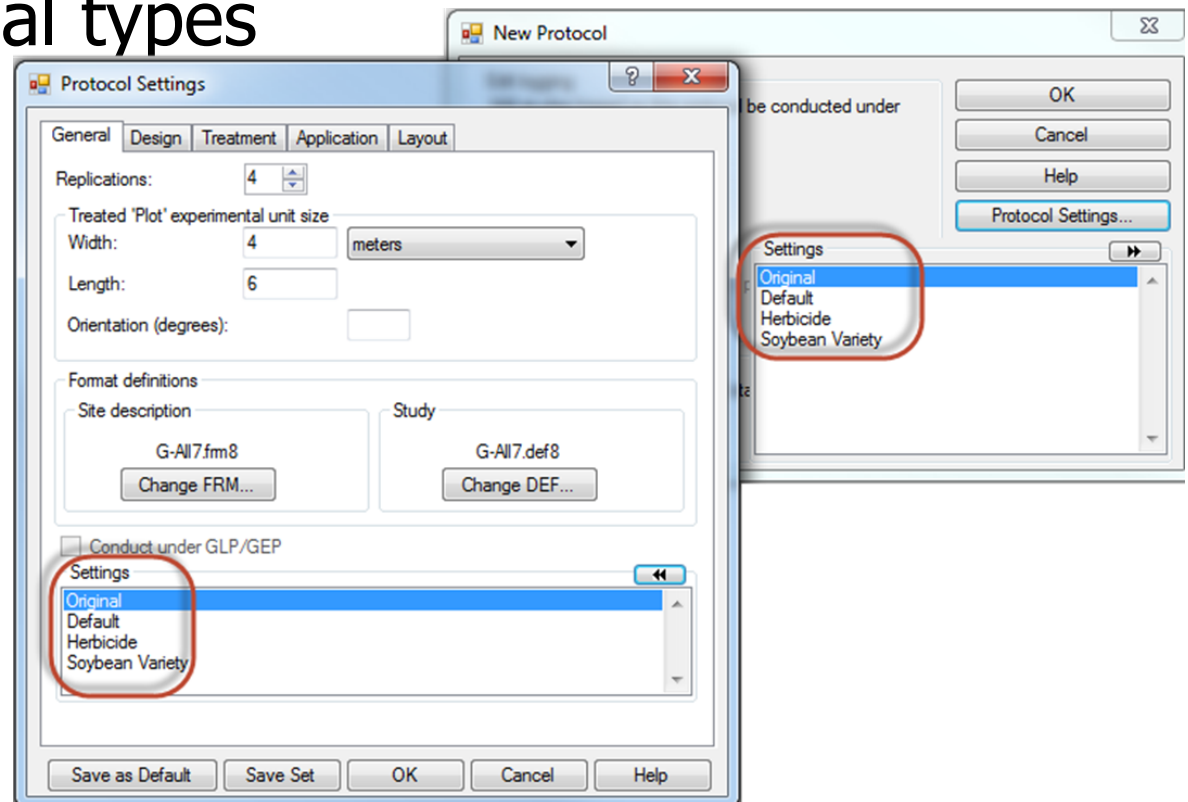# ARM 2015 Features

Gylling Data Management, Inc.

"New Protocol" Option Sets

- "Save Set" button to create appropriate defaults for different trial types

- Select set in New Protocol dialog or General tab of Protocol Settings

Power and Efficiency Planner, Plan Experiments to Have:

- A reasonable chance of distinguishing anticipated treatment differences
- The optimum number of replicates required to meet objectives
- An efficient experimental design and randomization for desired precision
- Cost-effective utilization of the available experimental area

Why is Planning Critical?

- Can reduce costs by selecting optimum number of replicates and samples

- Expected treatment differences are typically < 10%, and frequently < 5%, so small precision gains can help to:
  - Distinguish an actual treatment difference (reject null hypothesis H_0)
  - Strengthen evidence of no treatment diff.) (do not reject null hypothesis H_0)

Power and Efficiency Planner
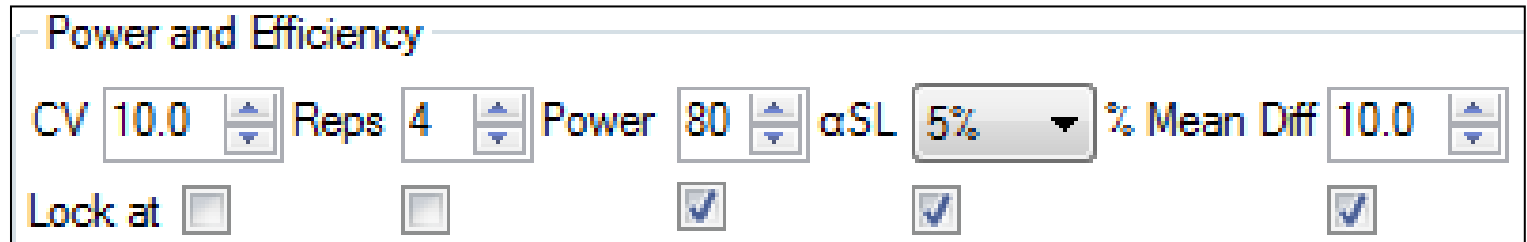
Power and Efficiency Planner

- Help plan experiments that successfully detect expected treatment differences
- Available in both protocols and trials so:
  - Protocol writers can more effectively plan experiments
  - Trialists can verify whether CV expectations are realistic based on local experience for specified crop(s)

Power and Efficiency Planner

- Calculates "power" based on:
  - Estimated CV of key assessment (e.g. yield)
  - Number of replicates
  - Power = Level of certainty to detect "real" treatment effects (80% or 90%)
  - Alpha Significance Level (e.g. 5%, 10%)
  - % Mean Diff = estimated treatment effect, expressed as percentage of overall (grand) mean across treatments of key assessment

Power and Efficiency Planner

- "Lock at" to keep 3-4 columns constant

- Calculates table of possible values for "unlocked" columns (e.g. Rep or CV)

- Values entered by protocol writer are carried into trials created from protocol, conveying protocol expectations

Power and Efficiency Planner

- Compare effect of significance level on minimum replicates for a CV

Power and Efficiency Planner

■ Consider impact of Replicates on precision to detect treatment differences

Power and Efficiency

CV 5.0 ▲▼ Reps 4 ▲▼ Power 80 ▲▼ αSL 5% ▼ % Mean Diff 5.0 ▲▼

Lock at ☑   ☐   ☑   ☑   ☐

Click on column heading to sort

CV	Reps ▲	Power	αSL	% Mean Diff	Error DF	'Plot' EUs
	3			13	8	15
	4			10.8	12	20
	5			9.4	16	25
	6			8.5	20	30
	8			7.26	28	40
5	9	80	5%	7	32	45
	12			6	44	60
	17			5	64	85
	26			4	100	130
	45			3	176	225
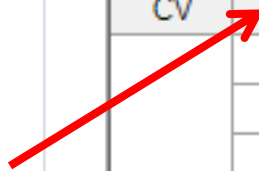
Randomization Quality Review

Goal is to improve experiment precision:

1. Arrange replicates as squares, not strips
2. Equalize treatment distribution
   a. Balance average distance from all other treatments
   b. Balance "Edge effect" across treatments
3. Randomize all replicates

🔍 🔍 ✋ ▶ ⊖ 75% ▾ ⊕ ⛶

Color by
- ○ Replicate
- ● Treatment
- ○ Current Treatment

☐ Auto-select for move
- ● Treatment
- ○ 'Plot' Experimental Unit
- ○ Replicate

Trial map cells (top to bottom rows):

Row 4: 401/4, 402/10, 403/3, 404/9, 405/6, 406/13, 407/12, 408/19, 409/18, 410/14, 411/1, 412/24, 413/16, 414/20, 415/22, 416/17, 417/23, 418/15, 419/8, 420/7, 421/11, 422/21, 423/2, 424/5

Row 3: 301/1, 302/2, 303/8, 304/6, 305/17, 306/11, 307/21, 308/4, 309/23, 310/19, 311/22, 312/14, 313/12, 314/10, 315/7, 316/13, 317/18, 318/20, 319/15, 320/9, 321/3, 322/5, 323/16, 324/24

Row 2: 201/2, 202/12, 203/18, 204/15, 205/11, 206/24, 207/5, 208/14, 209/19, 210/8, 211/6, 212/9, 213/ , 214/16, 215/10, 216/1, 217/20, 218/13

Row 1: 101/1, 102/2, 103/3, 104/4, 105/5, 106/6, 107/7, 108/8, 109/9, 110/10, 111/11, 112/12, 113/13, 114/14, 115/15, 116/16, 117/17, 118/18, 1 /19

Tabs: Options | Movement Arrows | Treatment Description | Comment | Quality

Suggested block size (*=optimum): [Apply]

Block Size	6	8*	12	24
Rep Width	50.5	67.5	101.5	203.5
Rep Length	103	77	51	25
Surface/Area	0.059	0.056*	0.059	0.090
Trial Width	50.5	67.5	101.5	203.5
Trial Length	415	311	207	103
Unused 'Plot'	0	0	0	0

1

Replicate shape

3 [Randomize All Replicates]

Replicate 1 is defined as non-randomized. It is best statistical practice to randomize all replicates.

