Monitoring and Assessment of GHG Emissions and Mitigation Potentials in Agriculture

Mapping emissions from organic soils

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Funded by:

Outline

- Defining and mapping organic soils
- Cultivated Organic Soils
- Organic Soils with Grassland
- Biomass Burning

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IPCC/FAO Definition

Histosols:

1. Thickness of organic horizon greater than or equal to 10 cm. A horizon of less than 20 cm must have 12% or more organic carbon when mixed to a depth of 20 cm.
2. Soils that are never saturated with water for more than a few days must contain more than 20% organic carbon by weight (i.e., about 35 percent organic matter).
3. Soils are subject to water saturation episodes and has either:
   a. At least 12 percent organic carbon by weight (i.e., about 20 percent organic matter) if the soil has no clay; or
   b. At least 18 percent organic carbon by weight (i.e., about 30 percent organic matter) if the soil has 60% or more clay; or
   c. An intermediate, proportional amount of organic carbon for intermediate amounts of clay.

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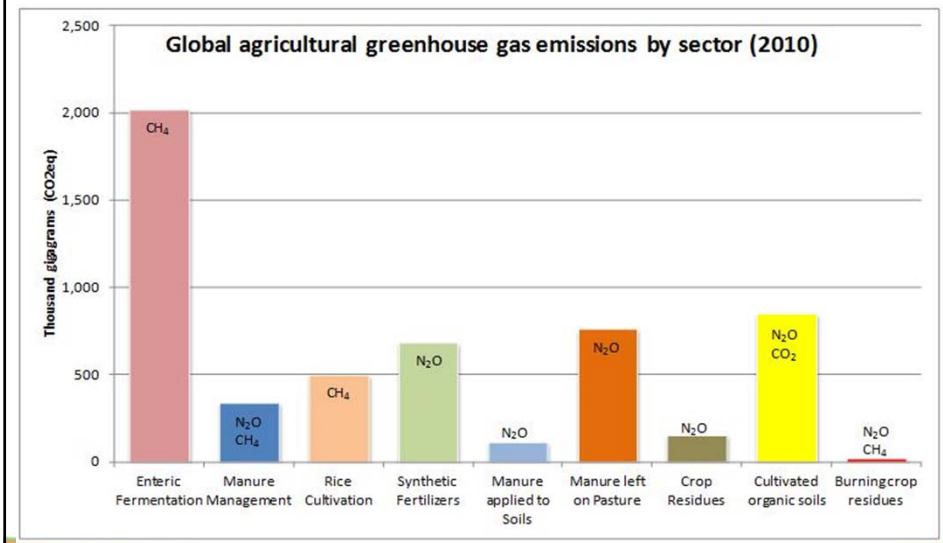
Global GHG Emissions, Agriculture



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The FAOSTAT Global Emissions Database

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FAOSTAT

& Spatial Data

+

IPCC Guidelines (Tier1 approach)

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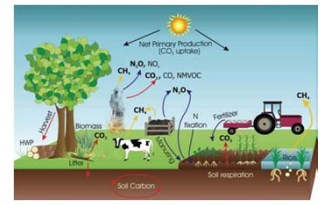

Database

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CROPLAND

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Geo-referenced data for cultivated organic soils

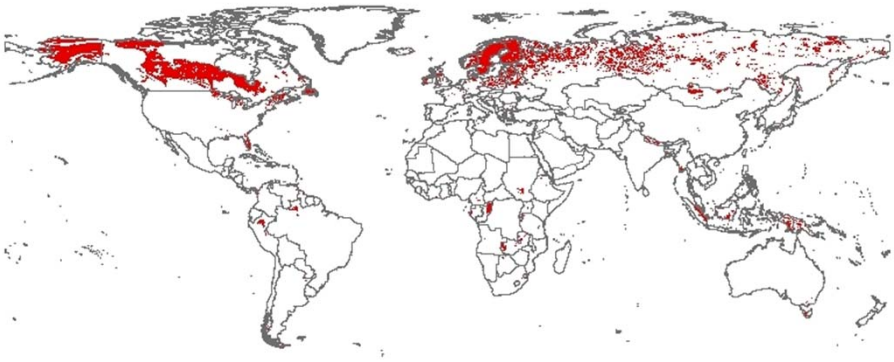
- Organic Soils (Histosols):
  - Harmonized World Soil Database (FAO, IIASA, ISRIC, CAS, JRC - 2012)
- Cultivated (cropped) areas:
  - GLC 2000
- Climatic zones:
  - JRC map, 2010, according to IPCC prescriptions

Identifying cultivated organic soils with GLC2000

- Cultivated and managed areas: 100% cropland
- Mosaic: cropland/tree cover/Other natural vegetation: 50% cropland
- Mosaic: cropland/Shrub and/or grass cover: 10% cropland

ref. You et al. (2009)

