



GHG emissions and removals from cropland and grazing land management

Institute for Environment and Sustainability,
Joint Research Centre, Ispra (Italy)

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Outline

- GHG Emission in the Regulations
- The role of agriculture in Climate Change mitigation
- The LULUCF elements of the IPCC/UNFCCC methodologies
- Correspondence with CAP concepts
- The optional LCM extension
- Conclusion

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EC 1306/2013 art 110.

Monitoring and evaluation of the CAP:

1. measure the performance of the CAP based on reporting by MS
 2. ... in relation to the following objectives:
 - (a) viable food production,
 - (b) sustainable management of natural resources and climate action, with a focus on greenhouse gas emissions, biodiversity, soil and water;
 - (c) balanced territorial development,
- ...adopt ... the set of indicators ... for the assessment of the progress, effectiveness and efficiency of the policy against objectives.
3. The M&E framework shall reflect the structure of the CAP
 4. MS shall provide ... all the information necessary to permit the monitoring and evaluation. As far as possible, such information shall be based on established sources of data, such as the FADN and Eurostat.

EC 1307/2013 art 43.

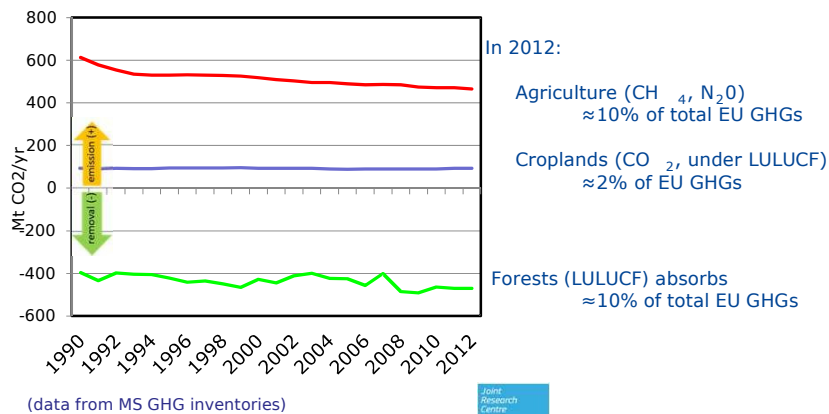
General rules

1. Farmers entitled to a payment shall observe, on all their eligible hectares ...agricultural practices beneficial for the climate and the environment or the equivalent practices
2. The agricultural practices ...shall be the following:
 - (a) crop diversification;
 - (b) maintaining existing permanent grassland; and
 - (c) having ecological focus area on the agricultural area.
3. The equivalent practices shall be those which include similar practices that yield an equivalent or higher level of benefit for the climate and the environment

The role of Agriculture on EU GHG budget

EU reduced total GHGs by $\pm 20\%$ since 1990

Agriculture reduced GHGs by $\pm 24\%$ since 1990



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General concepts on reporting and accounting

Within the UNFCCC and its Kyoto protocol:

Reporting: inclusion of GHG estimates and methods used in a national GHG inventory.
Accounting: use of the reported information to assess the impact of mitigation actions and/or the contribution towards a GHG target

Estimation and Reporting shall follow IPCC guidance on:

1. consistent representation of areas according to 3 approaches (from non-spatially explicit to geo-referenced)
2. estimating changes in C-pools using 3 tiers of increasing complexity & accuracy;
3. Key categories (KC): the most important categories/subcategories/C pools. For cost-effective use of resources, priority should be given to estimating KC with Tiers 2-3. Non-KC may be estimated with Tier-1.

Estimates must be: transparent, consistent, comparable, complete, accurate.

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When Accounting, the following additional requirements apply:

4. Land identification and tracking: the areas subject to various activities (and to various management systems within each activity) should be identified and tracked over time with spatially-explicit or statistical techniques.
5. "Not a source" principle: if a C- pool is not included in the accounting, evidence should be provided demonstrating that the pool is not a source.

