

Appendix 4.2: Modelling work with L-DNDC

Site level calibration:

Table 1. Statistical comparison of measured and simulated data at nine experimental sites using the DDC and LDNDC models. DDC: Daily DayCent; LDNDC: Landscape-DNDC

Croplands	Boxworth		Terrington		Middleton		Betley		Grange Field		Lamb Field	
	DDC	LDNDC	DDC	LDNDC	DDC	LDNDC	DDC	LDNDC	DDC	LDNDC	DDC	LDNDC
R ² (Coefficient of determination)	0.43	0.06	0.52	0.11	0.08	0.0014	0.42	0.15	0.50	0.15	0.27	0.07
RMSE	246.65	197.48	133.88	170.25	204.07	394.00	113.68	144.00	108.56	117.00	131.76	101.99
RMSE (95% Confidence Limit)	641.44	641.44	633.49	633.49	698.96	698.96	350.61	350.61	202.02	202.02	275.46	275.46
E	-92.51	-43.16	7.95	51.88	-20.77	-221.00	22.55	52.68	9.74	65.46	1.36	37.00
E (95% Confidence Limit)	458.23	458.23	394.16	394.16	594.89	594.89	273.08	273.08	145.24	145.24	206.33	206.33

Grasslands	Crichton		DeBathe		Rowden	
	DDC	LDNDC	DDC	LDNDC	DDC	LDNDC
R ² (Coefficient of determination)	0.44	0.05	0.12	0.13	0.19	0.02
RMSE	143.70	125.29	423.31	178.00	212.79	160.00
RMSE (95% Confidence Limit)	644.37	644.37	1670.70	1670.70	889.06	889.06
E	-38.73	2.00	-84.41	12.24	10.17	48.88
E (95% Confidence Limit)	423.01	423.01	626.86	626.86	364.76	364.76

DDC results taken from

Fitton, N. et al., 2014. The challenge of modelling nitrogen management at the field scale: Simulation and sensitivity analysis of N. Environmental Research Letters

