

STICS Performance Evaluation Report: Maize

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JavaSTICS version: 1.41

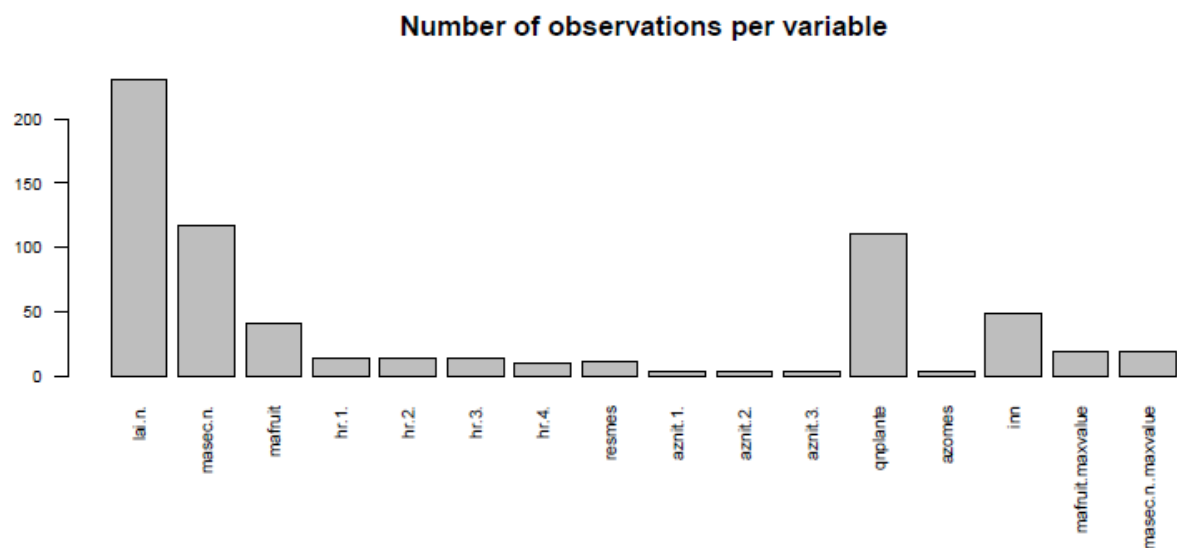
STICS version: 9.0

IdeSTICS version: r1220

Number of USMs: 19

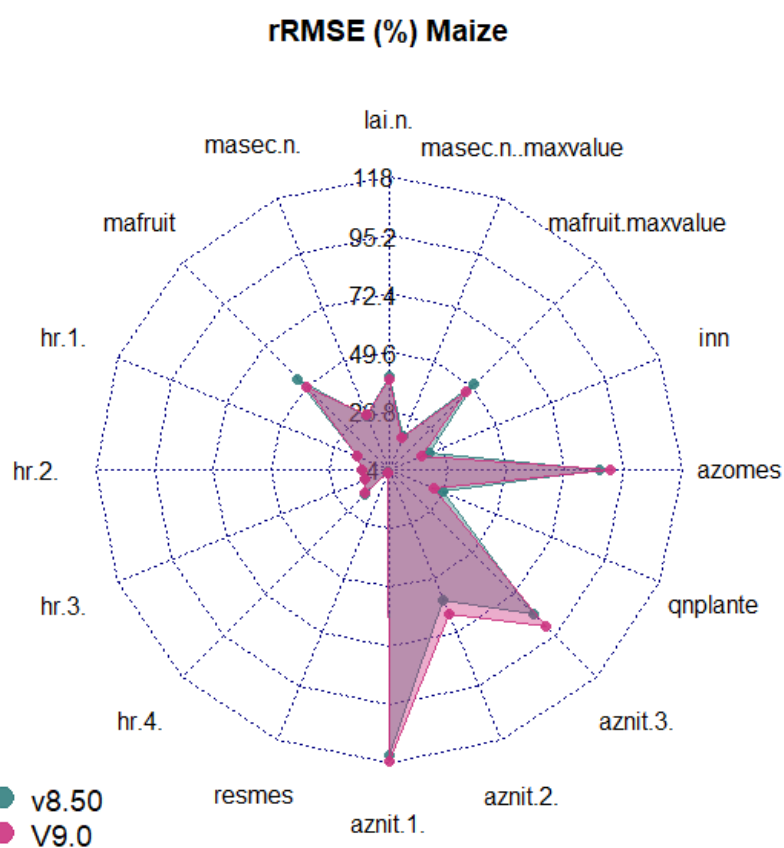
Number of cultivars: 4

Cultivars names: Furio, DK300, Anjou285, Volga



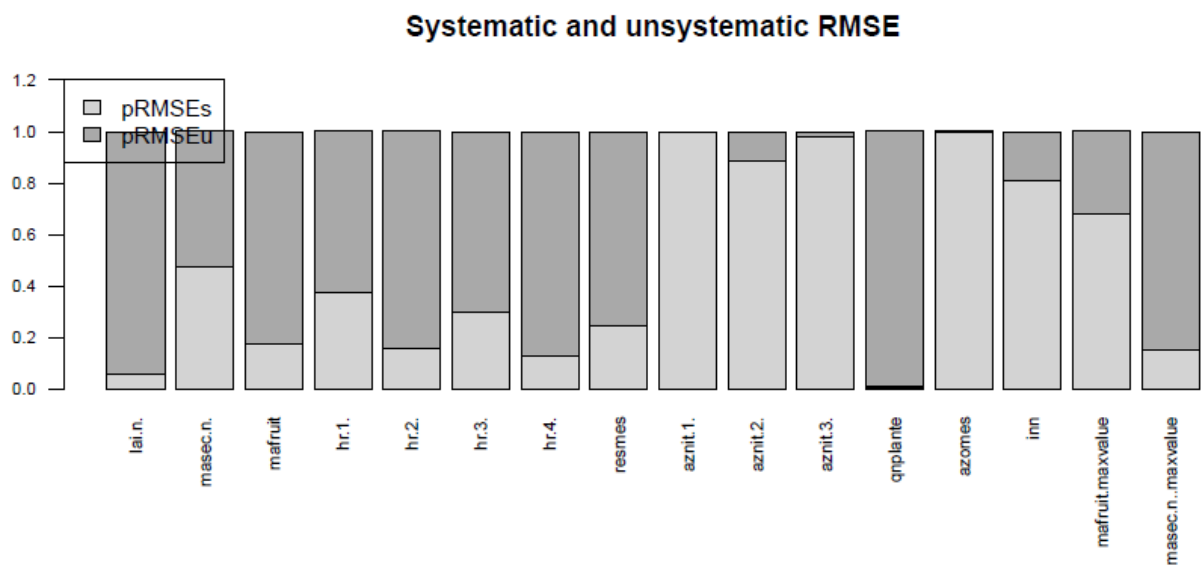
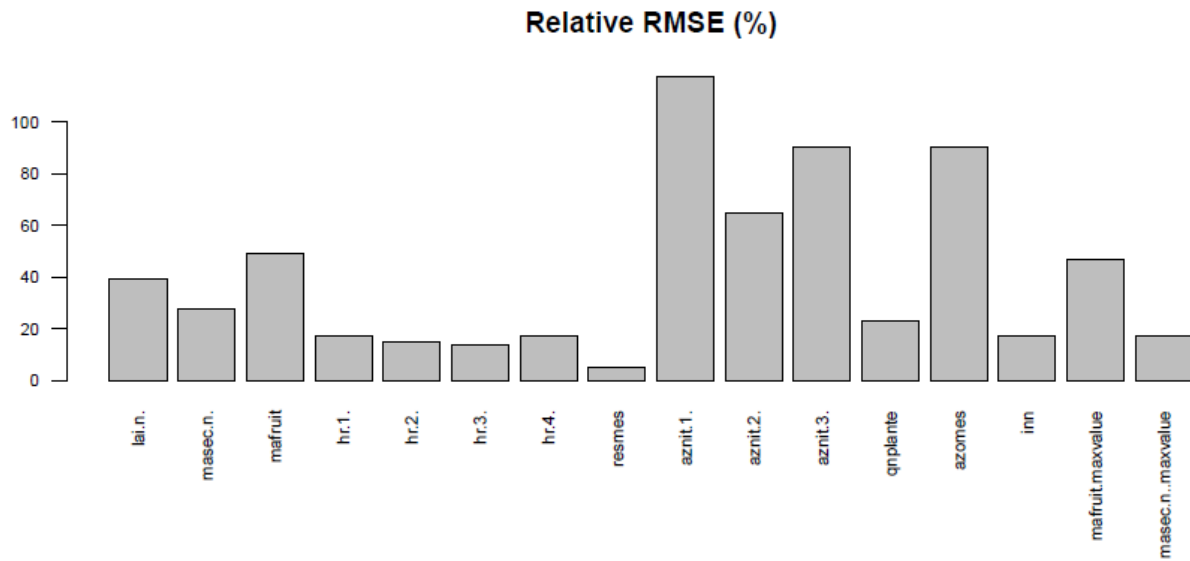
The evaluation dataset includes 19 USMs not used for model calibration and 4 cultivars. The number of observations varies a lot depending on the observed variable: large for *lai*, *masec* and *QNplante*, moderate for *mfruit* and *inn*, but low to very low for soil water and nitrogen content. Indeed, 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 former version 8.50



rRMSE obtained with version 9.0 are close to those obtained with the former version V8.50. 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.