The GHG inventories are subject to UNFCCC expert review process, which may "adjust" estimates which are considered not accurate. However, when accuracy cannot be met, conservative estimates may be accepted.

Reporting and accounting of Cropland and Grassland

	EU/UNFCCC	EU/KYOTO PROTOCOL	
	Reporting	Reporting	Accounting
Agri-culture	CH ₄ and N ₂ O from soils, livestock, manure	= UNFCCC	Mandatory, relative to 1990
LULUCF	GHG from 6 land uses (all managed land)	GHG only from direct human-induced activities	<div style="border: 1px solid red; padding: 5px; display: inline-block;"> mandatory in EU with LULUCF decision 529/2013 </div> Voluntary , relative to 1990
	FL Forest Land CL Cropland (CO ₂) GL Grassland (CO ₂) WL Wetland S Settlement O Other Land	AR Aff/Reforest. D Deforest. FM Forest Management CM Cropland mgmt. (CO ₂) GM Grazing land mgmt. (CO ₂) WM Wetland RV Revegetation	

"Established source of data"

Reporting on Cropland and Grassland by EU MS

The main challenges in current LULUCF sector reporting by MS are related to:

- Consistent land identification and tracking.
several MS (i.e. Austria, Belgium, Denmark, Finland, Latvia and Lithuania) are already using information from LPIS as a main or additional data source for reporting of CM and GM.
- Completeness of reporting.
Several MS assume no change in C stock in mineral soils without providing strong evidence (e.g. that no management change occurred).

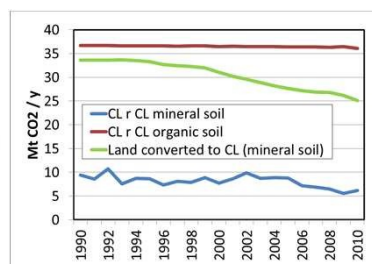
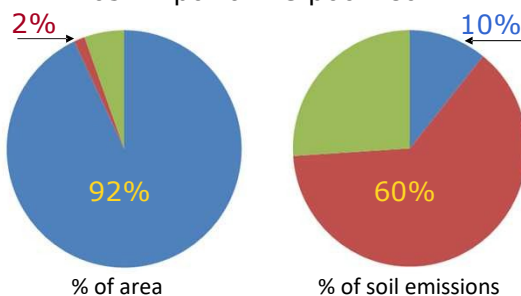
For the LULUCF decision 529/2013, all MS will implement a step-wise approach by 2020 to improve the quality of their estimates.

Large potential to exploit existing spatial datasets with management information as LPIS.

Efforts focus on “key categories” (most important sources of emissions)

Hotspots in emissions from cropland in the EU

Most important C-pool: soil



Share of different subcategories in Cropland (EU):

- CL rem. CL mineral soil 92% of area, 10% of CL soil emissions
- CL rem. CL organic soil 6% of area, 60% of CL soil emissions
- Land converted to CL 2% of area, 30% of CL soil emissions

(data from MS
GHG inventories)

IPCC basic concepts for GHG reporting

Reference Soil Organic C-stock was calculated by soil and climate type

Current SOC is calculated as $SOC_{year} = SOC_{ref} * F_{lu} * F_{mg} * F_{in} * area$

With F-factors depending on:

Factor	Orchard	Climate Regime	Default Value
F_{LU}	Long-term cultivated	tem&moist	0.48-0.80
	Paddy rice		110
	Permanent tree crop		100
F_{MG}	Set-aside	tem&moist	0.82-0.93
	Fall		100
	Reduced	tem&moist	102
F_{IN}	NH ₃	tem&moist	110
	Low	tem&moist	0.95
	Medium		100
	High without manure	tem&moist	104
	High with manure	tem&moist	137

after 2006 IPCC Guide lines for National Greenhouse Gas inventories, Table 5.5

F_{LU} Land Use

Grassland

Cropland

- Long-term cultivated
- Wetland rice (paddy)
- Perennial / tree crop
- Set-aside (< 20 yrs)
- Native vegetation

F_{MG} Management

- Improved
- Nominal/non-deg.
- Mod. degraded
- Sev. degraded

- Full tillage
- Reduced tillage
- No tillage

F_{IN} Inputs

- Medium
- High

- Low
- Medium
- High, no manure
- High, with manure

Accounting Categories (F_{LU})

Cropland Management (CM)

System of practices on land on which agricultural crops are grown and on land temporarily set-aside from crop production.