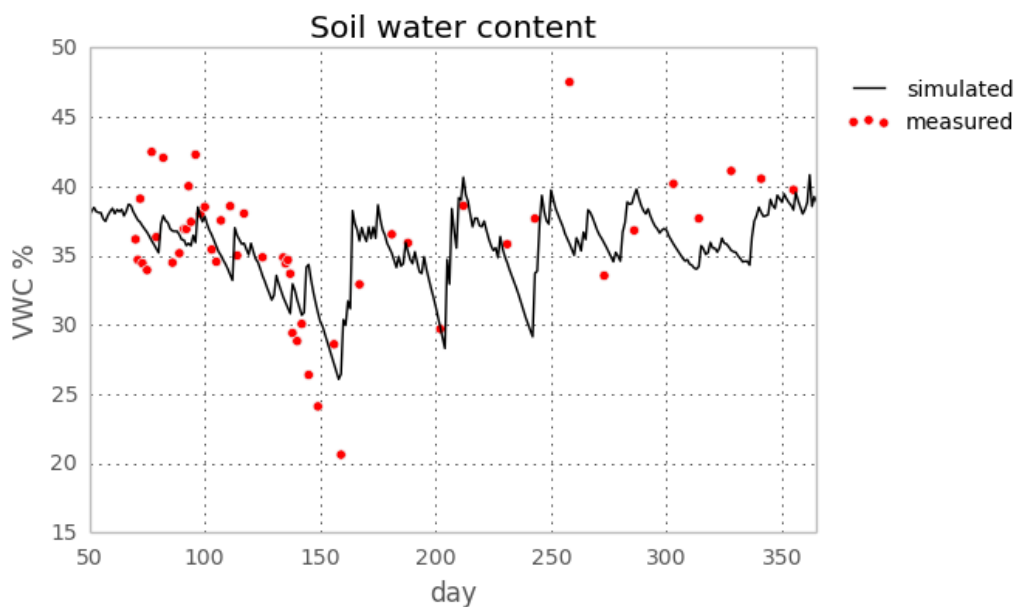


Figure 1. Measured and simulated (LDNDC) soil moisture content at Crichton

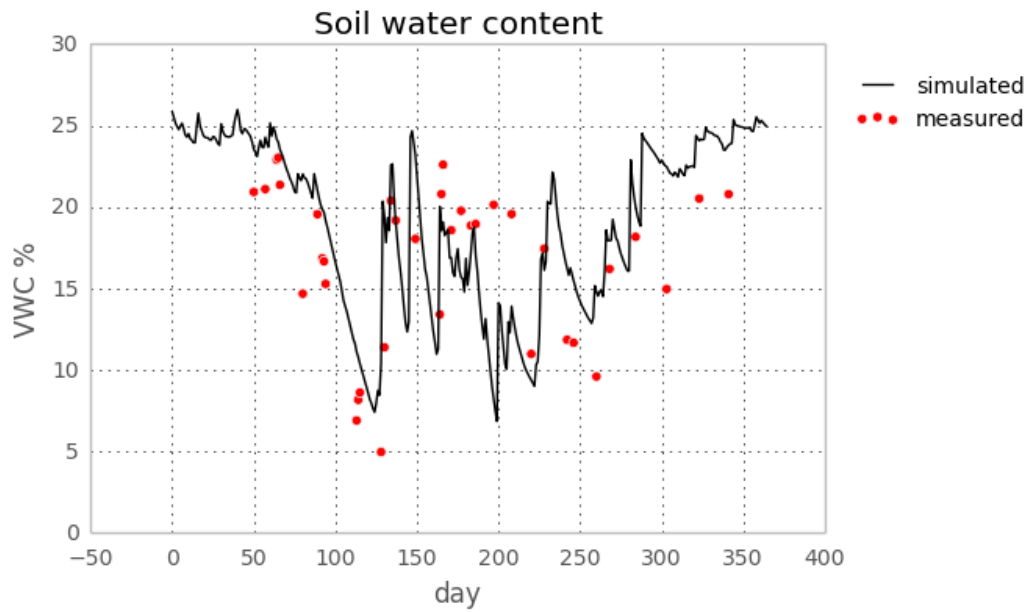


Figure 2. Measured and simulated (LDNDC) soil moisture content at Gleadthorpe Lamb Field.

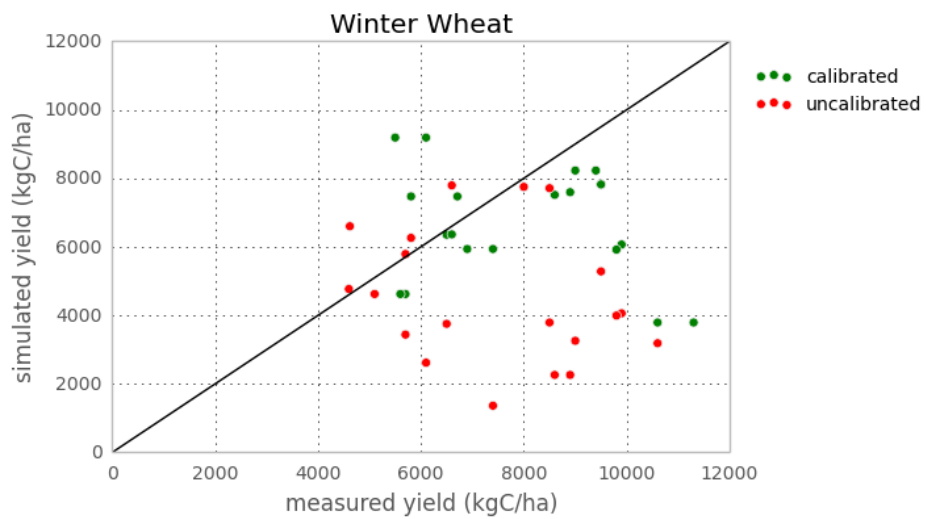


Figure 3. Scatter plot of measured and simulated (LDNDC) winter wheat yields at 10 experimental sites when LDNDC is run with calibrated (green) and un-calibrated (red) parameters. For each site the results for the two treatments closest (above and below) to the 100% of recommended N application are presented. The values used to calibrate the crop parameters were extracted from the relevant literature in order to represent their UK-wide variability. The impact of this approach is that some very high yields measured at two experimental sites could not be simulated by LDNDC.