Global analysis



Comments:

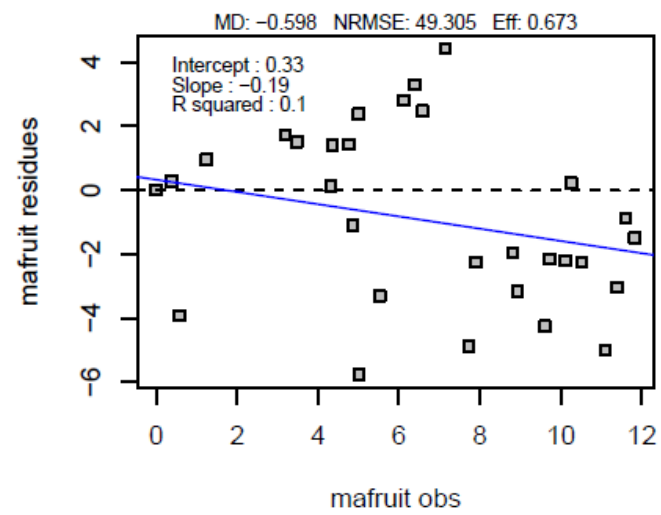
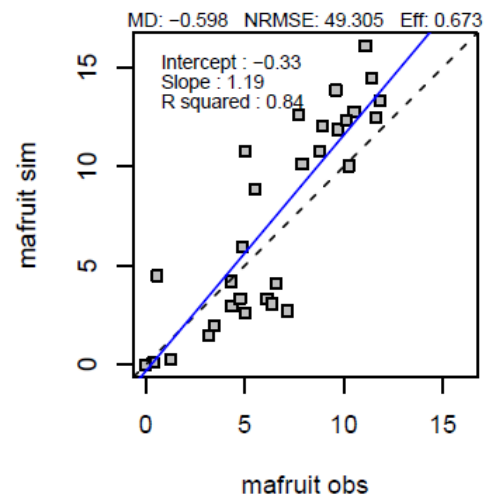
- rRMSE is:
 - low for soil water variables,
 - good for *masec*, *QNplante* and *inn*,
 - relatively high for *lai*,
 - high for *mafruit*,
 - very high for soil nitrogen variables.
- The part of bias with respect to dispersion is:
 - low to moderate for *lai*, *mafruit*, soil water variables and *QNplante*,
 - 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
number-of-usm	19
number-of-observations	41
Mean-of-measurement	4.841
CV-measurements	87
CV-simulations	101
RMSE	2.39
rRMSE (%)	49.31
pRMSEs	0.18
pRMSEu	0.83
Mean-difference (M)	-0.60
Relative error (%)	-16.20

Comments:

