



HAL
open science

Modelling faba bean with the STICS soil-crop model: Parameterization and independent validation

Gatien Falconnier, Etienne-Pascal Journet, Laurent Bedoussac, Anthony Vermue, Eric Justes

► To cite this version:

Gatien Falconnier, Etienne-Pascal Journet, Laurent Bedoussac, Anthony Vermue, Eric Justes. Modelling faba bean with the STICS soil-crop model: Parameterization and independent validation. Séminaire STICS 2007, Oct 2017, La Rochelle, France. , 1 p., 2017. hal-02787784

HAL Id: hal-02787784

<https://hal.inrae.fr/hal-02787784v1>

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.

Gatién N. Falconnier*, Etienne-Pascal Journet, Laurent Bedoussac, Anthony Vermue, Florent Chlébowski, Nicolas Beaudoin, Eric Justes

*gatién.falconnier@inra.fr

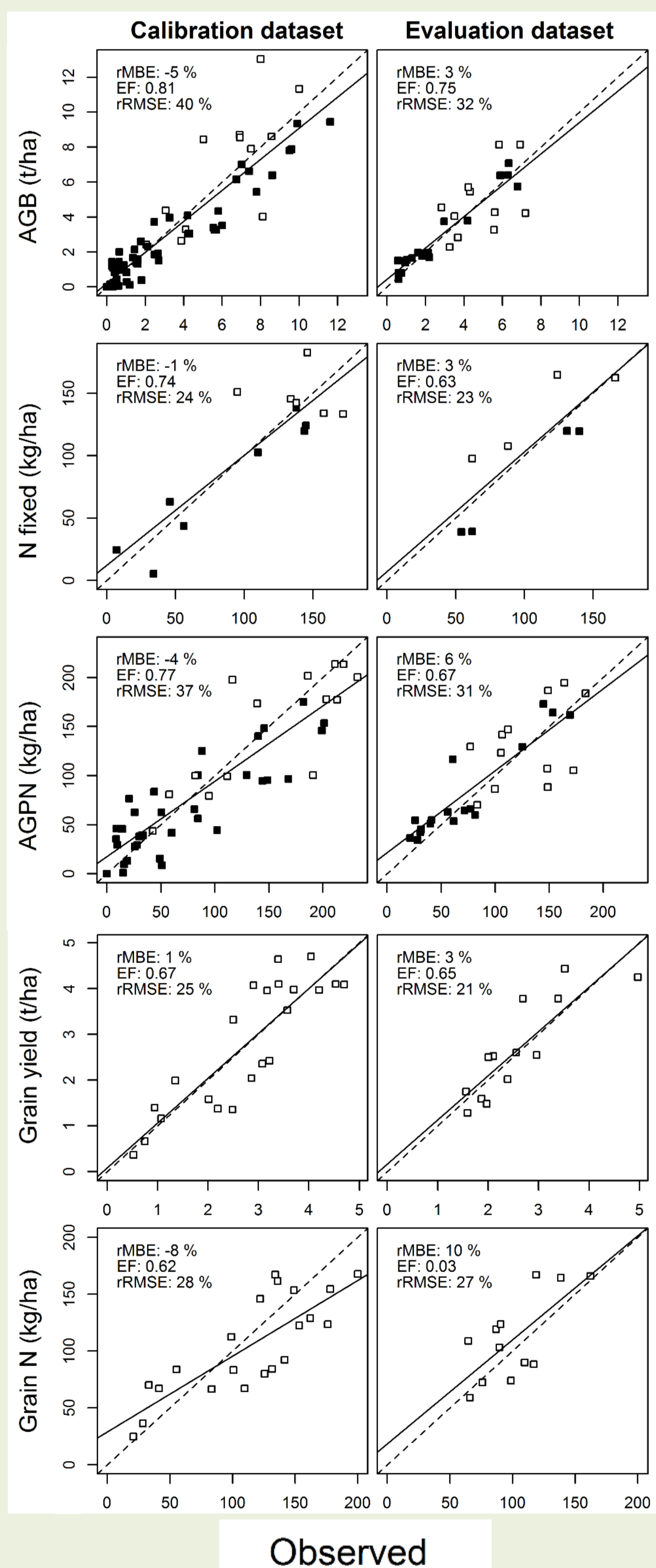
Introduction

- Faba bean (*Vicia Faba* L.) is the second most widely grown grain legume in Europe after pea.
- The *STICS* model can generate the quantitative information needed for the design of innovative cropping systems including legumes but **no parameterization for faba bean for the *STICS* model**.
- Twofold objective :
 - Calibrate** and **assess** *STICS* performance to simulate N acquisition (mineral uptake and N₂ fixation), growth, grain yield formation, N content in grains and residues
 - Analyze if *STICS* can accurately simulate the **temporal dynamic of water stress** and account for the **observed yield and fixed N variability**