Treatment

Trt	Code	At Edge	Ave Dist.	StDev	Min	Max
1	CHK	3	79	18.6	40.4	121
2		3	96	26.2	40.4	128
3		2	76.5	26.6	19.1	128
4		3	86	24.6	46.8	138
5		2	82	20.0	46.8	117
6		2	69	21.0	38.3	106
7		2	67	13.9	49	102
8		2	68	18.2	27.6	102
9		2	66	25.6	19.1	117
10		2	64.7	23.2	25.5	117
11		2	69	19.2	27.6	104
12		2	66	21.8	25.5	106
13		2	61	22.3	25.5	125
14			56	17.6	21.3	89
15		2	67	22.8	32	125
16		2	64.7	22.3	27.6	123
17		2	71.5	24.0	27.6	113
18		2	67	25.0	27.6	110
19		2	60.6	19.2	21.3	102
20		2	63	24.2	27.6	125
21		2	79	27.4	25.5	128
22		2	69	27.0	14.9	121
23		2	70	26.0	14.9	110
24	REF	3		27.7	38.3	138

a   **b**

[Settings...]
[Re-Randomize]
[Re-Number 'Plots']
[Accept Current]
[Cancel]
[Help]

Arrange Replicates as Squares not Strips

"Optimum" is smallest surface-to-area ratio

Equalize Treatment Distribution

"Undesirable" layout of 7 treatments and 5 replicates in Randomized Complete Block:

- Trt. 6 in middle 3 columns of all reps
- Trt. 5 in right 2 cols for all but one plot

2e	4e	7e	1e	6e	3e	5e
1d	7d	3d	4d	6d	2d	5d
7c	5c	4c	6c	2c	3c	1c
2b	1b	3b	6b	7b	5b	4b
7a	2a	6a	3a	4a	1a	5a

Example from Federer, "Experimental Design" 1955

Uses "Average Distance of Treatment" Comparison (ATDC)

- van Es and van Es, "Spatial Nature of Randomization and Its Effect on the Outcome of Field Experiments", Agronomy Journal, 85:420-428 (1993).

- Comparison between treatments 1 and 2 is taken from 5 plots for each treatment.

- Measure the plot-to-plot distance for each plot containing treatment 1 to the paired plot within replicate containing treatment 2, for a total of 5 distances.

- ADTC for the treatment pair 1-2 is the average of the 5 distances.

Distances, Treatments 1-2

- Average distance = 3 plots = 24 feet for 8 foot wide plots

2e	4e	7e	1e	6e	3e	5e
1d	7d	3d	4d	6d	2d	5d
7c	5c	4c	6c	2c	3c	1c
2b	1b	3b	6b	7b	5b	4b
7a	2a	6a	3a	4a	1a	5a
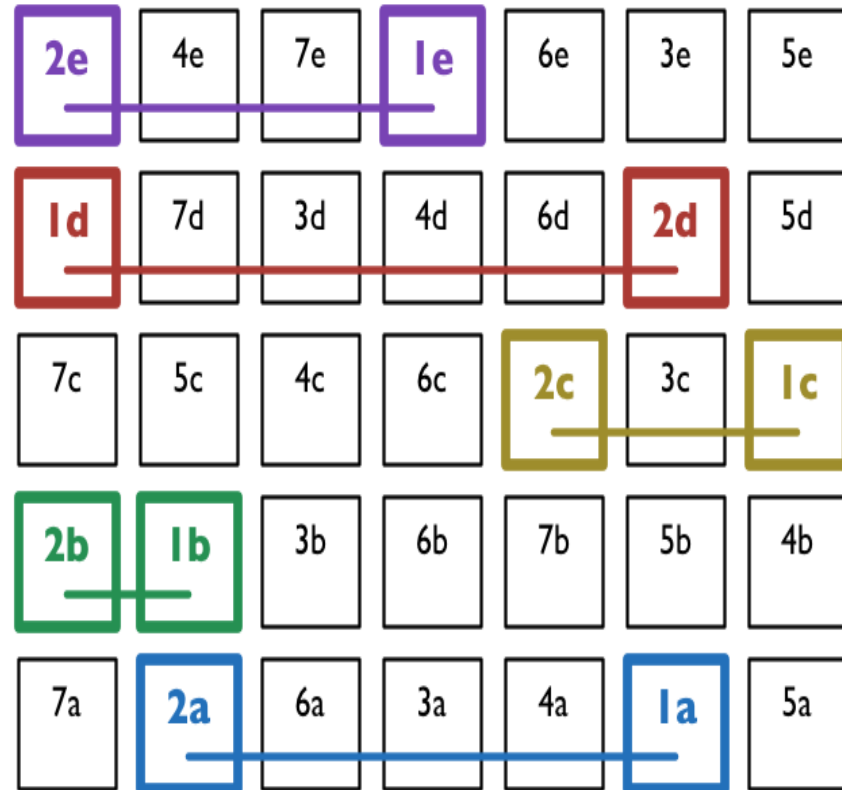
Unequal Treatment Distribution

- Average distance from 17.9 to 24.6
- Ranges from 11.9(T3,T6) to 34(T2,T5)
- Error variances for treatments may not be homogeneous

Trt	At Edge	Ave Dist.	StDev	Min	Max
1	4	24.4	6.24	13.6	32.3
2	3	24.6	5.56	17	34
3	2	19.8	5.66	11.9	25.5
4	3	21.3	3.18	17	25.5
5	3	27	5.83	20.4	34
6	2	17.9	3.53	11.9	22
7	3	23.8	4.3	18.7	29

Unbalanced "Edge effect"

- Treatment 1 occurs at edge 4 times, T2 and T3 at edge only 2 times

Treatment

Trt	At Edge	Ave Dist.	StDev	Min	Max
1	4	24.4	6.24	13.6	32.3
2	3	24.6	5.56	17	34
3	2	19.8	5.66	11.9	25.5
4	3	21.3	3.18	17	25.5
5	3	27	5.83	20.4	34
6	2	17.9	3.53	11.9	22
7	3	23.8	4.3	18.7	29

Properties

Color by
- ○ Replicate
- ○ Treatment
- ● Current Treatment

- ☑ Auto-select for move
- ● Treatment
- ○ 'Plot' Experimental Unit
- ○ Replicate

Balanced Treatment Distribution and Edge Effect

- Average distance from 21.3 to 24.4
- Distances range from 18.7 to 27.2
- "Edge effect" is balanced

501 3	502 4	503 7	504 6	505 5	506 1	507 2
401 2	402 6	403 4	404 1	405 7	406 3	407 5
301 7	302 1	303 2	304 4	305 3	306 5	307 6
201 4	202 5	203 1	204 7	205 6	206 2	207 3
101 1	102 3	103 6	104 5	105 2	106 4	107 7

Treatment

Trt	At Edge	Ave Dist.	StDev	Min	Max
1	2	22	2.15	20.4	25.5
2	3	23.8	3.57	18.7	27.2
3	3	24.4	1.76	22	27.2
4	3	22.4	3.47	18.7	25.5
5	3	22	3.4	18.7	27.2
6	3	21.3	2.58	18.7	25.5
7	3	22.7	2.56	18.7	25.5

Randomize All Replicates

- This frame displays when a non-randomized replicate is defined in Settings

- Select "Randomize All Replicates" to follow recommended statistical practice

Post-hoc Power Analysis

- Optional descriptive statistic on AOV Means Table report

  AOV Means Table Report Options

  Descriptive statistics

  ☑ Post-hoc power analysis

- Lists, for each assessment column, the minimum number of replicates required to statistically separate treatment means based on Treatment P(F) and current significance level

- Use for planning future trials
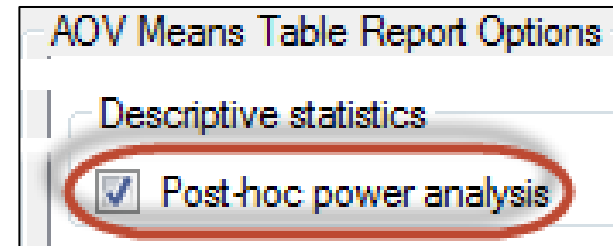
Post-hoc Power Analysis

