

Dataset Information:

Title	Cropland
Abstract	The FAOSTAT domain “Cropland” contains estimates of carbon dioxide (CO ₂) emissions from cropland. Emissions are currently limited to those associated with drainage of organic soils – using <i>histosols</i> as proxy – for cultivation. 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 “Cropland” disseminates CO₂ emissions, implied emission factors and underlying activity data, i.e. area (in ha) of organic soils drained for cultivation. Drainage and associated emissions are assessed as part of emissions for the IPCC land use category cropland. The latter corresponds to the FAO land use category “cropland”.</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 following geospatial processing. In 2019, 100 countries and 4 territories
Language	Multilingual (EN, FR, ES)

Methodology and Quality Information:

Methods and processing	<p>Overview</p> <p>The domain “Cropland” contains estimates of CO₂ emissions associated with carbon losses from drained organic soils under cultivation. Estimates are computed at Tier 1, following IPCC, 2006, Vol. 4, Ch. 5. They correspond to estimates of drained organic soils under FAO land use category “cropland”.</p> <p>Carbon emissions are estimated at pixel level, by applying the general formula:</p> $GHG = A * EF$ <p>where:</p> <p><i>GHG</i> = Annual emissions, in tonnes of C yr⁻¹; <i>A</i> = Activity data, representing the area of cultivated organic soils over the pixel, in ha. <i>EF</i> = Tier 1, default IPCC emission factors, expressed in tonnes of C ha⁻¹.</p>
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Uncertainties in estimates of GHG emissions are due to uncertainties in emission factors, activity data, as well as the underlying land cover maps used. More detailed information is available in the IPCC guidelines (IPCC, 2006: Vol. 4, Ch. 5, Section 5.2.3.5). Relevant discussions on methods and uncertainties are available in Tubiello et al. (2016).

Data sources

Data are obtained through the stratification of the following 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). Cropland 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 shares applied to compute the area of Cropland from CCI-LC classes

CLASS CODE	LABEL	CROPLAND SHARE BY PIXEL
10	Cropland, rainfed	85%
11	Cropland, rainfed, herbaceous cover*	
12	Cropland, rainfed, tree or shrub cover*	
20	Cropland, irrigated or post-flooding	
30	Mosaic cropland (>50%) / natural vegetation (tree, shrub, herbaceous cover) (<50%)	60%
40	Mosaic natural vegetation (tree, shrub, herbaceous cover) (>50%) / cropland (< 50%)	40%

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

Estimates of areas of drained organic soils were thus obtained as the area of non-zero overlap between the two maps defined in *i* and *ii* above, i.e., as the overlap of area of histosols and area of cropland as land cover. The underlying assumption is that organic soils must be drained to allow for crop cultivation activities.

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. 5, Tab. 5.6 and summarized in Table 2 below. 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 IPCC (2006).

Table 2. IPCC emission Factors (EF) for CO₂ emissions from cropped organic soils*

CLIMATE TEMPERATURE REGIME	IPCC DEFAULT (tonnes C ha ⁻¹ yr ⁻¹)
Boreal/ Cool Temperate	5.0
Warm Temperate	10.0
Tropical/Sub-Tropical	20.0

*Source: Table 5.6, 2006 IPCC Guidelines, Chapter 5 – page 5.19.

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 emissions from C to CO₂;

10⁻³, to convert tonnes to Gg.

Supplementary documentation

The section Related Documents 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>

IPCC **2006**. 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (Eds), IGES, Hayama, Japan. Available at: <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>

FAO/IIASA/ISRIC/ISSCAS/JRC **2012**. Harmonized World Soil Database (version 1.2). FAO, Rome, Italy and IIASA, Laxenburg, Austria. Available at: <http://www.fao.org/soils-portal/soil-survey/soil-maps-and-databases/harmonized-world-soil-database-v12/it/>

Tubiello, N. F.; Biancalani, R.; Salvatore, M.; Rossi, S.; Conchedda, G. **2016**. A Worldwide Assessment of Greenhouse Gas Emissions from Drained Organic Soils. *Sustainability* 2016, 8 (4). Available at: <http://www.mdpi.com/2071-1050/8/4/371>

Land Cover CCI Product User Guide Version 2.0 **2017**. UCL Geomatic (Université catholique de Louvain; Friederich-Schille-Universität Jena; Wageningen University; Max-Planck-Institut für Meteorologie; JRC European Commission; Met Office. Deliverable ref: D3.3. Belgium. Available from: http://maps.elie.ucl.ac.be/CCI/viewer/download/ESACCI-LC-Ph2-PUGv2_2.0.pdf.

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 Method	Collection	100% Computed from underlying geospatial information and aggregated at national level
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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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Citation	FAO, 2020. FAOSTAT Emissions Database, Land Use, Cropland http://www.fao.org/faostat/en/#data/GC
Acknowledgements	The FAOSTAT Emissions database is developed and maintained from FAO Regular Programme Funds under SO2. Initial support was kindly provided by Norway and Germany under Trust Funds GCP/GLO/286/GER and GCP/GLO/325/NOR.