ARM Tips & Techniques

20th Annual at NAICC

Powered by GDM

Our **Mission**

“Provide the research community technology to improve efficiency and accelerate innovation”

ARM Software is Trusted by Over 10,000 Researchers and Scientists Worldwide

Use ARM for all stages of an experiment.

To **plan** and **create** protocols, to **randomize** and **manage** trials, to **analyze** data and **report** the results.

ARM software provides a defined structure to enter information consistently, with master list dictionaries to standardize vocabulary, and has tools for every step of an experiment.

The **Last Year in Review**

ARM the Industry Standard

The top 12 Agro-Chemical companies now depend on ARM Software worldwide.

Field License Bundle

This bundle brings ARM to the field to help improve efficiency and accuracy.

Leaf Wall Area

Software solution for an industry specific challenge. ARM facilitates the research techniques for future regulation of product applications.

Weather Data Import

Collaboration with ClearAg (Iteris) to build a new feature that allows you to import weather data.

ClearAg offers specific information by utilizing meteorology, agronomy, land surface modeling and crop production at specific GPS coordinates.

Marketing & Support

We hired a full-time sales and marketing associate to focus on our client communications.

The **Year Ahead**

Training Initiatives

Continue to expand our tools and resources to make it easier for our clients.

- Tutorials
- Coaching Events
- Webinars

Product Release

Work as a team to ensure every client is aware of the new features and how to use them to make their work more efficient.

Precision Ag

Work closely with South Dakota State University to provide support with development and implementation.

- Correlation of known variability
- UAV data analysis

Client Driven Development

Working closely with our clients to implement additional features and intuitive reporting.

Providing new features throughout the year.

ARM improves efficiency, increases accuracy, and promotes better quality of results.

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ARM 2019 Enhancements

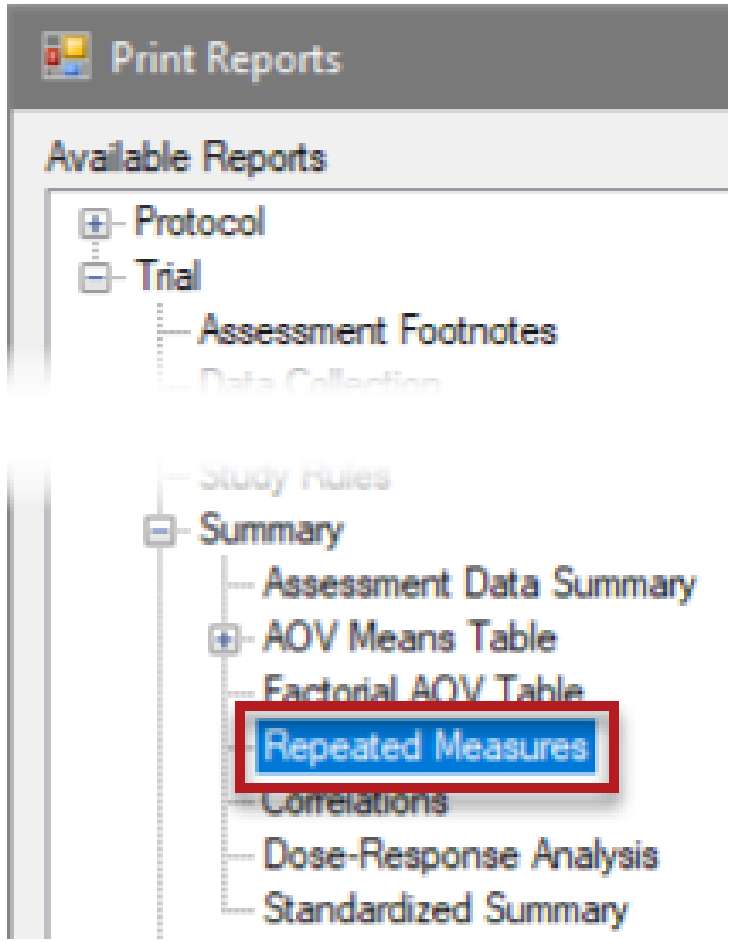
Repeated Measures

Repeated Measures

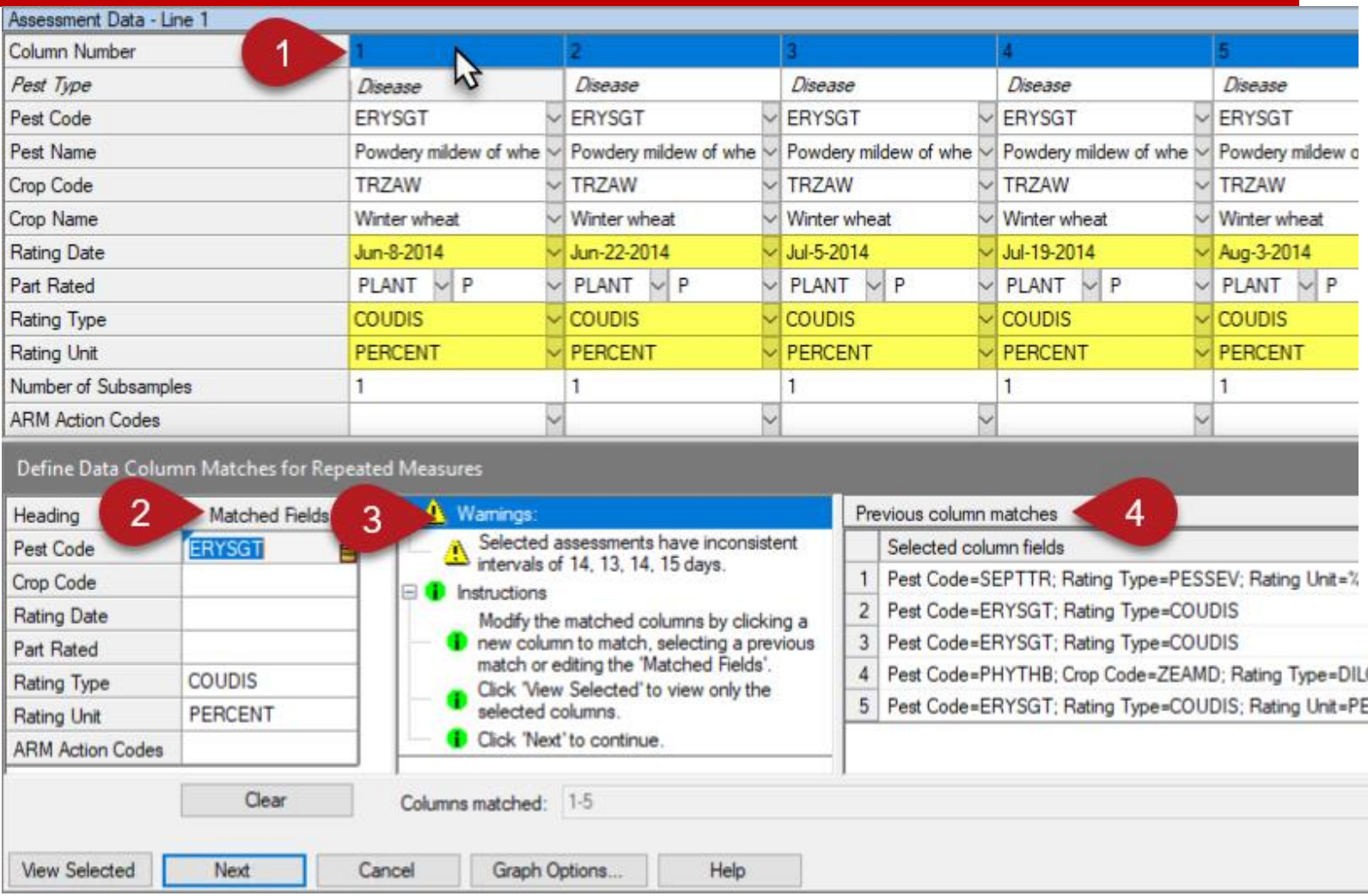
Analyze repeated assessments across time

Enhancement

- Powerful statistical analysis which enable the control of factors which cause variability between treatments over time.
- Provides analysis of treatment means over time to determine if there is an overall time effect on the treatments performance.



Repeated Measures



Define assessments for analysis:

1. Select a column to find potential repeated assessments.
2. ARM proposes fields to match other columns.
3. Diagnose issues with column selection.
4. Or load from history of column matches.