- In example, LSD can distinguish 25% mean difference (largest existing difference is 18%)

- Current AOV Trt P(F) is 0.2979, so use 0.30+ significance level to separate treatment means

- Need 8+ replicates to reject null hypothesis at 0.05 significance

Crop Variety	CEZANNE
Trt No.	24
2	85.33 a
3	81.67 a
4	98.00 a
5	95.33 a
LSD P=.05 (% mean diff)	21.808 (25%)
Standard Deviation	10.915
CV	12.12
Grand Mean	90.083
Minimum Replicates (power = 80)	8
Largest Mean Difference (% mean diff)	16.333 (18%)
Treatment F	1.541
Treatment Prob(F)	0.2979

Factorial AOV Report Options

- "Analysis method" options:
  - Least squares analysis (like SAS GLM)
  - Print adjusted means (if missing data)

Factorial AOV Table Report Options

| Report Options | General Summary | Report Preview |

Mean comparison test

Test: Tukey's HSD

Significance or alpha level: 5%

☑ Only when significant AOV treatment P(F)

Symbol indicating no significant difference between treatment means: -

Adjusted treatment mean
☑ Use adjusted mean as primary mean

Descriptive statistics for each factor mean section
☑ LSD (or HSD if Tukey's)
☑ Standard Deviation
☑ Coefficient of Variation

AOV tables to print
◉ Complete
○ Pooled error
○ Both

Analysis method
○ Traditional AOV
◉ Least square estimation

Factorial AOV Report Options

"Include descriptive statistics for each Factor means section" adds Descriptive statistics under each "Table of X" section:

- LSD (or Tukey's HSD)
- Standard Deviation
- CV

Rating Date		Apr-22-2014
Rating Type		CONTRO
Rating Unit		%
Trt-Eval Interval		7 DA-A
Trt Treatment	Rate	
No. Name	Rate Unit	1
TABLE OF A (Herbicide) MEANS		
1 Accord		53.5 b
2 Brominal PLUS		72.0 a
3 Cannon		51.3 c
LSD P=.05		0.76
Standard Deviation		0.76
CV		1.29
TABLE OF B (Rate) MEANS		
1 Rate 1	1 LB AI/A	45.0 b
2 Rate 2	1.5 LB AI/A	61.8 a
3 Rate 3	2 LB AI/A	70.0 a
LSD P=.05		12.74
Standard Deviation		15.05
CV		25.54
TABLE OF A (Herbicide) B (Rate)		
1 Accord		26.9 a
1 Rate 1	1 LB AI/A	
2 Brominal PLUS		61.3 a
3 Rate 3	2 LB AI/A	
3 Cannon		55.8 a
3 Rate 3	2 LB AI/A	
LSD P=.05		22.07
Standard Deviation		15.05
CV		25.54

Study Rules

- Selectively hide protocol or site description fields according to person who opens study (based on ARM license information):
    - From everyone else
    - From everyone who is not in my company

Condition

If not in my company ▼

If not me
If not in my company

Study Rules

- Lock protocol or site description fields (such as Trial ID), to prevent modifying information in those fields by:
  - Everyone else
  - Everyone who is not in my company

Study Rules

- Examples of new study rules:

Rule	Rule ID	Editor	Field	Condition
1	Required	Header	Trial Number	Lock field to prevent edits
2	Limit validation list	Assessment Data Header	Crop & Pest in Site Description	Always
3	Lock Trial ID as position 1	Assessment Data	Image Attachments	Always
4	Strict Validation	Treatments		
5	Required	Trial	Image Attachments	One or more Plots
6	Hidden Field	Protocol Description	Trial Establishment Guidelines - Responsible	If not in my company
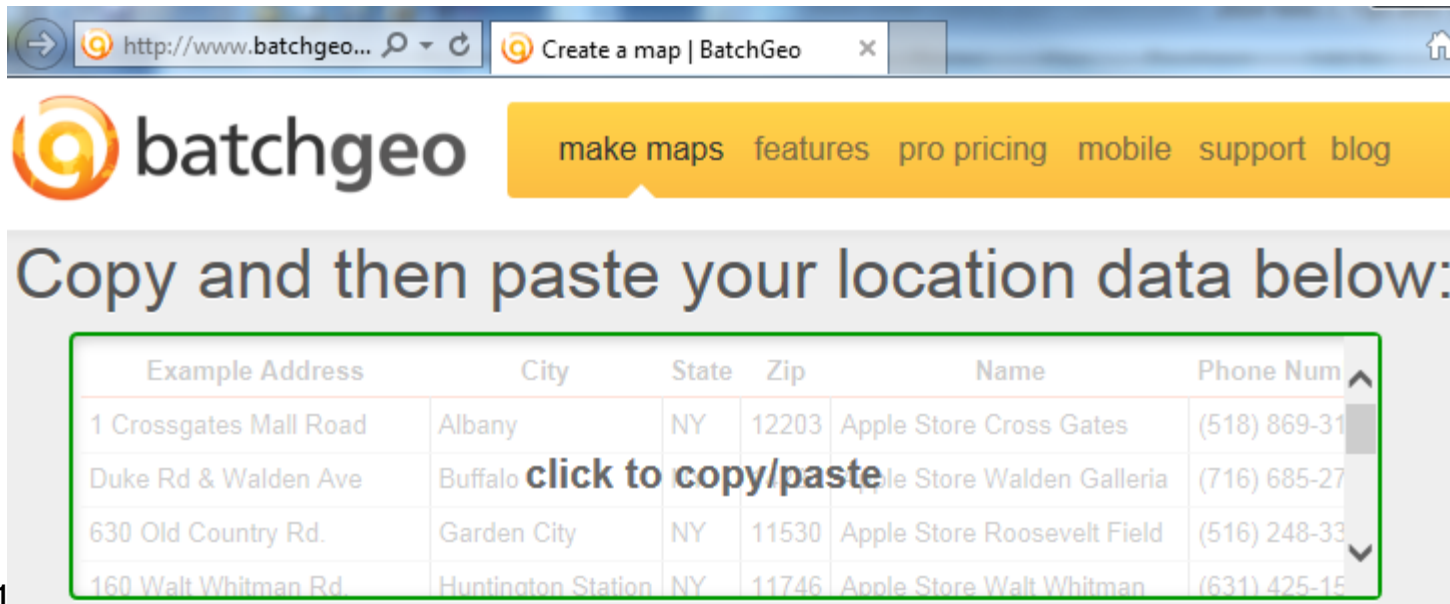
Map Trials from Study List

- Select trials of interest
- Copy map latitude and longitude to clipboard
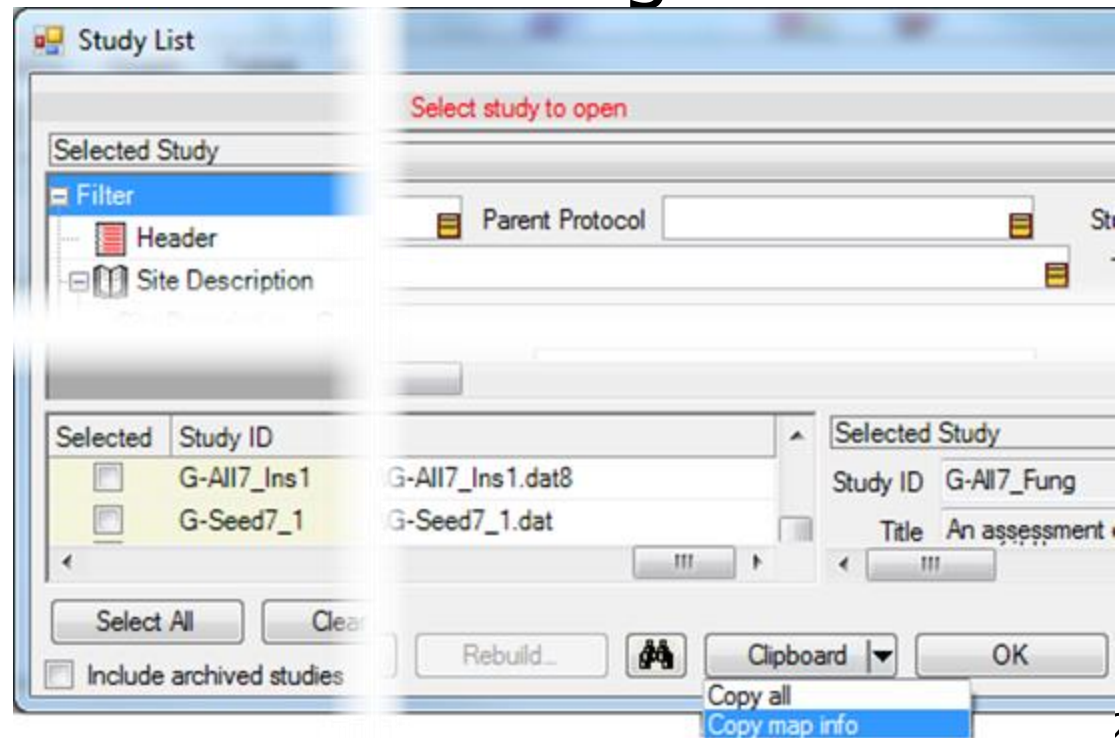
Map Trials from Study List