Methods

- Experiments in Auzeville and Auch (2002-2015)
 - Contrasting soil types (valley/hillside)
 - Similar cultivars (Castel/Irena)
 - 35 site – year – management simulation units
 - Monitoring of crop development stages, LAI, above-ground biomass, fixed N and total N accumulated, grain yield and grain N
- Step parameterization procedure with ten steps carried out on 29 crop-related parameters. Mathematical optimization with OPTIMISTIC
- Water supply/demand ratio, i.e. the ratio of actual evapotranspiration over potential evapotranspiration

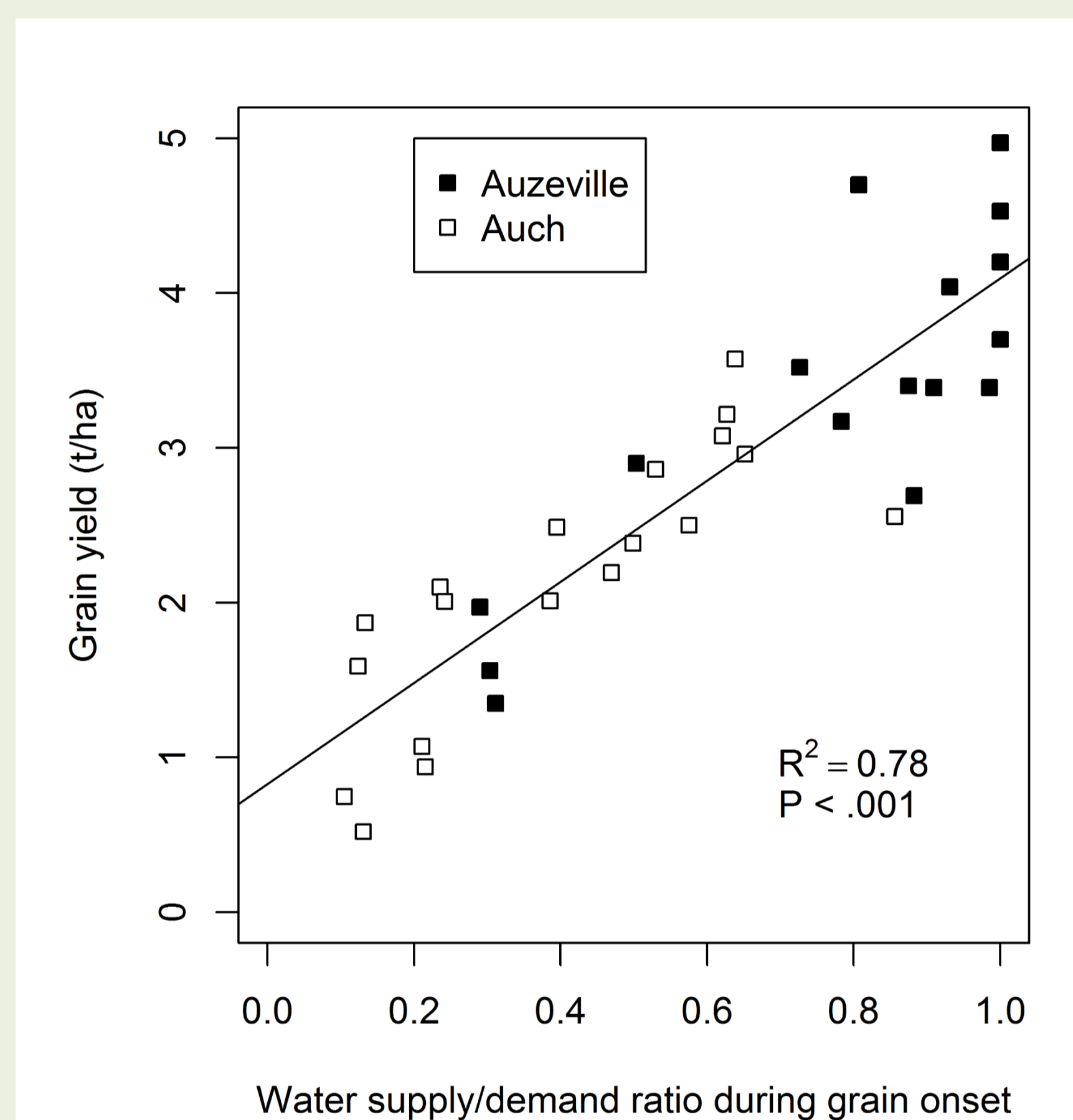
Results



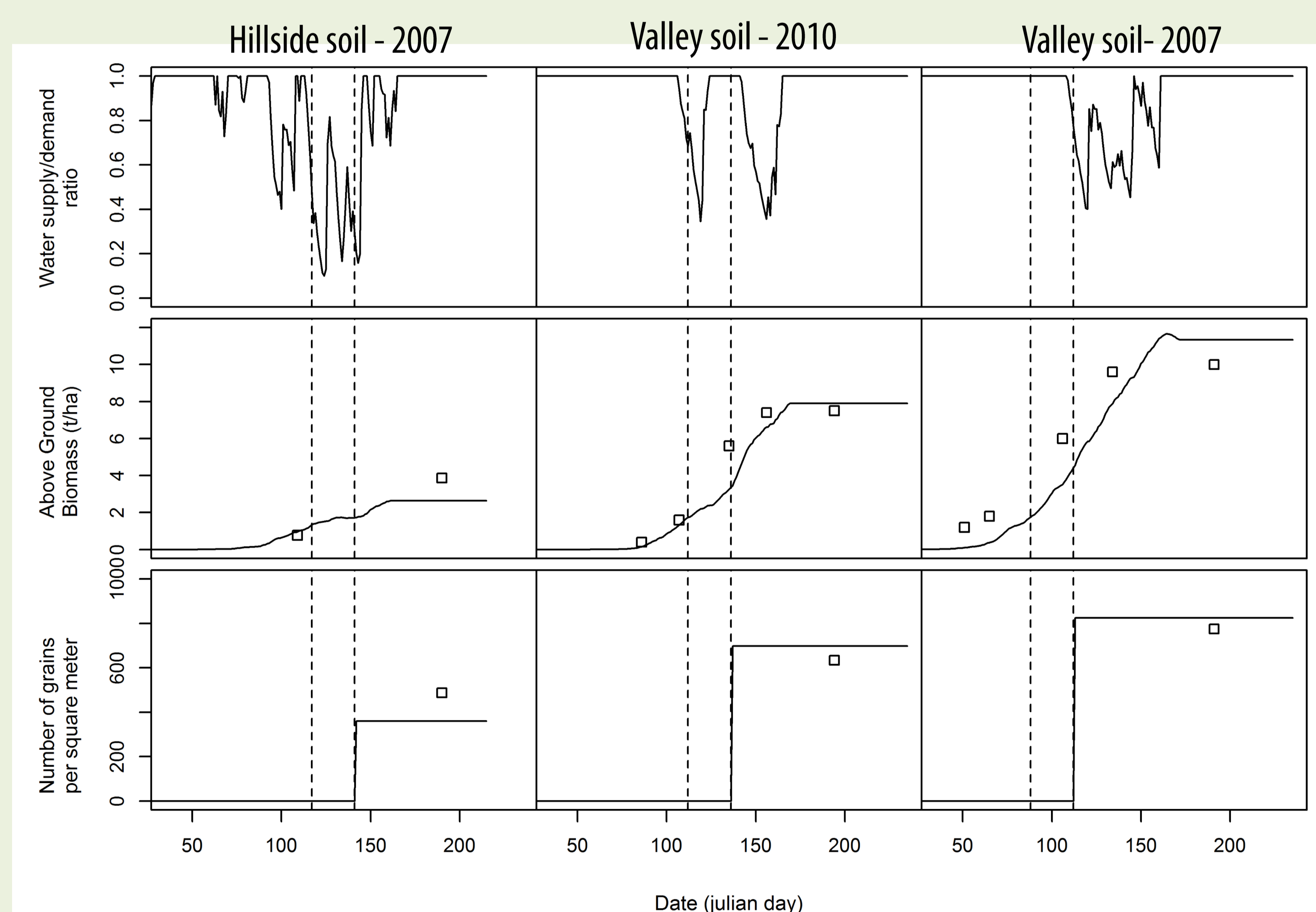
Simulated

Observed

- The model reproduced well dynamic growth of above ground biomass, uptake of mineral N and N₂ fixation with satisfactory model Efficiency (EF) and relative Mean Bias Error (rMBE)



- Water supply/demand ratio averaged over a period of six days preceding grain filling explained 78% of the observed grain yield variability in the experiments



- Dynamic simulation of contrasting water stress occurring in different soil type (valley/hillside) for a range of climatic conditions and final impact on number of grain and grain yield

Conclusion

- First calibration and evaluation** of faba bean with the *STICS* model
- Relevance of the model for the analysis of **variability in grain legume yield and N fixation due to abiotic stresses**