02_Soil

Loïc Thurre

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0. Data importation

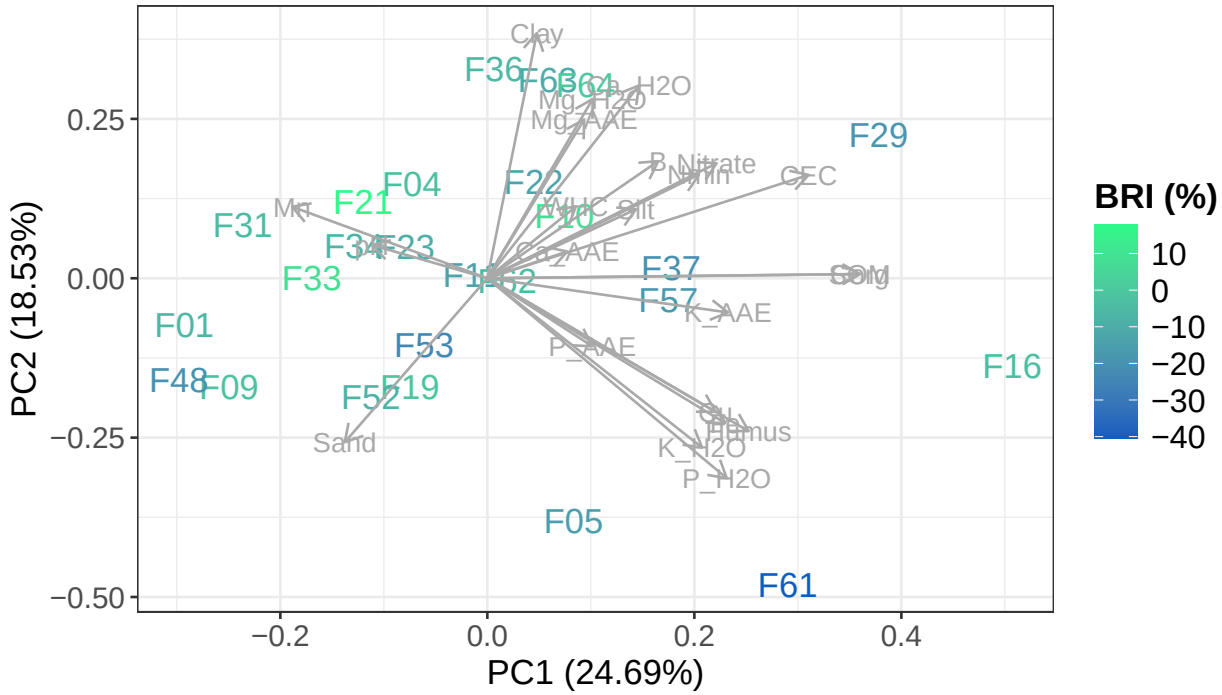
1. Principal coordinate analysis (PCA)

First, we performed a principal component analysis (PCA) to reveal relationships between the assessed physicochemical parameters across the 25 soils # 1.1 Computing PCA

```
## Importance of components:
##                           PC1    PC2    PC3    PC4     PC5     PC6     PC7
## Standard deviation     2.3832 2.0647 1.6499 1.5564 1.35700 1.09755 0.99388
## Proportion of Variance 0.2469 0.1853 0.1184 0.1053 0.08006 0.05238 0.04295
## Cumulative Proportion  0.2469 0.4323 0.5506 0.6560 0.73602 0.78840 0.83134
##                           PC8     PC9    PC10    PC11    PC12    PC13    PC14
## Standard deviation     0.93561 0.86814 0.78603 0.64483 0.57209 0.54035 0.47326
## Proportion of Variance 0.03806 0.03277 0.02686 0.01808 0.01423 0.01269 0.00974
## Cumulative Proportion  0.86940 0.90217 0.92903 0.94711 0.96134 0.97404 0.98378
##                           PC15   PC16   PC17    PC18    PC19    PC20    PC21
## Standard deviation     0.38049 0.3181 0.2347 0.21169 0.11623 0.09642 0.06691
## Proportion of Variance 0.00629 0.0044 0.0024 0.00195 0.00059 0.00040 0.00019
## Cumulative Proportion  0.99007 0.9945 0.9969 0.99881 0.99940 0.99981 1.00000
##                           PC22      PC23
## Standard deviation     0.002475 2.307e-16
## Proportion of Variance 0.000000 0.000e+00
## Cumulative Proportion  1.000000 1.000e+00
```

1.2 Figure 3A

To obtain insights on the relationship of soil parameters and BRI, we coloured the soils in the PCA based on the BRI of wheat growth on these soils



1.3 ANOVA

Formula: BRI ~ soil_variables

```
##
##  Shapiro-Wilk normality test
##
## data:  masterTable$BRI
## W = 0.96776, p-value = 0.5889
```

Table S3?