- ARM opens batchgeo.com website
- Right-click in batchgeo.com location grid, and then paste

Map Trials from Study List

- Select "Map Now" button

Map Now

Study List Filter Form

- Clicking into a field on filter form automatically scrolls lower grid to the matching column

- Right-click menu

- Automatically save Study List filters the client has applied
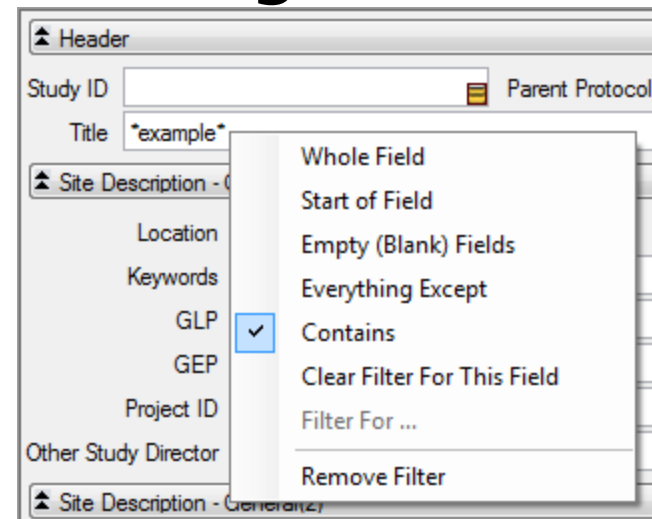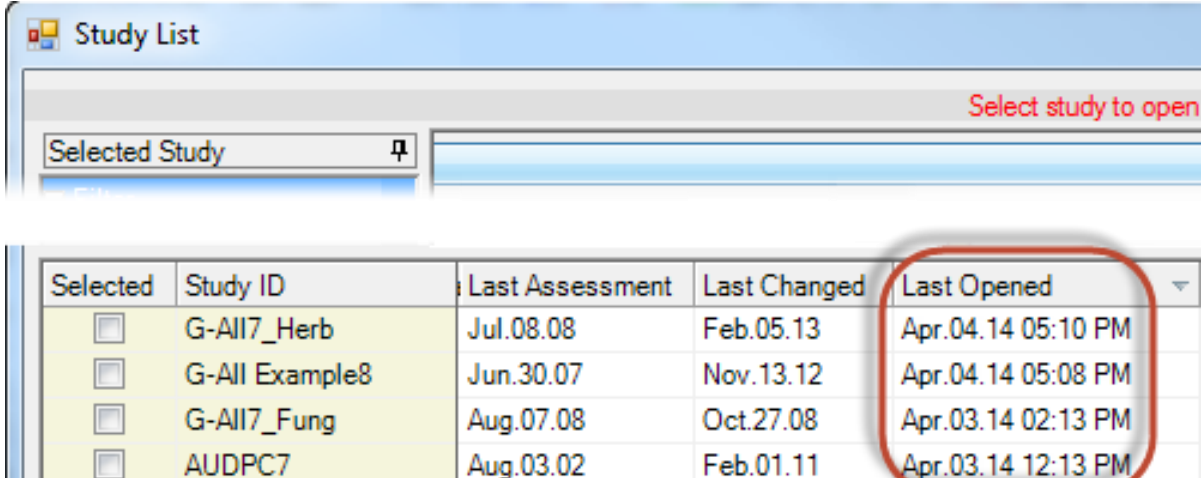
Study List Filter Form

- Right-click menu

Study List, Recently Changed

- 'Last Opened' column in study list includes time

- Most recent study is always the top row until default sort order is changed

New Study List Fields

- Treatment Type (TTT)
- Treatment Form. Type (TFD)
- Treatment Growth Stage (TGI)
- Assessment Part Rated (ECP)
- Assessment Rating Type (EDT)
- Assessment Rating Unit (ERU)
- Crop Group (KF)
- Pest Type (~P)
- Pest Stage Majority (PS)
- Previous Crop (PC)

- Trial Region (~R)
- Reliability (TQ)
- Study Design (ED)
- Trial Usage/Type (VU)
- Application Soil Moisture (SM)
- Rainfall/Irrigation Type (RT)
- Application Equipment (SZ)
- Nozzle Type (NT)
- Carrier (DC)
- Propellant (TP)

Report Options

- Directly set report options on option tab
  - simple and intuitive

Separate Option Reset Buttons

Separate "Reset" buttons for ARM Options and Report Options:

- Tools – Options: Reset program options to default settings without affecting your report changes

- Reset report options to default settings without changing other ARM program options
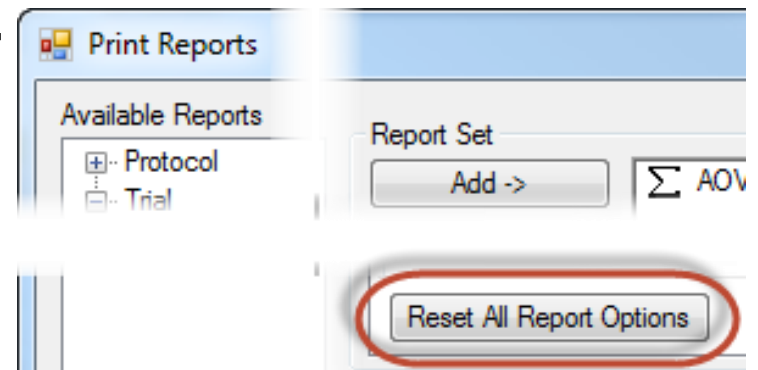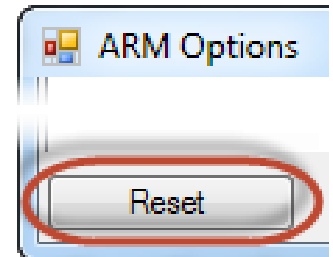
Report Preview

- Report Preview tab stays open
  - One-click preview of reports
  - Zoom in/out
  - Adjust logo size
  - Quickly find a label by clicking through list of available labels
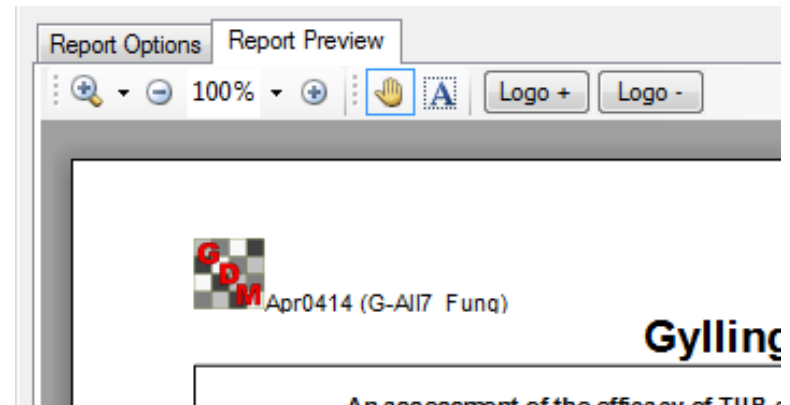
Report Sets

