

Experimental Design and Data Analysis Workshop

Day One

8:00 Registration

8:30 1. Objectives of Workshop
a. Steps in conducting a research experiment

9:00 2. Review of Basic Statistical Concepts
a. Distributions
b. Descriptive statistics
c. T-test and confidence limits

9:45 3. Basic Experimental Design Concepts
a. Basic experimental designs
1. Experimental unit
2. Completely randomized design
3. Randomization
4. Randomized complete block design
5. Blocking
6. Latin square

10:45 Break

11:00 b. Hypothesis testing
1. Defining the question
2. Defining the objective(s)
3. Choosing a treatment design
12:00 c. Sampling considerations
1. Number of samples

12:15 Lunch

1:15 4. Installing Experiments

1:45 5. Basic Data Management Concepts
a. Data collection, entry and management
b. Avoiding bias, double-blind studies
c. Checking for normality, scatter plots, outliers

2:15 6. Basic Statistical Analysis Methods
a. F test
b. Analysis of variance

2:45 Break

- 3:00 c. Replication
 - 1. Number of replicates
- 3:30 d. Mean separation procedures

4:30 Evaluation

Day Two

Morning (teaching room)

- 8:30 1. Review; Questions and Answers; Collect Homework Assignments
- 8:45 2. Correlation and Regression

9:45 Break

10:00 3. Split Plots / Other Designs

- 11:00 4. Report Writing and Data Presentation
 - a. Mean \pm standard error
 - b. Mean comparisons
 - c. Charts and graphs

12:00 Lunch

Afternoon (computer lab)

1:00 5. Software for Data Analysis:
SAS demonstration/participation

2:30 Break

- 2:45 6. Breakout Groups: SPSS, SAS, STATISTIX
 - a. Run sample data sets
 - b. Q/A period
 - c. Other topics? (i.e., spatial data analysis, covariance?)

4:00 7. Roundup, Review
Q/A
Homework assignment

4:30 Evaluation

Learning Outcomes

1. Objectives

Able to list the steps in conducting an experiment

2. Review of Basic Statistical Concepts

Able to sketch a normal distribution

Able to calculate descriptive statistics

Able to perform t-tests and calculate confidence limits

Able to correctly use basic statistical terminology

3. Basic Experimental Design Concepts

Able to correctly select/identify an experimental unit

Able to design and install a CRD

Able to design and install an RCBD

Aware of other designs (LS, SP)

Able to formulate an hypothesis

Able to design treatments to test:

- discrete variables (eg varieties)

- dose response

- factorials and interactions

Able to select and follow a sampling design

Able to determine number of samples needed

4. Installing experiments

Able to install an experiment in the field

Able to install an experiment in animal pens

5. Basic Data Management Concepts

Aware of bias and ways to limit it

Able to test data for normality and outliers

Able to prepare a data collection form (including environmental measurements)

6. Basic Statistical Analysis Methods

Know how F test relates to t-test

Able to write out sources of variation and formula for degrees of freedom for CRD, RCBD and LS

Able to calculate the number of replicates needed

Able to divide treatment SS into single degree of freedom comparisons

Able to use a multiple range test

7. Correlation and Regression

Aware of assumptions in ANOVA and regression

Know difference between correlation and regression

8. Split Plots and Other Designs

Able to design and install a split plot

Able to write out sources of variation and formula for degrees of freedom for split plot

Aware of other designs

9. Data Presentation and Interpretation

Able to check for normality of data

Able to assign superscripts to means

Able to present data means, SEs and tests of significance in tables and graphs

Able to check for outliers and have criteria for whether to include them in analysis

10. Software for Data Analysis

Able to import data into SAS

Able to translate sources of variation from ANOVA into a model statement

Able to analyze a CRD, RCBD, LS or split plot using SAS

Able to perform a regression using SAS