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

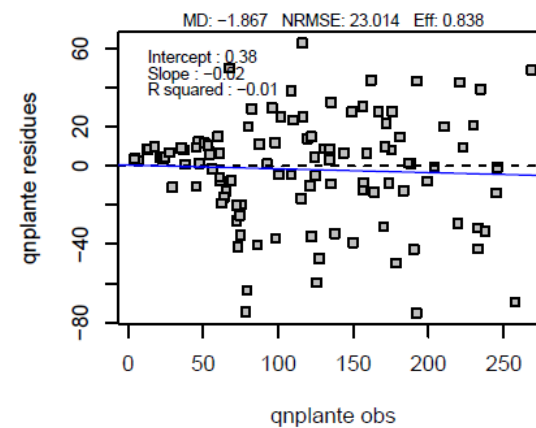
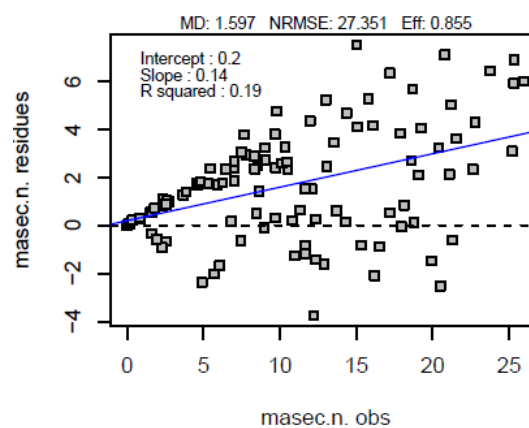
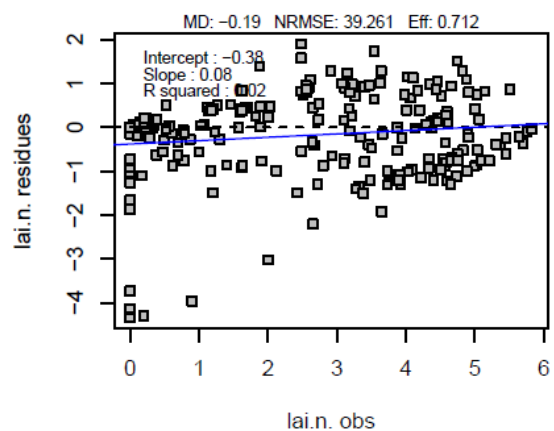
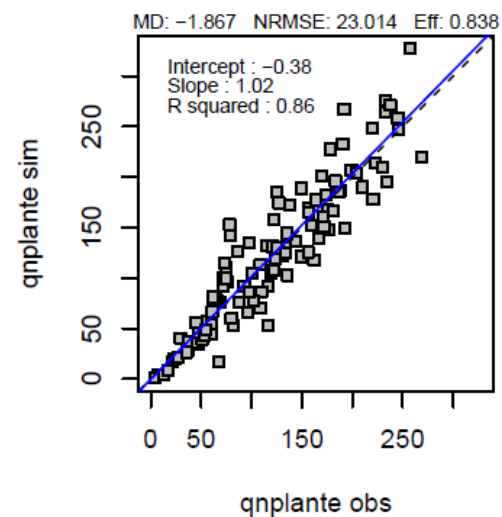
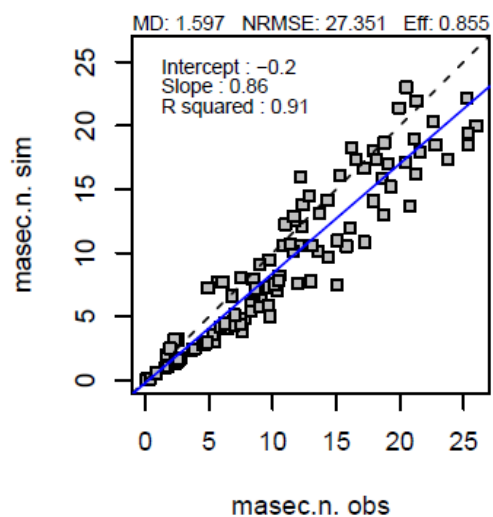
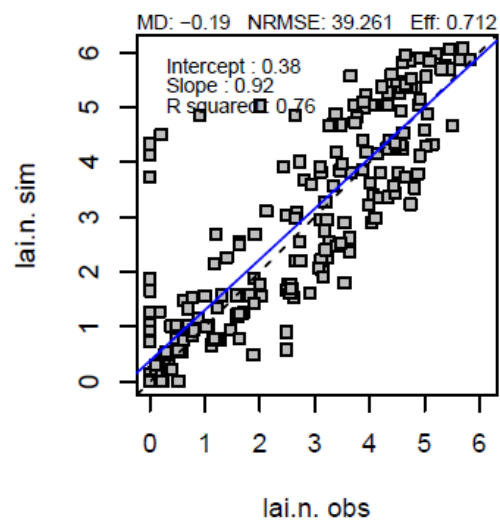


Growth dynamic

	lai	masec	qnplante
number-of-usm	19	19	18
number-of-observations	231	117	110
mean-of-measurement	2.51	10.04	117.45
CV-measurements	73	72	57
CV-simulations	72	77	62
RMSE	0.99	2.75	27.03
rRMSE (%)	39.26	27.35	23.01
pRMSEs	0.06	0.47	0.01
pRMSEu	0.94	0.53	0.99
Mean-difference (M)	-0.19	1.60	-1.87
Relative error (%)	-17.86	19.63	2.01

Comments:

- 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 closed to the observed ones (CV-measurements).
- pRMSEu is equal to pRMSEs for *masec*, and the model tends to underestimate *masec* values.