- New list box displays available sets
  - Click once to select a set from list
  - "More sets" to browse
  - Shows lists across all language subfolders
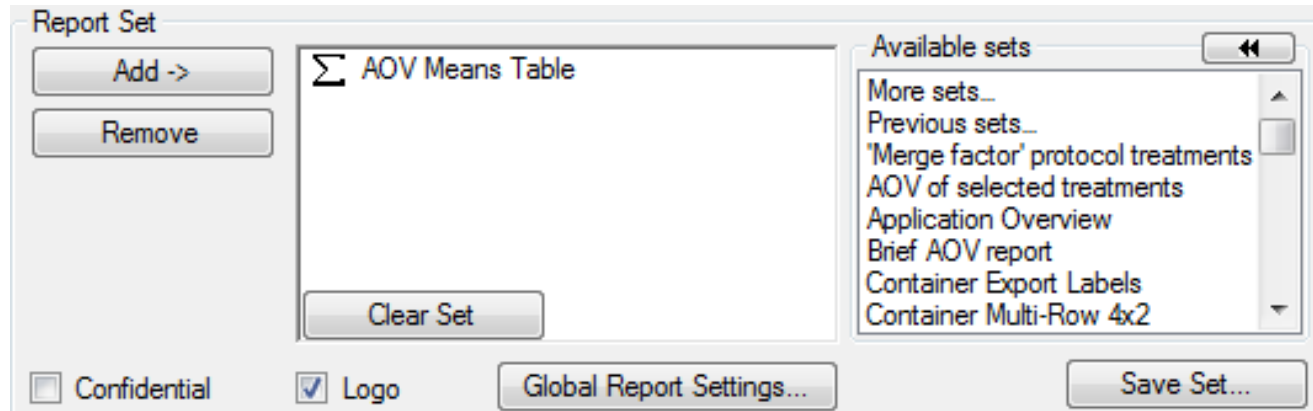
Report Sets

- Last selected set highlighted by default
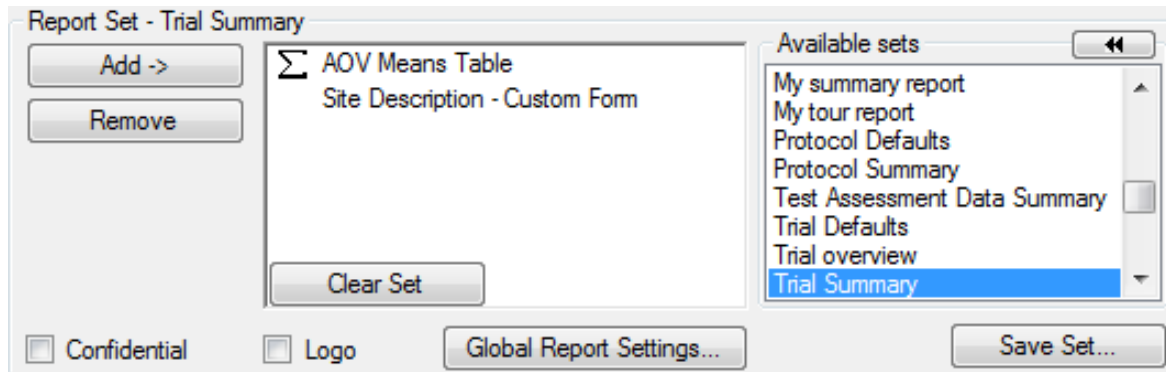
- "Previous sets" shows the report history
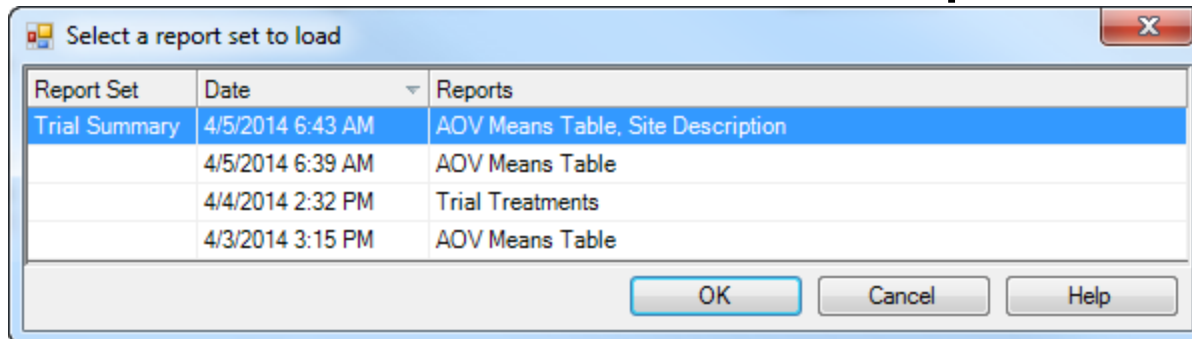
Page Heading

- Customize arrangement

- Simple way to add a logo and adjust logo size and position on report
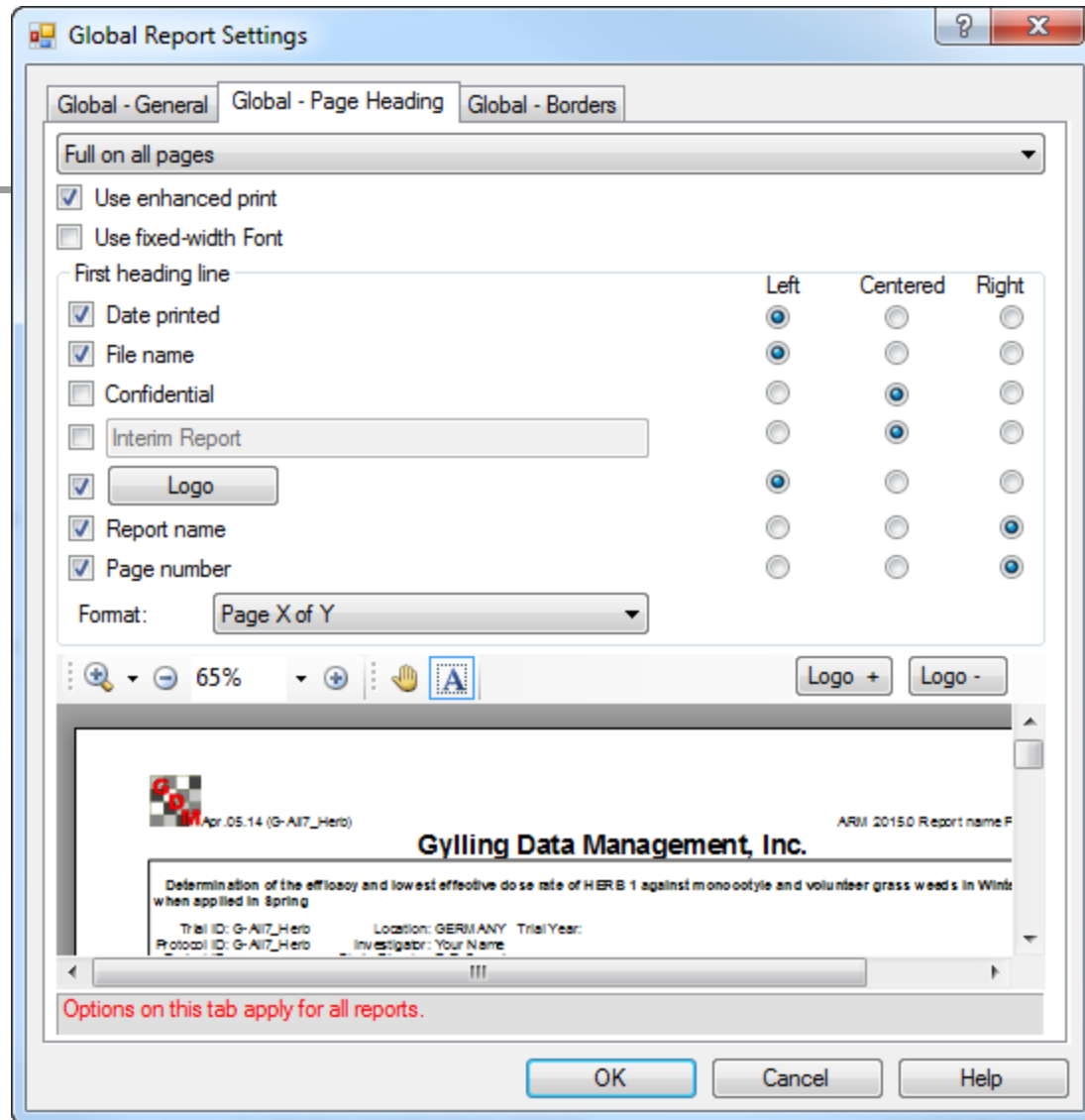
Help for AOV Means Table

New "Interactive AOV Means Table Report" help topic shows which options control various parts of the report

Interactive AOV Means Table Report

How does this work?

Aug-1-2014 (InteractiveAOV)   ARM 2015.0 AOV Means Table Page 1 of 3

Gylling Data Management, Inc.