IPCC-category	≈ IACS-area (agricultural parcel)
annual crops	cereals, oils seeds, vegetables, root crops, forages
	rice field
	non-permanent grassland
perennial crops	trees and shrubs in combination with herbaceous crops, orchards, vineyards and plantations
	agro-forestry areas
temporary fallow	fallow, set-aside, EFA strips

* from: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 5.1

Accounting Categories (F_{LU})

Grazing Land Management (GM)

System of practices on land used for livestock production aimed at manipulating the amount and type of vegetation and livestock produced. Generally has vegetation dominated by perennial grasses*:

IPCC-category	≈ IACS area (agricultural parcel)
extensively managed rangelands and savannahs	"1307/2013" permanent pasture, pro-rata grasslands
intensively managed continuous pasture	"1122/2009" permanent grassland
hay land	Specific Natura2000 area?

* from: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 6

Land Use System: Management (F_{MG})

Full Tillage

- Substantial soil disturbance with full inversion and/or frequent (within year) tillage operations.

Reduced Tillage

- Primary and/or secondary tillage but with reduced soil disturbance (usually shallow and without full soil inversion). Normally leaves surface with >30% coverage by residues at planting.

No Tillage

- Direct seeding without primary tillage, with only minimal soil disturbance in the seeding zone.

Aren't there such GAEC measures?

Land Use System: Input (F_{IN})

Crop Residue Removal

- Removed for animal bedding, energy, (burnt).

Crop Rotation, low residue crops

- Low residue crops, bare fallow .

Input-enhancing practice

- Cover crops, green manure, mixed crop/grass, vegetated fallow.

Fertiliser

- Mineral fertiliser, N-fixing crops, organic amendments.

Aren't these similar to EFA elements?

Better data does matter

Time series

- IPCC assumes a 20 year transition period for land use changes before C stock reach stability

Land Use System Factors

- Cropland and grazing land management from land use data.
- For non-changing categories, F_{MG} and F_I are main source of C-stock changes, i.e. CO_2 emissions / removals.

Spatial Detail (Approach)

- ESTAT Farm Structure Survey: data by administrative units.
- LPIS: spatially explicit transitions for Land Use System factors.

In summary

The EU LULUCF decision requires all MS to implement a step-wise approach to increase the completeness and quality its GHG estimates -as accounting- from “cropland” and “grassland”, following the well-established IPCC guidance.

Despite challenges (e.g. identify/track land over time), this is technically feasible:

- 1) IPCC allows a cost-effective and flexible reporting.
- 2) MS do not start from zero (many years of experience on CL/GL reporting to UNFCCC) and there is time to improve (till 2020)
- 3) Large potential for better use of national and/or EU datasets (incl. LPIS).

High potential for synergies between LULUCF Decision and CAP Regulation:

- matching requirements (assess the impact of mitigation actions),
 - common basis for estimation (IPCC guidance):
- coordination of efforts is obvious!

In practice?

1. LCM will contain a provision for collecting LULUCF factors in the agricultural parcel class

For your key categories: consider integrating relevant elements in your IT system or AP application procedure, even if not GAEC or EFA
JRC has NO direct interest in these optional raw data (as outside CAP)

2. JRC seeks voluntary collaboration with the MS who (will) use LPIS for accounting under the LULUCF decision for methodological developments to:
 - Improve accounting accuracy
 - Share efforts and developments
 - Consolidate and document experiences



Thank you!

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