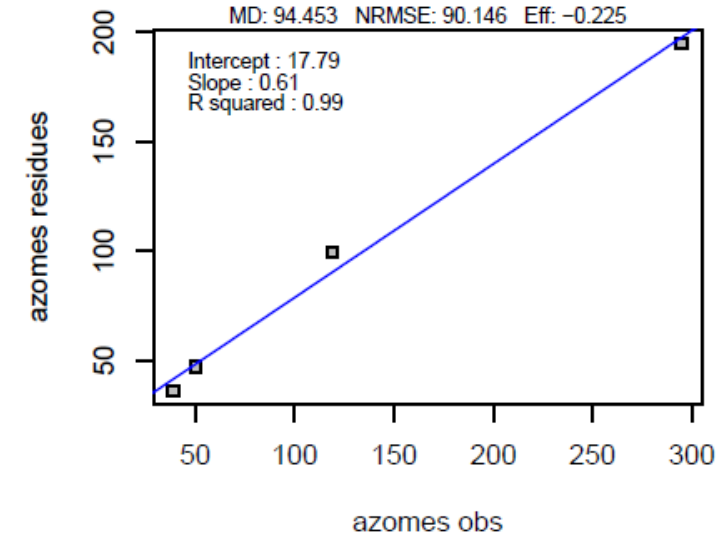
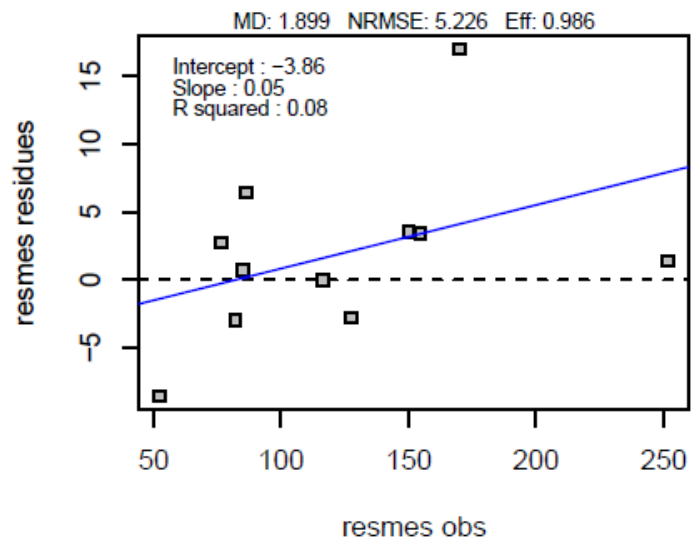
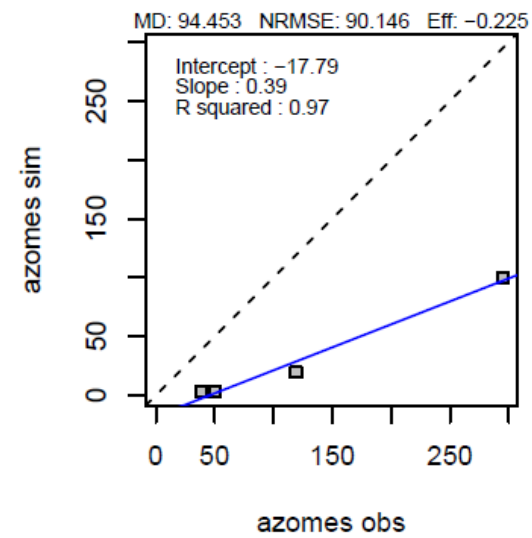
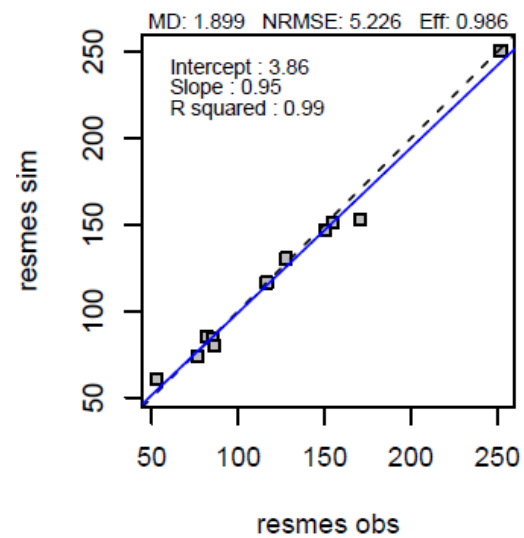


Water and nitrogen soil content

	resmes	azomes
number-of-usm	3	4
number-of-observations	11	4
Mean-of-measurement	123.02	125.75
CV-measurements	46	94
CV-simulations	45	149
RMSE	6.43	113.36
rRMSE (%)	5.23	90.15
pRMSEs	0.24	1.00
pRMSEu	0.76	0.00
Mean-difference (M)	1.90	94.45
Relative error (%)	0.44	84.27

Comments:

- 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).



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.