Randomising for a Completely Randomised Design ANOVA

BeST Module 2

You need R and RStudio installed on your computer

Start an R Project or go into the project that you have set up for this Module

This program is code to assist you to randomise a CRD

Run through it to understand a simple example

Resave as a new program name and customise to suit yourself

Customise for your experiment

Completely Randomised Design (CRD)

For a number of treatments (more than 2)

and completey randomised experimental units across the site

Randomising using R code

Remember all code following a hash (in green in R) are comments to help you.

```
library(agricolae) ##firstly you need this package

str(design.crd) ## We use the design.crd function in this package to design a CRD
```

```
## function (trt, r, serie = 2, seed = 0, kinds = "Super-Duper", randomization = TRUE)
```

To run this you put in your "treatments" called trt

You need to decide on what plot numbering to use

serie =2 or serie = 1 (plot number style)

you can give a seed number for the random number generator

you specify the number of replication; the package was written with this called repetition.

The example 'Outdesign' for CRD design has 3 trt (treatments) and 4 replications (repetition)

```
trt <- c("N1", "N2", "N3") ## naming the treatments

repetiton1 <- c(4, 4, 4) ## 4 replications of each treatment


outdesign <- design.crd(trt,r=repetiton1,seed=789,serie=0)
##Creating the full  design
outdesign #prints design
```

```
## $parameters
## $parameters$design
## [1] "crd"
##
## $parameters$trt
## [1] "N1" "N2" "N3"
##
## $parameters$r
## [1] 4 4 4
##
## $parameters$serie
## [1] 0
##
## $parameters$seed
## [1] 789
##
## $parameters$kinds
## [1] "Super-Duper"
##
## $parameters[[7]]
## [1] TRUE
##
##
## $book
##    plots r trt
```

```
## 1      1 1  N3
## 2      2 1  N1
## 3      3 2  N1
## 4      4 3  N1
## 5      5 2  N3
## 6      6 3  N3
## 7      7 1  N2
## 8      8 4  N1
## 9      9 4  N3
## 10    10 2  N2
## 11    11 3  N2
## 12    12 4  N2
```

```
CRDbook1 <- outdesign$book## naming the design as a book gives same as outdesign
head(CRDbook1)
```

```
##   plots r trt
## 1     1 1  N3
## 2     2 1  N1
## 3     3 2  N1
## 4     4 3  N1
## 5     5 2  N3
## 6     6 3  N3
```

```
## this just gives the top 6 lines, for checking
write.csv(CRDbook1,"CRDbook1.csv",row.names=FALSE)
##saves a csv file to project  directory
CRDbook1  # prints the book called CRDbook1 to Console pane
```

```
##    plots r trt
## 1      1 1  N3
## 2      2 1  N1
## 3      3 2  N1
## 4      4 3  N1
## 5      5 2  N3
## 6      6 3  N3
## 7      7 1  N2
## 8      8 4  N1
## 9      9 4  N3
## 10    10 2  N2
## 11    11 3  N2
## 12    12 4  N2
```

Remember each time you run an experiment you need a fresh randomisation

Next are the steps for your design are make an Excel file with Worksheets for

1 the randomisation (eg from this output)

2 the plot layout as in the glass house or lab

3 your data sheet in a separate worksheet (this needs to be a seperate csv file to run later in RStudio; make sure you don't change anything in it)

4 Metadata -the description of your variables and treatments

save this file and back it up too

Example 2

```
trt <- c("N1", "N2", "N3", "N4") # 4 Treatments

repetition <- c(5, 5, 5, 5) # 5 replications per treatment
##name of the design as mydesign
mydesign <- design.crd(trt,r=repetition,seed=789,serie=0)
CRDbook2 <- mydesign$book ##naming the design in a book
head(CRDbook2)  ## this just gives the top 6 lines, for checking
```

```
##   plots r trt
## 1     1 1  N3
## 2     2 1  N2
## 3     3 1  N1
## 4     4 2  N1
## 5     5 2  N2
## 6     6 3  N2
```

```
CRDbook2  # prints the 'book' called CRDbook3 to Console
```

```
##    plots r trt
## 1      1 1  N3
## 2      2 1  N2
## 3      3 1  N1
## 4      4 2  N1
## 5      5 2  N2
## 6      6 3  N2
## 7      7 4  N2
```

```
## 8      8 3  N1
## 9      9 1  N4
## 10    10 5  N2
## 11    11 2  N4
## 12    12 3  N4
## 13    13 2  N3
## 14    14 4  N1
## 15    15 4  N4
## 16    16 5  N1
## 17    17 3  N3
## 18    18 4  N3
## 19    19 5  N3
## 20    20 5  N4
```

```
###print(t(matrix(feildbook[,3],4,5)))


write.csv(CRDbook2,"CRDbook2.csv",row.names=FALSE)
```

