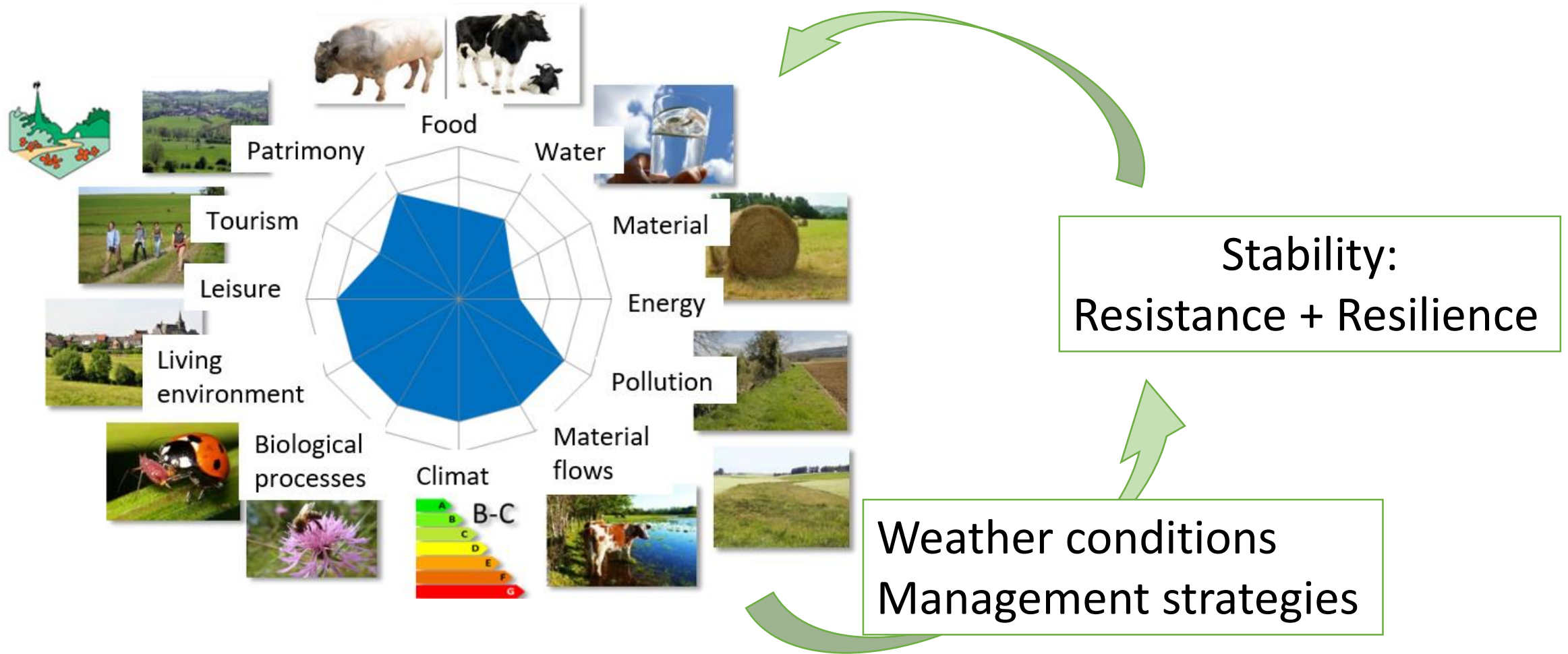


# Modeling the biomass production of grasslands of Wallonia according to their functional