Stics Performance Evaluation Report : Maize

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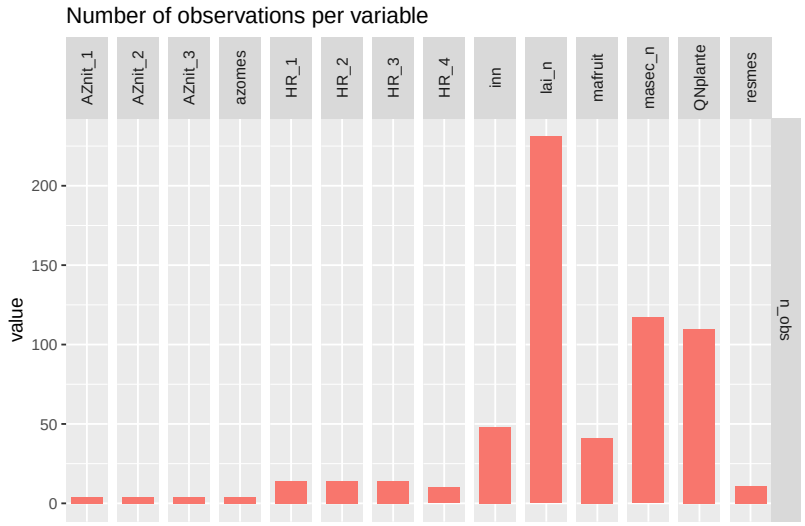
STICS version: V10.0.0

IdeSTICS version: r1956

Number of USMs: 19

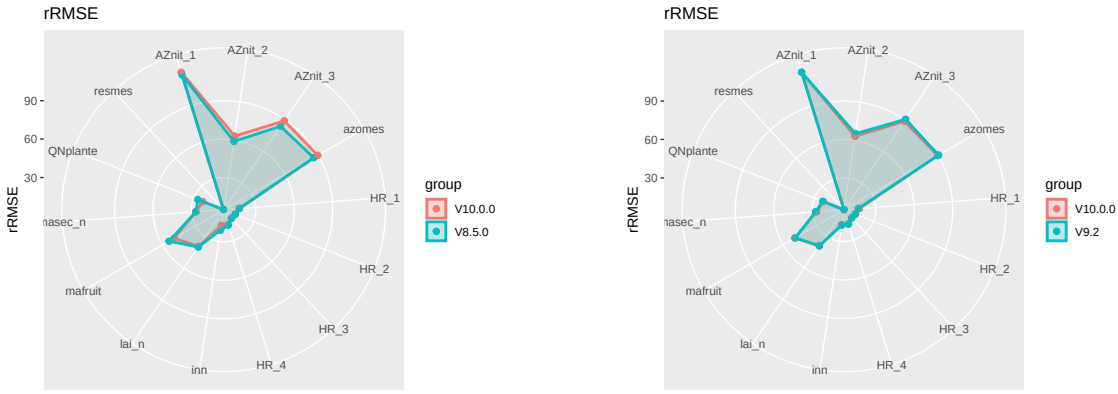
Number of cultivars: 4

Cultivars names: Furio, DK300, Anjou285, Volga



The evaluation dataset includes 19 USMs not used for model calibration and 4 cultivars. The number of observations varies a lot depending on the observed variable: large for lai, masec and QNplante, moderate for mafruit and inn, but low to very low for soil water and nitrogen content. Indeed, there are dynamic values for the first set of variables, generally no dynamic values or a few for the second set and no observations for all the USMs for soil variables.

