Modelling climate change impact on European crop and livestock systems

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MODELLING CLIMATE CHANGE IMPACT ON EUROPEAN CROP AND LIVESTOCK SYSTEMS

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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

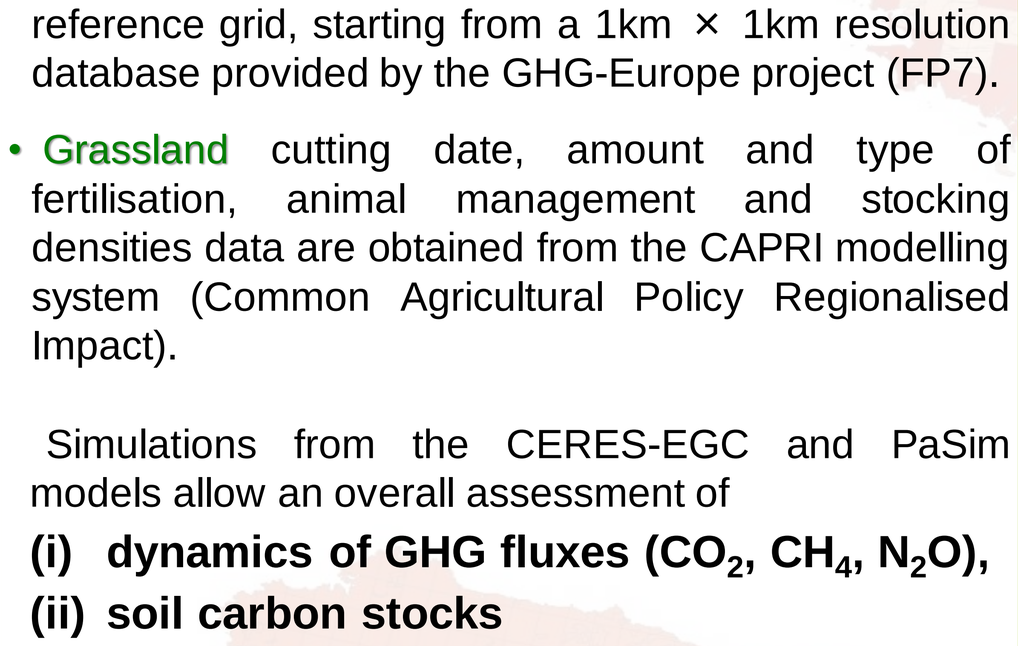
The Pasture Simulation model **PaSim** and the crop model **CERES-EGC** were run by using input variables derived from spatialized meteorological, soil and management data, to a reference grid of 0.25° × 0.25°.

- 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^{-2}.
- 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

(i) dynamics of GHG fluxes (CO_2, CH_4, N_2O),
(ii) soil carbon stocks
(iii) biomass and animal productions.

PRELIMINAR RESULTS



Gross primary production (kg C m^{-2}) for three time slices represented by the trial climate scenario AB1 by using PaSim model.

THE ANIMALCHANGE PROJECT

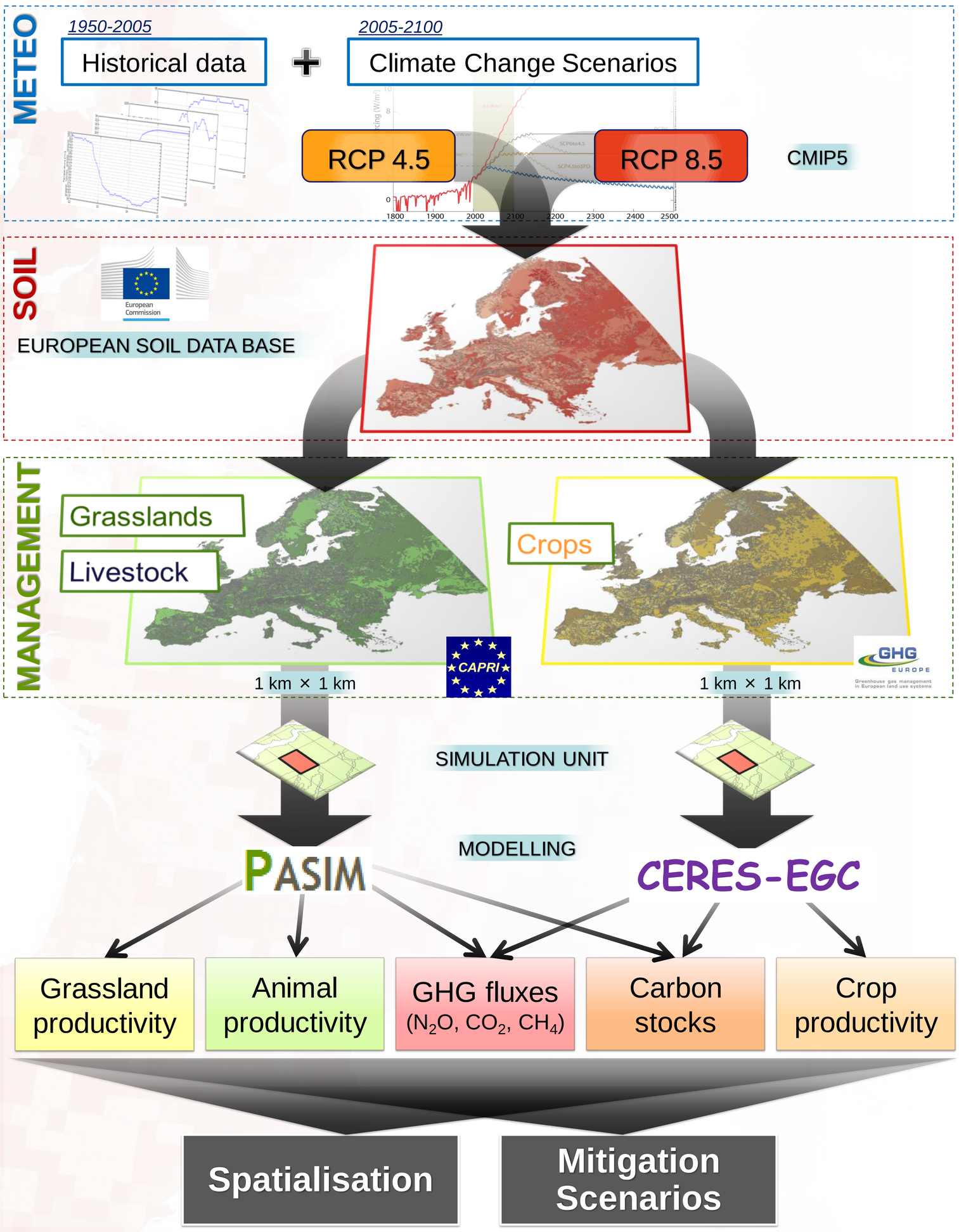
The main goals of this project are to draw sustainable scenarios for livestock production and reduce uncertainties in GHG emissions.

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

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 modelling approach is used at European scale.



CONCLUSIONS

The approach followed allows to represent the real response of models to climate and others drivers of changes.Even though the architecture of the system is currently being completion, a series of factorial experiments will be provided in order to attribute the simulated changes to the different variables affecting the system. Finally, a series of mitigation strategies will be proposed.

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