type

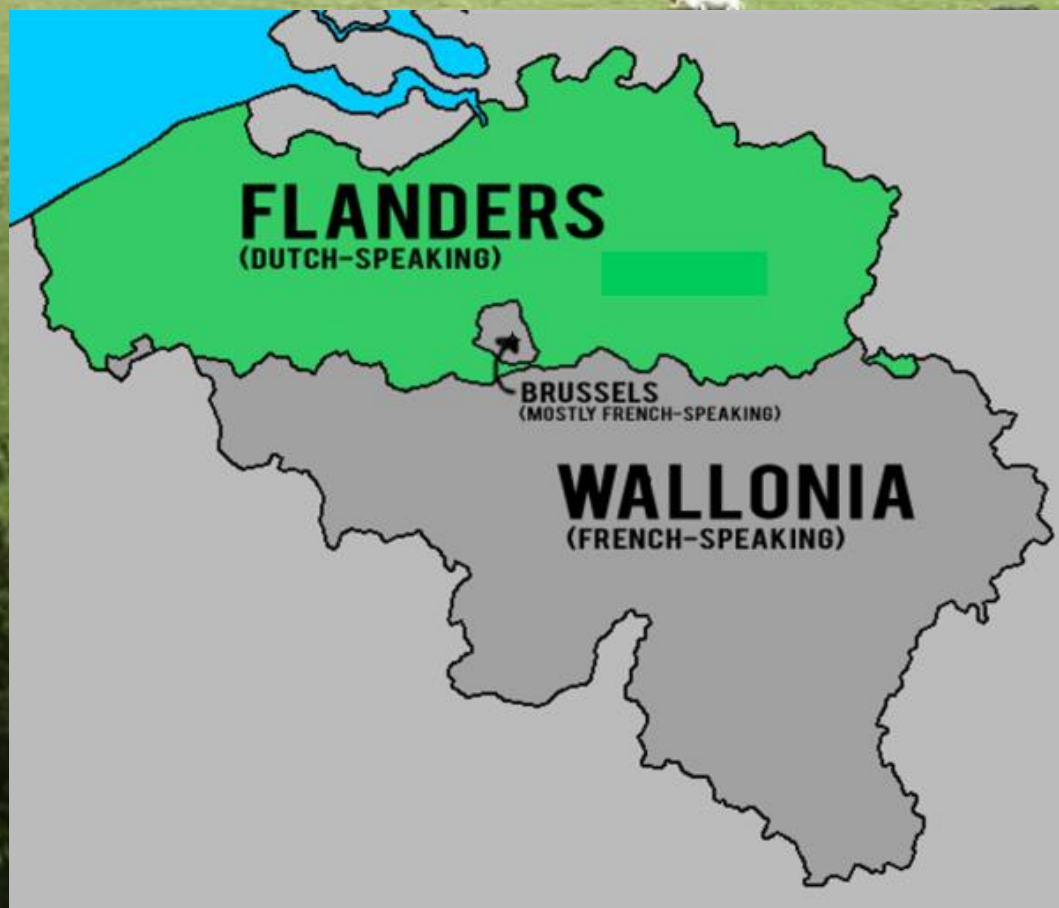
Co-researchers:  
David Knoden  
Prof. Benjamin Dumont  
Prof. Jérôme Bindelle

