

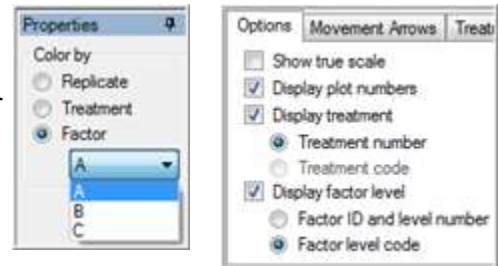
2011 NAICC ARM Tips and Techniques Workshop

Maximizing ARM 8.3.1 Benefits, Jan. 2011

Trial Map Enhancements to Better Visualize or Duplicate Trial Layouts

1) New options to better visualize trial layout for various experimental designs:

- a) Select how trial map is colored: by Replicate, Treatment, or Factor (for multi-factor experiment designs)
- b) For multi-factor experimental designs:
 - i) Include factor ID and level number (A1 B2) or a user-assigned factor level code on Trial Map
 - ii) New Level Description tab to change default Factor Level Codes and Descriptions.



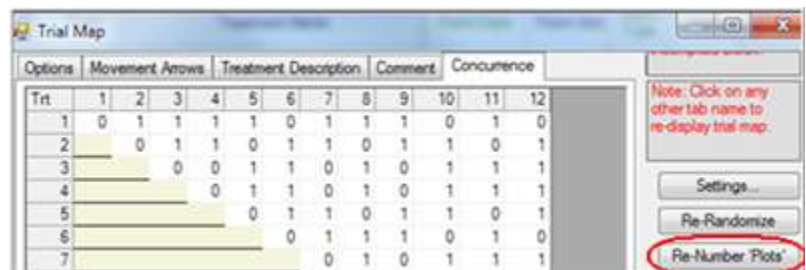
Options	Movement Arrows	Treatment Description	Level Description
Factor	Level	Level Code	Description
A	1	Opt	Optimal
A	2	Def	Deficit

2) Right-click options to adjust trial layout:

- a) Move Main Units and Sub-Units in split-plot or strip-block trials.
- b) Insert multiple columns or rows in a trial map, when providing space to move multi-plot units (replicate, block, or factor).

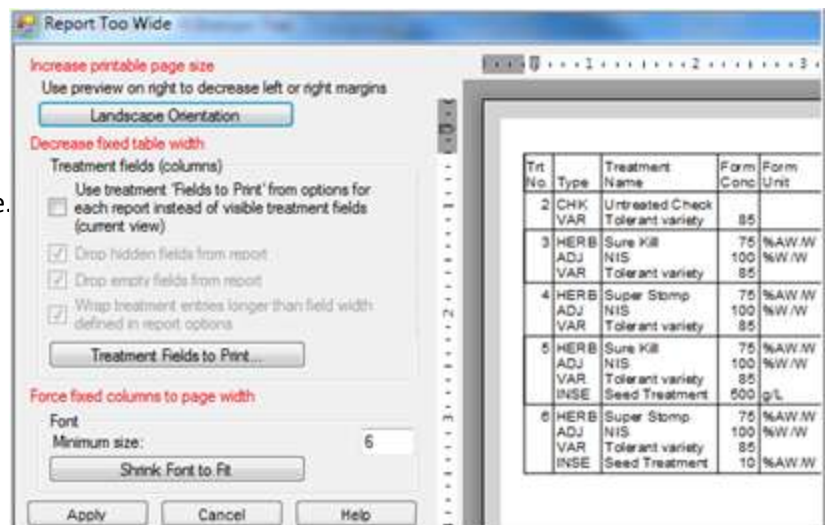
3) Re-Number 'Plot' button that rennumbers 'plot' experimental units in a trial, skipping numbers for any blank experimental units in the trial map (button only active for trials with no assessment data).

4) Concurrence tab that displays treatment concurrence for a Lattice trial. Concurrence=how often a treatment occurs with every other treatment within an incomplete block.