Repeated Measures

Means and comparison letters for:

- Treatments Rating Dates
- Treatment x Rating Date interaction

Apply correction to adjust for correlation (H-F-L or G-G)

Repeated Measures AOV table

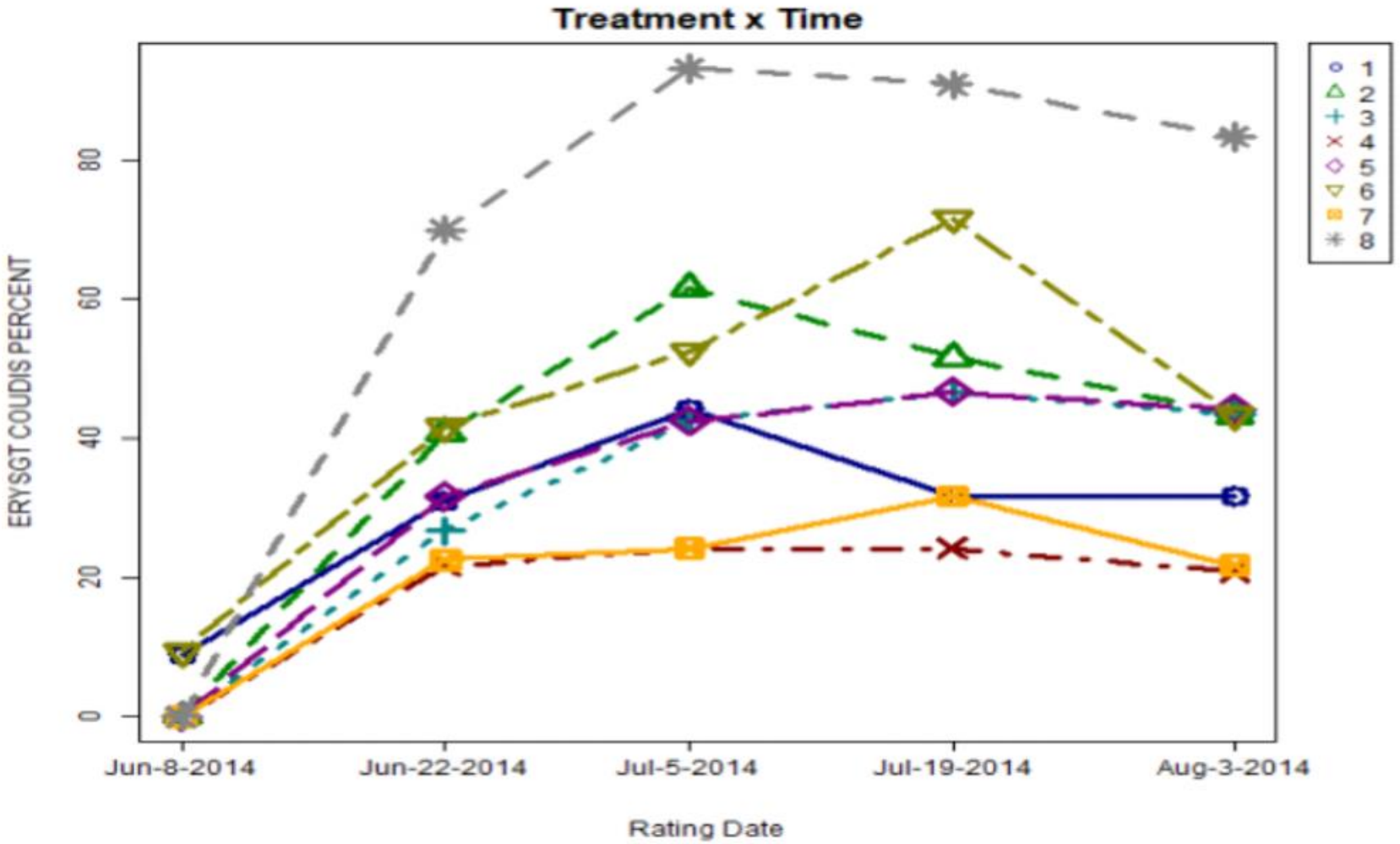
REPEATED MEASURES AOV For D ERYSGT Blumeria graminis tritici Powdery mildew of wheat TRZAW
PLANT P COUDIS PERCENT 1

Source	DF	Sum of Squares	Mean Square	F	Prob(F)	HSD (.05)	Variance
Total	220.0	141626.962500					
Replicate	5.0	65.637500	13.127500	3.127	0.0195		0.223238
Treatment	7.0	51065.995833	7295.142262	1737.776	0.0001	1.70	
Treatment Error	35.0	146.929167	4.197976				-0.246155
Rating Date	3.6	71570.358333	17892.589583	3295.895	0.0001	1.31	
Treatment x Rating Date	25.1	17909.441667	639.622917	117.821	0.0001	5.35	
Error/Residual	143.6	868.600000	5.428750				5.428751

Pest Code	ERYSGT
Pest Name	mildew of wheat
Crop Code	TRZAW
Crop Name	Winter wheat
Part Rated	PLANT P
Rating Type	COUDIS
Rating Unit	PERCENT
Number of Subsamples	1

Trt No.	Treatment Name	Rate	Rate Unit	Appl Code	
TABLE OF Treatment MEANS					
1	Sure Kill	3	lb ai/a	A	29.4 f
2	Sure Kill	3	lb ai/a	A	39.5 c
3	Sure Kill	3	lb ai/a	A	31.8 e
4	Sure Kill	3.5	lb ai/a	A	18.2 h
5	Sure Kill	3	lb ai/a	A	33.0 d
6	Sure Kill	4	lb ai/a	A	43.7 b
7	Super Stomp	2.5	lb ai/a	A	20.0 g
8	Untreated				67.5 a
Error DF Correction (H-F-L)					.
Tukey's HSD P=.05					1.70
Standard Deviation					2.05
CV					5.79
TABLE OF Rating Date MEANS					
1	Jun-8-2014 (Data Col 1)				2.3 e
2	Jun-22-2014 (Data Col 2)				35.7 d
3	Jul-5-2014 (Data Col 3)				48.1 b
4	Jul-19-2014 (Data Col 4)				49.4 a
5	Aug-3-2014 (Data Col 5)				41.5 c
Error DF Correction (H-F-L)					0.90
Tukey's HSD P=.05					1.31
Standard Deviation					2.33
CV					6.58
TABLE OF Treatment Rating Date MEANS					
1	Sure Kill 1 Jun-8-2014 (Data Col 1)	3	lb ai/a	A	8.8 o
2	Sure Kill	3	lb ai/a	A	0.0 p
2	Super Stomp	1.5	lb ai/a	A	

Repeated Measures



Treatment x Time Graph

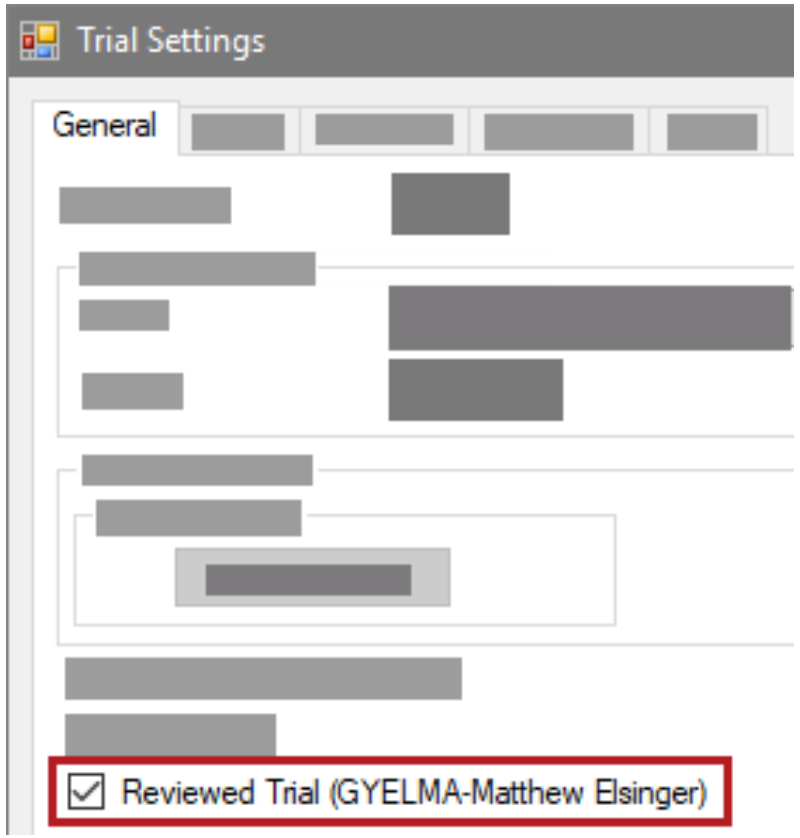
- Plot treatment means over time.
- Visually identify treatment interaction across assessment dates.