May 18, 2023  
Presenter :  
Essomandan Urbain KOKAH

# Grassland Ecosystem Services



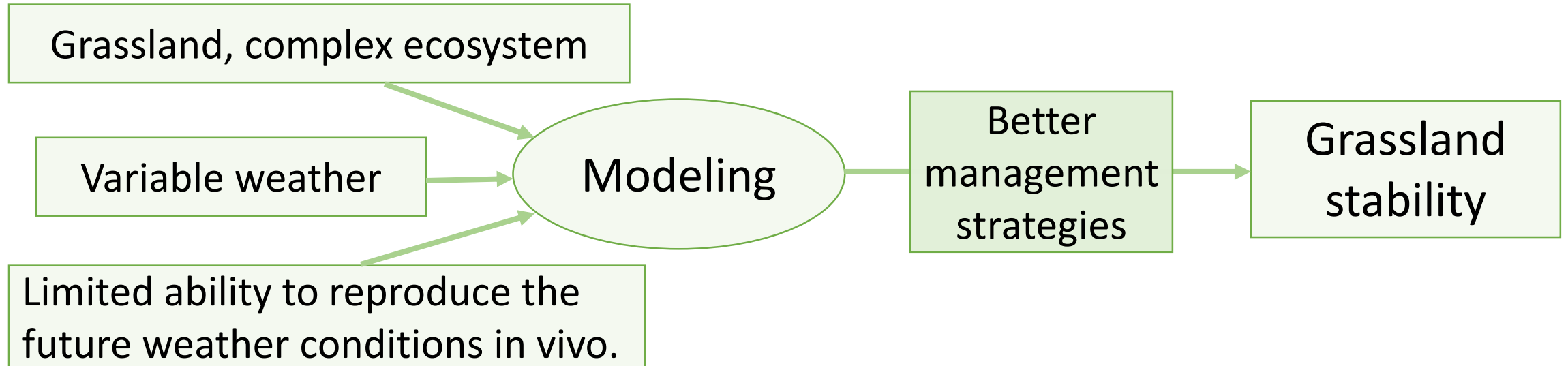
# Grasslands in Wallonia



≈ 2.4 million head of cattle  
46% in Wallonia

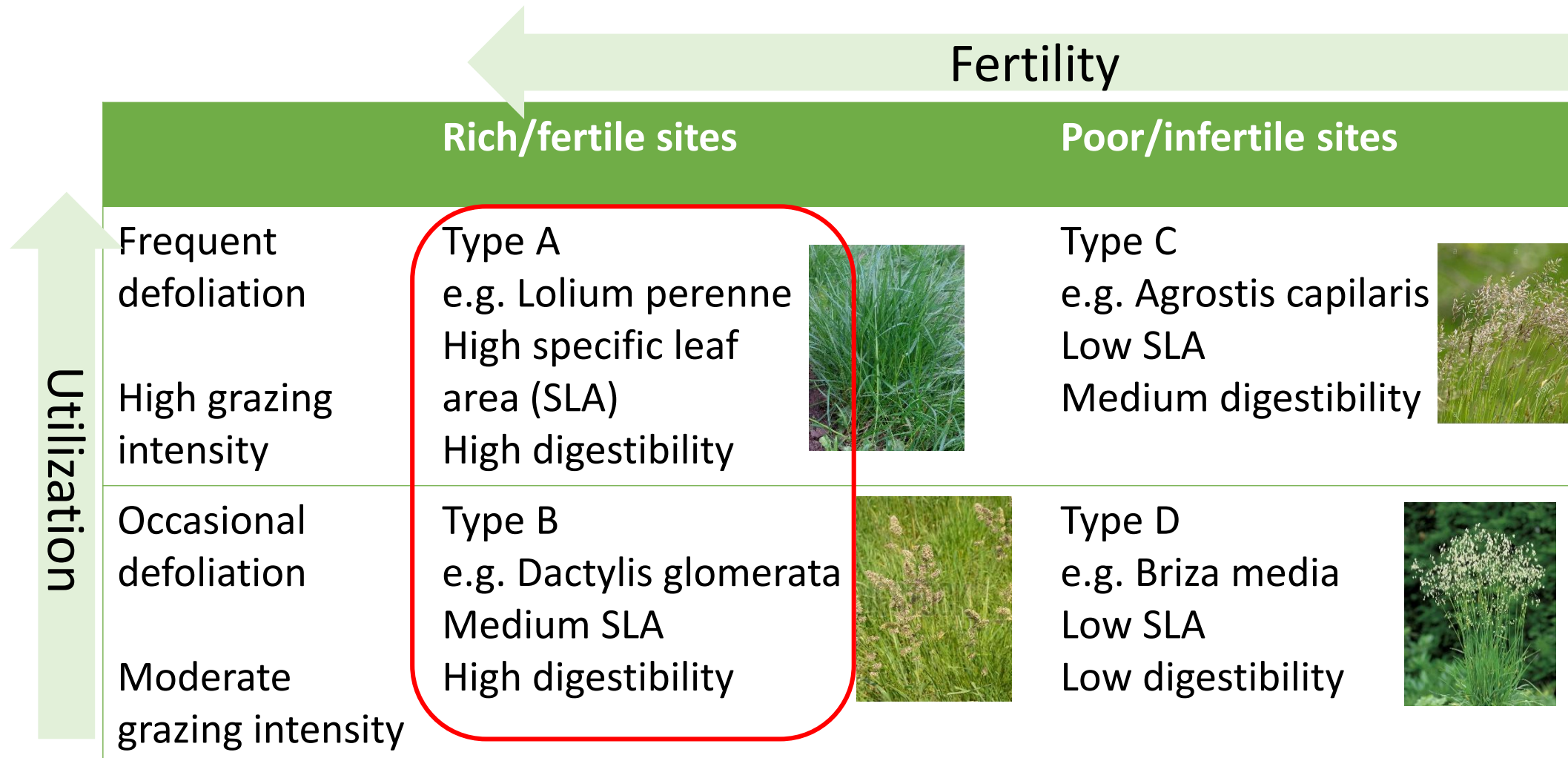
≈ 480 000 ha of permanent  
grassland  
65% in Wallonia