Reporting

- 1) 'Report Too Wide' dialog automatically displays while printing when a report table is too wide to fit on report. When this occurs, the dialog shows a preview of the report section that is too wide. User can:
 - a) Change between portrait and landscape.
 - b) Move page margins.
 - c) Select 'Shrink font to fit' button, which automatically reduces font size.
 - d) Define minimum font size for 'Shrink font to fit' button, including fractional points, to avoid making report font too small.
 - e) Change treatment fields to print.

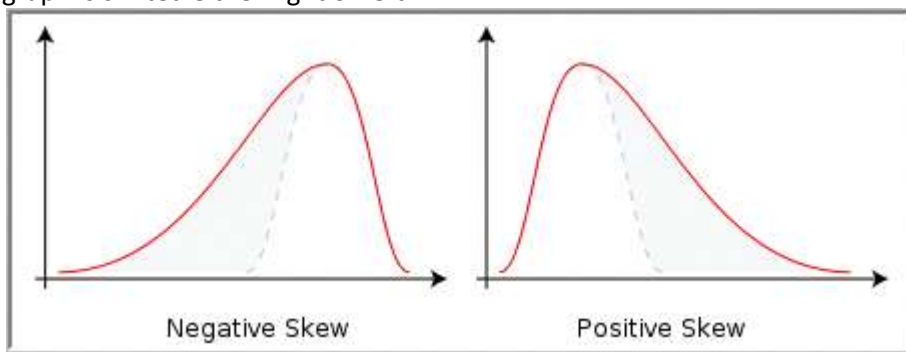


2) AOV Means Table

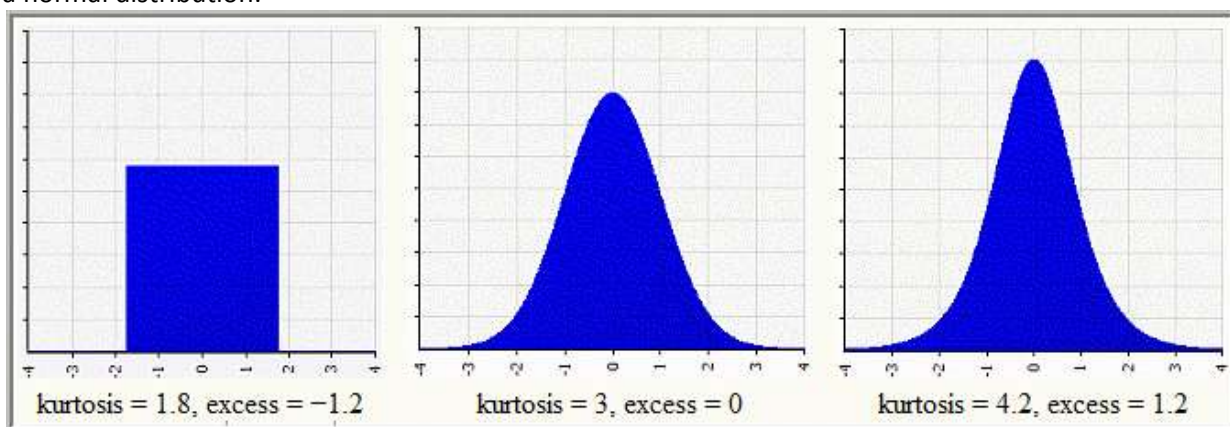
- a) Skewness and Kurtosis tests of normality, as descriptive statistics. Assumptions of AOV - data are random, independent, normally distributed, and have a common variance.

Detect violations of AOV assumptions using:

- 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:



- iii) 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.

- iv) The mean descriptions of standard deviation or standard error can also help identify treatments with a different variance, to exclude these treatments from analysis.

- b) CV of Treatment Mean as mean description

- c) Least squares estimation analysis method estimates sum of squares using least squares method (sometimes called Linear Model) to minimize sum of squared residuals. Some statisticians prefer this analysis method for assessments with missing data. Lattice design assessments with a missing incomplete block or column within rep are forced to use least squares estimation analysis method.

