Stics Performance Evaluation Report : Grass

Authors: F. Ruget, G. Louarn, A.I. Graux, S. Buis

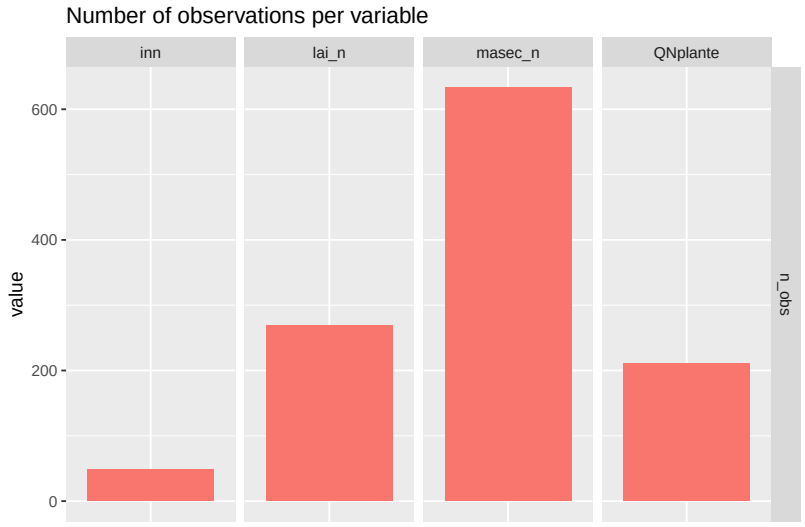
STICS version: V10.0.0

IdeSTICS version: r1956

Number of USMs: 107

Number of cultivars: 1

Cultivars names: mix

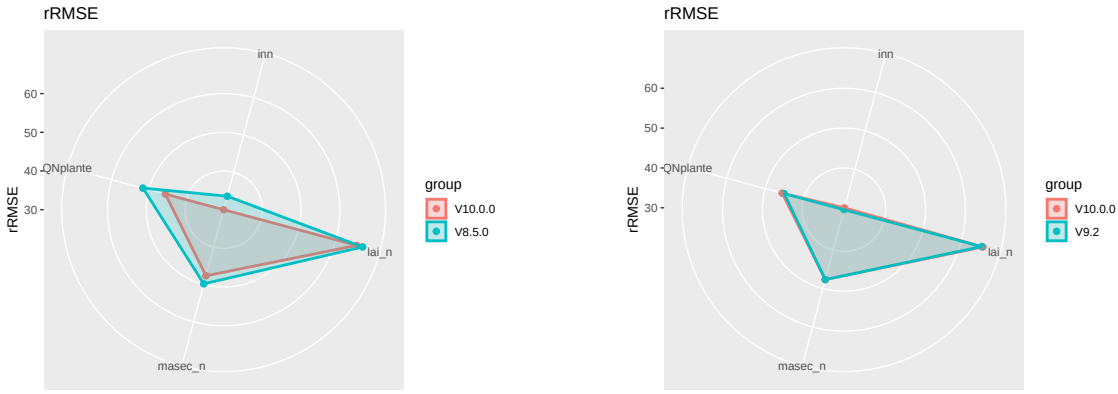


The evaluation dataset includes 107 USMs not used for model calibration, a large number of observations for lai, masec and QNplante, but relatively few for inn. Observations correspond to a single functional grassland type (B only, Cruz et al., 2010) simulated with the 'grass_plt.xml' plant file. It must be noted that measurements of herbage growth were made in all seasons: mainly summer and spring (with or without initial cut as it happens in the French agricultural practices). This dataset does not include any measurement of soil water and soil nitrogen content nor residual biomass or root parts.

Only a global overview of the dataset is given here. There are very different situations in this dataset:

- per species: tall fescue, cocksfoot, "natural" grasslands,
- per season: spring, summer and intermediate (late spring),
- per level of fertilization (response curve to fertilization) and organic nitrogen in the soil,
- rainfed vs irrigated treatments analysis.

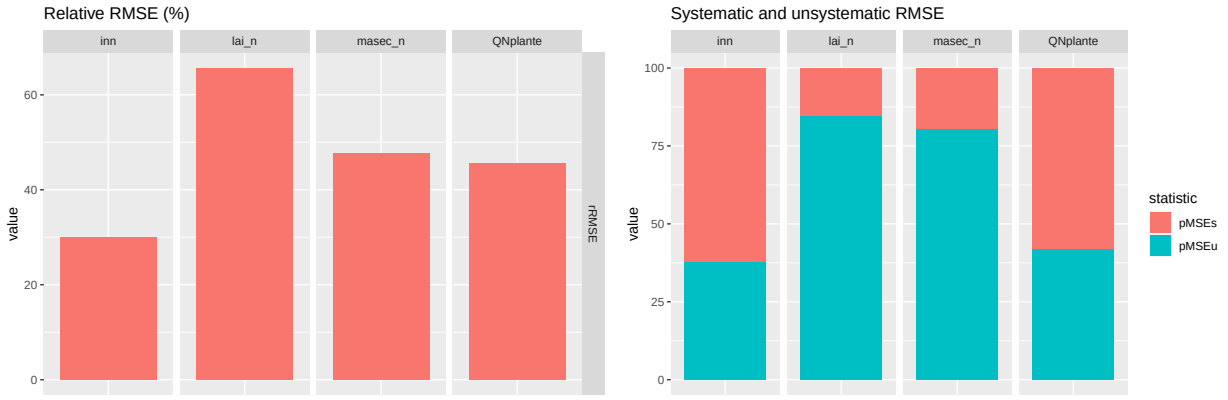
Evolution of performances with respect to previous versions



The performances of STICS version V10.0.0 are very close to these of version V9.2 on the situations and variables evaluated (see graph on the right).

rRMSE are significantly improved for the four measured variables with the new version V10.0 compared to those obtained with the former version V8.5.0 (graph on the left), mainly due to modifications implemented in version V9.0.