An assessment of the efficacy of TUB and other fungicides for the control of Septoria Diseases in winter wheat

Trial ID: InteractiveAOV	Location: Gembloux Trial Year:	
Protocol ID: Interactive	Investigator: Your Name	
Project ID:	Study Director: R.E. Cearch	
	Sponsor Contact:	

Pest Type		D Disease	D Disease	D Disease	D Disease	
Pest Code		SEPTTR	SEPTTR	ZZXXEE	ZZXXEE	
Crop Code	TRZAW	TRZAW	TRZAW	TRZAW	TRZAW	TRZAW
Crop Name	Winter wheat	Winter wheat	Winter wheat	Winter wheat	Winter wheat	Winter wheat
Part Rated	LEAF2 P	LEAF2 P	LEAF2 P	LEAGRE P	LEADIS -	GRAIN C
Rating Date	May-2-2008	Jul-2-2008	Jul-2-2008	Jul-15-2008	Aug-7-2008	Aug-7-2008
Rating Type	PESSEV	PESSEV	PESSEV	AREA	AREA	YIELD
Rating Unit	%	%	%UNCK	%AREA	%AREA	KG
Number of Subsamples	1	1	1	1	1	1
ARM Action Codes			TAB[2]	AL	ET1	
Number of Decimals	1	2	2	2	2	2

Trt Treatment Rate						
No. Name Rate Unit	1	2	3	4	5	6
1 Untreated Check	11.7 -	15.51 a	0.00 c	2.31 b	32.88	7.55 b
2 TUB 0.5 l/ha	11.6 -	1.74 b	88.74 ab	21.58 a	4.53 bc	8.20 a
3 TUB 1 l/ha	12.2 -	0.83 b	95.62 a	28.98 a	3.93 c	8.16 a
4 TILT 250 0.5 l/ha	12.1 -	2.35 b	85.11 ab	27.82 a	8.59 a	8.20 a
5 MICO 60 1.5 l/ha FUNGOL 1.25 l/ha	12.5 -	3.88 b	74.08 b	11.46 a	5.13 b	8.16 a

LSD (P=.05)	1.46	3.146	12.747	0.435t	0.830	0.360
Standard Deviation	0.95	2.042	8.273	0.282t	0.509	0.233
CV	7.86	42.0	12.04	23.91	9.19	2.9
Bartlett's X2	8.56	10.194	6.96	6.687	4.22	2.316
P(Bartlett's X2)	0.073	0.037*	0.073	0.153	0.239	0.678
Skewness	2.0681*	1.7361*	-1.3261*	-0.7822	1.2312*	0.1737
Kurtosis	5.3045*	2.3213*	0.1148	-0.6432	0.3684	-0.5835
Replicate F	0.945	4.361	2.117	0.673	0.842	22.649
Replicate Prob(F)	0.4494	0.0270	0.1515	0.5849	0.5083	0.0001
Treatment F	0.695	35.181	89.772	8.017	67.461	5.873
Treatment Prob(F)	0.6094	0.0001	0.0001	0.0022	0.0001	0.0074

Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)
t=Mean descriptions are reported in transformed data units, and are not de-transformed.
Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.
Missing data estimates are included in columns:Yates=5

December 2014

Help for AOV Means Table

For example, click on treatments in help topic for options on treatments and treatments fields on report

Assessment Data "Column Properties"

- New editor panel
- Presents analysis of the current data column
- Fix violations of AOV assumptions
- Find statistical outliers
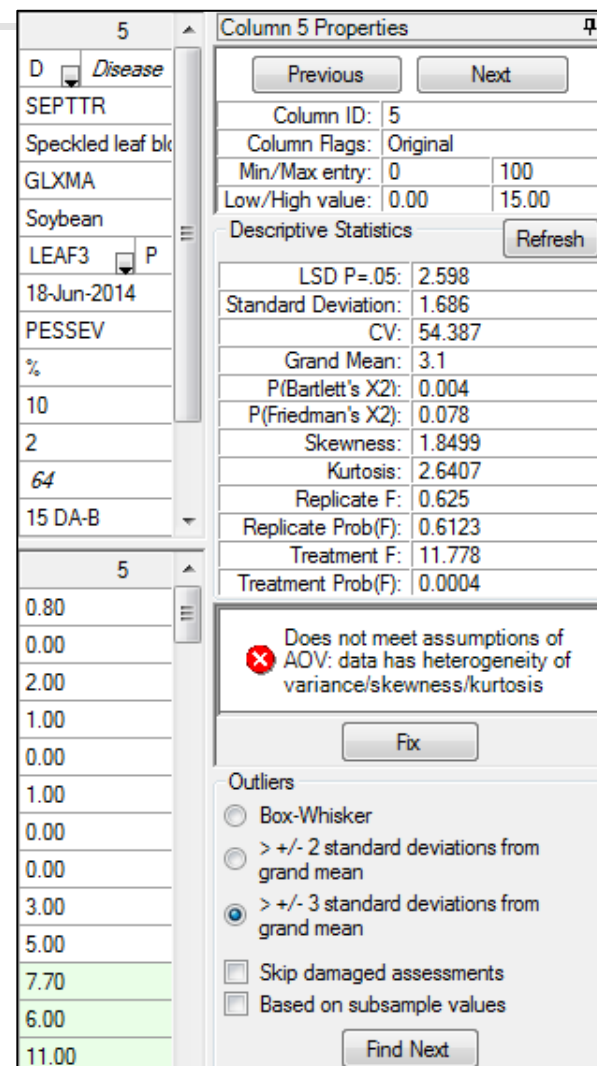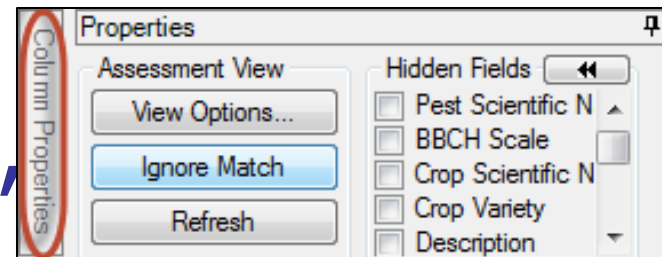
Assessment Data "Column Properties"

- Column navigation
- Column description
- Min, Max, Range
- Transformation formula description
- Click "Refresh" to update after changing current data column

Column 5 Properties	📌
Previous	Next
Column ID:	5
Column Flags:	Original, Changed, ARM action code changed
Min/Max entry:	0 | 100
Low/High value:	0.00 | 15.00
Formula AL:	LOG([5]+ 1)
	Refresh

Assessment Data "Column Properties"

LSD P=.05:	2.598
Standard Deviation:	1.686
CV:	54.387
Grand Mean:	3.1
Bartlett's X2:	15.5
P(Bartlett's X2):	0.004
Friedman's X2:	8.4
P(Friedman's X2):	0.078
Skewness:	1.8499
Kurtosis:	2.6407
Replicate F:	0.625
Replicate Prob(F):	0.6123
Treatment F:	11.778
Treatment Prob(F):	0.0004

- Descriptive statistics from full AOV of data

- Displays violations of AOV assumptions

- "Fix" prompts if can resolve violations

Does not meet assumptions of AOV: data has heterogeneity of variance/skewness/kurtosis

Fix

ARM - SPECIAL CONFIRMATION

Apply automatic data correction transformation 'Log(n+1)' to data column 5 to correct ?

Yes　　No　　Help
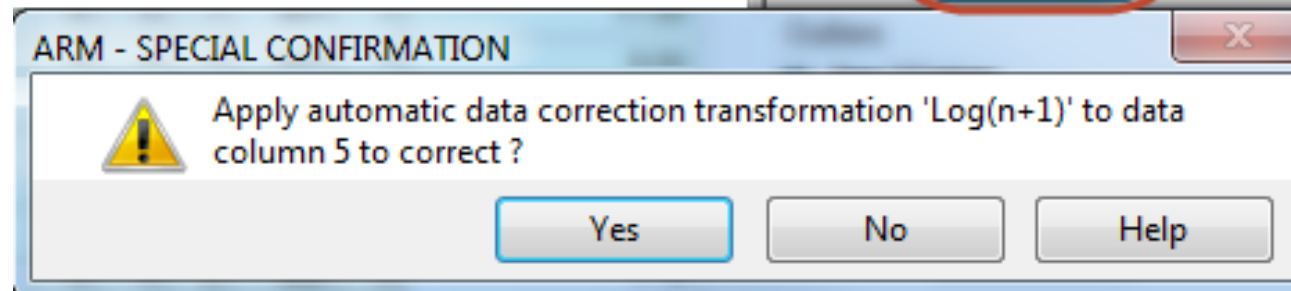
Assessment Data "Column Properties"

