02_Soil

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0. Data importation

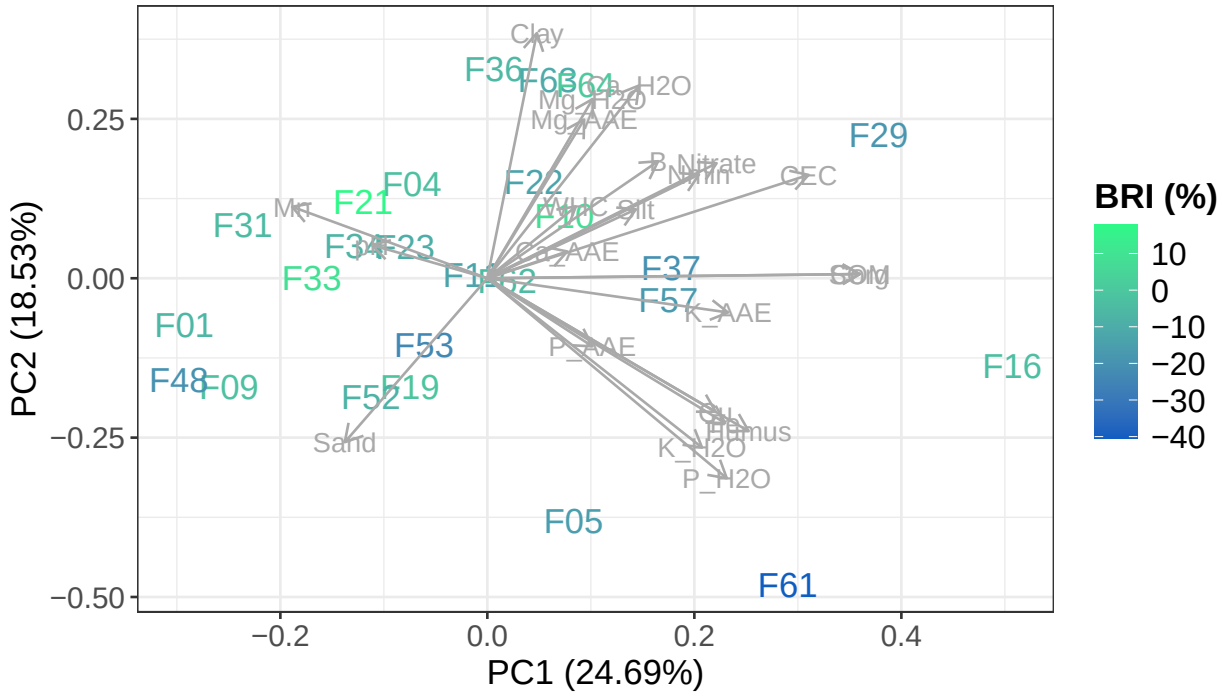
1. Principal coordinate analysis (PCA)

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	3.5443120	0.2004564
Clay	1	195.774132	195.774132	0.9486117	0.4328010
Silt	1	120.781345	120.781345	0.5852387	0.5242090
Sand	1	16.923856	16.923856	0.0820035	0.8015388
pH	1	19.351810	19.351810	0.0937680	0.7883769
P_H2O	1	208.090057	208.090057	1.0082877	0.4210613
K_H2O	1	11.101981	11.101981	0.0537940	0.8381591
Mg_H2O	1	85.423177	85.423177	0.4139128	0.5859110
Ca_H2O	1	40.108611	40.108611	0.1943438	0.7023999
Nitrate	1	24.457783	24.457783	0.1185087	0.7634843
P_AAE	1	9.361584	9.361584	0.0453610	0.8510789
K_AAE	1	199.459571	199.459571	0.9664692	0.4292130
Mg_AAE	1	2.433612	2.433612	0.0117919	0.9234402

