PaSim - Pasture Simulation Model

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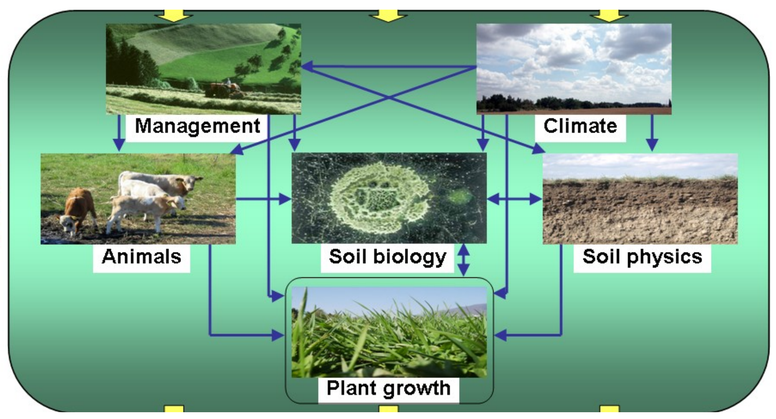
https://www1.clermont.inra.fr/urep/modeles/pasim.htm

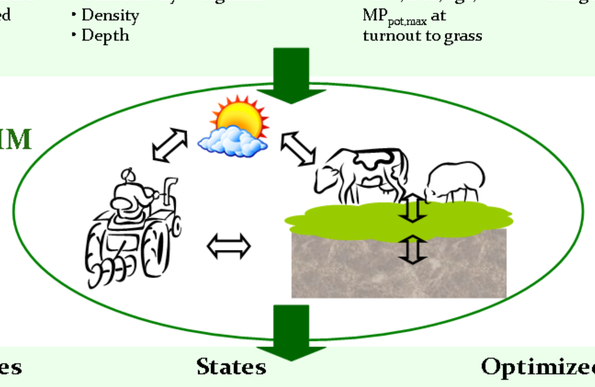
Model structure



Data in- and output

INPUT

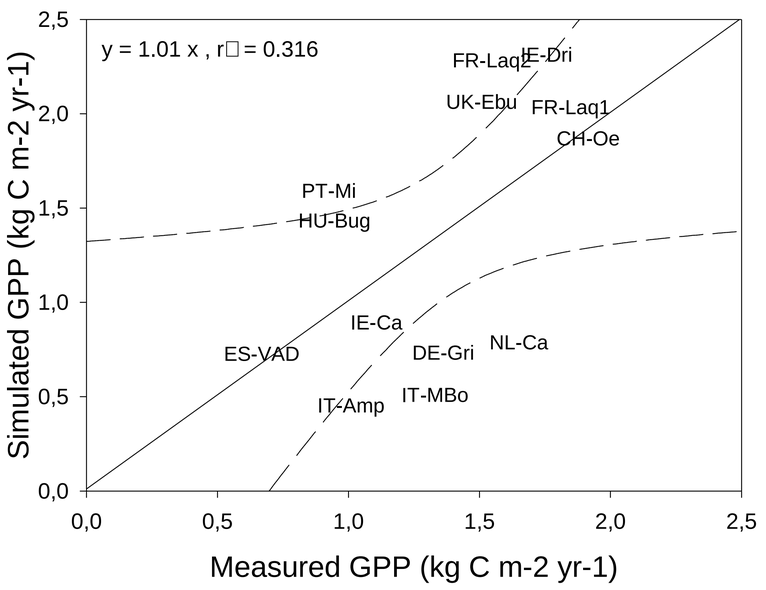
Climate	Soil	Vegetation	Herbivores	Management
• Radiation • Precipitation • Temperature • Vapor pressure • Wind speed • CO_2 • NH_3	• Texture • Soil water content • Conductivity • Density • Depth	• Multi or monospecies • With or without legumes	• Type (heifers, suckler or dairy cows, sheeps) • LW, BCS, age, $MP_{pot.max}$ at turnout to grass	• Mowing • N fertilization • Grazing • Tillage