Study Review

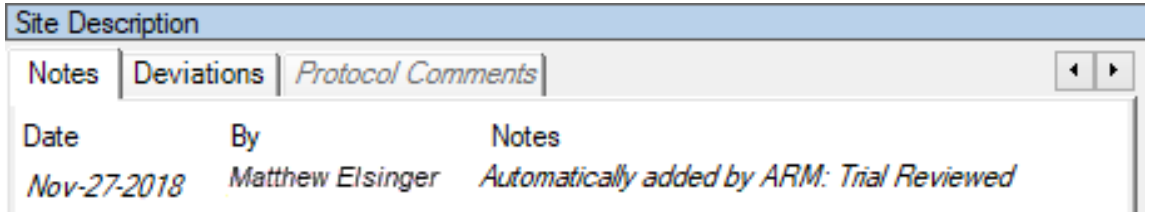
Review Study

Mark a trial as Reviewed

- Track whether a trial has been reviewed
- Identifies who marked as reviewed
- Trial Settings > General tab



- 'Trial Reviewed' action is automatically logged in Notes tab of Site Description
- Checkbox is cleared when any change is made to data in the trial



Review Study

Create a review group

Study Rules - Rule 1 of 1

Rule	Rule ID	Editor	Field	Condition
1	Review	Trial	Trial	Everyone in my company

- 'Review' study rule defines who is allowed to mark a trial as reviewed
- **Condition** field defines who to include in the group:
  - just protocol or trial owner(s)
  - everyone in my company
  - Anyone (i.e. no group)
- Example: Sponsor wants to ensure the study is reviewed internally. Contractor can still create their own separate review group to review before sending back to the sponsor by adding another 'Review' rule for their company.

Study Rules

Study Rules

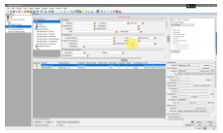
Merge Study Information

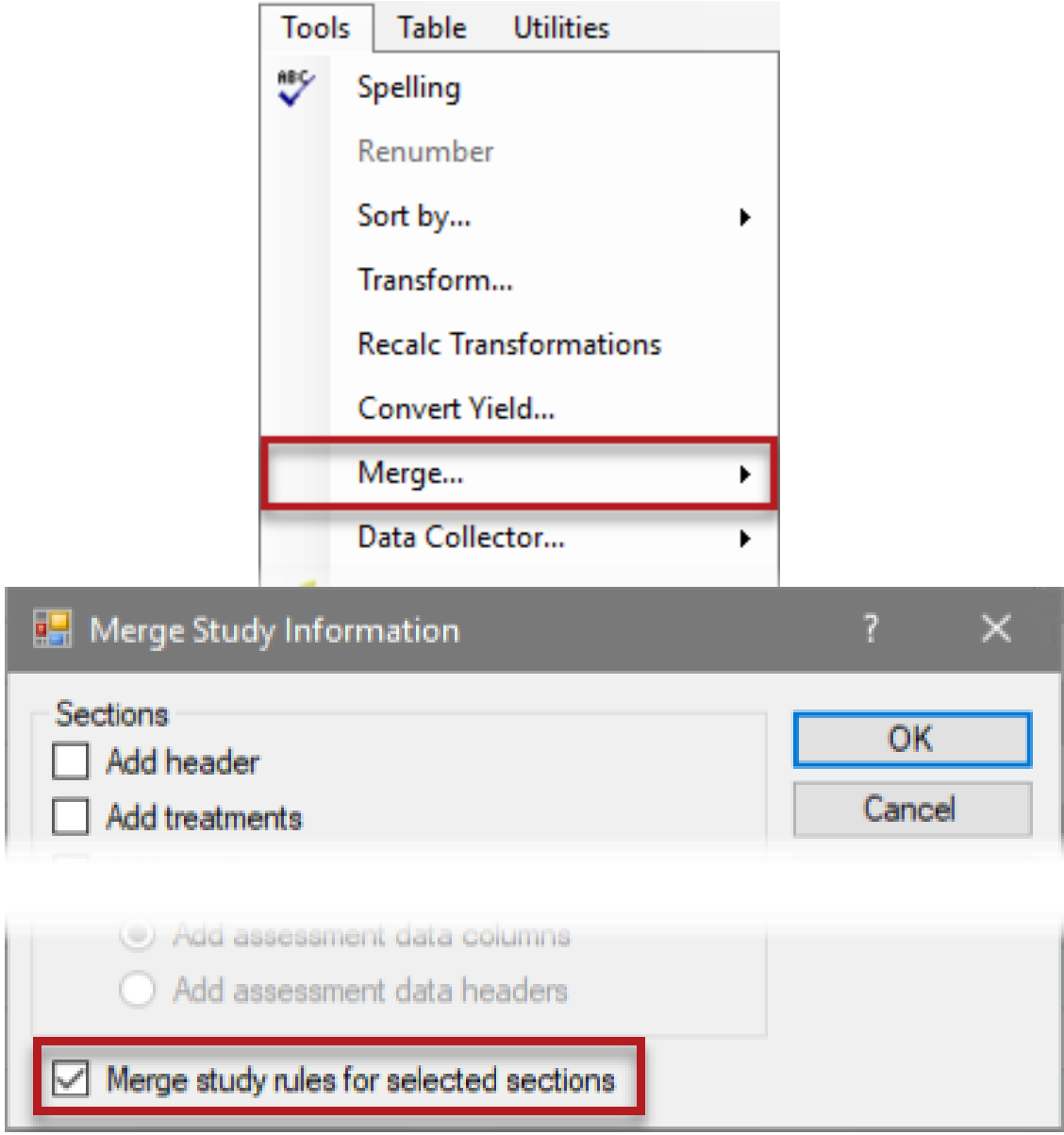
- Easily copy information from study to study.
- Replaces “Save As” function.

Enhancement

- Choose to *not* merge study rules if the study is originated by your company.
- Offers new flexibility for internal researchers.

