Dataset Information:

Title	Crop Residues
Abstract	Greenhouse Gas (GHG) emissions from crop residues consist of nitrous oxide gas from decomposition of nitrogen in crop residues left on managed soils. Computed at Tier 1 following the 2006 IPCC Guidelines for National GHG Inventories (IPCC, 2006); available by country, with global coverage and relative to the period 1961 to present, with annual updates, and projections for 2030 and 2050.
Supplemental	This domain contains data on GHG emissions, associated emission factors and underlying activity data. The FAOSTAT Emissions data are estimates by FAO and do not coincide with GHG data reported by member countries to UNFCCC. The database is intended primarily as a service to help member countries assess and report their emissions, as well as a useful international benchmark. The FAOSTAT Emissions data are disseminated publicly to facilitate continuous feedback from member countries.
Creation Date	2012
Last Update	2013
Data Type	Climate Change - Greenhouse Gases
Category	Environment
Time Period	1961-present; projections for 2030 and 2050
Periodicity	Annual
Geographical Coverage	World
Spatial Unit	Country
Language	Multilingual (EN, FR, ES)

Methodology and Quality Information:

Methods and processing	Greenhouse gas (GHG) emissions from crop residues consist of direct and indirect nitrous oxide (N_2O) emissions from nitrogen (N) in crop residues and forage/pasture renewal left on agricultural fields by farmers. Specifically, N_2O 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_2O yr^{-1}; *A* = Activity data, representing the total amount of N in crop residues in kg N yr^{-1}, (1); *EF* = Tier 1, default IPCC emission factors, expressed in kg N_2O-N/kg N yr^{-1} (2).
	(1) Activity data are calculated from Crop yield and harvested area and cover for the following crop categories: Barley, Beans-dry, Maize, Millet, Oats, Potatoes, Rice-paddy, Rye, Sorghum, Soybeans, and Wheat. Crop yield 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. In a few cases where default parameters were not provided (N content of below-ground residues for Rice and Millet, and Ratio of below-ground residues to above-ground biomass for Millet, Sorghum, Rye, and Dry bean) the correspondent default values for crops with similar biophysical characteristics were used. This biomass N amount is then reduced by the fraction of crop residue burnt on site—assumed to be 10% by area, following IPCC, 2000: Ch. 4, Section 4A.2.1.1 —with specified combustion coefficients by crop, as per IPCC, 2006: Vol.4, Ch. 2, Tab. 2.6. 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-present, Crop yield and harvested area are taken from FAOSTAT (domain: Production/Crops). 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 used cover some 140 countries. Projections of activity data for countries not included assume the same growth rate of neighbouring countries.

(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 Gg N_2O yr^{-1};
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^{-1} (3);
EF = Tier 1, default IPCC emission factors, expressed in kg N_2O-N / kg N yr^{-1} (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. 11.1.

Dimensionless conversion factors used are:
10^{-3}, to convert the activity data from kg to tonnes;
44/28, to convert the emissions from kg N_2O-N to kg N_2O gas;
10^{-6}, to convert the emissions from kg N_2O to Gg N_2O; and
GWP-N_2O = 310 (100-year time horizon global warming potential), to convert Gg N_2O to Gg CO_2eq (IPCC, 1996: Technical Summary, Tab. 4 pg. 22).

The crop residues domain contains the following data categories available for download: country-level GHG emissions, provided as total, direct and indirect amounts in both Gg N_2O and Gg CO_2eq; implied emission factors; and activity data. Data are available for all countries and territories, as well as for standard FAOSTAT regional aggregations, plus Annex I and non-Annex I groups. The data period is 1990 to present, with annual updates and projections for 2030 and 2050.

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 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

Alexandratos, N. and J. Bruinsma. 2012. World agriculture towards 2030/2050: the 2012 revision. ESA Working paper No. 12-03. Rome, FAO.

IPCC. 1996. Climate Change 1995 - The Science of Climate Change: Contribution of Working Group I to the Second Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge.

IPCC. 2000. Good practice guidance and uncertainty management in national greenhouse gas inventories. In: J. Penman et al. (Eds.), IPCC National Greenhouse Gas Inventories Programme, Technical Support Unit, Hayama, Japan.

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.

Data Collection Method	Computed
Completeness	100%
Links	www.fao.org/climatechange/micca/ghg/
	www.ipcc-nggip.iges.or.jp/public/

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