Global analysis

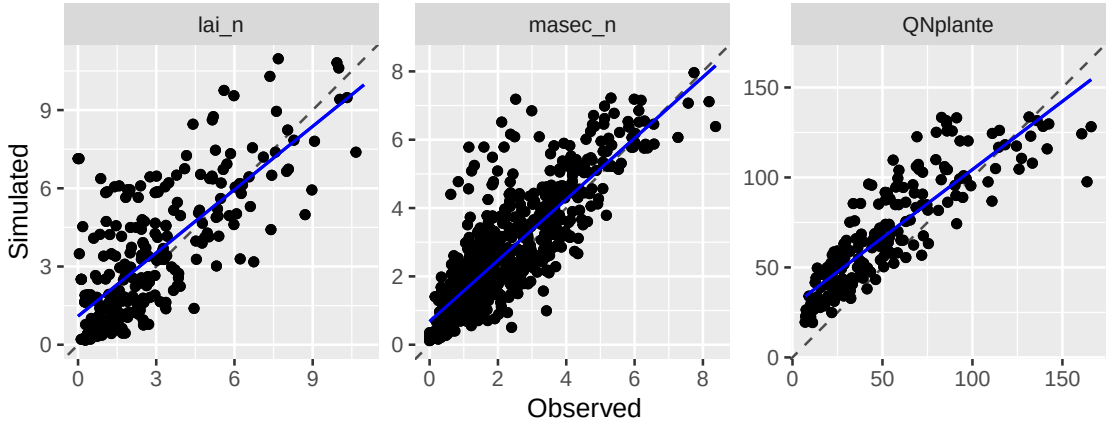


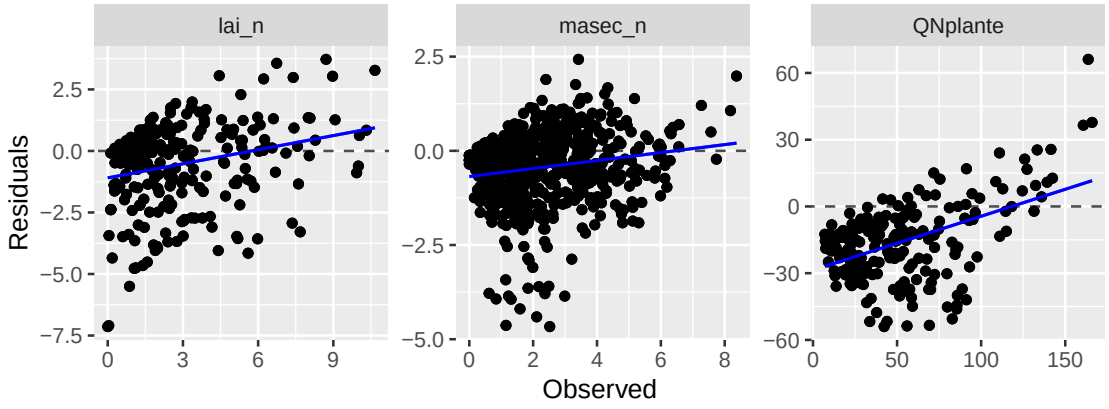
- Model errors (rRMSE) for lai are relatively high (>60%). For the agronomical variables simulating forage yield (masec) and protein content (QNplante) model errors are lower and relatively acceptable.
- No systematic error of the model (bias) was observed compared to dispersion for lai and masec while a significant bias is observed for QNplante with respect to dispersion error.
- Regarding inn, only a few situations were characterized. A significant bias of model predictions towards high inn values was observed in these situations.

Growth dynamic

	lai_n	masec_n	QNplante
n_obs	269.00	633.00	211.00
mean_obs	2.77	2.24	52.12
mean_sim	3.34	2.69	68.12
CV_obs	83.95	69.72	67.23
CV_sim	75.53	63.14	45.08
RMSE	1.82	1.07	23.76
rRMSE	0.66	0.48	0.46
pMSEs	0.16	0.20	0.58
pMSEu	0.84	0.80	0.42
EF	0.39	0.53	0.54
Bias	0.56	0.44	16.00

- Simulated lai and masec are strongly overestimated for a limited set of USMs, which may largely impact the statistical criteria.
- The model overestimate QNplante, particularly for low to medium values.
- CV of simulations is slightly lower than CV of measurements for all three variables.


lai_n
masec_n
QNplante
Simulated
Observed
0
3
6
9
2
4
8
50
100
150


lai_n
masec_n
QNplante
Residuals
Observed
2.5
0.0
−2.5
−5.0
−7.5
60
30
−30
−60

Conclusion

Model performances are globally acceptable, although RMSE is a bit high for lai. It must however be noticed that the few badly simulated USMs may significantly degrade the statistical criteria values. Bias is low for lai and masec simulations, but the model tends to overestimate low to medium QNplante values.