

Dataset Information:

Title	Grassland
Abstract	The FAOSTAT domain “Grassland” contains estimates of carbon dioxide (CO ₂) emissions from grasslands. Emissions are currently limited to those associated with drainage of organic soils – using <i>histosols</i> as <i>proxy</i> – for grazed grasslands. Data are computed geospatially, using the Tier 1 default factors of the Intergovernmental Panel on Climate Change (IPCC, 2006). Estimates are available by country, by FAOSTAT regional aggregation and special group, including the Annex I and Non-Annex I Parties to the United Nations Framework Convention on Climate Change (UNFCCC), and with global coverage for the period 1990–2019.
Supplemental	<p>The FAOSTAT domain “Grassland” disseminates CO₂ emissions, implied emission factors and underlying activity data, i.e. area (in ha) of histosols drained as a result of grazing on grassland organic soils. Drainage and associated emissions are assessed as part of emissions for the IPCC land use category grassland. The latter corresponds to the FAO land use category “permanent meadows and pastures”.</p> <p>The FAOSTAT emissions estimates may not coincide with GHG data reported by member countries to relevant international reporting processes. The aim of this domain is to provide a global reference database for assessing regional and global trends and in support of national data quality/data assurance processes.</p>
Creation Date	2012
Last Update	2020
Data Type	Climate Change - Greenhouse Gases
Category	Agriculture; Environment
Time Period	1990–2019
Periodicity	Annual
Geographical Coverage	World
Spatial Unit	Country aggregations from geospatial processing. In 2019, 98 countries and 4 territories
Language	Multilingual (EN, FR, ES)

Methodology and Quality Information:

Methods and processing	<p>Overview</p> <p>The FAOSTAT domain “Grassland” contains estimates of CO₂ emissions associated with carbon losses from drained organic soils under grazed grassland. Estimates are computed at Tier 1, following IPCC, 2006, Vol. 4, Ch. 6. They correspond to estimates of drained organic soils under FAO land use category “permanent meadows and pastures”.</p> <p>Carbon emissions are estimated at pixel level, using the general formula:</p> $GHG = A * EF$ <p>where:</p> <p><i>GHG</i>= Annual emissions, in units of tonnes C yr⁻¹; <i>A</i> = Activity data, representing the area of organic soils under grazed grassland, in ha. <i>EF</i> = Tier 1, default IPCC emission factors, expressed in units of tonnes C ha⁻¹.</p> <p>Uncertainties in estimates of GHG emissions are due to uncertainties in emission factors and activity data. They may be related to, inter alia, natural variability, partitioning fractions, lack of spatial or temporal coverage, spatial aggregation. In the</p>
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case of grassland, more detailed information are available in the guidelines (IPCC, 2006: Vol. 4, Ch. 6, Section 6.2.3.5). Relevant discussions on methods and uncertainties are available in Tubiello *et al.* (2016).

Data sources

Data are obtained through the stratification of three different spatial datasets:

i. A map derived from the Harmonized World Soil Database (HWSD-FAO *et al.*, 2012) with percentages of the pixel area covered with *histosols* (both as dominant and secondary soil type). The area covered by *histosols* is used as proxy for organic soils (IPCC 2006). Methods relevant to the development and use of this spatial layer are discussed in Tubiello *et al.* (2016).

ii. Annual land cover maps produced by the Catholic University of Louvain Geomatics as part of the Climate Change Initiative of the European Spatial Agency (version 2.0, CCI UCL Geomatics, 2017) and updated version 2.1 under the European Copernicus program (2019). Grassland Land Use area is identified from available CCI-LC yearly land cover maps (1992–2018), by applying specific proportions to pixel area in the relevant land cover categories (Tab. 1). This approach is consistent with the methods applied for the production of the FAOSTAT [Land Cover](#) statistics.