Feature in action

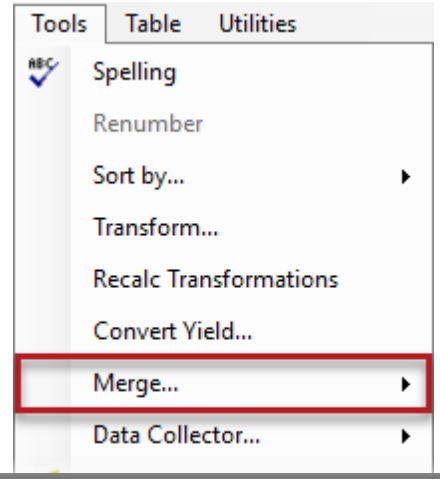


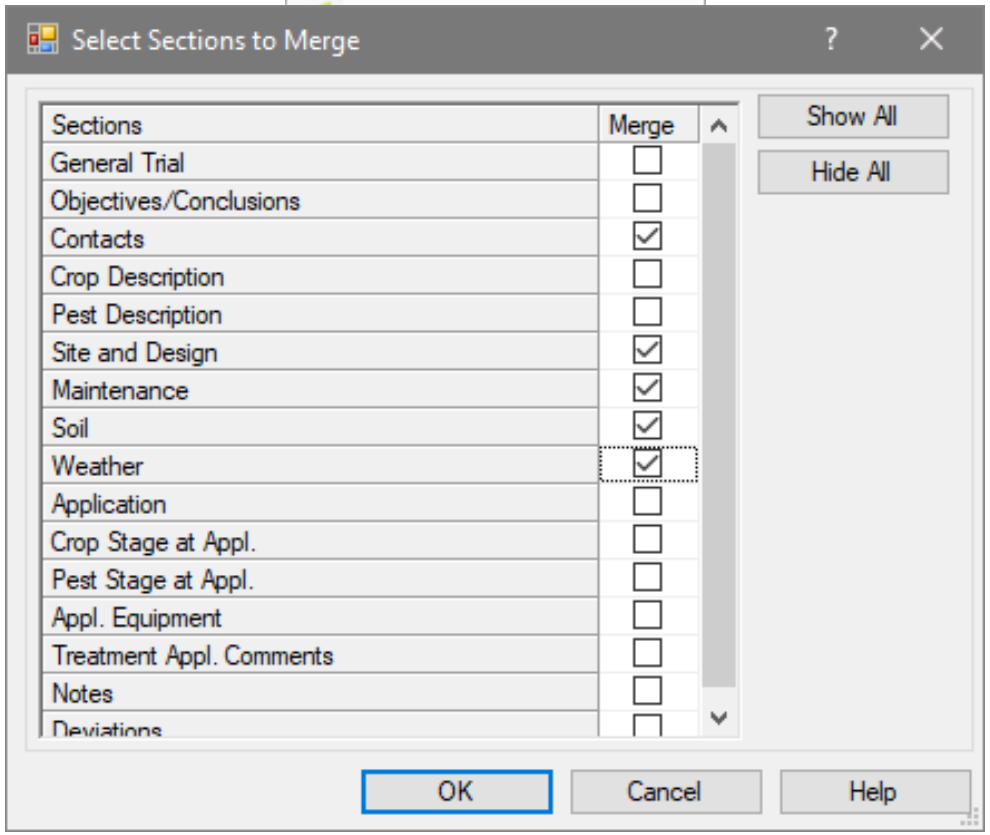


Merge Study Rules

Enhancement

- Limit study rules merged to only selected protocol/site description sections.

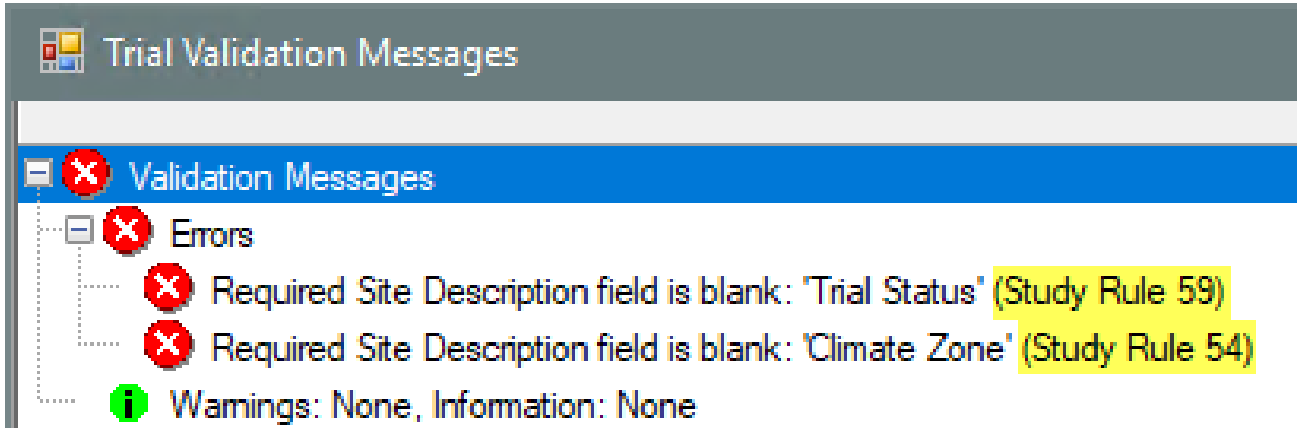




Validation

Always Validate Studies

- Validation ensures all protocol criteria has been met.



Enhancement

- Validation messages now list the study rule number that triggered the error or warning message.

Feature in action

Rule Set

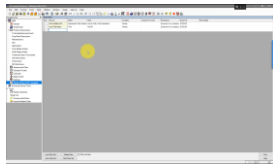
Rule Set Name Identification

- Identifies/Verification of the correct rule set used within study.

Enhancement

- The name of the loaded rule set now displays in the editor heading when a rule is selected within the table.

Feature in action



Study Rules - Rule 2 of 4 | Rule Set: hiddenFldsGDM

Rule	Rule ID	Editor	Field	Condition
1	Limit validation list	Assessment Data Header	Crop & Pest in Site Description	Always
2	Hidden Field	Header	Trial Title Line # 2	If not in my company
3	Hidden Field	Treatments	Description	If not in my company
4	Hidden Field	Treatments	Comment 2	If not in my company

Tools

Tools: Merge

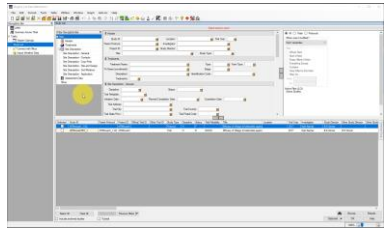
Existing blank treatments are automatically removed when performing a merge with another study.

Treatments - Line 1

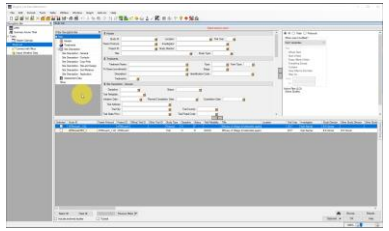
Trt Line	Trt No.	Type	Treatment Name	Form Conc	Form Unit	Form Type
1	1					
2						
3						
4						

Treatments - Line 1

Trt Line	Trt No.	Type	Treatment Name	Form Conc	Form Unit	Form Type
1	1	CHK	Untreated Check			
2	2	HERB	Banvel 720	348	GA/L	L
3	3	HERB	FallowMaster	251.999985	GA/L	SC
4	4	HERB	Marksman	384	GA/L	F



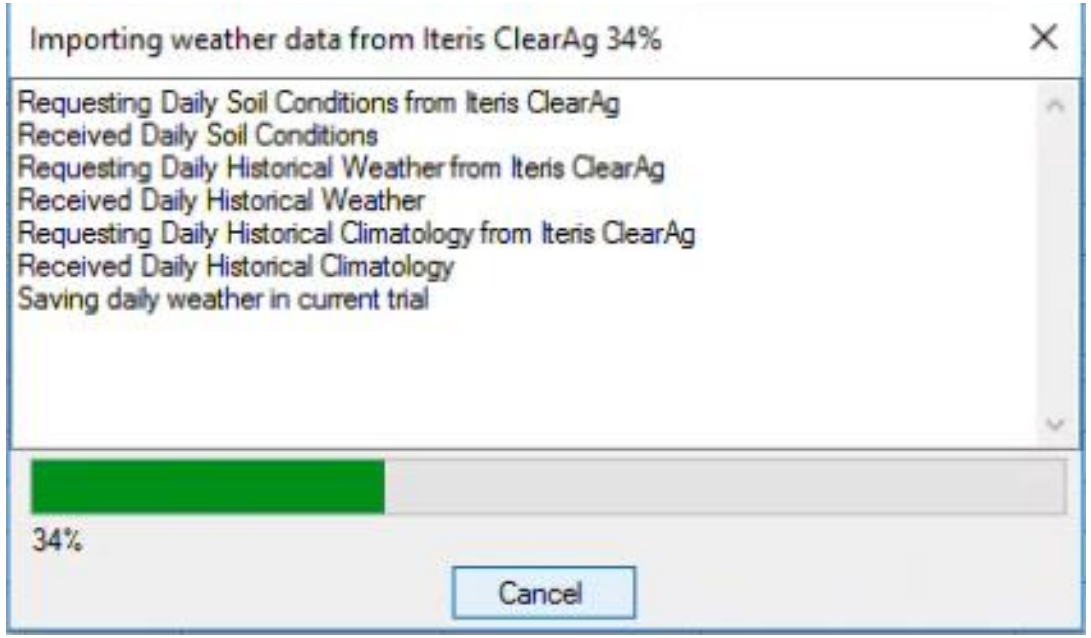
<- Before and After ->



Tools: Import Weather

Progress bar added during Weather import

- The weather is imported from outside the ARM software.
- This ensures you know that progress is being made ☺.