# Modeling to ensure grassland stability



First step hypothesis:  
The model as parameterized, correctly simulates the dynamics of grass growth for plant functional type (PFT) A and B

# PFT concept of Cruz et al. (2002)



# Models based on the PFT concept

Model predicting dynamics of biomass, structure and digestibility of herbage in managed permanent pastures. 1. Model description

**M. Joven\***, **P. Carrère†** and **R. Baumont\***

\*INRA, Unité de Recherches sur les Herbivores, St Genès Champanelle, France, and †INRA, Unité d'Agronomie, Clermont-Ferrand, France

ModVege (2006)  
PFTs: A, B, C and D  
Simulates the effects of management on biomass, structure and quality .  
Designed to consider with the animal component  
No soil compartment

(MoSt GG) 2018  
PFT A  
Soil compartment

Development of the Moorepark St Gilles grass growth model (MoSt GG model): A predictive model for grass growth for pasture based systems

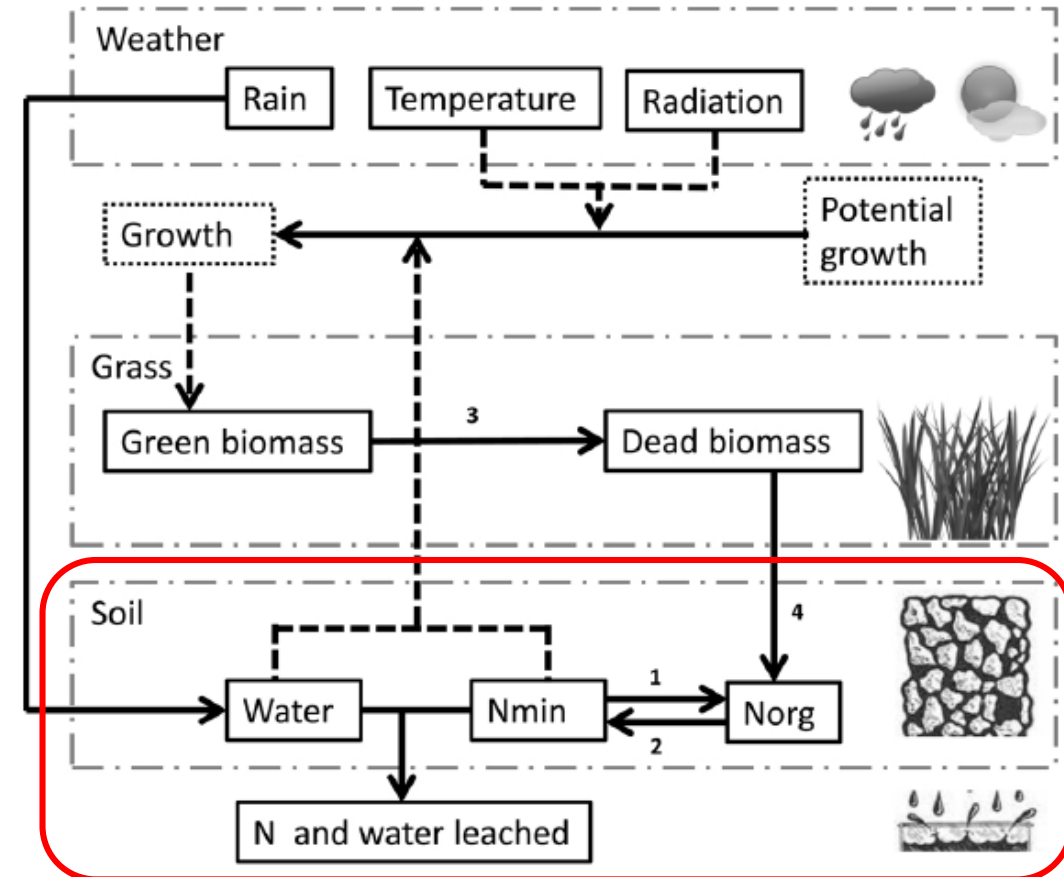
E. Ruelle<sup>a,\*</sup>, D. Hennessy<sup>a</sup>, L. Delaby<sup>b</sup>

