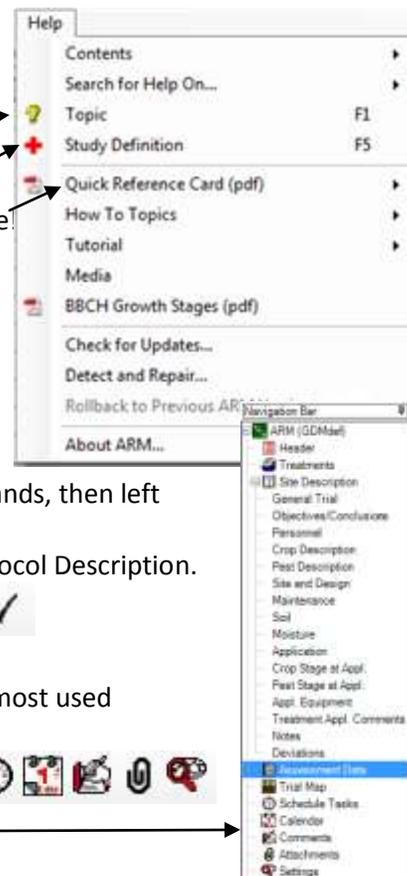


# 2011 NAICC ARM 8 Introduction Training, Jan. 2011

## General Overview of ARM Menu Choices

1) Help:

- F1, any Help button, or  displays help on current Topic.
- F5 or  on a study editor displays help about current data entry field.
- ARM Quick Reference card is very useful; print it as a convenient reference.
- Use Tutorial for an introduction and overview of ARM, and How To Topics for information on typical ARM tasks.



2) File: most File commands are available on the toolbar, which is faster to use:



3) Edit: Undo and block commands are available on toolbar:

Click right mouse button (right-click) on study editors for common edit commands, then left button to select.

4) Format and Table are for editing "rich text" in Trial Comments and Site or Protocol Description.



5) Tools: several Tools commands are on toolbar:

Right-click menu on study editor for common Tools.

6) Utilities: Install License, Rebuild Study List, and Conversion Calculator are the most used commands.



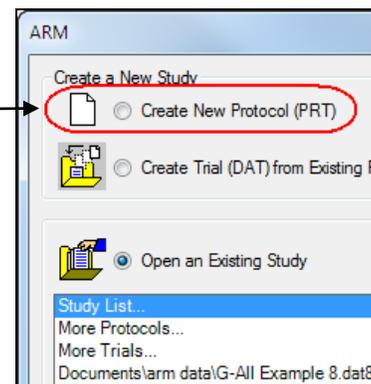
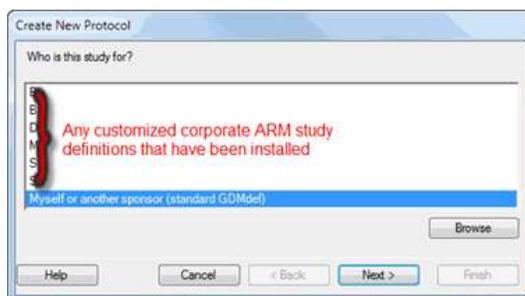
7) Window: Split command. Study editors are on toolbar: and Navigation bar:

## Creating and Using Protocols

1) Create protocol by selecting New Protocol icon on toolbar , File - Create Protocol, or from "Startup Wizard"

a) Define who study is for:

Any customized corporate ARM study definitions installed on your PC are listed on the upper portion of dialog. Note that the ARM install does not include customized study definitions. These are provided with a special installation program at request of a research sponsor.



b) "Who is the study for?" selection determines which study definition(s) are listed on the next dialog:

i) a=Definition: Listed are choices for "Myself or another sponsor (standard GDMdef)" company. The recommended study definition is highlighted by default, such as "G-All7" in the example above.



- ii) b=Language: If the default study definition language is not appropriate, then select a different definition language by clicking the down arrow on the language drop-down.