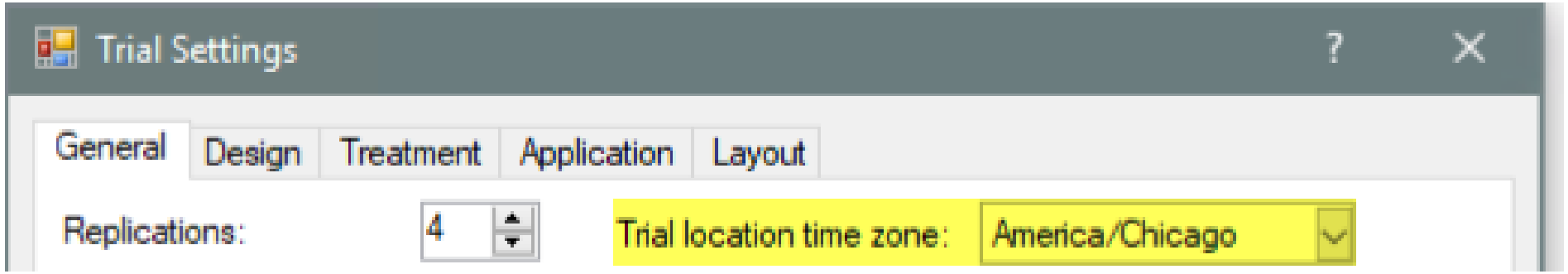


Study Settings

Trial Time Zone

Why is a specific time zone needed?

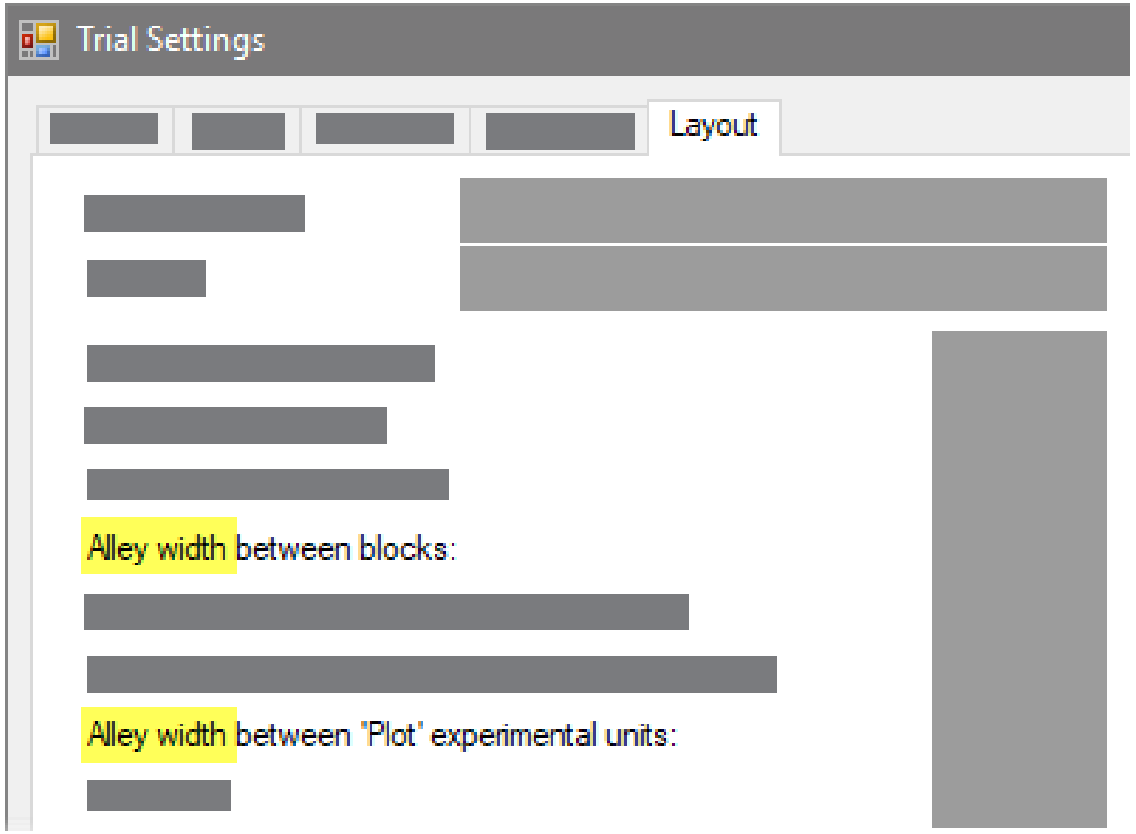
- Ensure the alignment of the trial location in relation to time zone to external data providers.
  - New Weather API will align location specific weather for a particular time, such as per application.
- Trial Settings > General tab



Layout Options

Clarified 'buffer' option text

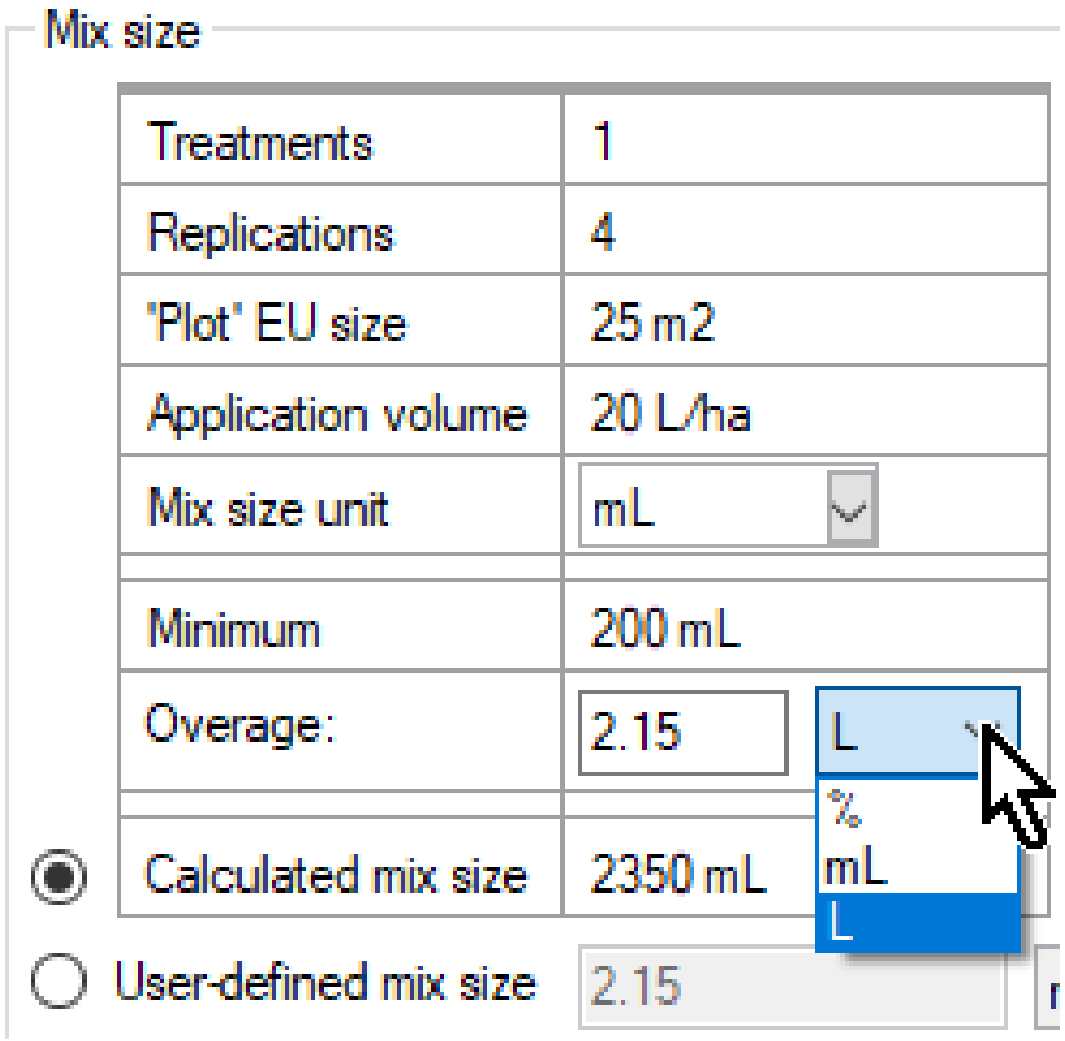
- Changed to 'Alley width' - a more commonly used term
- Previously called 'Buffer' between blocks or plots
- Protocol/Trial Settings > Layout tab