ARM Action Codes		EC	TL[11]	TS[11]
Trt No.	11	12	13	14
1	106.3 a 7.5 StErr	106.3 7.5 StErr	105.5 a 0.0 StErr	105.9 a 0.4 StErr
2	13.5 bc 3.1 StErr	13.5 b 3.1 StErr	12.6 cd 0.1 StErr	13.0 cd 0.4 StErr
3	17.0 bc 0.7 StErr	17.0 b 0.7 StErr	17.0 bc 0.0 StErr	17.0 c 0.1 StErr
4	9.5 c 1.9 StErr	9.5 b 1.9 StErr	9.0 d 0.1 StErr	9.2 d 0.3 StErr
5	24.0 b 4.0 StErr	24.0 a 4.0 StErr	22.8 b 0.1 StErr	23.4 b 0.4 StErr
LSD (P=.05)	8.93	6.15	0.14t	0.62t
Standard Deviation	5.80	3.84	0.09t	0.40t
CV	17.03	24.03	6.52	7.73
Bartlett's X2	12.244	6.488	7.706	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

- 3) Summary: Automatic data correction transformations AS, AA, AL (like TS, TA, TL) that are applied to current data column while analyzing data. Specify these automatic transformations in ARM Action Code field the same as APC/APOC/APOTM.

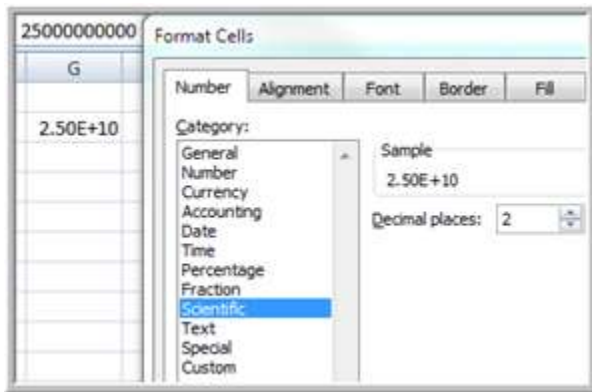
- Benefit is no need to create a separate data column for the transformation.

- Disadvantage is that transformed data is not available to summarize in ST, however it is “tricky” to summarize data columns in ST that have been transformed with TS, TA, TL data correction transformations since the means cannot be readily de-transformed.

- 4) Multi-trial label report, to print seed and harvest labels sorted across trials based on experimental 'plot' unit position in a field. Select trials in the field as the batch of trials to print.
- 5) Site/Protocol Description report option to include Study Rules on report.

Study Editors

- 1) Entering large numbers into study editors using scientific E-notation, such as 2.5E+10.
 - a) “E-notation” is abbreviation of “exponential notation”. For example, a formulation concentration of 25,000,000,000 organisms per liter expressed in mathematical exponential notation terms is 2.5×10^{10} , and in computer E-notation is 2.5E+10 (E=exponent).
 - b) Microsoft Excel offers this as Scientific cell format:
 - c) E-notation is primarily needed for entering biological product treatments when treatment formulation concentration and/or rates identify number of biological organisms or entities, since these are typically very large numbers.
 - d) ARM 8.3.1 supports entering numbers using E-notation into any number field. However, the main fields where this is useful are Form. Conc.



and Rate fields in treatments.

- 2) Alternating background color on:
 - a) By treatment on Treatments editor
 - b) By ‘n’ lines or plot on Assessment Data editor

Trt No.	Treatment Name	Form Conc.	Form Unit
2	Untreated Check		
3	Sure Kill	75	%AWW
3	NIS	100	%W/W
4	Super Stomp	75	%AWW
4	NIS	100	%W/W
5	Sure Kill	75	%AWW