- c) After selecting “Finish” button, then define appropriate Protocol Settings on the New Protocol dialog:



- 2) Review of Settings dialog choices
- 3) Entering header, overview of how to move between various data entry fields
- 4) Entering treatments, description of various data entry fields, copy/paste, keyboard shortcuts
- 5) Entering tasks:
  - a) Type each task “from scratch” (when this is the only choice!)
  - b) Copy/paste existing tasks from another protocol or trial
  - c) Tools - Merge - from ARM Study to merge tasks from another protocol

## Creating Trial from Protocol

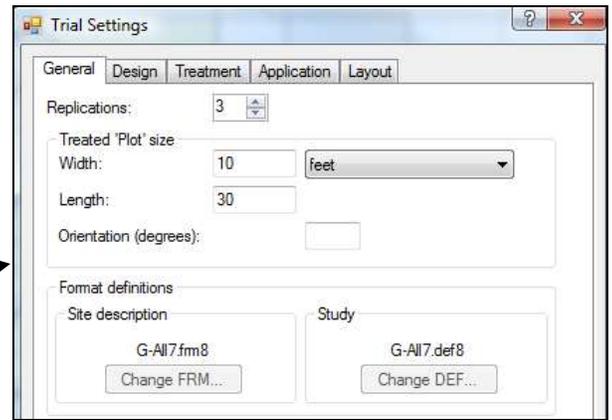
- 1) Begin by selecting the Create Trial wizard on toolbar , File - Create Trial, or from “Startup Wizard”.
- 2) Modifying a proposed randomization on Trial Map
  - a) Select Settings button to change:
    - i) General: number of replications, plot size
    - ii) Layout: change numbering and position of plots, buffer between plots
 

**Tips:** Set “Block size” smaller than number of treatments to split replicates into smaller blocks.  
Set “Block size” larger than number of treatments with “Fill blocks” to get more than one replicate into the same block giving “side by side” replicates.
    - iii) Design: change experiment design, which may influence number of treatments or how treatment information must be entered!
  - b) Use right-click menu commands to move treatments, plots, replicates
  - c) “Color by” options control how trial map is colored: by Replicate, Treatment, or Factor (for multi-factor experiment designs).
  - d) Insert multiple columns or rows in a trial map to define a blank space to move multi-plot units (replicate or factor)
- 3) Naming and saving new trial

## Editing Trials

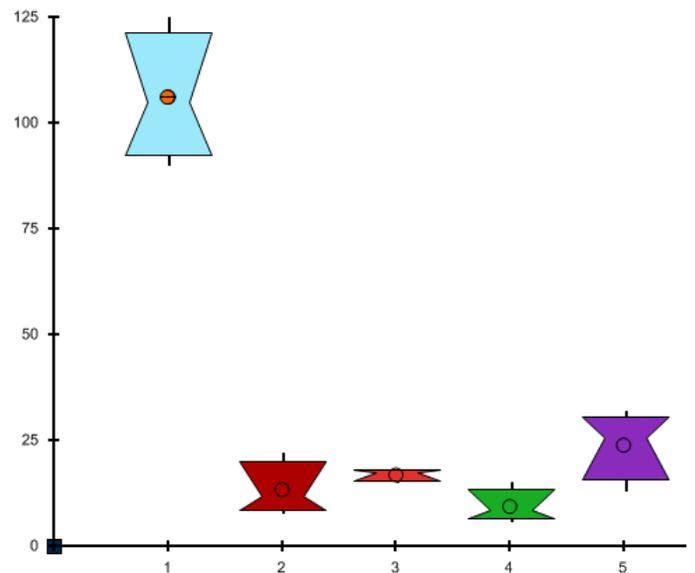
- 1) Printing trial establishment reports
  - a) Trial map
  - b) Spray/seeding plan report and options
  - c) Data collection and verification reports
- 2) Entering assessment data
  - a) Copy/paste shortcuts