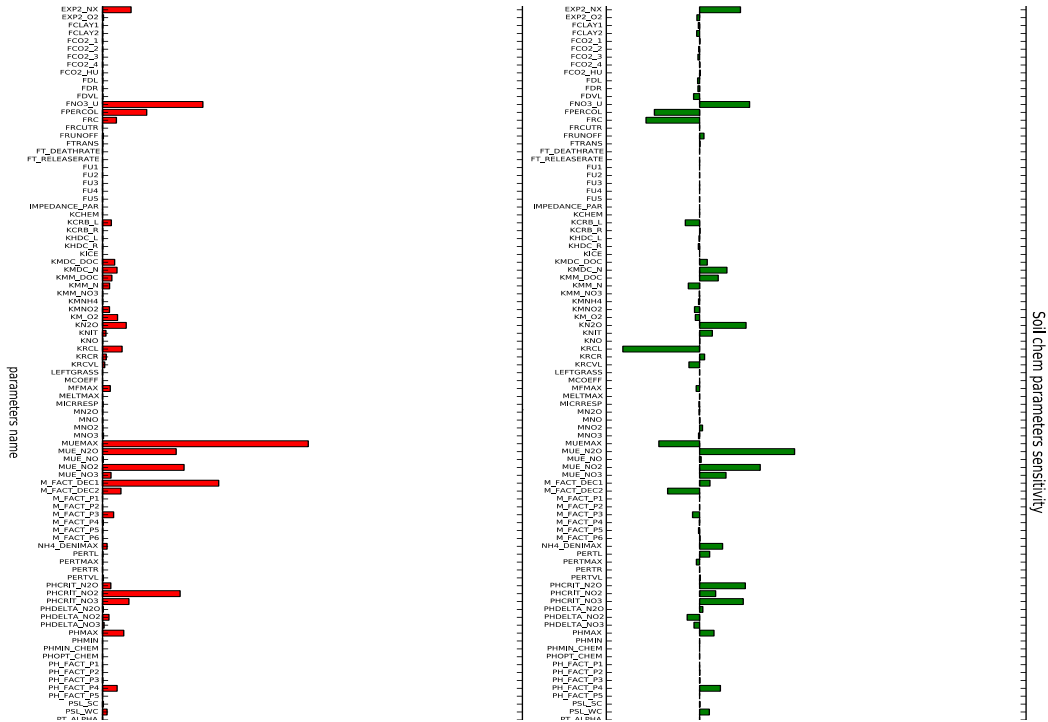


Figure 4. Scatter plot of measured and simulated (LDNDC) spring barley yields at three experimental sites when LDNDC is run with calibrated (green) and un-calibrated (red) model parameters. For each site the results of the two treatments closest (above and below) to the 100% recommended N application are presented.

