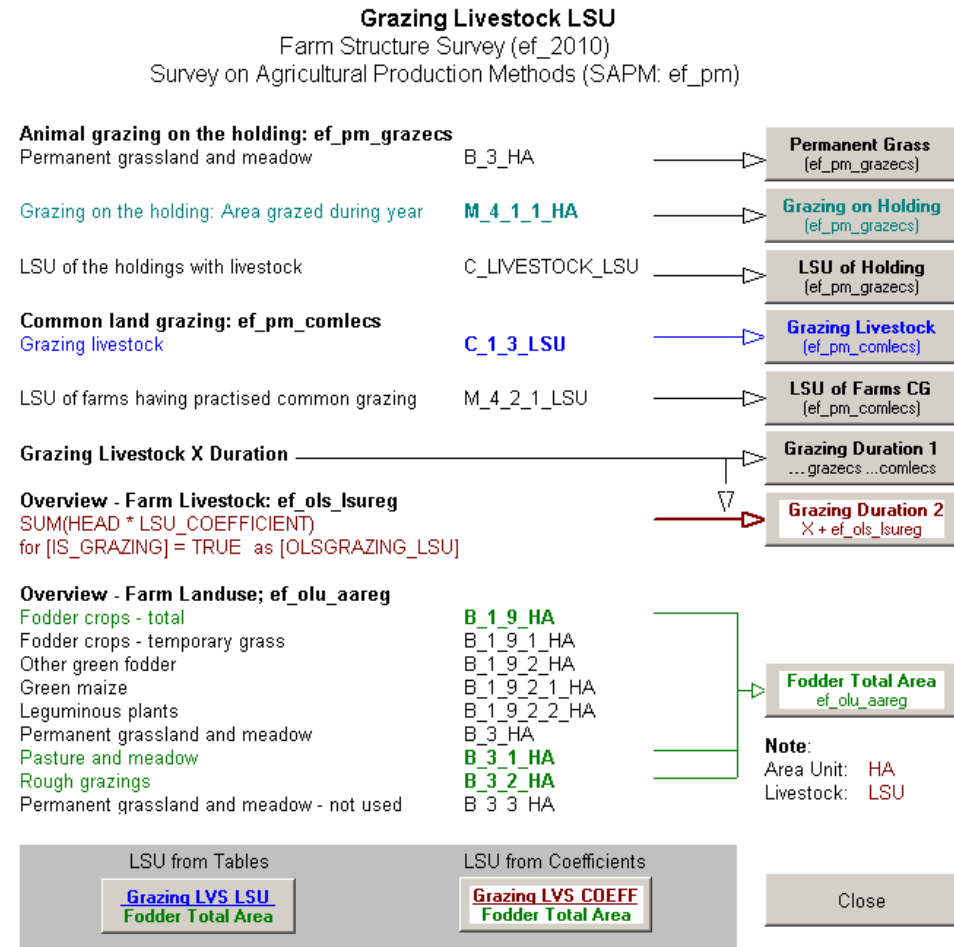
## C. Data Sources

### 3. Management *FMG* (continued)

GM  $F_{MG}$  Degradation

Estimated from data on:

- number of livestock;
- production of fodder crops;
- on-farm vs. common grazing.



## C. Data Sources

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### 4. Input

#### CM $F_I$ Organic Material

- Fertiliser
- Manure
- Crop residues  
additions,  
removals

- Eurostat
  - Agri-environmental Indicators
    - Farm management
      - Use of inorganic fertilizer [aei\_fm\_manfert]
      - Consumption estimate [aei\_fm\_usefert]
    - Farm Structure Survey
      - Survey on Agricultural Production Methods (SAPM)
        - Solid manure application [ef\_pmmanapaa]
      - Survey on Agricultural Production Methods (SAPM)
        - Soil conservation [ef\_pmsoilecs]

#### GM $F_I$ Organic Material

- Fertiliser
- Irrigation
- Liming

- Eurostat
  - Farm Structure Survey
    - Farm Land use
      - Irrigation [ef\_poirrig]
- FAO Aquastat
  - Irrigation and drainage development
    - Irrigated crop area and cropping intensity

## D. Summary

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### Approaches and Methods

- IPCC Tier 1 method with national data
- Net-net accounting with transition estimates.

### Data Framework

- Spatial data modified by regional statistics.
- Processing attribute and spatial data in GIS.

### Data Sources

- Eurostat SAPM and AEI contain thematically relevant data.
- For spatial allocation by suitability and transition potential a large number of ancillary data are needed.
- Missing data, and ambiguity about it, main source of uncertainty and processing overhead.