- b) Copying data from spreadsheet
- c) Special plot data tools
- 3) Entering site description information
  - a) Copy/paste shortcuts
  - b) Tools - Merge - from ARM Study
  - c) Copying weather information from spreadsheet
- 4) Changing settings that influence the trial
- 5) Use attachments to manage linked trial information
- 6) Use tasks to manage work calendars



## Graphing and Reviewing Data

- 1) Graph types and recommended uses:
  - a) Bar - most suitable for discrete treatments, such as comparison of different treatment products
  - b) Line - used to show trends in values over a continuous scale, such as different rates of a treatment product
  - c) Box-Whisker - illustrates the spread of treatment data groups around their medians, using a "box" and "whiskers" to break down each data group by percentiles. The **box** extends from 25th to the 75th percentile and is divided by the median. The **whiskers** extend from ends of the box to largest and smallest observation.
    - i) Shows variability within a treatment, thus is a measure of assessment consistency within each treatment. Waist position is skewed when one replicate is somewhat higher or lower than others. (E.g. when waist is "high", then value in one of the replicates is somewhat lower than in other replicates.)
    - ii) Provides a visual mean comparison, since treatments where boxes overlap are probably not significantly different.
    - iii) Simplest method to identify heterogeneous treatments.

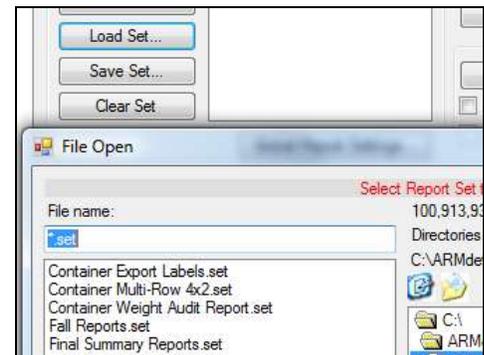


**Shortcut:** Display box-whisker graph for current assessment data column by selecting "Box-Whisker" button on Assessment Properties panel.

- 2) Graph **tips**:
  - a) Treatment Description on Trial Map is used for treatment labels on graph, giving a brief 1-line description of each treatment. Edit the treatment description to adjust (typically shorten) treatment labels for graphs and map reports.
  - b) Use Horizontal bar graph to better display long treatment names.
  - c) Use Next Data/Previous Data buttons on Graph window to display the same graph for other data columns.
  - d) Use "Error Bars" tab on Graph Options to display standard deviation or standard error bars
 

**Note:** The error bars on ARM graphs are calculated using appropriate error terms from AOV. On many graph programs (such as Excel) error bars are *only correct for Completely Random design*.

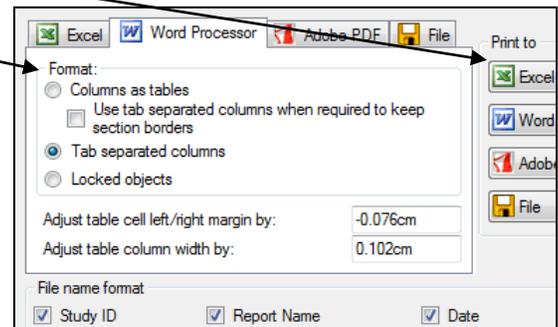
- e) Use “Show data labels” on Labels tab of Graph Options to display treatment mean values.
  - f) Use “Display AOV mean comparison letters” on Labels tab of Graph Options to display mean comparison letters from AOV.  
Options button displays AOV Means Table Report options, to choose a different mean comparison test or significance level.
  - g) Treatment selection order (e.g. 5 4 3 2 1) determines treatment order on a graph.
  - h) Clipboard button is the easiest way to copy graphs to another program; select Paste in destination program to include the graph.
- 3) Exporting graphs to other software: display graph, then:
- a) Clipboard button copies to clipboard, to paste into another program
  - b) Save As button saves graph to a file on disk.



## Printing Reports

- 1) Review reports and uses of each report  
**Tip:** Save report sets to keep your changes to report settings, Load Set to restore those settings.
- 2) Report options: Highlight report and select “Edit Report Options” button, or right-click then “Report Options”.
- 3) Print menu includes shortcut buttons for printing reports to file.  
Remember that each file choice has options!