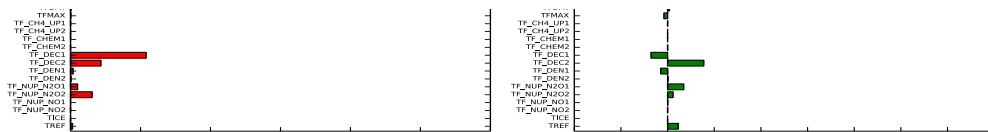
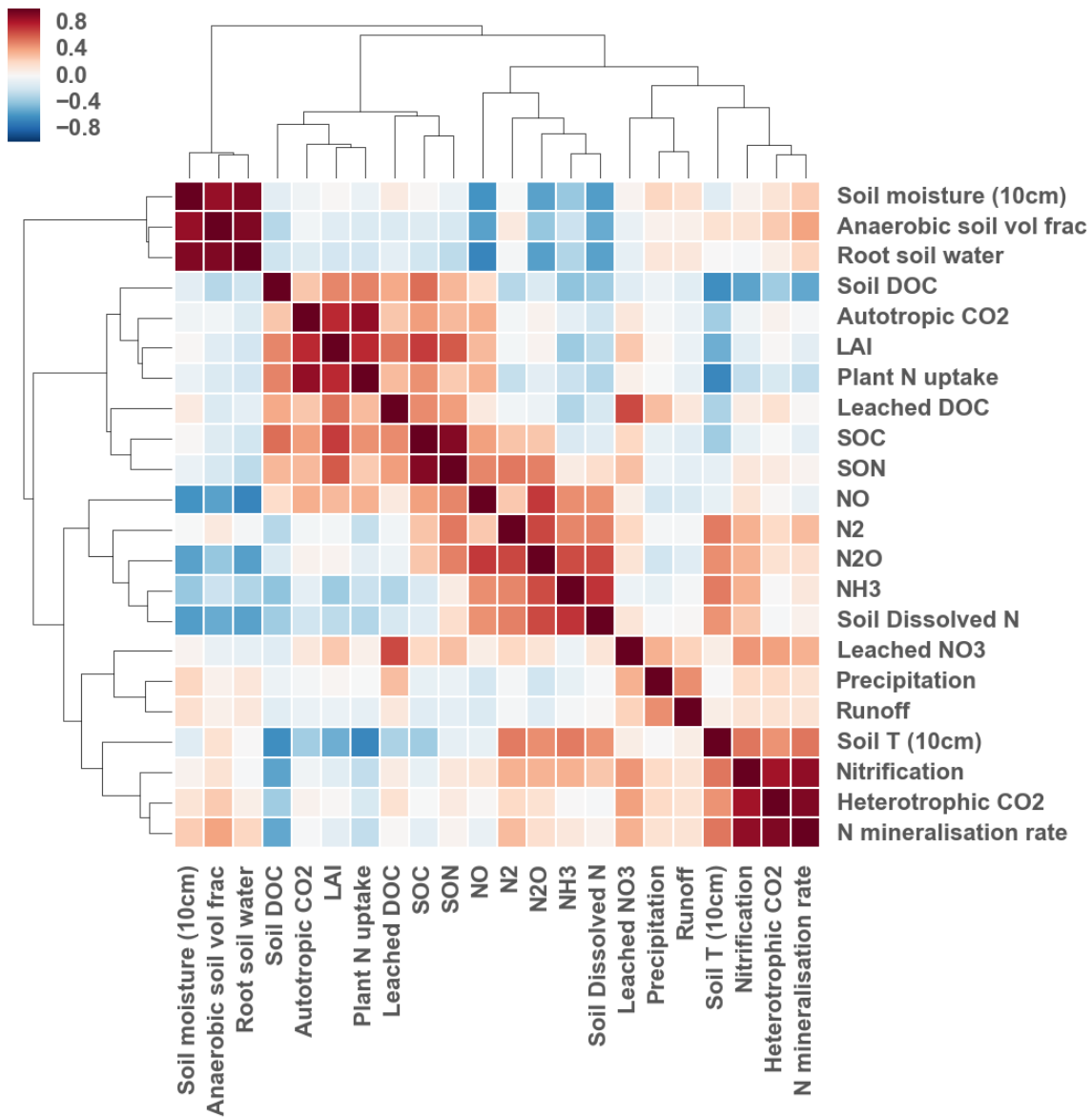


Figure 5. Bar chart showing the level of sensitivity of simulated N₂O (total annual) to each of the soil biochemistry parameters of LDNDC. The green bars (Sobol first order) show the direct impact of each parameter to the simulated N₂O (can be positive or negative). The red bars (Sobol total index) show



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