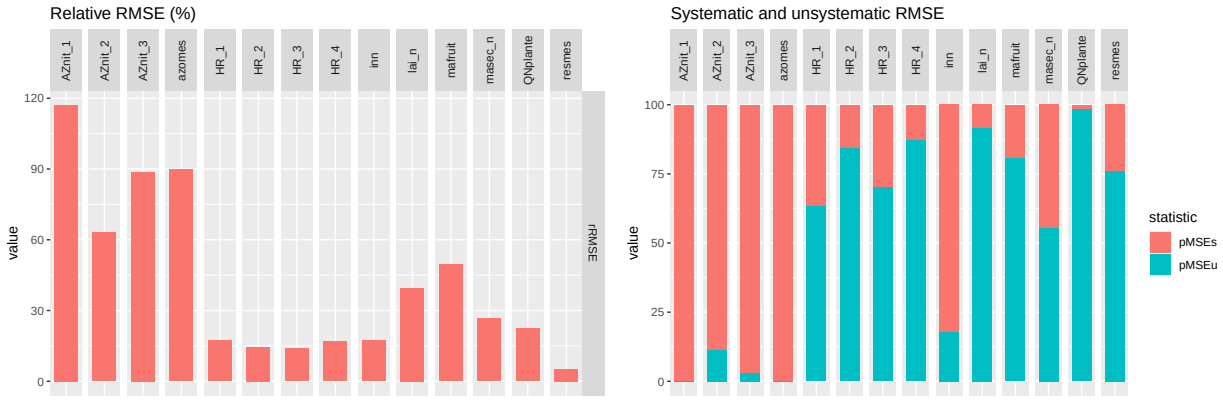
Evolution of performances with respect to previous versions



The performances of STICS version 10.0.0 are very close to these of version 9.2 on the situations and variables evaluated here (graph on the right).

rRMSE obtained with the version 10.0.0. are close to those obtained with the former version 8.5.0 (graph on the left). They are slightly better for mafruit, inn and QNplante. They are degraded for soil nitrogen content variables (aznit1-3 and azomes) but the number of observations for these variables is too low for an objective assessment of the quality of their prediction. rRMSE are very close for the other variables. The main differences in performances between versions 10.0.0 and 8.5.0 where introduced in version 9.0.