Example 3

```
trt <-c("CIP-101","CIP-201","CIP-301","CIP-401","CIP-501")
r <-c(4,3,5,4,3)## unbalanced/ different number rep per treatments e.g.4 "CIP-101"
# seed = 12543
outdesign3 <-design.crd(trt,r,serie=2,2543,"Mersenne-Twister")
book3<-outdesign3
outdesign3
```

```
## $parameters
## $parameters$design
## [1] "crd"
##
## $parameters$trt
## [1] "CIP-101" "CIP-201" "CIP-301" "CIP-401" "CIP-501"
##
## $parameters$r
## [1] 4 3 5 4 3
##
## $parameters$serie
## [1] 2
##
## $parameters$seed
## [1] 2543
##
## $parameters$kinds
## [1] "Mersenne-Twister"
##
## $parameters[[7]]
## [1] TRUE
##
##
## $book
```

```
##    plots r     trt
## 1    101 1 CIP-501
## 2    102 1 CIP-301
## 3    103 1 CIP-401
## 4    104 2 CIP-501
## 5    105 2 CIP-301
## 6    106 1 CIP-201
## 7    107 3 CIP-301
## 8    108 4 CIP-301
## 9    109 1 CIP-101
## 10   110 2 CIP-101
## 11   111 2 CIP-401
## 12   112 2 CIP-201
## 13   113 3 CIP-101
## 14   114 3 CIP-501
## 15   115 5 CIP-301
## 16   116 3 CIP-401
## 17   117 4 CIP-101
## 18   118 3 CIP-201
## 19   119 4 CIP-401
```

```
# no seed
outdesign4 <-design.crd(trt,r,serie=3)
print(outdesign4$parameters)
```

```
## $design
## [1] "crd"
##
## $trt
## [1] "CIP-101" "CIP-201" "CIP-301" "CIP-401" "CIP-501"
##
## $r
## [1] 4 3 5 4 3
##
## $serie
## [1] 3
##
## $seed
## [1] -80596508
##
## $kinds
## [1] "Super-Duper"
##
## [[7]]
## [1] TRUE
```

```
book4<-outdesign4
outdesign4
```

```
## $parameters
## $parameters$design
## [1] "crd"
##
## $parameters$trt
## [1] "CIP-101" "CIP-201" "CIP-301" "CIP-401" "CIP-501"
##
```

```
## $parameters$r
## [1] 4 3 5 4 3
##
## $parameters$serie
## [1] 3
##
## $parameters$seed
## [1] -80596508
##
## $parameters$kinds
## [1] "Super-Duper"
##
## $parameters[[7]]
## [1] TRUE
##
##
## $book
##    plots r     trt
## 1   1001 1 CIP-201
## 2   1002 1 CIP-301
## 3   1003 1 CIP-401
## 4   1004 2 CIP-401
## 5   1005 1 CIP-501
## 6   1006 3 CIP-401
## 7   1007 2 CIP-201
## 8   1008 2 CIP-501
## 9   1009 2 CIP-301
## 10  1010 3 CIP-201
## 11  1011 1 CIP-101
## 12  1012 3 CIP-301
## 13  1013 4 CIP-301
## 14  1014 5 CIP-301
## 15  1015 3 CIP-501
## 16  1016 2 CIP-101
## 17  1017 3 CIP-101
## 18  1018 4 CIP-401
## 19  1019 4 CIP-101
```

```
#write.csv(book4,"CRDbook4.csv",row.names=FALSE)
#write to hard disk
#write.table(book3,"crd.txt", row.names=FALSE, sep="\t")
#file.show("crd.txt")
```