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Ca_AAE	1	12.483302	12.483302	0.0604871	0.8286649
Cu	1	482.399236	482.399236	2.3374362	0.2659032
Fe	1	70.135315	70.135315	0.3398364	0.6188971
Mn	1	21.144488	21.144488	0.1024543	0.7792494
B	1	4.786092	4.786092	0.0231907	0.8929372
WHC	1	579.004066	579.004066	2.8055291	0.2359236
Corg	1	13.082482	13.082482	0.0633904	0.8247246
Nmin	1	22.041172	22.041172	0.1067992	0.7748498
CEC	1	45.737495	45.737495	0.2216183	0.6841593
Residuals	2	412.759272	206.379636	NA	NA

2. Pairwise correlation BRI ~ soil_variable

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

Table S4

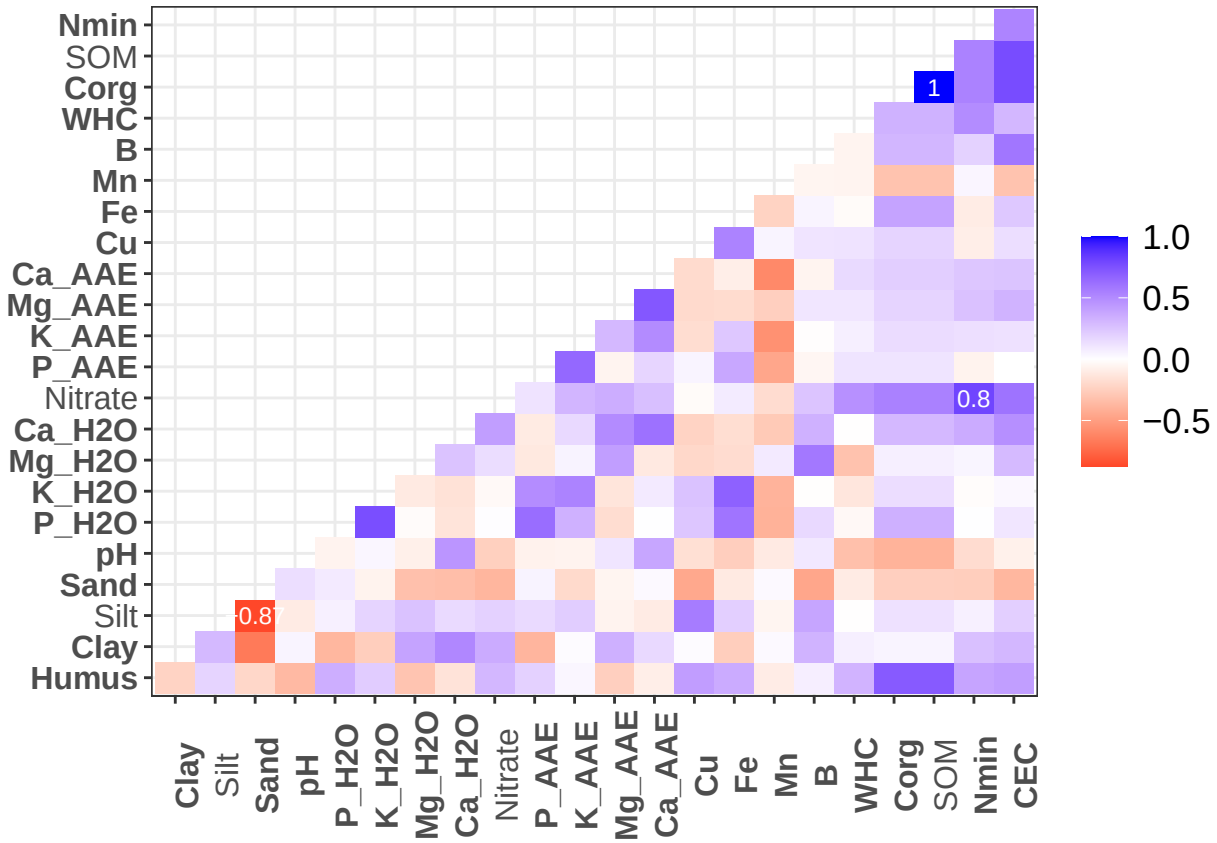
Table S4

	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