Global analysis

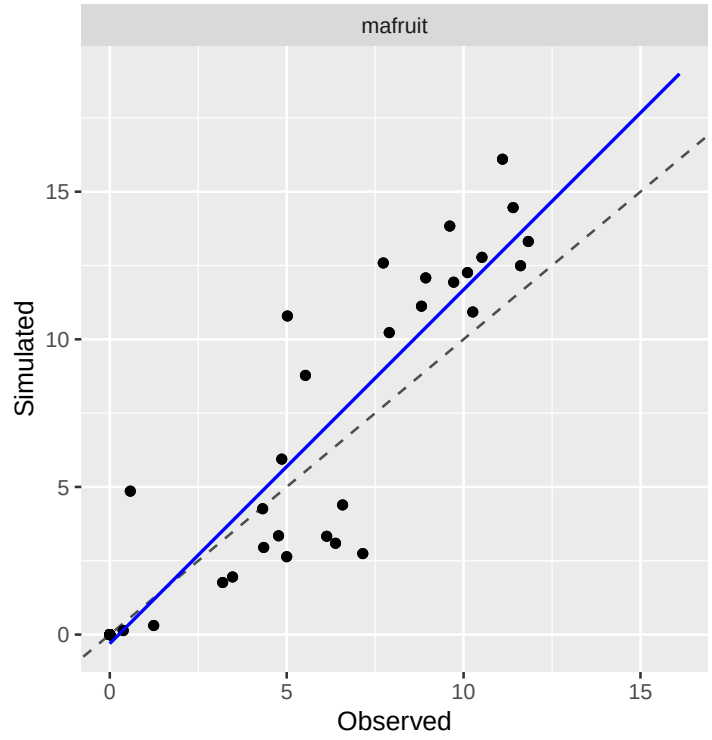


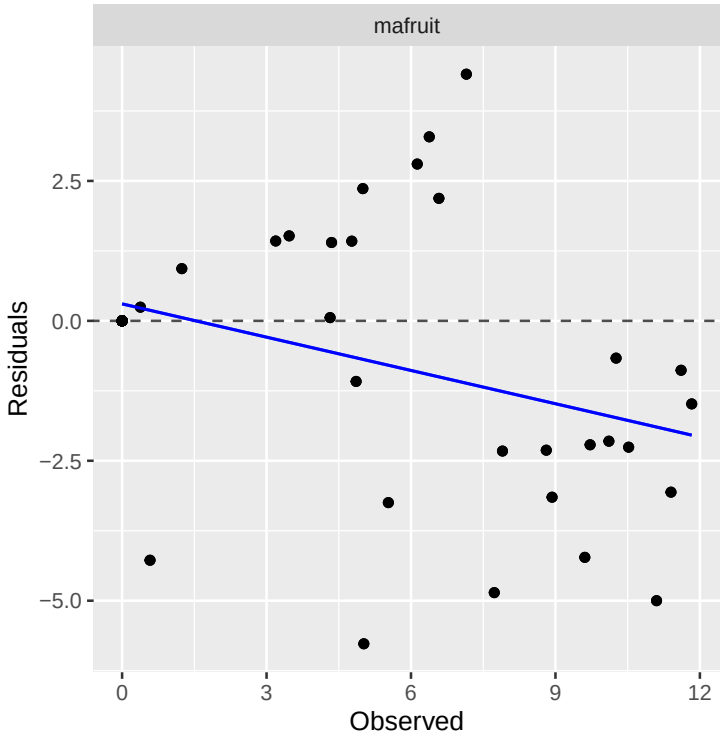
- rRMSE is:
  - low for soil water variables,
  - good for masec, QNplante and inn,
  - relatively high for lai,
  - high for mafruit,
  - very high for soil nitrogen variables.
- The part of bias with respect to dispersion is:
  - low to moderate for lai, mafruit, soil water variables and QNplante,
  - high to very high for masec, soil nitrogen variables and inn.
- The poor agreement between simulations and measurements of soil nitrogen variables must be put in perspective of the low number of observations.

Yield elaboration

	mafruit
n_obs	41.00
mean_obs	4.84
mean_sim	5.50
CV_obs	87.23
CV_sim	100.21
RMSE	2.40
rRMSE	0.50
pMSEs	0.19
pMSEu	0.81
EF	0.67
Bias	0.66

- Global accuracy: high rRMSE around 50 %.
- Proportion of bias and dispersion: more dispersion than bias (pRMSEs«pRMSEu).
- The variability of mafruit is slightly overestimated by the model compared to the observations (CV-simulations>CV-measurements).