World map of Histosols



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World distribution of cultivated histosols

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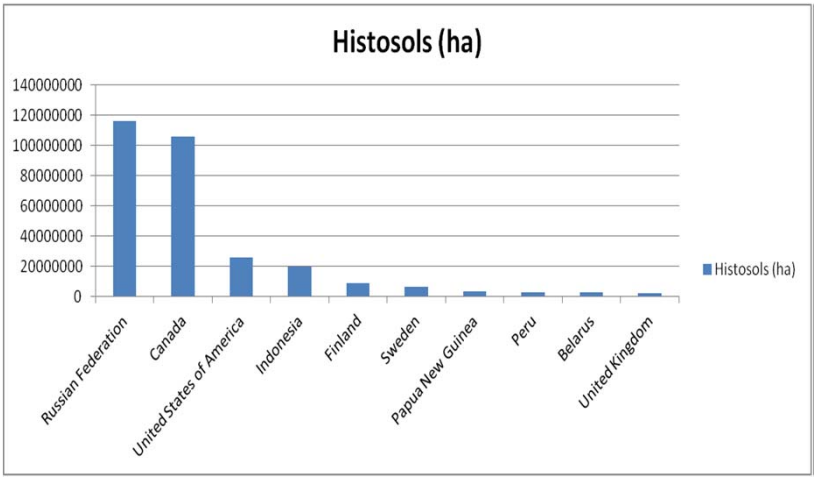
Top ten countries, by area



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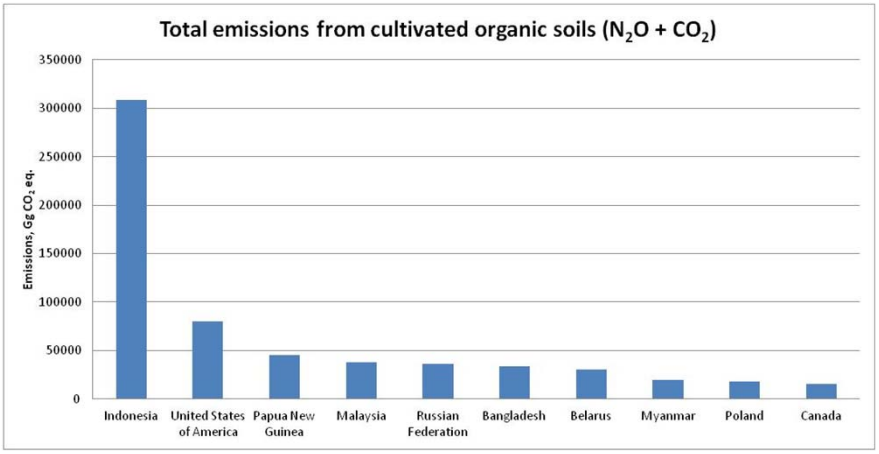
Top ten countries, by GHG emissions



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FAOSTAT Emissions Database: Global emissions from cultivated organic soils

GIS DB	N2O CO2 eq (Gg)	CO2 (Gg)	Total (Gg)
GLC2000	99,183.92	756,075.19	855,259.11
GC 2005	82,454.28	679,793.48	762,247.76
GC 2009	88,026.26	715,350.22	803,376.49

GRASSLAND

Identifying Grassland on Organic Soils

Main issues:

•Identifying grassland on organic soils

•Defining the drainage/management status

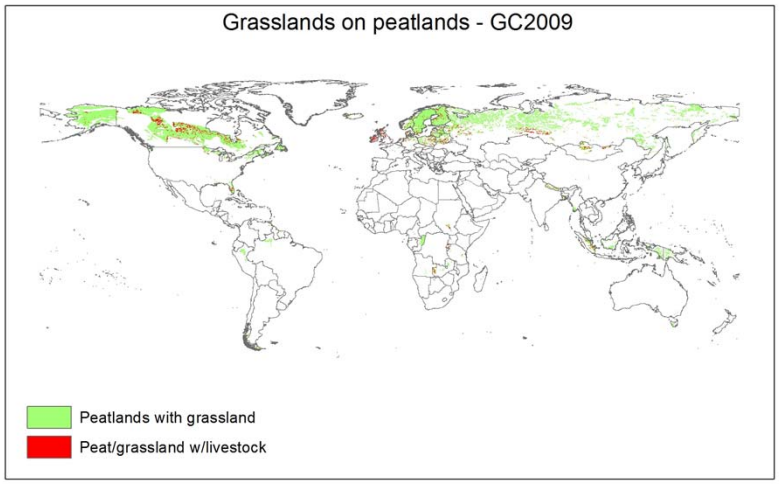
Geo-referenced data for grassland on organic soils

•Grasslands:
-GLC 2000
-GlobCover 2005
-GlobCover 2009
- currently using MODIS MCD12Q1 2001-2012 land cover product