Table 1. Percentage share applied to computer the area of Grassland and Shrubland from CCI-LC classes

CLASS CODE	LABEL	GRASSLAND SHARE BY PER PIXEL
130	Grassland	100% herbaceous cover
140	Lichens and mosses	
120	Shrubland	
121	Evergreen shrubland*	
122	Deciduous shrubland*	30% (20% herbaceous + 10% shrub cover)
30	Mosaic cropland (>50%) / natural vegetation (tree, shrub, herbaceous cover) (<50%)	
40	Mosaic natural vegetation (tree, shrub, herbaceous cover) (>50%) / cropland (< 50%)	40% (20% herbaceous + 20% shrub cover)
100	Mosaic tree and shrub (>50%) / herbaceous cover (<50%)	55% (30% herbaceous + 35% shrub cover)
110	Mosaic herbaceous cover (<50%) / tree and shrub (>50%)	80% (60% herbaceous + 20% shrub cover)
10	Cropland rainfed	5% natural herbaceous cover
11	Herbaceous crops*	

*Level 2 detail of the original CCI-LC legend / where available, regional information

iii. The presence of grazing animals is derived from the spatial distribution of cattle, sheep and goats as mapped in the Gridded Livestock of the World (Robinson *et al.*, 2014). Animal numbers by pixel were first converted in Livestock Units (LU) using the coefficients as in FAOSTAT [Livestock Patterns](#) dataset. Pixels with LU values equal or higher than 0.1 (Critchley *et al.*, 2008; Worrall and Clay, 2012) are superimposed to the other spatial layers to identify the grazed grasslands on organic soils. The underlying assumption is that the trampling of grazing animals on organic soils causes drainage and C release from degraded organic soils.

Estimates of areas of drained organic soils under grazed grassland were thus obtained as the area of the non-zero overlap between the maps defined in *i*, *ii* and *iii* above, i.e., as the overlap of area of histosols, the area of grassland and shrubland as land cover and the presence of grazing livestock.

Land cover information is sourced from yearly maps for the period 1992–2018. Values backward to 1990 are carried backwards by using the 1992 values. Values for 2019 and for the 2030 and 2050 are carry-forwards of the latest available year (2018).

Emission factors (EF)

The EF values are those specified in IPCC, 2006: Vol. 4, Ch. 6, Tab. 6.3 (Tab 2). EF values are climate dependent, and were allocated at pixel level to the relevant climatic zone, as defined in IPCC, 2006: Vol. 4, Ch. 3, Annex 3A.5. The map of climate zones used in the analysis has been developed by the Joint Research Centre of the European Commission (JRC, IPCC climatic zones), following the IPCC guidelines.

Table 2. Annual Emission Factors (EF) for drained grassland organic soils*

CLIMATE TEMPERATURE REGIME	IPCC DEFAULT (tonnes C ha ⁻¹ yr ⁻¹)
Boreal/ Cool Temperate	0.25
Warm Temperate	2.5
Tropical/Sub-Tropical	5.0

*Source: Table 6.3, 2006 IPCC Guidelines, Chapter 6 – page 6.17.

The analysis was carried out in a Geographic Information System (GIS) environment, combining the above datasets. Pixel estimates were then aggregated by country using the FAO Global Administrative Layer Units (GAUL, 2015 version).

Dimensionless conversion factors

12/44, to convert from C to CO₂;
10⁻³, to convert tonnes to Gg.

Supplementary documentation

The Related Documents section of this domain also contains a csv table with total area of histosols by country, FAOSTAT regions and special groups. The countries with mapped histosols were 107, of which Mozambique and Saint Pierre and Miquelon were the only two countries where histosols have never been drained for agriculture.

References

IPCC Climatic Zones, Joint Research Centre of the European Commission. Available at: <https://esdac.jrc.ec.europa.eu/projects/renewable-energy-directive>

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Copernicus Climate Change Service **2019**. Documentation for version 2.1 of the dataset. Land cover classification gridded maps from 1992 to present derived from satellite observations. Available at: <https://cds.climate.copernicus.eu/cdsapp#!/dataset/satellite-land-cover?tab=doc>.

Data Collection Method	100% Computed from underlying geospatial information and aggregated at national level
Completeness	100%
Useful links	http://www.fao.org/economic/ess/environment/en/ http://www.ipcc-nggip.iges.or.jp/public/ http://maps.elie.ucl.ac.be/CCI/viewer/ https://www.esa-landcover-cci.org/?q=node/197

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