- Search for outliers in current data column using a standard outlier test

- "Find Next" locates each statistical outlier

- "Damaged" drop from outlier test and AOV

New Assessment Sorts

- Sort data by any 'plot' experimental unit description column

- Click heading once for ascending sort, click again for descending sort

+	Sub	Rp	Bk	Col	Plot	Trt	3
🔒	1	4	4	5	405	5	10.00
📋	1	4	4	4	404	4	0.00
	1	4	4	3	403	2	3.00
	1	4	4	2	402	3	0.00
	1	4	4	1	401	1	0.00
	1	3	3	5	305	4	3.00
	1	3	3	4	304	5	0.00

New Assessment Sorts

⬇	Sort by (Ascending)...	▶
⬆	Sort by (Descending)...	▶
	Transform...	
	Recalc Transformations	

Replicate
Block
Column
'Plot' Experimental Unit
Treatment
Alt Plot ID
Barcode/RFID
Latitude
Longitude
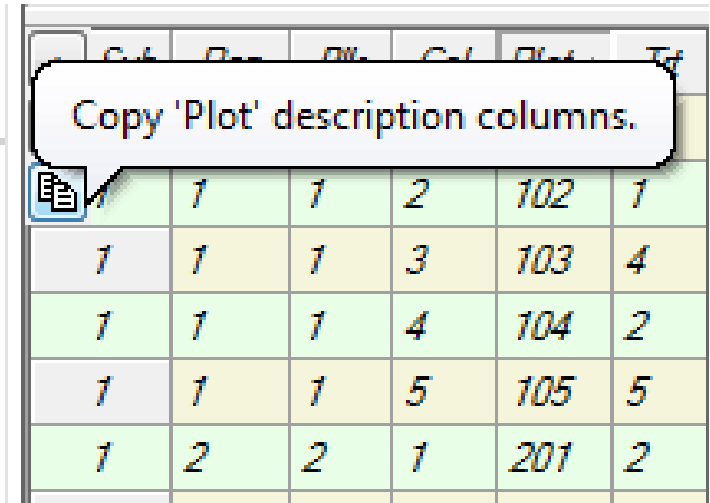
Assessment Order
Harvest Order

- New sorts are also on right-click menu

- Provides full list of sort orders from available 'Plot' experimental unit descriptors
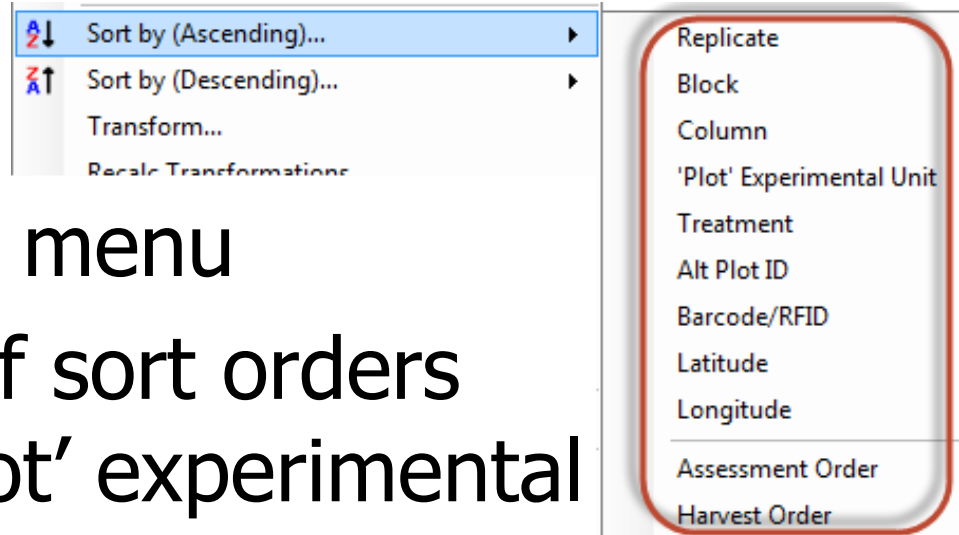
Copy 'Plot' Assessment Unit Description

- New shortcut button in assessment editor
- Copies entire plot description, including column headings
- Simple transfer of ARM randomization to planting, application, or harvest software (shown pasted to Excel)

	A	B	C	D	E
1	Rep	Blk	Col	Plot	Trt
2	1	1	1	101	3
3	1	1	2	102	1
4	1	1	3	103	4
5	1	1	4	104	2
6	1	1	5	105	5
7	2	2	1	201	2
8	2	2	2	202	3

Convert Yield using Harvested Plot Length/Width per Plot 9.2014

Automatic Mix Size Calculator

On Settings - Application tab, to calculate mix for all plots of 1 liquid treatment application select:

1. Volume unit
2. Mix unit
3. Overage to fill applicator lines per treatment + before/after plot

# Insert or Delete Multiple Repeating Sections at Once

New option on Site/Protocol Description Properties panel

1. Define number to add or delete
2. Select 'Insert' or 'Delete' button
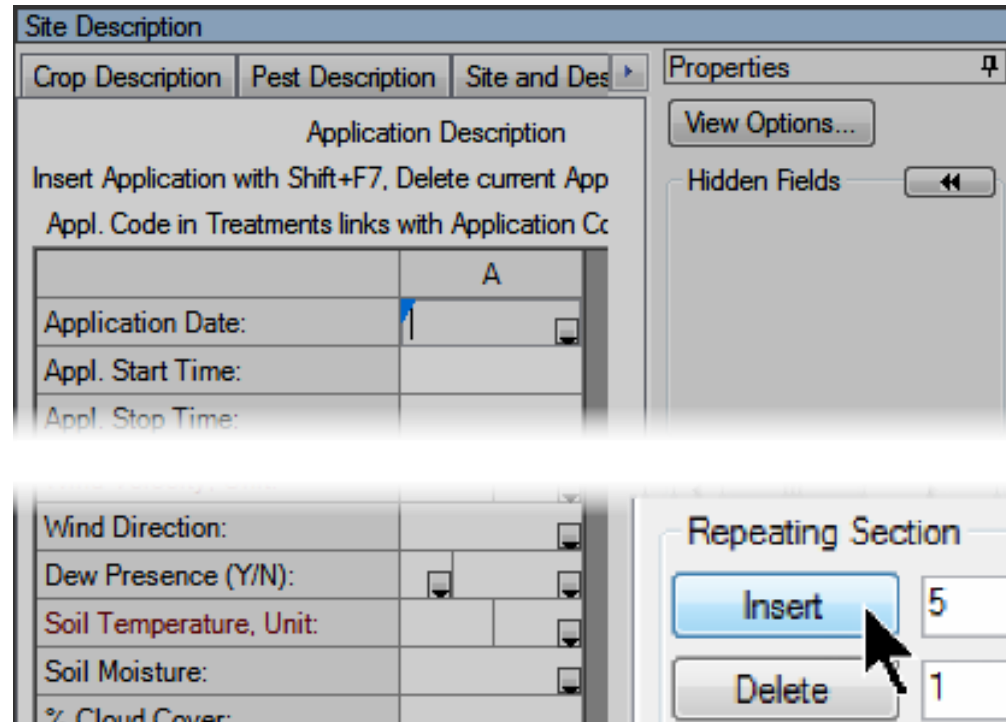
Assist Migration to a New PC

- Create migration package of original PC (in ARM 9.2014.2+) containing:

Utilities	Window	Graph	Add-Ins	Help

  Historical Tools

  Install License...

  Rebuild Study List

  Migrate Studies and Settings to New Computer...

  Conversion Calculator

  - ARM studies
  - Personal lists
  - ARM and report options, report sets
  - ARMbackup folder contents (if package is stored on ARM's backup device)
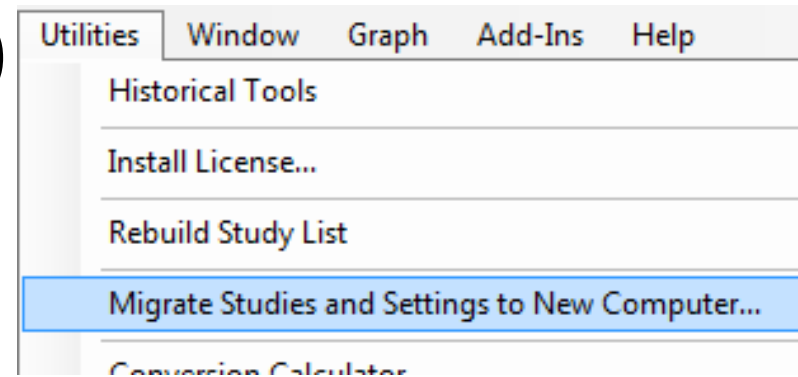
Migration Wizard

- Select ARM version that will be installed on the new PC

- Select items to include in the package

Migrate Studies and Settings to New Computer

Are you migrating files to ARM 9 or ARM 2015?