•Livestock density approach:
-Gridded Livestock of the World (GLW)

Identifying Grasslands with GLC2000

- Herbaceous Cover, closed-open: 100% grassland
- Sparse herbaceous or sparse shrub cover: 50% grassland
- Mosaic: Cropland / Shrub and/or grass cover: 45% grassland
- Mosaic: Cropland / Tree Cover / Other natural vegetation: 25% grassland



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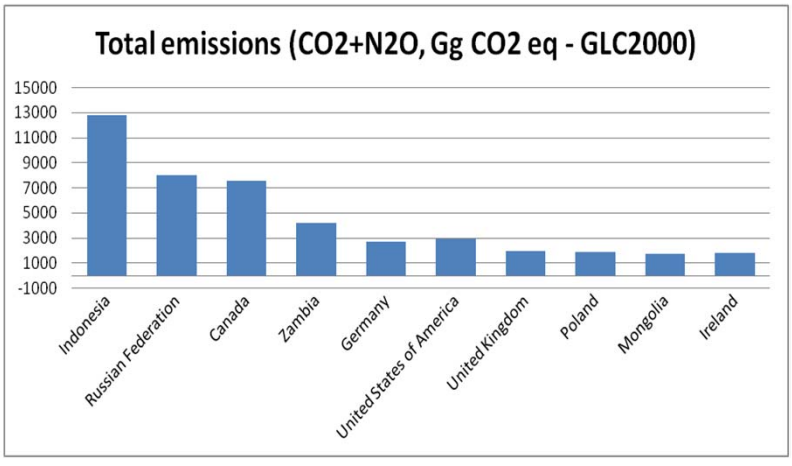
FAOSTAT Emissions Database: Global emissions from grassland on organic soils

Grassland on org. soils with livestock	N2O CO2 eq (Gg)	CO2 (Gg)	Total (Gg)
GLC2000	33,655	25,704	59,360
GC 2005	34,293	18,663	52,957
GC 2009	38,396	19,219	57,615

Average values

Grassland on Organic Soils



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Using MODIS Land Cover

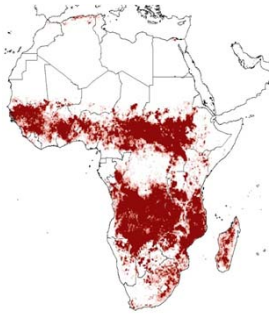
•MCD12Q1 Land Cover Type Yearly L3 Global 500 m SIN Grid

-500 meters resolution
-Yearly data 2001-2012
- Different land cover classes (e.g. grassland, savanna, 5 forest classes…)
- % of area belonging to each class in each grid cell.

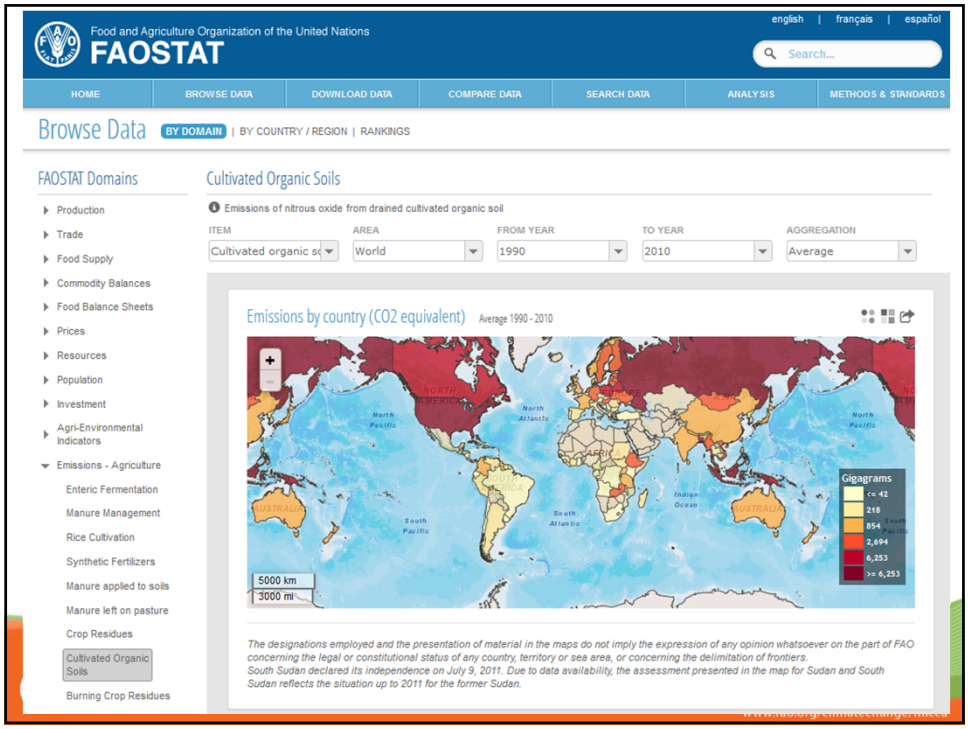
MODIS data are overlapped with HWSD to estimate area of grassland on organic soils. This allows producing yearly time series.

