GREENHOUSE GAS INVENTORY FOR GRASSLANDS IN THE BASQUE COUNTRY IN 1990 AND 2008

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INTRODUCTION

The countries that have ratified United Nation Framework Convention on Climate Change have the obligation to report their greenhouse gas (GHG) inventories. These inventories must cover all sectors (Energy, Industrial processes, Solvent and other product use, Waste, Agriculture, LULUCF and Other).

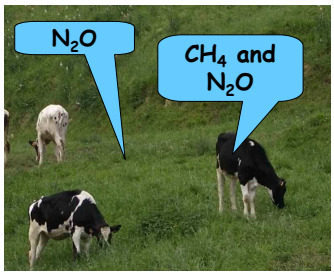
Grasslands cover about 220000 ha of the Basque Country (about 30 % of the total area). So, they may represent a major source or sink of GHG in the Basque Country.

Emissions/removals concerning to grasslands are included, according to IPCC guidelines, in the Agriculture and LULUCF (Land Use, Land-Use Change and Forestry) sectors of the GHG inventories.

OBJECTIVE

➢ To estimate, according to IPCC guidelines, emissions and removals in 1990 and 2008 concerning to grasslands for developing research strategies and management practices in order to enhance C sequestration and mitigate GHG emissions in the Basque Country.

MATERIALS AND METHODS



Agriculture sector

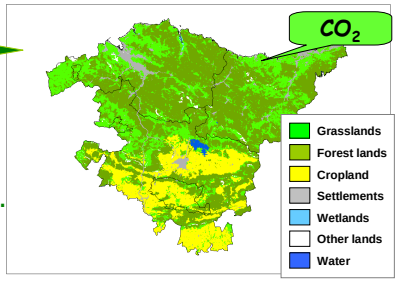
IPCC 2006 methodology: estimation of emissions of CH_4 and N_2O due to livestock (enteric fermentation, manure management) and grasslands management (fertilization, grazing, …).

- Populations of cattle, horses, goats and sheep, by subcategories, in 1990 and 2008 → Annual Census.
- Mineral fertilization of grasslands → statistical information.
- Emissions of CH_4 and N_2O (emission factors, equations, …) → IPCC 2006 methodology.

LULUCF sector (Land-Use, Land-Use Change and Forestry)

IPCC 2006 methodology: estimation of changes in C stock from above-ground biomass, below-ground biomass, dead wood, litter and soil organic matter.

- Area data in 1990 and 2008 by land-use categories → Agricultural census and forest inventories.
- Subdivision of grasslands by management practices → Agricultural census and forest inventories.
- Emissions and removals of CO_2 (emission factors, equations, …) → IPCC 2006 methodology.



RESULTS

513 Gg of CO_2-equivalents were emitted from Agriculture sector related to grasslands in 2008 (31 % lower than in 1990 due to lower emissions from enteric fermentation, because there were fewer dairy cows in 2008).

Total removals from LULUCF sector related to grasslands in 2008 were 288 Gg CO_2-eq (42 % lower than in 1990, mainly due to a high cropland area converted to grassland, but the uncertities of changes in grassland area were very high, particularly in 1990).

Considering Agriculture and LULUCF sectors together, grasslands were an emission source of GHG, emitting 224 Gg CO_2-eq in 2008 (6 % lower than in 1990).

Emissions ('+' sign) and removals ('-' sign) of GHG derived from grasslands in 1990 and 2008

	Source	Gg CO_2-eq y^{-1} 1990	2008
AGRICULTURE	CH_4 from enteric fermentation	461	336
	CH_4 from manure management	74	36
	N_2O from manure management	23	19
	N_2O from direct soil emissions (DSE): synthetic fertilizers	29	5
	N_2O from DSE: manure applied to soils	36	27
	N_2O from DSE: N in residues returned to soils	13	10
	N_2O from indirect soil emissions (ISE): N excretion on pasture	42	39
	N_2O from ISE: atmospheric deposition, leaching and run-off	61	41
	TOTAL emissions of Agriculture sector (grasslands)	**739**	**513**
LULUCF	CO_2 from grassland remaining grassland (GG)	0	- 120
	CO_2 from forest land converted to grassland (FG)	14	10
	CO_2 from cropland converted to grassland (CG)	- 513	- 51
	CO_2 from grassland converted to forest land (GF)	0	- 135
	CO_2 from grassland converted to settlements (GS)	0	9
	TOTAL removals of LULUCF sector (grasslands)	**- 499**	**- 288**
TOTAL emissions of GreenHouse Gases from grasslands		**239**	**224**

CONCLUSIONS

♣ In the Basque Country, gransslands were a net source of GHG because the net emissions of the Agriculture sector were higher than the net removals of the LULUCF sector.

♣ Considering the extent of grasslands in the Basque Country and its potential as C sink or source, research efforts should focused firstly to improve estimates of land-use changes particularly for 1990 and, secondly, to get better emission factors (particularly those related to organic C contents in grasslands and to enteric fermentation).

23rd General Meeting of the European Grassland Federation. Kiel, Germany. August 29th – September 2nd (2010)