

Multiphase experiments: from design to analysis

Presenters: Rosemary Bailey, Chris Brien and Alison Smith

Date and location: Sunday November 29, 2015 at Hadley's Orient Hotel.

Maximum number of attendees: 25

Computing environment: You will need a laptop with the latest version of R, with RStudio and with the latest versions of the packages `asreml-R`, `asremlPlus`, `dae` and `od` installed prior to the workshop. R and the packages `asremlPlus` and `dae` can be downloaded and installed from CRAN (<http://cran.r-project.org/>); RStudio can be downloaded from <https://www.rstudio.com/products/rstudio/download/>; `od` can be downloaded from <https://www.dropbox.com/sh/z7a6fa8j7gph3mq/-SFMaumQpW>. `asreml-R` will be able to be downloaded from <http://www.vsni.co.uk/> and a temporary license key for it will be made available for participants that do not have a license; details will be provided closer to the time of the short course.

Assumed knowledge: It will be assumed that participants are familiar with basic experimental designs, with analysis of variance and have used R.

Abstract

It is intended that participants will gain the knowledge and skills necessary to design multiphase experiments, evaluate the properties of the designs and analyse the results from multiphase experiments. To this end the course will consist of a combination of presentations and practical sessions. Also, the range of applications in which multiphase experiments occur will be demonstrated.

Topics covered in the course will include:

Concepts in experimental design and analysis: experiment description; set of treatments and set of observational units; randomization by permutation; blocking; factorial treatments; examples of poset block structures; randomization-based mixed-model analysis; anova decompositions for orthogonal designs; treatment effects in more than one stratum, e.g. split-plot designs.

Non-orthogonality: non-orthogonal block designs; more general non-orthogonality; efficiency factors and measures derived from them; anova under non-orthogonality.

Multiphase experiments: three sets of objects; two randomizations in a chain; principles in designing multiphase experiments; anova decompositions; randomization-based mixed models.

Design and analysis of experiments in R: Practical sessions will involve the use of the R package `dae` to both produce and evaluate designs for two-tiered and multiphase experiments. Results from such experiments will be analysed using the packages `asreml-R` and `asremlPlus`.

Model based design and analysis: Multiphase experiments often require the construction of non-standard designs. It is often the case that practical restrictions lead to awkward combinations of treatments and blocking structures, both across and within phases, and financial restrictions necessitate the use of compositing strategies in one or more phases. When the treatments are plant or animal genotypes, measures of relatedness, obtained from either ancestral or marker information, may be available. Model based design provides a flexible framework that can produce near optimal designs for all of these scenarios, and still produce standard block designs where desired. In this part of the course we use the Optimal Design (`od`) software within R to illustrate the concepts of model based design in the context of multiphase experiments. The corresponding analyses will be conducted using `asreml-R`.