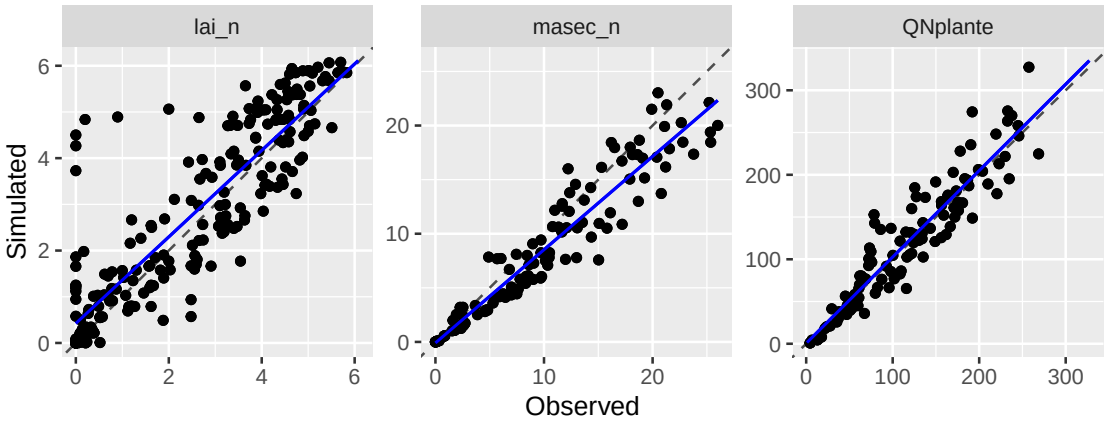

mafruit
Simulated
Observed
0
5
10
15

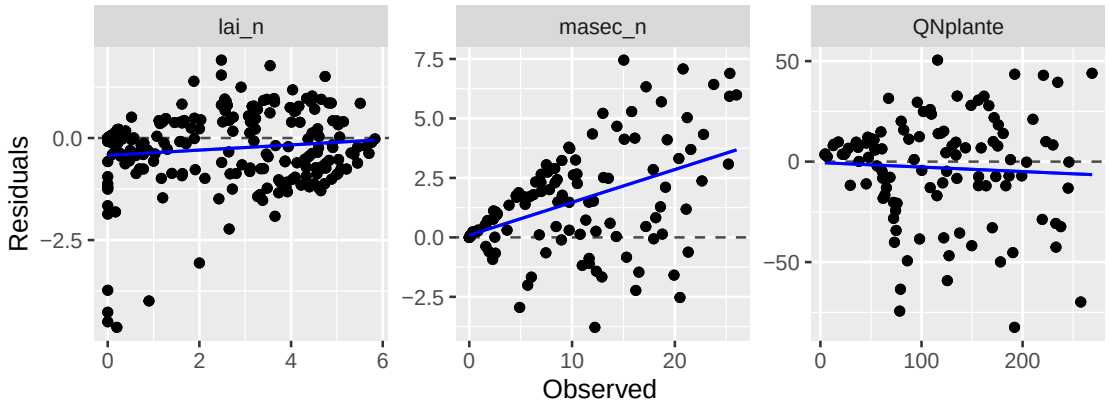

mafruit
Residuals
Observed
2.5
0.0
−2.5
−5.0
0
3
6
9
12

Growth dynamic

	lai_n	masec_n	QNplante
n_obs	231.00	117.00	110.00
mean_obs	2.51	10.04	117.45
mean_sim	2.78	8.56	120.55
CV_obs	73.26	72.03	57.43
CV_sim	70.90	76.48	61.20
RMSE	0.99	2.67	26.35
rRMSE	0.39	0.27	0.22
pMSEs	0.08	0.45	0.02
pMSEu	0.92	0.55	0.98
EF	0.71	0.86	0.85
Bias	0.26	-1.48	3.10

- Global accuracy: relatively high rRMSE for lai, about 40 %, but good for masec and QNplante.
- lai (and masec to a lesser extent) is very badly simulated for 2 USMs which largely impact the statistical criteria (without these 2 USMs rRMSE of lai is about 31% which is acceptable).
- pRMSEu»pRMSEs for lai and QNplante, thus very low bias compared to dispersion error, but the simulated variabilities (CV-simulations) are close to the observed ones (CV-measurements).
- pRMSEu is equal to pRMSEs for masec, and the model tends to underestimate masec values.