New Options - Liters

Liters as an Overage Option

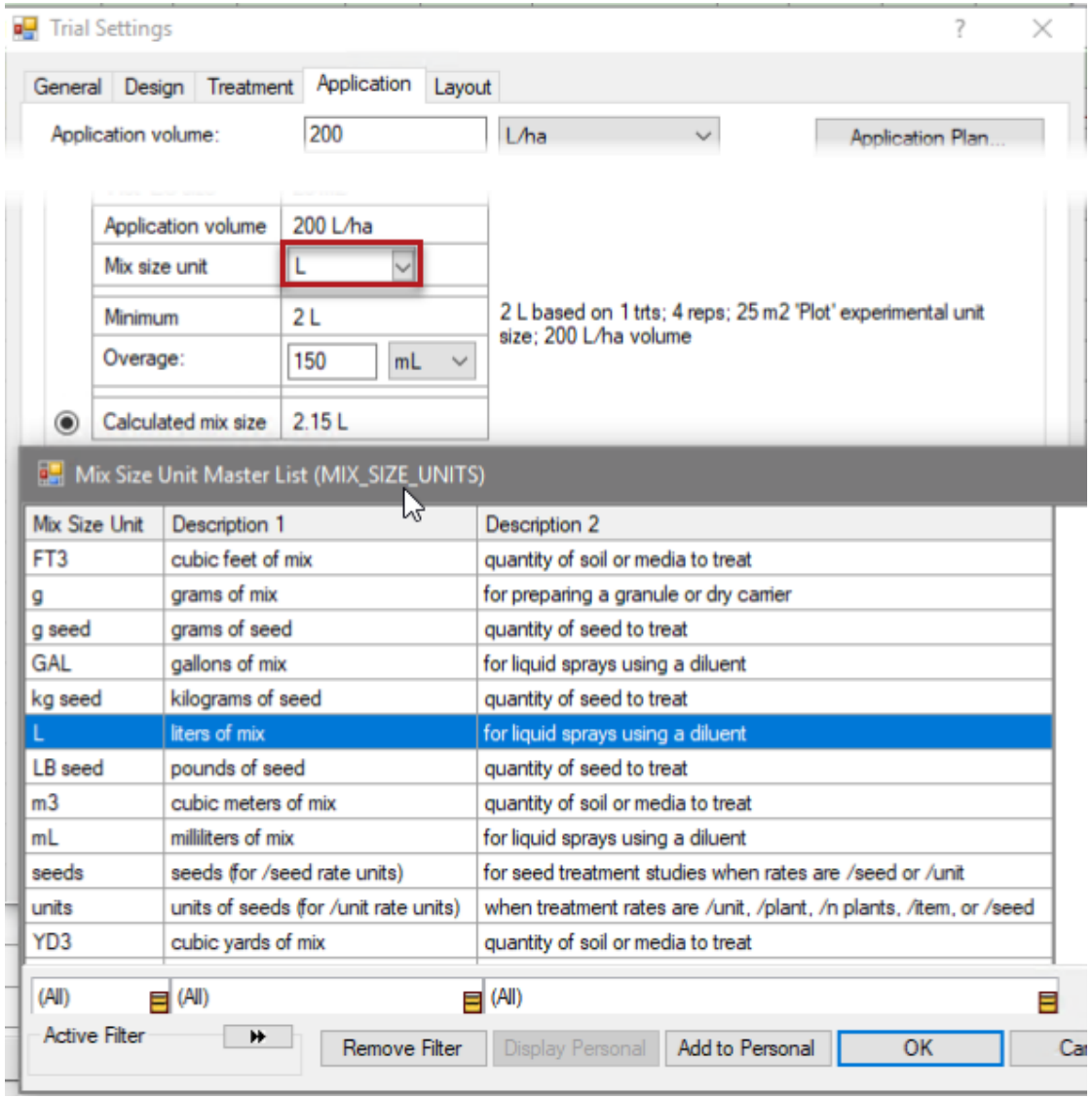
- Clients may have equipment that requires a very large amount of overage. Instead of using ML's (1000's), you now have the option of Liters. Example: 2150ML vs, 2.15L.
- Can be entered in the Settings > Application tab or, Appl. Equipment > Mix Overage, Unit or, Application Plan.



Mix Size Units

Enhancement

- Brings consistency to the unit names whether you are in the treatments editor, settings, or application plan.
- Settings > Application tab
- Appl. Equipment > Mix Overage, Unit or, Application Plan



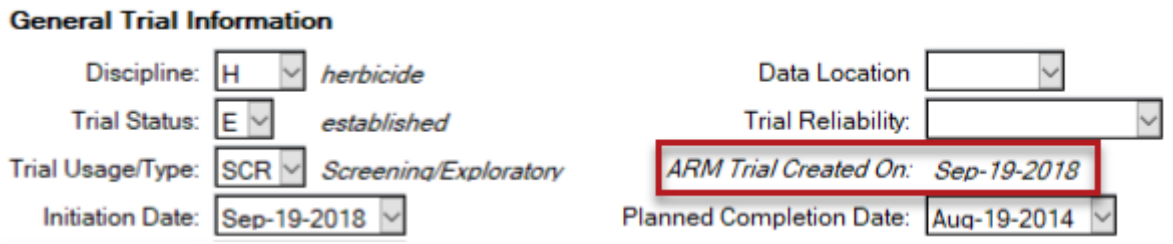
Site Description

Track Trial Progress*

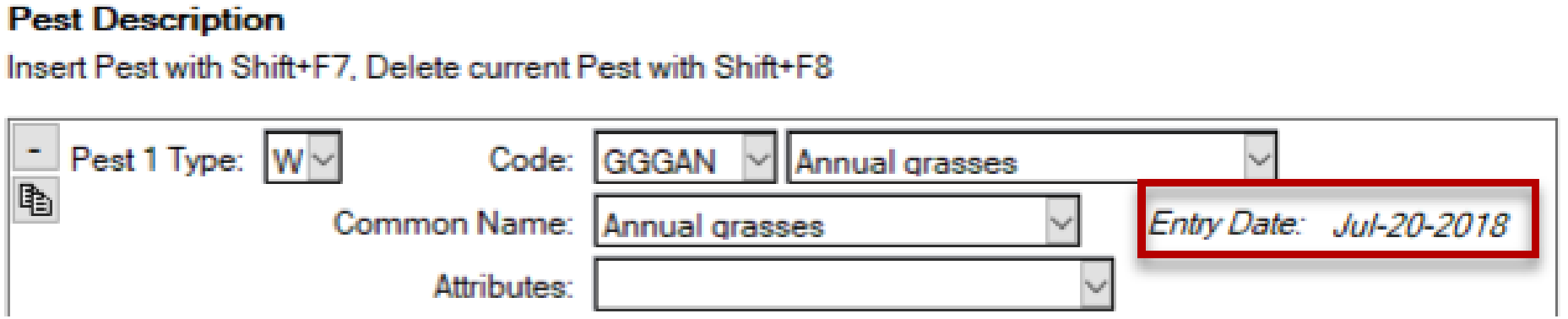
*Coming in ARM 2019.1

Why document trial progress?

- Requested by sponsors.
- Provides visibility and credibility to timely data entry.



- Added new fields to track status and progress throughout the season.