<sup>a</sup> Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork, Ireland

<sup>b</sup> INRA, AgroCampus Ouest, UMR Physiologie, Environnement, Génétique pour l'Animal et les Systèmes d'Elevage, 35590 St. Gilles, France

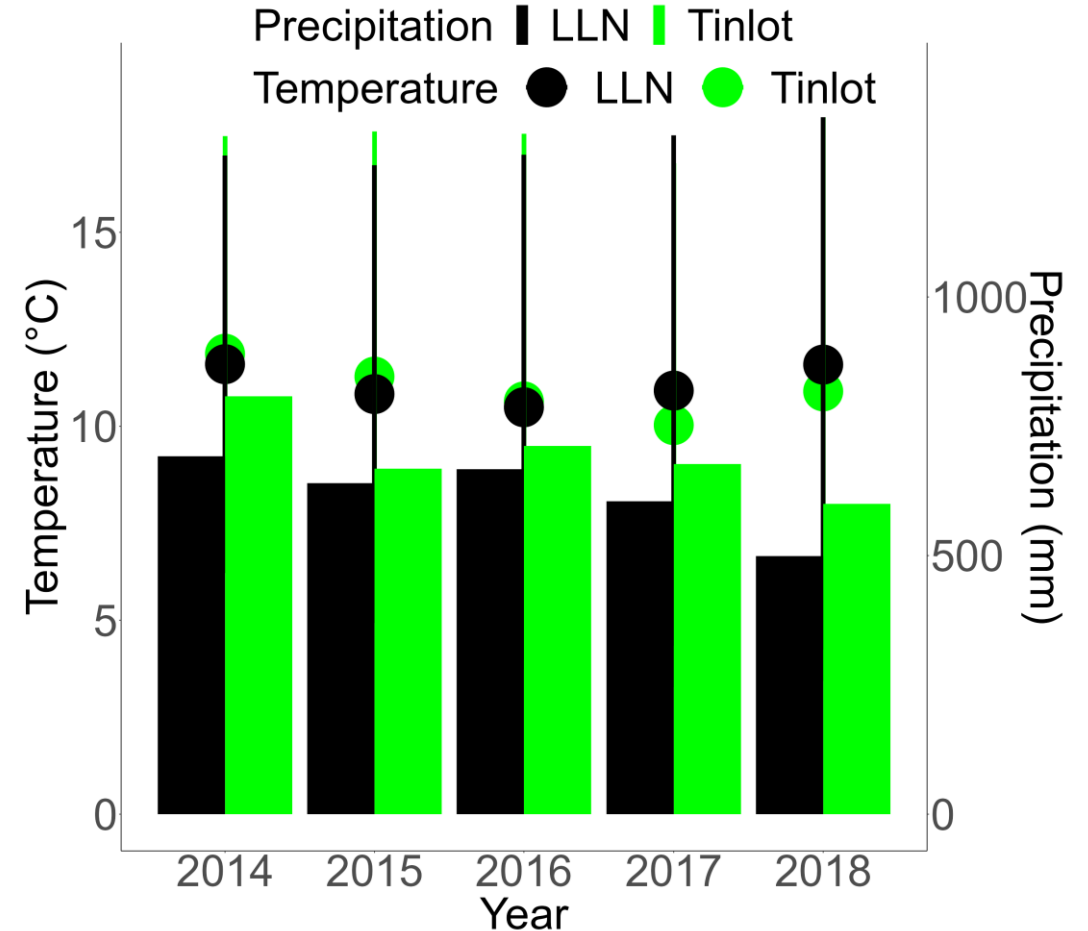
# A new model with a soil compartment

- Code the ModVeg model entirely in R for PFTs A and B
- Develop the soil compartment based on the MostGG and CATIMO (Bonesmo and Bélanger, 2002) models



<sup>1</sup> Immobilisation, <sup>2</sup> Mineralisation, <sup>3</sup> Senescence, <sup>4</sup> Abscission.