- a) Excel button “pushes” report directly into Excel
- b) Word Processor button creates \*.rtf file and opens Word
- c) Adobe button creates standard Adobe \*.pdf file and opens your \*.pdf reader program



- 4) Summary reports analyze assessment data:
  - a) AOV Means Table - to analyze all single factor designs, or 2 factor designs with significant A\*B interactions, or 3 factor designs with significant A\*B\*C interactions. Some key options are:

- i) Mean comparison test
  - (1) LSD (Least Significant Difference)
    - Use with “Only when significant AOV treatment P(F)” option for “Fisher’s Protected LSD” test.
    - Use when analyzing only 2 treatments (General -Global - Print selected) for “Paired t-Test”.
  - (2) Duncan’s New Multiple-Range Test
  - (3) Student-Newman-Keuls’ Test
  - (4) Tukey’s w Procedure
  - (5) Waller-Duncan’s Bayesian k-ratio t Test
  - (6) Dunnett’s vs. Control
  - (7) Dunnett’s vs. Reference

Set “None” to not do a mean comparison test.

The first four mean comparison tests are listed in order of most liberal to most conservative. A liberal test is more likely to identify random differences as significant, while a conservative test is more likely to ignore actual treatment differences.

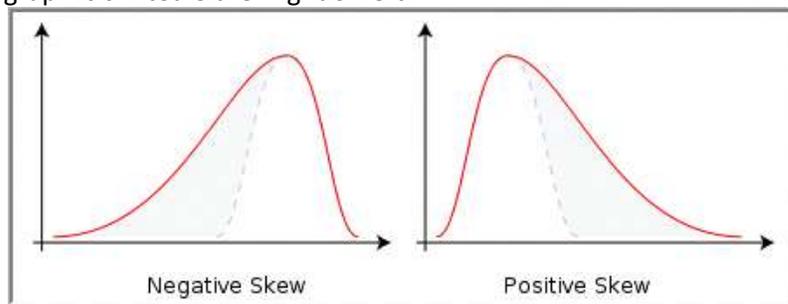
When using LSD to make an unplanned comparison of the highest and lowest mean in a trial with more than two treatments, the difference between treatments can be substantial even when there is no treatment effect. Some statisticians have determined that when using 5% LSD for a trial with:

- (1) Three treatments the significance level is actually 13%
- (2) Six treatments the significance level is 40%
- (3) Ten treatments the significance level is 60%, and for 20 treatments the significance level is 90%.

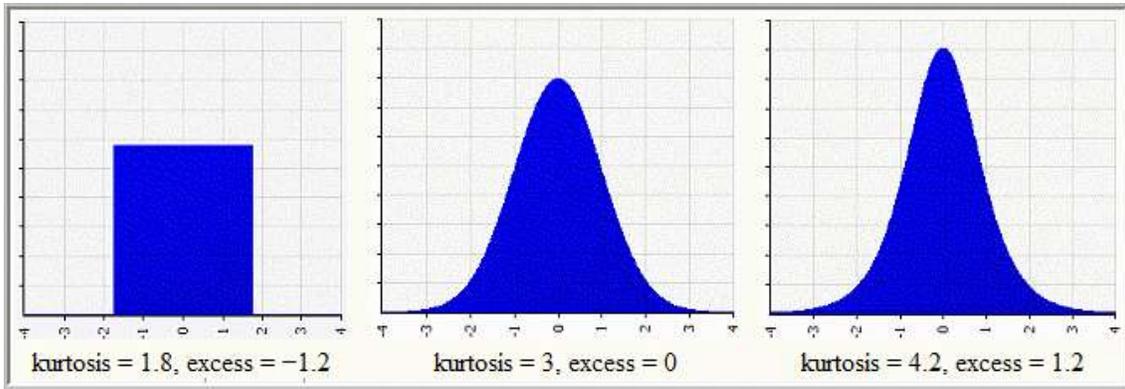
- ii) "Use FAOV complete error term for split-plot trials" option automatically uses appropriate error term for AOV Means Table analysis of a split-plot or strip-block trial.
  - iii) "Only when significant AOV treatment P(F)" option give a "protected" mean comparison test, since mean comparisons are only performed when analysis indicates there are significant differences between treatments at probability level specified for the mean comparison test.  
**Note:** Using this option with LSD mean comparison test gives "Fisher's Protected LSD" test.
  - iv) Select "Bartlett's homogeneity of variance" option to help identify treatment heterogeneity, important because homogeneous treatment variance is an assumption for AOV.
  - v) "Mean sorting" option sorts treatment means from low-to-high or high-to-low on the report.
- b) Factorial AOV - to perform initial analysis of all multi-factor designs, identify if there are significant interactions between factors (A\*B, A\*B\*C, etc.), and calculate means for each factor level averaged across remaining factors.
  - c) Correlation - to determine degree of association between different data columns.
  - d) Dose-Response - to estimate the treatment rate that provides the desired response level.
  - e) Standardized Summary - an AOV means table report that performs only the mean comparison test identified from ARM Action Code in each data column.

