



**HAL**  
open science

## Evaluation of GHGs, carbon stocks and yield from european cropping and pasture systems under two climate change scenarios

Marco Carozzi, Raia Silvia Massad, Katja Klumpp, Ecrah Hoba Ulrich Eza, Anastasiya Shtiliyanova, Jean-Louis Drouet, Raphaël Martin

### ► To cite this version:

Marco Carozzi, Raia Silvia Massad, Katja Klumpp, Ecrah Hoba Ulrich Eza, Anastasiya Shtiliyanova, et al.. Evaluation of GHGs, carbon stocks and yield from european cropping and pasture systems under two climate change scenarios. Climate SMART Agriculture 2015 - Global science conference - Towards Climate smart Solutions, 2015, Montpellier, France. 2015. hal-02793033

**HAL Id: hal-02793033**

**<https://hal.inrae.fr/hal-02793033v1>**

Submitted on 5 Jun 2020

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



# EVALUATION OF GHGs, CARBON STOCKS AND YIELDS FROM EUROPEAN CROPPING AND PASTURE SYSTEMS UNDER TWO CLIMATE CHANGE SCENARIOS



Carozzi M.<sup>1</sup>, Massad R.S.<sup>1</sup>, Klumpp K.<sup>2</sup>, Eza U.<sup>2</sup>, Shtiliyanova A.<sup>2</sup>, Drouet J-L.<sup>1</sup>, Martin R.<sup>2</sup>

<sup>1</sup> INRA, AgroParisTech, UMR 1402 - EcoSys, 78850 Thiverval-Grignon, FR (mcarozzi@grignon.inra.fr)

<sup>2</sup> INRA, UR 0874 UREP Unité de Recherche sur l'Ecosystème Prairial, 63100 Clermont-Ferrand, FR

**CONTEXT:** Various strategies can be implemented to counteract the effects of climate change on agricultural production. The most practical aspects are related to the adaptation of livestock system including forage production system, with respect to mitigation options of GHG emissions.

**METHOD:** The Pasture Simulation model **PaSim** and the crop model **CERES-EGC** were run by using input variables derived from spatialized meteorological, soil and management data, to a reference grid of 0.25° × 0.25°.

- The **climate change scenarios** (RCP4.5 and RCP8.5) derive from CMIP5 (Coupled Model Intercomparison Project Phase 5), which provides daily data (from year 2005 to 2100) of anthropogenic perturbation of the climate system of +4.5 and +8.5 W m<sup>-2</sup>.

- Soil** representative characteristics for each grid cell are provided from the ESDB (European Soil Data Base).

- Crop** and fertilisation data are obtained by identifying the two main crop rotations for each mesh of the reference grid, starting from a 1km × 1km resolution database provided by the GHG-Europe project (FP7).

- Grassland** cutting date, amount and type of fertilisation, animal management and stocking densities data are obtained from the CAPRI modelling system (Common Agricultural Policy Regionalised Impact).

Simulations from the CERES-EGC and PaSim models allow an overall assessment of

- dynamics of GHG fluxes (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O),
- soil carbon stocks
- biomass and animal productions.

**CONCLUSIONS:** The approach followed allows to represent the real response of models to climate and others drivers of changes. A change in the sowing dates and in the cycle duration of the main cultivated crops, as well as the need to introduce crop irrigation in some European areas has been observed.

## THE ANIMALCHANGE PROJECT



The main goals of this project are to draw sustainable scenarios for livestock production and reduce uncertainties in GHG emissions.

One of the major uncertainties to be tested is the impact of future climate projections

- ▶ on **crop** and **grassland** systems,
- ▶ soil **carbon sequestration**,
- ▶ **GHG** emissions.

To achieve that, a combined modeling approach is used at European scale.



Addressed in the Task 5.1 of the project over European continent.