# Weather data during the experimental period



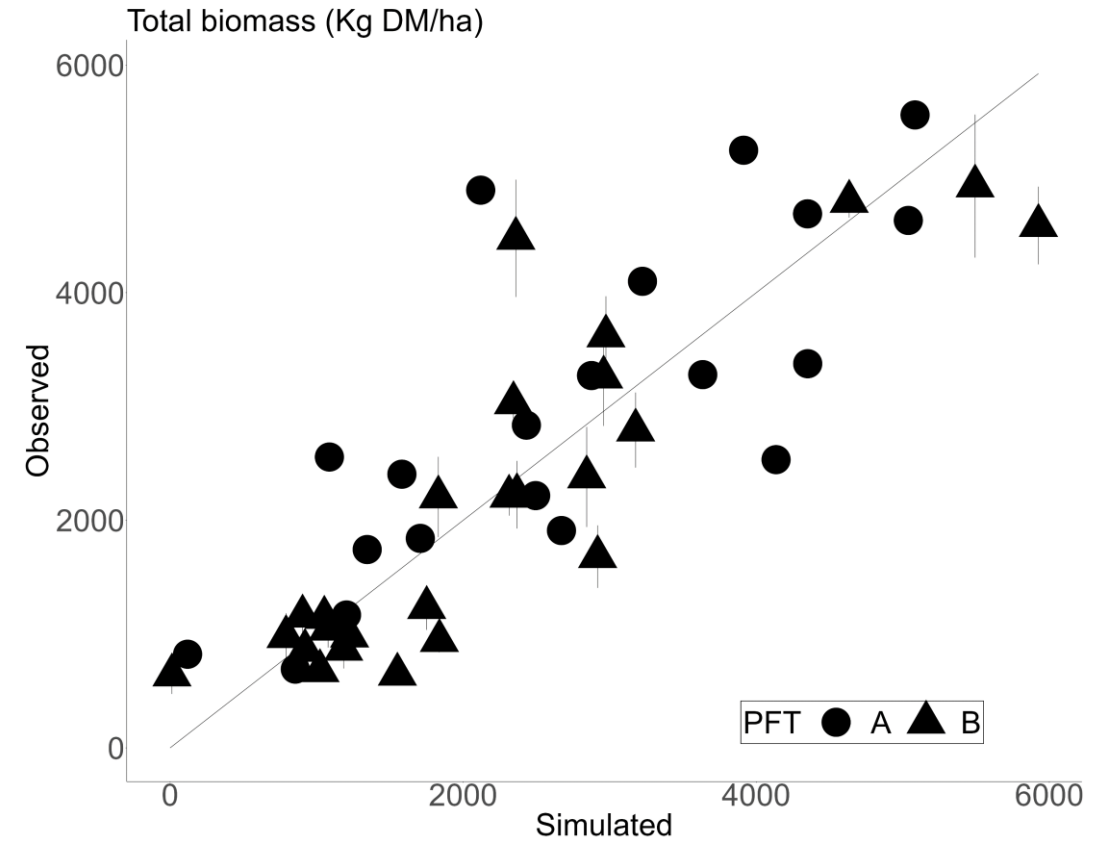


# Validation data: 5 years and 45 cuts

<b>Year</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>
Cuts	10	7	15	7	6
Site	LLN Tinlot	LLN Tinlot	LLN Tinlot	LLN Tinlot	LLN Tinlot
PFT	B	B	A, B	A	A

# Simulation results: total biomass production

Total (n=45)	
Observed	2515 (1497)
Simulated	2437 (1463)
RRMSE ( $\leq 0.3$ )	0.33
$ ND (\leq 0.1)$	0.03
EF ( $> 0.5$ )	0.68



Biomass (kg DM/cut/ha)

# Simulation results: biomass production by PFT

	A (n=20)	B (n=25)
Observed	2990 (1473)	2135 (1433)
Simulated	2711 (1464)	2219 (1453)
RRMSE ( $\leq 0.3$ )	0.33	0.33
ND  ( $\leq 0.1$ )	0.09	0.04
EF ( $> 0.5$ )	0.54	0.75




Biomass (kg DM/cut/ha)

# Conclusion: hypothesis of the first step validated

The model predicts with a good accuracy the biomass of grasslands dominated by ryegrass (PFT A) or orchard-grass (PFT B)...



Parameterizing and calibrating work continues to consider all PFTs.

A black and white cow is grazing in a lush green field. A thought bubble is positioned to the right of the cow, containing the text "Thank you for your attention".

Thank you for  
your attention

Urbain Kokah  
eukokah@uliege.be