Emissions from biomass burning

• Burned area:
- GFED4 Burned Areas DB (MODIS-based, 13 LC classes)
• Peatland map (% per pixel):
- HWSD
• Additional GIS data (Climate and Forests maps)
•Biomass burned:
- estimated applying IPCC Tier1 default values.
•Emissions:
- Estimated applying Tier1 default EF
- Classes: Savanna, Woody Savanna, Closed Shrublands, Open Shrublands, Grassland, Tropical humid forest&rainforest, other forests, organic soils.



Total burned area in 2012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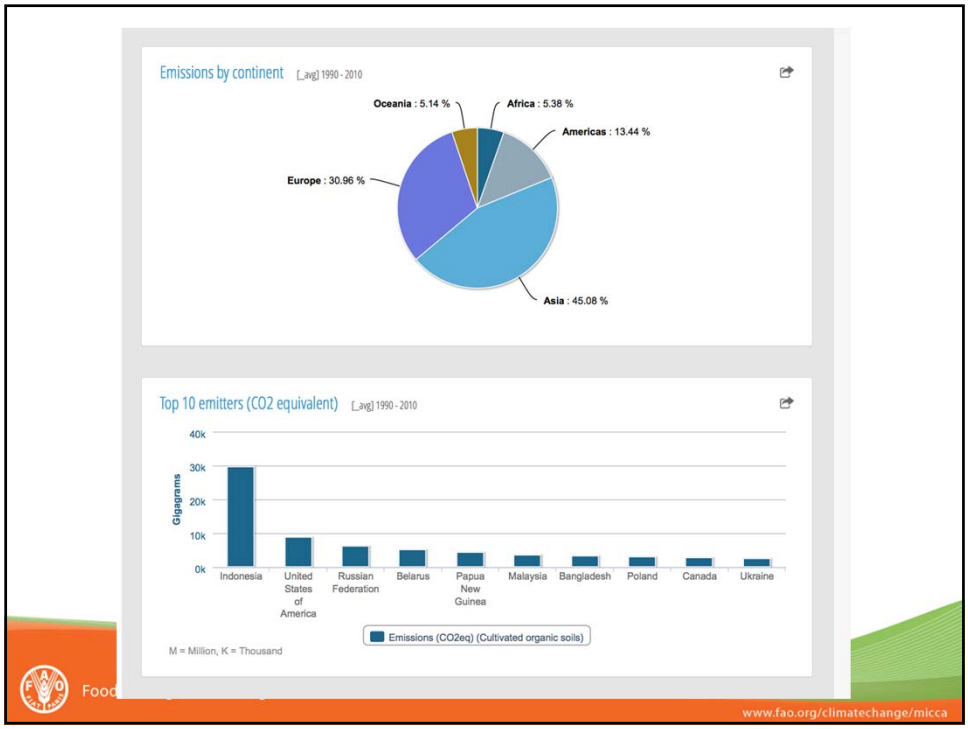
Synthetic Fertilizers
Manure applied to soils
Manure left on pasture
Crop Residues
Cultivated Organic Soils
Burning Crop Residues
Cultivated Organic Soils
Emissions of nitrous oxide from drained cultivated organic soil
ITEM
Cultivated organic s
AREA
World
FROM YEAR
1990
TO YEAR
2010
AGGREGATION
Average
Emissions by country (CO2 equivalent)
Average 1990 - 2010
Gigagrams
<= 42
218
854
2,694
6,253
>= 6,253
5000 km
3000 mi
The designations employed and the presentation of material in the maps do not imply the expression of any opinion whatsoever on the part of FAO concerning the legal or constitutional status of any country, territory or sea area, or concerning the delimitation of frontiers.
South Sudan declared its independence on July 9, 2011. Due to data availability, the assessment presented in the map for Sudan and South Sudan reflects the situation up to 2011 for the former Sudan.


Emissions by continent
[_avg] 1990 - 2010
Oceania : 5.14 %
Africa : 5.38 %
Americas : 13.44 %
Europe : 30.96 %
Asia : 45.08 %
Top 10 emitters (CO2 equivalent)
[_avg] 1990 - 2010
Gigagrams
40k
30k
20k
10k
0k
Indonesia
United States of America
Russian Federation
Belarus
Papua New Guinea
Malaysia
Bangladesh
Poland
Canada
Ukraine
Emissions (CO2eq) (Cultivated organic soils)
M = Million, K = Thousand
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Thank you!

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http://faostat.fao.org/
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