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**Dataset Information:**

<b>Title</b>	<b>Crop Residues</b>
<b>Abstract</b>	The FAOSTAT domain <a href="#">Crop Residues</a> contains estimates of nitrous oxide (N <sub>2</sub> O) emissions from the decomposition of nitrogen in crop residues left on managed soils. Estimates are computed at Tier 1 following the 2006 IPCC Guidelines for National greenhouse gas (GHG) Inventories (IPCC, 2006). Data are available by country, with global coverage and relative to the period 1961–2020, with annual updates, and projections for 2030 and 2050.
<b>Supplemental</b>	<p>The FAOSTAT domain Crop Residues disseminates information by crop (Barley, Beans, dry, Maize, Millet, Oats, Potatoes, Rye, Sorghum, Soybeans, Wheat and Rice, paddy) on: activity data (<i>i.e.</i> amount of N in crop residues); direct and indirect nitrous oxide emissions (kilotonnes N<sub>2</sub>O). Data are available for most countries and territories, for standard FAOSTAT regional aggregations, and for Annex I and non-Annex I groups.</p> <p>This FAOSTAT domain also disseminates the activity data and N<sub>2</sub>O emissions reported by countries to the United Nations Framework Convention on Climate Change (UNFCCC), under the category ‘Direct and indirect N<sub>2</sub>O emissions from agricultural soils’. Activity data are sourced from the most recently available GHG National Inventories (NGHGI) or from National Communications. Emission data are sourced directly from the <a href="#">UNFCCC</a> data portal or from Biennial Update Reports (BURs). UNFCCC data are disseminated in FAOSTAT with permission, formalized via a FAO-UNFCCC Memorandum of Understanding.</p> <p>The IPCC (2019) Guidelines indicate the FAOSTAT database as a useful tool for NGHGI QA/QC processes and validation of both activity data and emissions estimates.</p>
<b>Creation Date</b>	2012
<b>Last Update</b>	2022
<b>Data Type</b>	Climate Change - Greenhouse Gases
<b>Category</b>	Agriculture; Environment
<b>Time Period</b>	1961–2020; projections for 2030 and 2050
<b>Periodicity</b>	Annual
<b>Geographical Coverage</b>	World
<b>Spatial Unit</b>	In 2020, 177 Countries and 5 territories (FAO Tier I)
<b>Language</b>	Multilingual (EN, FR, ES)

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**Methodology and Quality Information:**

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**Methods and processing****Overview**

Greenhouse gas (GHG) emissions from crop residues consist of direct and indirect nitrous oxide (N<sub>2</sub>O) emissions from nitrogen (N) in crop residues and forage/pasture renewal left on agricultural fields by farmers. Specifically, N<sub>2</sub>O is produced by microbial processes of nitrification and de-nitrification taking place on the deposition site (direct emissions), and after volatilization/re-deposition and leaching processes (indirect emissions). The FAOSTAT data are estimated at Tier 1 following IPCC, 2006, Vol. 4, Ch. 2 and 11.

Direct emissions are estimated at country level, using the formula:

$$Emission = A * EF$$

where:

*Emission* = GHG emissions in units of kg N<sub>2</sub>O yr<sup>-1</sup>;

*A* = Activity data, representing the total amount of N in crop residues in kg N yr<sup>-1</sup> (1);

*EF* = Tier 1, default IPCC emission factors, expressed in kg N<sub>2</sub>O-N/kg N yr<sup>-1</sup> (2).

(1) Activity data are calculated from Crop yield and harvested area and derived from the FAOSTAT domain “Production/Crops and livestock products” (<http://www.fao.org/faostat/en/#data/QCL>). Estimates cover the following crops: Barley, Beans-dry, Maize, Millet, Oats, Potatoes, Rice-paddy, Rye, Sorghum, Soybeans, and Wheat. Crop yields and harvested area are used to estimate the amount of biomass N in above and below-ground residues by crop and by country, using IPCC, 2006: Vol.4, Ch. 11, Eq. 11.6 default crop values in Tab. 11.2. Default values of crops with similar biophysical characteristics and/or grown in comparable production systems were used to fill those cases for which default parameters are not available. More specifically, the default values of N content in below-ground residues of Wheat and Sorghum (0.009 and 0.006) are applied for Rice and Millet respectively. The Ratio of below-ground residues to above-ground biomass for Millet, Sorghum, and Rye is the one of Maize (0.22) while the default value of Soybeans (0.19) for this parameter is used for Dry beans. This biomass N amount is then reduced by the fraction of crop residues that is burnt on site—assumed to be 10 percent of the area, following IPCC, 2000: Ch. 4, Section 4A.2.1.1. Calculations include the application of specified combustion coefficients by crop, representing a measure of the proportion of the fuel that is actually combusted. The IPCC guidelines report default combustion factor values only for wheat (0.9), maize, rice and sugarcane (all 0.8) residues (IPCC, 2006: Vol.4, Ch. 2, Tab. 2.6). With the exception of wheat, the latter value is used for all crops in scope of this domain. Finally, all N in crop residues, net of amount burnt, is assumed to remain on the field, as per IPCC, 2006: Vol.4, Ch. 11, Eq. 11.6.

For the period 1961–2020, crop yield and harvested area are taken from FAOSTAT (domain: Production/ Crops and livestock products). Projections of crop yield and harvested area for 2030 and 2050 are computed with respect to a baseline, defined as the 2005–2007 average of the corresponding FAOSTAT activity data, and by applying percentage growth rates from FAO perspective studies (Alexandratos and Bruinsma, 2012). The FAO projections cover some 140 countries. The growth rate of neighbouring countries is applied to activity data of countries, which are not included in the original set of FAO projections.

(2) Global default EF values taken from IPCC, 2006: Vol. 4, Ch. 11, Tab. 11.1.

Indirect emissions are estimated at country level, using the formula:

$$Emission = A * EF$$

where:

*Emission* = GHG emissions, in units of kt N<sub>2</sub>O yr<sup>-1</sup>;

*A* = Activity data, representing the fraction of N in crop residues forage/pasture renewal that is lost through runoff and leaching in kg N yr<sup>-1</sup> (3);

*EF* = Tier 1, default IPCC emission factors, expressed in kg N<sub>2</sub>O-N / kg N yr<sup>-1</sup> (4).

(3) Obtained through the leaching factor in IPCC, 2006: Vol.4, Ch. 11, Tab. 11.3.

(4) Global IPCC default EF values from IPCC, 2006: Vol.4, Ch. 11, Tab. 11.3.

Dimensionless conversion factors:

10<sup>-3</sup>, to convert the activity data from kg to tonnes;

44/28, to convert the emissions from kg N<sub>2</sub>O-N to kg N<sub>2</sub>O gas;

10<sup>-6</sup>, to convert the emissions from kg N<sub>2</sub>O to kt N<sub>2</sub>O; and

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 case of crop residues more detailed information is available in the IPCC guidelines (IPCC, 2006: Vol.4, Ch. 11, Section 11.2.1.4 for direct emissions, and Section 11.2.2.4 for indirect emissions).

### **References**

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**Data Collection Method** Computed

**Completeness** 100%

**Useful links** <http://www.fao.org/economic/ess/environment/en/>  
<http://www.ipcc-nggip.iges.or.jp/public/>  
<https://unfccc.int>

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