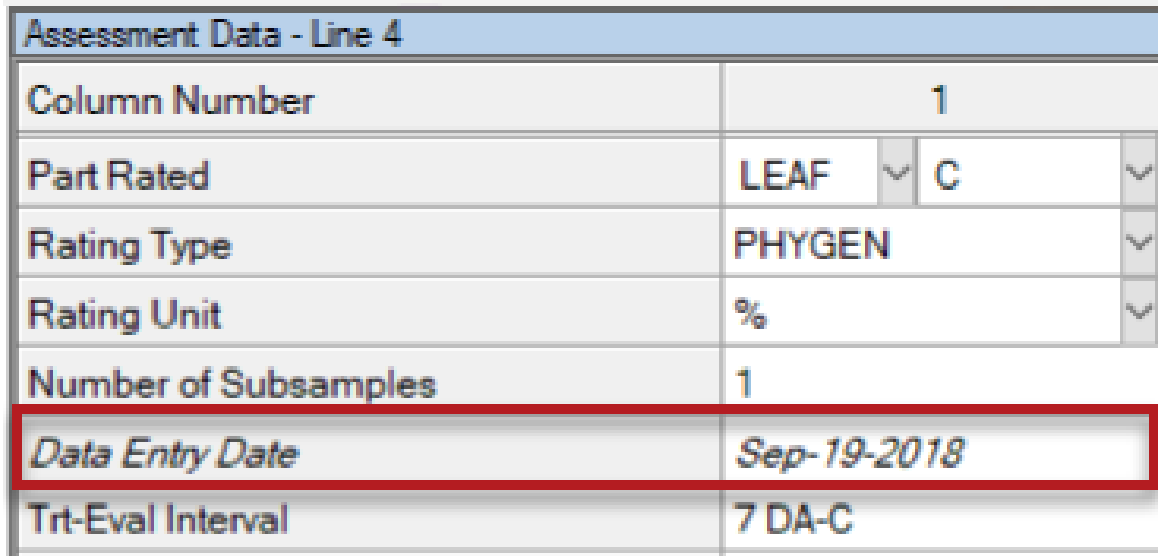


*Coming in ARM 2019.1

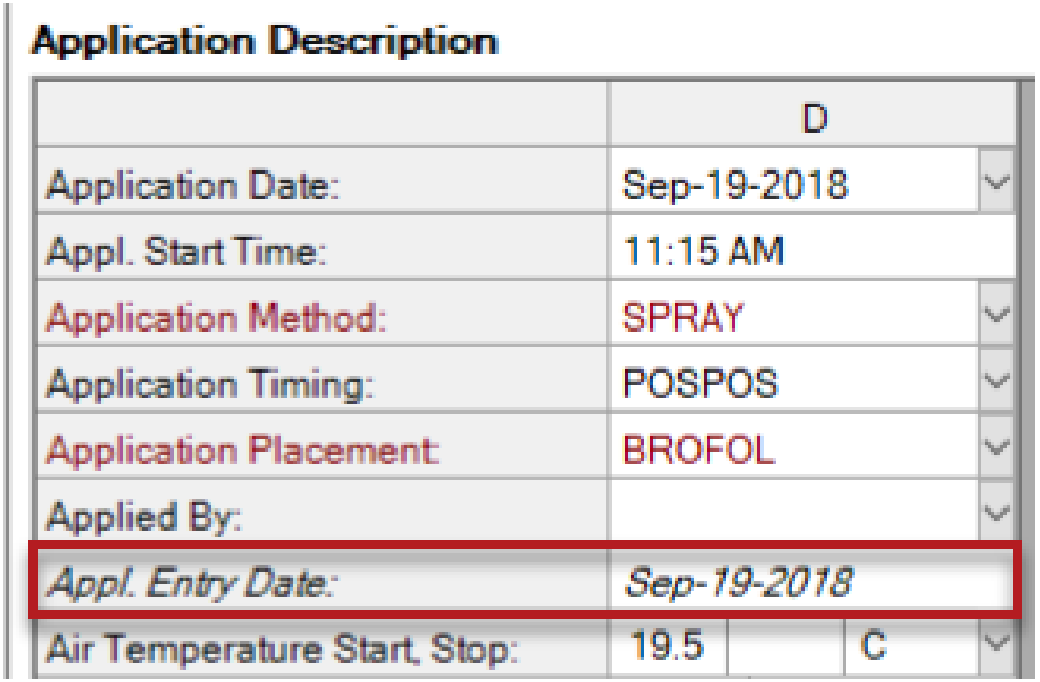
Track Trial Progress*

Additional new fields to track status and progress throughout the season.

- Application tab > **Appl. Entry Date**
- Assessment Header > **Data Entry Date**



Assessment Data - Line 4	
Column Number	1
Part Rated	LEAF C
Rating Type	PHYGEN
Rating Unit	%
Number of Subsamples	1
Data Entry Date	*Sep-19-2018*
Trt-Eval Interval	7 DA-C



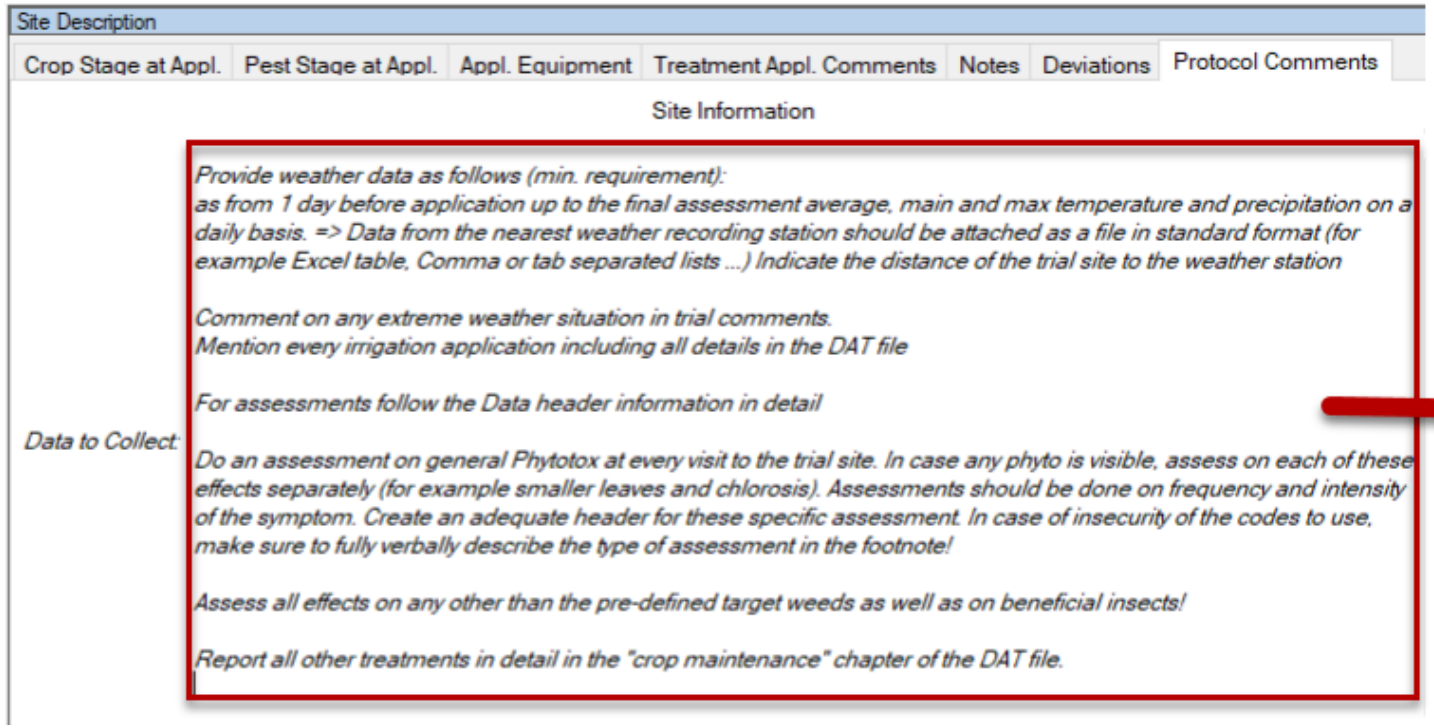
Application Description

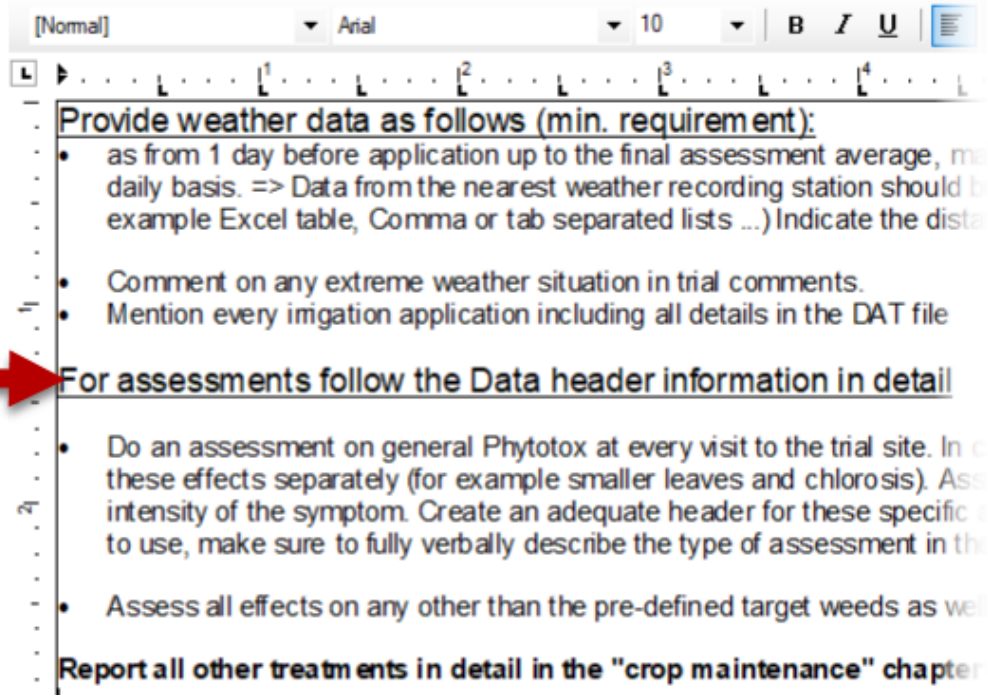
	D
Application Date:	Sep-19-2018
Appl. Start Time:	11:15 AM
Application Method:	SPRAY
Application Timing:	POSPOS
Application Placement:	BROFOL
Applied By:	
Appl. Entry Date:	*Sep-19-2018*
Air Temperature Start, Stop:	19.5 C

Protocol Instructions

Support Rich-Text Formatting

- Preserves the format from the original protocol through to the Trial.