Table S3

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Humus	1	731.473828	731.473828	7.0263656	0.0569384
Clay	1	195.774132	195.774132	1.8805603	0.2421685
Sand	1	119.756400	119.756400	1.1503518	0.3438738
pH	1	18.724524	18.724524	0.1798634	0.6933047
P_H2O	1	200.357802	200.357802	1.9245899	0.2376429
K_H2O	1	5.138320	5.138320	0.0493575	0.8350673
Mg_H2O	1	95.859279	95.859279	0.9208017	0.3916050
Ca_H2O	1	39.130323	39.130323	0.3758767	0.5729635
P_AAE	1	5.383909	5.383909	0.0517166	0.8312535
K_AAE	1	119.616416	119.616416	1.1490072	0.3441238
Mg_AAE	1	19.899151	19.899151	0.1911466	0.6845322
Ca_AAE	1	8.263297	8.263297	0.0793753	0.7921208
Cu	1	519.077036	519.077036	4.9861319	0.0893164

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Fe	1	90.531967	90.531967	0.8696288	0.4038488
Mn	1	12.859107	12.859107	0.1235216	0.7429780
B	1	1.371004	1.371004	0.0131695	0.9141664
WHC	1	570.578949	570.578949	5.4808472	0.0792811
Corg	1	61.302653	61.302653	0.5888589	0.4856500
Nmin	1	9.968629	9.968629	0.0957563	0.7724326
CEC	1	86.830934	86.830934	0.8340775	0.4127640
Residuals	4	416.416607	104.104152	NA	NA

2. Pairwise correlation BRI ~ soil_variable

Next, we assessed pairwise correlations between the physicochemical soil parameters and BRI.