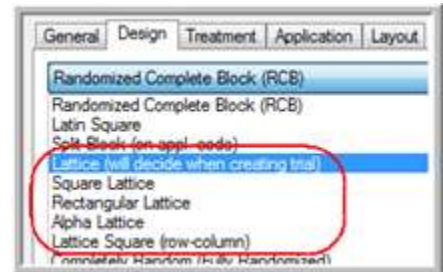
Rp	Bk	Col	Plot	Trt	7	8	9
1	1	1	101	3	75	90	22
1	1	2	102	6	85	80	32
1	1	3	103	5	100	93	15
1	1	4	104	2	0	0	125
1	1	5	105	4	92	75	18
2	2	1	201	6	90	78	27

- 3) SAUDPC transformation - Standardized Area Under Disease Progress Curve = AUDPC / Days, so AUDPC can be compared or summarized across trials

Lattice Incomplete Block Experimental Design Changes

Lattice designs are a subclass of incomplete block designs. Incomplete block designs improve accuracy of randomized complete block or Latin square designs by grouping treatments into blocks smaller than complete replicates, for when variability within a block is less than variability across blocks. These are most beneficial when testing a large number of treatments (varieties) in one trial, to reduce effect of variability across a large field area.

- 1) Design tab of Settings
 - a) Select desired lattice design from selection list
 - b) If uncertain, use “Lattice (will decide when creating trial)”, a wizard to help select appropriate design



- 2) Trial Map - Concurrence tab displays treatment concurrence for a Lattice trial. Concurrence=how often a treatment occurs with every other treatment within an incomplete block.
- 3) AOV Means Table

a) Adjusted treatment mean options: For lattice design analysis methods ARM can adjust (weight) treatment means for block effects, eliminating treatment variations from significant block effects.

Adjusted treatment mean

Use adjusted mean as primary mean

Calculate adjusted mean only when justified by AOV

- i) Use adjusted mean as primary mean: when analysis can calculate an adjusted treatment mean, use this adjusted mean as the primary treatment mean on reports, graphs, etc.
- ii) Calculate adjusted mean only when justified by AOV: reports an adjusted treatment mean only when analysis P(F) for incomplete block or column within replicate indicates that an adjusted mean is more accurate than original unadjusted mean.

b) AOV table changes

- i) Block (within rep) = amount of trial variation accounted for by the incomplete blocks, included for all lattice designs.
- ii) Column (with rep) = amount of trial variation from column within replicate, included for Lattice Square (row-column) design.

Source	DF	Sum of Squares	Mean Square	F	Prob(F)
Total	74	2211.595135	2211.595135		
Replicate	2	546.876782	273.438391	28.558	0.0001
Block (within rep)	12	585.630126	48.802511	5.097	0.0003
Column (within rep)	12	238.210784	19.850899	2.073	0.0621
Treatment	24	611.081818	25.461742	2.659	0.0100
Error	24	229.795625	9.574818		
Efficiency Gain 172%					

Additional ARM 8.3.1 Features

- 1) Close button on top right side of editor caption bar to close current editor when screen is split.
- 2) Enhanced study rules, including rules for assessment data headers.
 - a) Study rules edit boxes support auto-complete and allow directly typing rules.
 - b) Standard short-cut keys and right-click menu for Study Rules grid.
 - c) Automatically update Study Rules directly from changes to the rules panel (no more 'Apply' button).
 - d) 'Show all rules' option to display all rules, or only rules for the current editor or editor column.
 - e) Undo for study rules changes.
 - f) Study rules for assessment data headers:
 - i) With assessment data: a reminder to fill header fields when data is entered.
 - ii) Clear SE name if entry changed (when changing a key data header field entry invalidates the SE). Rule is not enforced when a 'minor' change is made to ARM Action Code for: mean separation test ID, analysis action flag (APC/APOC), exclude data column from summary flag (ES), or the order of items in ARM Action code.
 - iii) Lock field to prevent edits: prevents changing data headers that were specified in protocol.
 - iv) Consistent entries across SE Group: available when study definition includes SE Group field.
- 3) Rich text fields in GDMdef study definitions now accept up to 256,000 characters.
- 4) Graph options for line thickness, symbol size, line pattern, bar pattern, and background color.