○ ARM 9

◉ ARM 2015 (or newer)

Note: Full migration is only supported for ARM 2015

| Help | Cancel | < Back | Next > |

Migrate Studies and Settings to New Computer

Select which components to migrate to an ARM 2015 (or newer) computer.

☑ Settings folder options

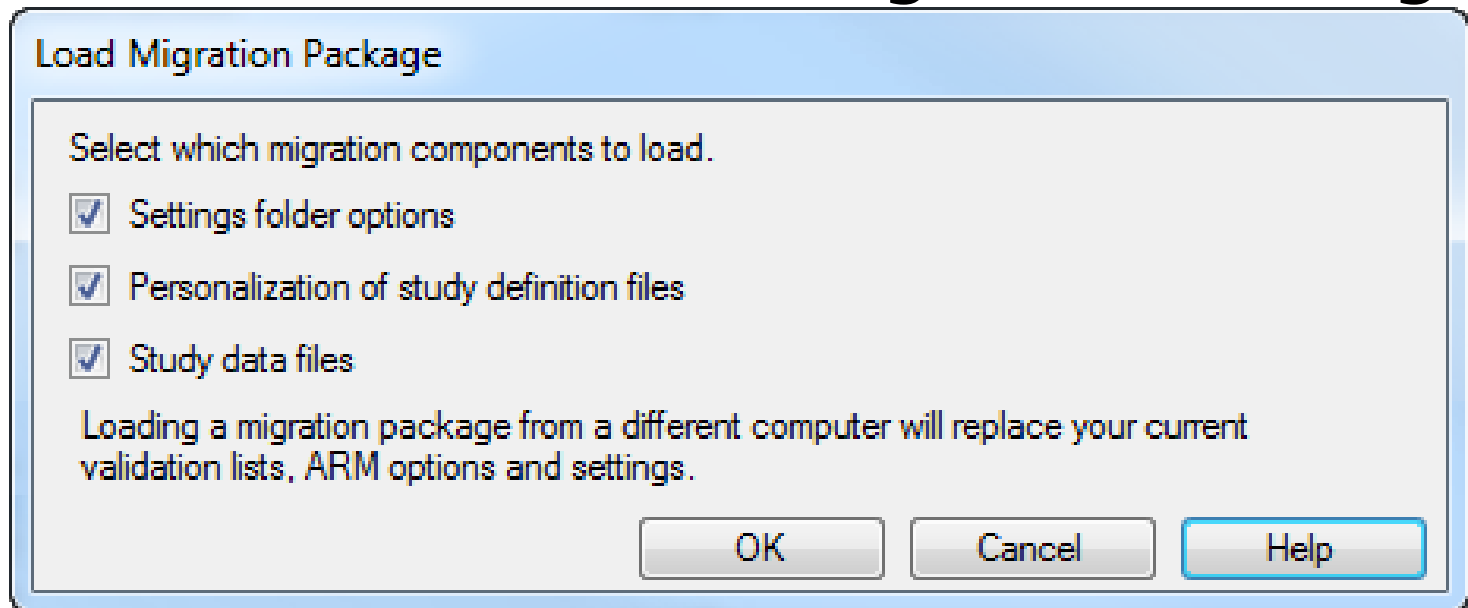☑ Personalization of study definition files

☑ Study data files

Migration files will be created in F:\ARMbackup\.

| Help | Cancel | < Back | Next > | Finish |

Import Migration in ARM 2015

On the new PC with ARM 2015, either:

- Use migration package when installing ARM
- Use Utilities menu "Load Migration Package"

Load Migration Package

Select which migration components to load.

- ☑ Settings folder options
- ☑ Personalization of study definition files
- ☑ Study data files

Loading a migration package from a different computer will replace your current validation lists, ARM options and settings.

OK   Cancel   Help

'Create this Trial' in Protocol

- Right-click on row of trial to create in planned trials grid of protocol

- Creates each trial using listed trial ID, opens in separate ARM sessions

Summary Across Trials 2015

- ST Report option to print Mean Level CV

- Identify on ST Report the error term used for mean comparison tests when either Trial or Treatment is random, as defined on ST Summary Options dialog
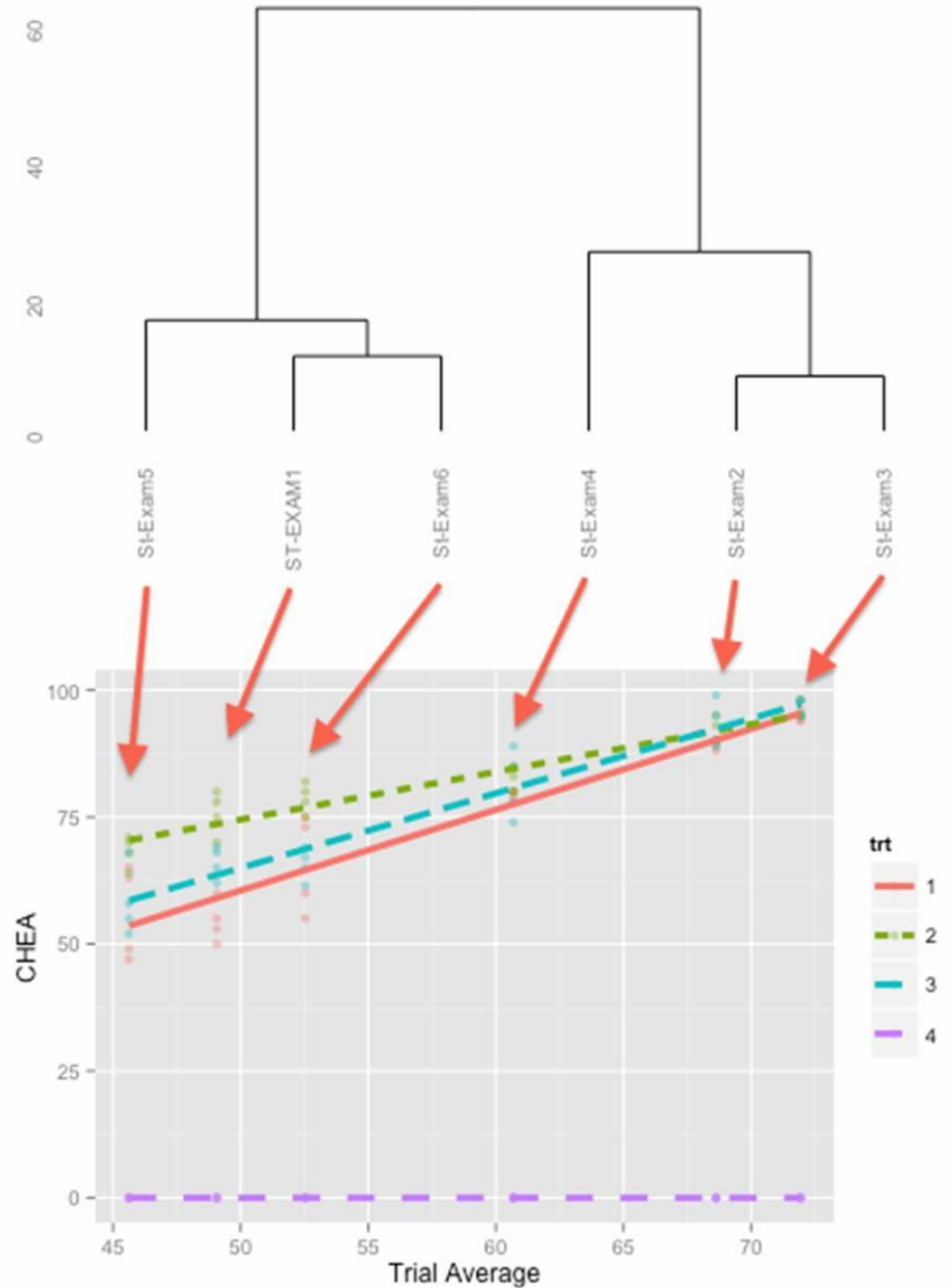
Summary Across Trials 2015

- Graph helps identify "location" (trial) groups when a significant location effect (treatment x trial interaction) is detected

ST 2015

- Dendogram

- Treatment *
  Trial graph

Summary

New ARM 2015 tools can help improve trial quality and efficiency:

- Plan appropriate number of replicates
- Improve quality of randomizations
- Analyze results to improve planning of follow-up experiments

Summary

- ARM 2015 release 4th quarter 2014
- Upgrade from ARM 9/8 for reduced cost
- See www.gdmdata.com for the newest information on ARM 2015