Table S4

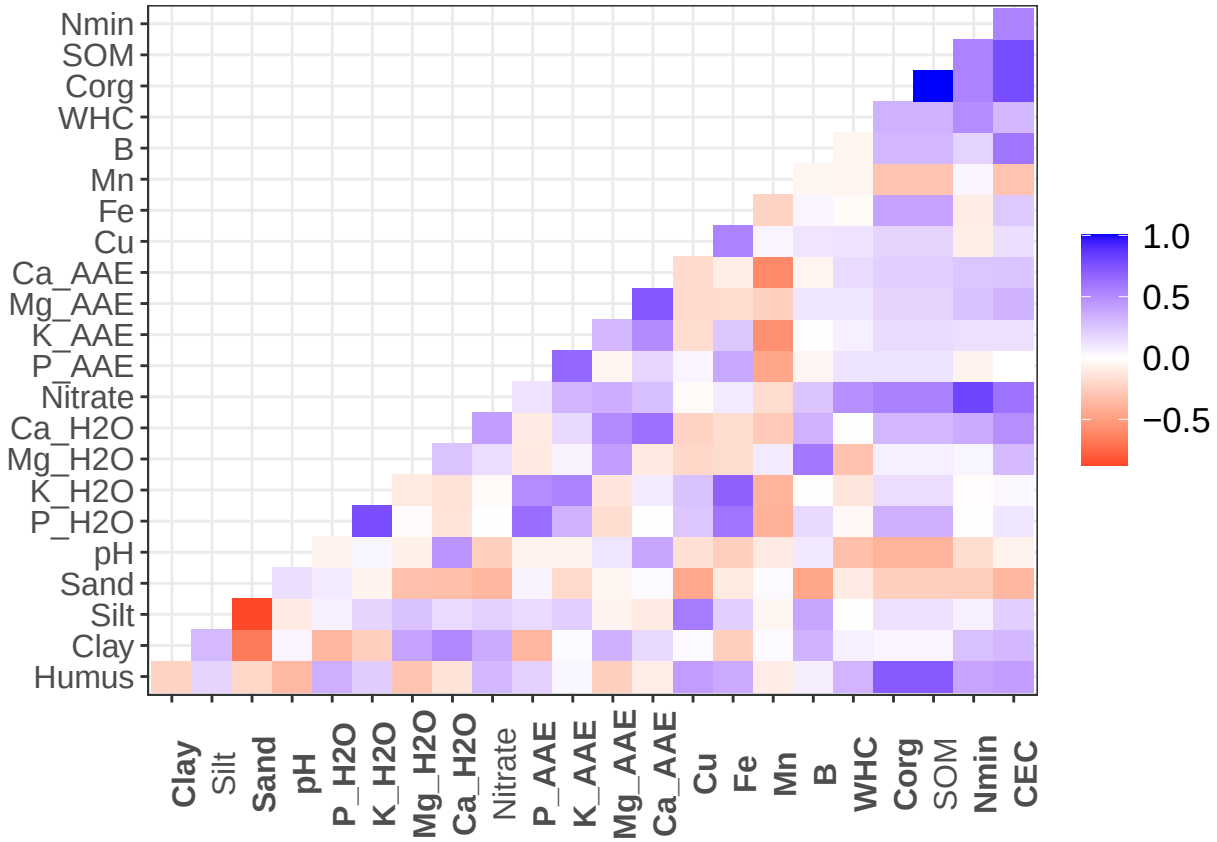
Table S4

	Spearman coefficient	P-value	Adjusted P-value
Humus	-0.3000837	0.1449954	1.0000000
Clay	0.2935210	0.1544289	1.0000000
Silt	-0.0419314	0.8422546	1.0000000
Sand	-0.0470499	0.8232794	1.0000000
pH	0.1244242	0.5534617	1.0000000
P_H2O	-0.3715385	0.0674481	1.0000000
K_H2O	-0.2846154	0.1679142	1.0000000
Mg_H2O	-0.0861538	0.6821887	1.0000000
Ca_H2O	0.0730769	0.7284839	1.0000000
Nitrate	0.0015385	0.9941767	1.0000000
P_AAE	-0.3984615	0.0485087	1.0000000
K_AAE	-0.3615385	0.0757707	1.0000000
Mg_AAE	0.1300000	0.5356794	1.0000000
Ca_AAE	-0.0069231	0.9737994	1.0000000
Cu	0.1476923	0.4811006	1.0000000
Fe	-0.2961538	0.1505935	1.0000000
Mn	0.2638462	0.2025155	1.0000000
B	-0.1346931	0.5209237	1.0000000
WHC	0.4730769	0.0169225	0.4061408
Corg	-0.2907692	0.1585109	1.0000000
SOM	-0.2907692	0.1585109	1.0000000
Nmin	0.1538462	0.4628040	1.0000000
CEC	0.0023077	0.9912652	1.0000000

2. Removal of co-correlated predictors

We reduced the sets of parameters (removal of co-correlated variables). We exclude the co-correlated predictors ($|r| > 0.8$).

2.1 Figure S5



3. Exhaustive screening of candidate models with glmulti()

To find the best model we proceed to an exhaustive screening of all the possible models BRI ~ soil_variables with the AICc criterion.

```
##
## Call:
## fitfunc(formula = as.formula(x), data = data, trace = ..1)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -13.102  -4.372   0.438   5.792  11.952
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept) -102.80486   18.50365  -5.556 1.94e-05 ***
## Ca_H2O         0.10409    0.03755   2.772 0.011761 *
## P_AAE         -0.02587    0.01304  -1.984 0.061118 .
## WHC            0.41536    0.07758   5.354 3.06e-05 ***
## Corg          -9.33690    1.99713  -4.675 0.000146 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Residual standard error: 7.232 on 20 degrees of freedom
## Multiple R-squared:  0.6857, Adjusted R-squared:  0.6229
## F-statistic: 10.91 on 4 and 20 DF,  p-value: 7.385e-05
```

3.1 Normality assumptions of the model

Assessing the residuals normality assumptions the produced model. These values are aggregated into the Table S5 for each model.

```
## ------------------------------------------------
##        Test             Statistic       pvalue
## ------------------------------------------------
## Shapiro-Wilk              0.9811         0.9062
## Kolmogorov-Smirnov        0.0899         0.9767
## Cramer-von Mises          1.7687         0.0000
## Anderson-Darling          0.1695         0.9245
## ------------------------------------------------
```

3.2 Relative importance of best model

The relative importance of each predictor in the previously selected model is computed in this step. These values are then used to complete the figure 3B in illustrator.

3.3 Table S6

Summary of the model coefficient and relative importance

Table S6

Parameter	Coefficient	Relative importance
P_AAE	-0.0258744	0.0390570
Ca_H2O	0.1040869	0.0619036
Corg	-9.3368961	0.2294487
WHC	0.4153630	0.3553156
(Intercept)	-102.8048558	NA

3.4 Figure 3B