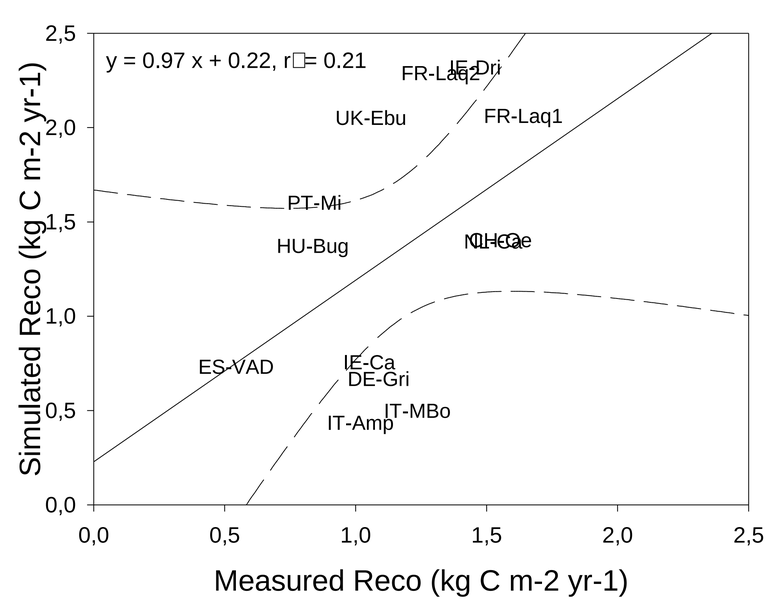


OUTPUT

Fluxes	States	Optimized management
• GHG (CO_2, N_2O, CH_4) • C, N, H_2O & energy fluxes ...	• Forage provision • MP, LW and BCS • Soil organic matter • Soil water content...	• Mowing • N fertilization • Grazing • Irrigation

Model validation





Comparison of simulated vs. observed mean annual gross primary productivity (GPP) and ecosystem respiration (Reco) at 13 European grassland sites.

Main properties

- **Process-based biogeochemical** model (H_2O, C and N cycles)
- **System simulated**: soil-vegetation-animal-atmosphere
- **Short and long term simulations**
- **Subdaily (hourly) time scale** for detailed dynamics and energy budgets stability
- **Plot scale** (upscaling ability)

Accessibility

- Used for **process understanding** rather than decision support
- Graphical user **interface**
- **Software and documentation** available for research at https://www1.clermont.inra.fr/urep/modeles/pasim.htm

Evaluation/Validation

- **Variables:**
  - Forage yield and quality
  - Greenhouse gas and energy fluxes
  - Soil temperature and water content
  - Animal performance
- **Conditions:** European climate

Usefulness and originality

Prediction of:

- **mechanistically cattle performance**
- **biogeochemical cycles** of grasslands and their interactions
- **climate changes impacts** on livestock systems, and possible **adaption** options

Project involvement

- **National Projects**

CLIMATOR, VALIDATE, ORACLE, EPAD

- **European projects**

GREENGRASS (2003-2005)
CARBOEUROPE (2005-2008)
NITROEUROPE (2007-2011)

CARBO-EXTREME, GHG-EUROPE, ANIMAL CHANGE

Perspectives

to improve:

- **legume dynamics**
- **functional plant traits responses** to climate change and management
- grasslands responses to climate and management under **tropical conditions**

PaSim references

Riedo et al. 1998, 2002 Ecol. Model.
Schmid et al. 2001 Nutr. Cycl. Agroecosys.
Vuichard et al. 2007a,b Global Biogeochem. Cy.
Graux et al. 2011 (submitted to Agricultural Forest and Meteorology)
Graux et al. 2011 (Agr. Ecosyst. Environ., in press)
Lardy et al. 2011 (Environmental Modelling and Software, in press)

For further information:
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