Assumptions of AOV - data are random, independent, normally distributed, and have a common variance. Detect violations of AOV assumptions using:

- a) Skewness and Kurtosis tests of normality
  - i) Skewness measures asymmetry of the data distribution, meaning that the peak on a data distribution graph is shifted either right or left:



- ii) Kurtosis measures “peakedness” of data distribution, meaning the peak is either flatter or sharper than a normal distribution:



- b) Bartlett’s test of homogeneity of variance

Assessment data columns with probability  $\geq 95\%$  of treatment heterogeneity or non-normal data are indicated by \* in descriptive statistics section at bottom of AOV Means Table report.

Trt No.	Treatment Name	11	12	13	14
1	Untreated	106.3 a (0.0%)	106.3	105.5 a	105.9 a
2		13.5 bc (87.3%)	13.5 b	12.6 cd	13.0 cd
3		17.0 bc (84.0%)	17.0 b	17.0 bc	17.0 c
4		9.5 c (91.1%)	9.5 b	9.0 d	9.2 d
5		24.0 b (77.4%)	24.0 a	22.8 b	23.4 b
LSD (P=.05)		8.93	6.15	0.14t	0.62t
Bartlett's X2		12.244	6.488	7.786	5.586
P (Bartlett's X2)		0.016*	0.09	0.103	0.231
Skewness		1.6078*	0.677	0.8784	1.34*
Kurtosis		1.0506	-0.0687	-0.2758	0.399

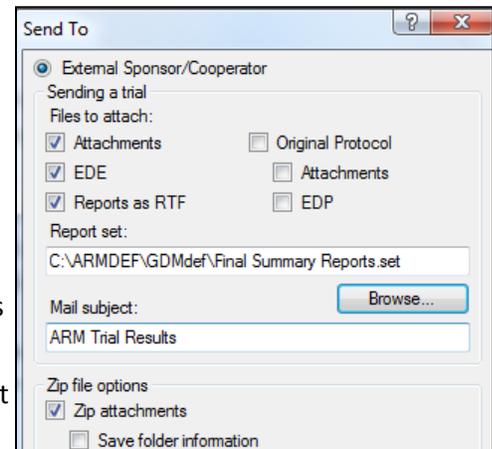


## Reporting Results to Sponsor

- 1) Sponsors need a validated trial  to reduce the number of mistakes in trials they receive.

- 2) Package results using Send To:

- Validates trial
- Creates a \*.ede to import into sponsor study definitions
- Includes the ARM trial \*.dat8/\*.dat so all original data is included
- Includes attachments, providing all supplemental information
- Includes reports printed to \*.rtf for a quick overview of trial results



**Remember:** Typically 20% of ARM features are enough to perform all needed activities. Raising that to 30% helps you perform the activities most efficiently.