Two-day statistics intensive courses I and II for soil scientists
from March 3rd until March 4th 2022 (in English)

I. Fundamentals of descriptive and inferential statistics and introduction to R (March 3rd)

II. Exploratory statistics: statistical modelling and regressions using R for soil scientists (March 4th)

The media and scientific journals of different disciplines repeatedly address the topic of erroneous research due to insufficient statistical knowledge (see e.g., Ainsworth (2007, Nature 448, 849)). To some extent there may be similar problems in soil science.

Examples of such problems could be (I) research without hypotheses; (II) inappropriate experimental design; (III) a lack of understanding of pseudoreplication; (IV) an inappropriate handling of outliers; (V) missing inspections of conditions for hypothesis testing; (VI) an insufficient description of statistical analyses in publications; (VII) a lack of knowledge of the importance of residual inspections; (VIII) a lack of understanding of the differences between a minimal adequate model and a maximal model; (IX) a lack of knowledge of the differences between a calibration, a cross-validation and a validation of a model; and (X) a lack of understanding of important special topics such as polynomial regressions and model comparisons.

The intensive courses I and II aim to improve soil scientists' statistical knowledge and include an introduction to R. A main objective is to reduce the occurrence of the above-mentioned problems in soil science research and publications.

Date: Intensive course I: March 3rd 2022, 10:00 a.m. until 6:00 p.m.
Intensive course II: March 4th 2022, 10:00 a.m. until 6:00 p.m.

Location: Kassel University, 37213 Witzenhausen, Nordbahnhofstr. 1a. In case of legal restrictions due to the Covid-19 pandemic, the intensive courses will be held as Zoom session.

Costs: The costs for the intensive courses including catering during coffee breaks (excluding accommodation and meals) are 83.00€ for each of the courses I and II; thus 166.00€ for the two days (courses I and II). The prices stated here are final prices and must be transferred before the start of the course.

Number of participants: The number of participants is restricted to a maximal 25.

Laptops: Course participants should bring laptops with R and RStudio software already loaded onto them. If necessary, laptops can be borrowed by prior arrangement.

Materials: Lecture notes (more than 200 pages), exercises and model solutions will be provided.

Recommended literature: Crawley (2012). The R Book. 2nd Ed., Wiley. Welham et al. (2014). Statistical Methods in Biology. Design and Analysis of Experiments and Regression, CRC.

Lecturer: Prof. Dr. Bernard Ludwig

Schedule of the intensive courses:
Thursday, 03.03.2022

Time	Contents
10:00 - 13:30	Welcome; introduction to descriptive statistics (measures of central tendency and of variation, normal distribution and other important distributions, central limit theorem, 95%-confidence interval); introduction to inferential statistics (hypothesis testing, fundamental tests, type I and II errors); planning of experiments, experimental designs and data analysis (observational study vs. randomized controlled experiment, CRD, RCBD, replication, pseudo-replication and hypothesis testing)
13:30 - 14:30	Lunch break
14:30 - 16:00	Introduction to R (data types, vectors, lists and data frames, reading of data), tests of normality and of variance homogeneity, parametric (various t-tests) and non-parametric tests (Wilcoxon signed rank test, matched-pairs Wilcoxon test, Mann-Whitney U-test); exercises using R with practical examples
16:00 - 16:10	Coffee break
16:10 - 18:00	Spearman and Pearson correlation methods, chi-square tests and exercises using R with practical examples: Correlations

Friday, 04.03.2022

Time	Contents
10:00 - 13:30	Welcome, inferential statistics: regressions, lack of fit test and residual inspections; exploratory statistics: statistical modelling (model types and model simplification)
13:30 - 14:30	Lunch break
14:30 - 16:00	Exploratory statistics: steps of model simplification and exercises using R
16:00 - 16:10	Coffee break
16:10 - 18:00	Transformations (square-root and logarithmic), dealing with variability and predictions (confidence and prediction bands; validation and cross-validation), polynomial and non-linear regressions including exercises in R

Registration is open until March 1st 2022. Registration and general queries: Prof. Bernard Ludwig, Kassel University, bludwig@uni-kassel.de

Please note that the intensive courses may be cancelled if not enough registrations have been received. In this case or in the event of cancellation due to illness of the lecturer or any other events beyond the control of the lecturer, there will be no claims possible, except for the reimbursement of participation costs (83.00€ for each of the courses, 166.00€ for both).

Additional information on statistical training courses: see

https://www.uni-kassel.de/fb11agrar/en/sections-/-facilities/environmental-chemistry/statistics-courses