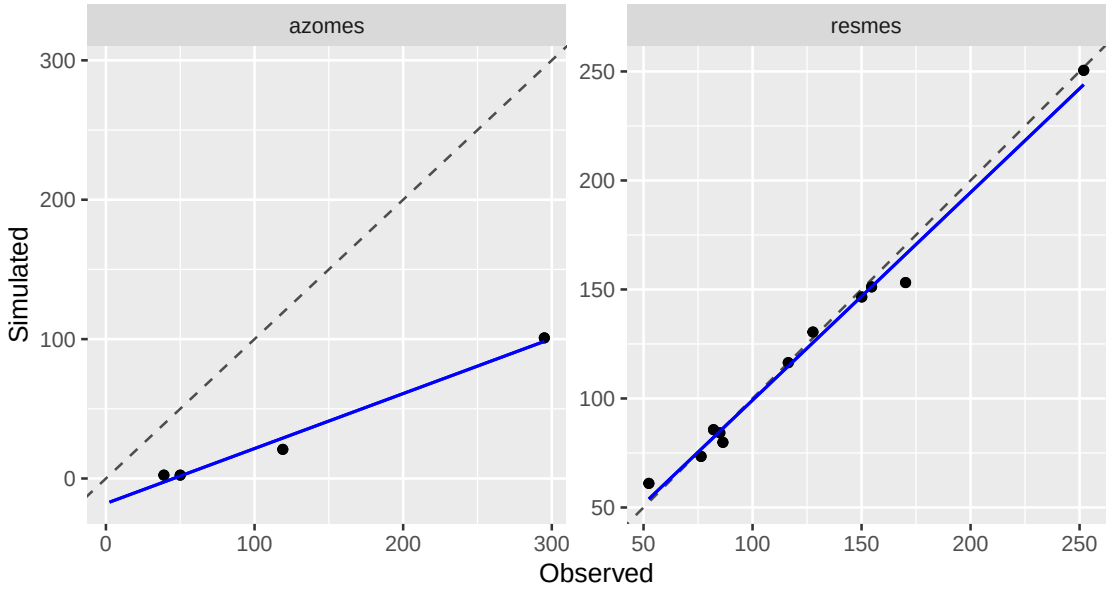


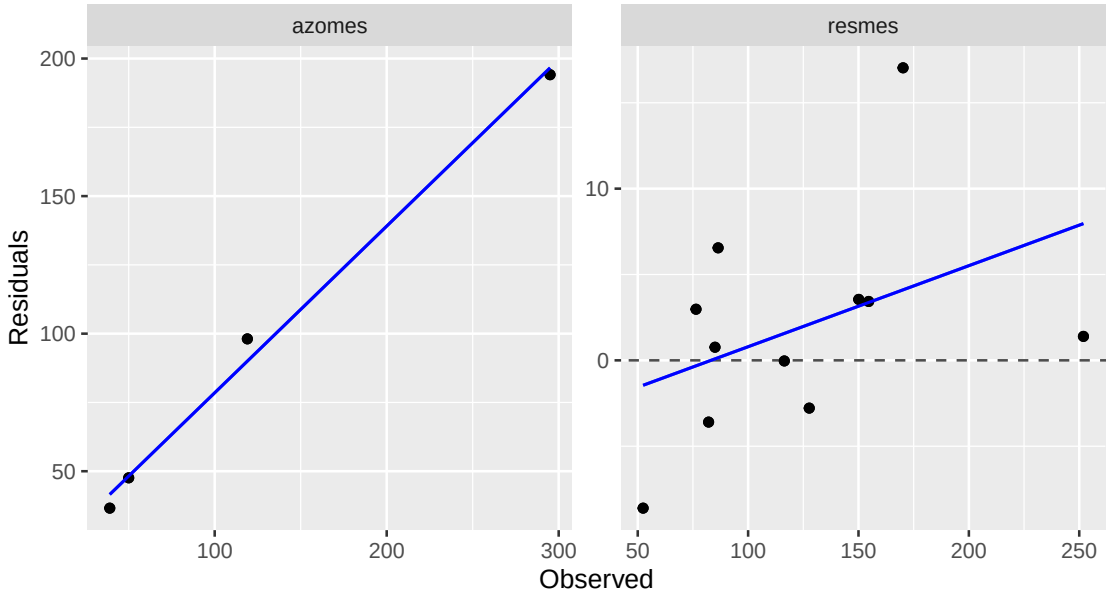


Water and nitrogen soil content

	resmes	azomes
n_obs	11.00	4.00
mean_obs	123.02	125.75
mean_sim	121.14	31.65
CV_obs	46.16	94.04
CV_sim	44.93	148.39
RMSE	6.49	112.82
rRMSE	0.05	0.90
pMSEs	0.24	1.00
pMSEu	0.76	0.00
EF	0.99	-0.21
Bias	-1.88	-94.10

- Global accuracy: RMSE and rRMSE are low for soil water and very high for soil nitrogen.
- Proportion of bias and dispersion (pRMSEs, pRMSEu): for water, more dispersion than bias, but for nitrogen, high systematic RMSE.
- High under-estimation by the model for soil nitrogen, but the number of USMs with water and nitrogen measurements is low, each USM having only one measurement after the end of the crop. Moreover, the observed values seem very high (especially in dry conditions: 300 kg N remaining).


azomes
resmes
Simulated
Observed
300
200
100
0
250
150
50


azomes
resmes
Residuals
Observed
200
150
100
50
10
0

Conclusion

Biological estimations are globally satisfying although some improvements could be done in maize parameterization. Errors are low for growth dynamic variables except for lai but this comes from a few badly simulated USMs. rRMSE is relatively high for yield estimation: harvest index may be too high since mafruit is slightly over-estimated while masec is globally under-estimated. The number of observations for soil water and nitrogen content is too low for an objective assessment of the quality of their prediction.