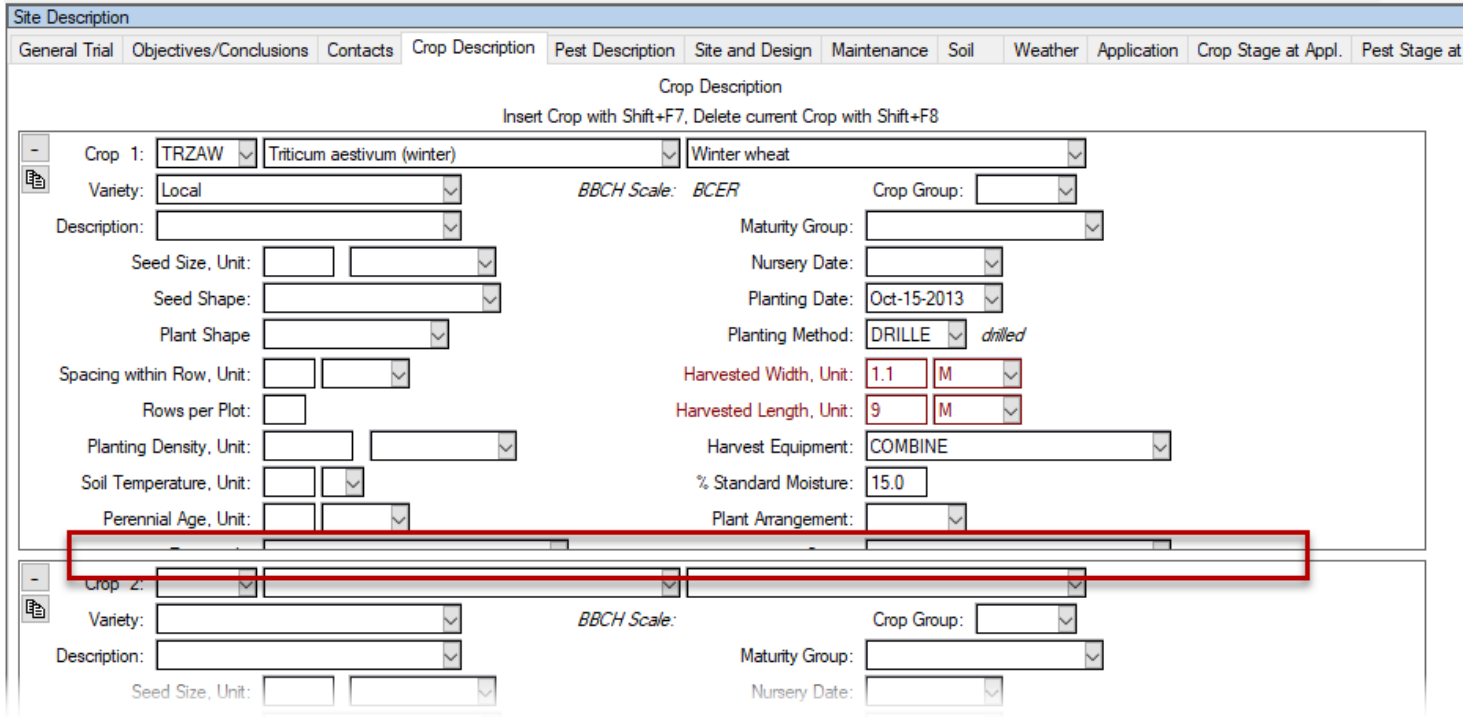




Collapsible Repeating Sections

Fixed:

- Repeating section panels now resize after displaying hidden fields.



Trial Origin*

*Coming in ARM 2019.1

Why track the trial origin?

- Helps answer budget questions.
- Valuable to the R&D division.
- ID's in-house, contracted or by a public institution trials.

Trial Location

Insert row with Shift+F7, Delete current row with Shift+F8

Trial ID	Responsible	Site	Trial Origin	Number of Trials	Site Requirements
123 a 1-5	R.E. Cearch		C	5	
123 a 6-7	Debra Dooley's Data		I	2	
123 a 8-10	Fred's Quality Data		C	3	

Header editor > Trial Origin or,
Trial Establishment Guidelines > Trial location Table

Application Equipment and Plan

Auto-Fill default settings for application planning fields.

- Intuitive way of using Settings set to default and fill out the plan.

Application Information		
Application Date	*Apr-15*	
Row Sides Applied		
Spray Volume, Unit	250	L/HA
Minimum Mix/Treatment	*2.5*	*liters*

Enhancement

- Auto-fills with default entries when clicking in a blank field for mix size, mix overage and spray volumes.

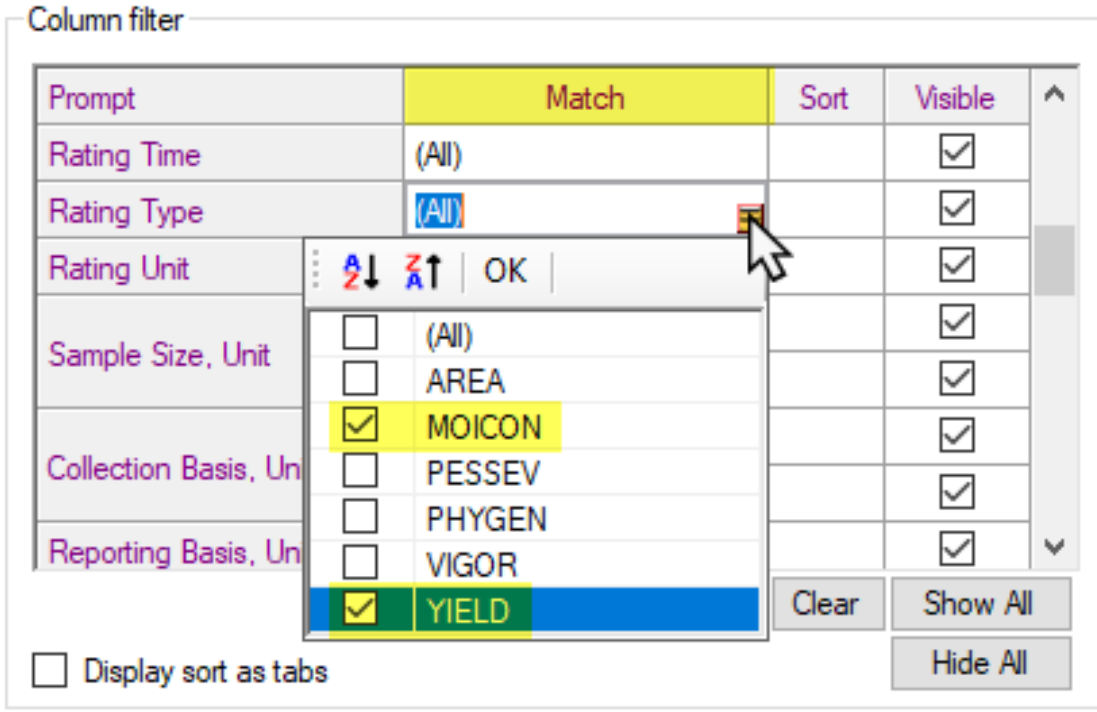
Assessment Data

View Options

Show more than one type of entry when matching on a field.

How does it work?

Select multiple items for the “Match” column Filter.



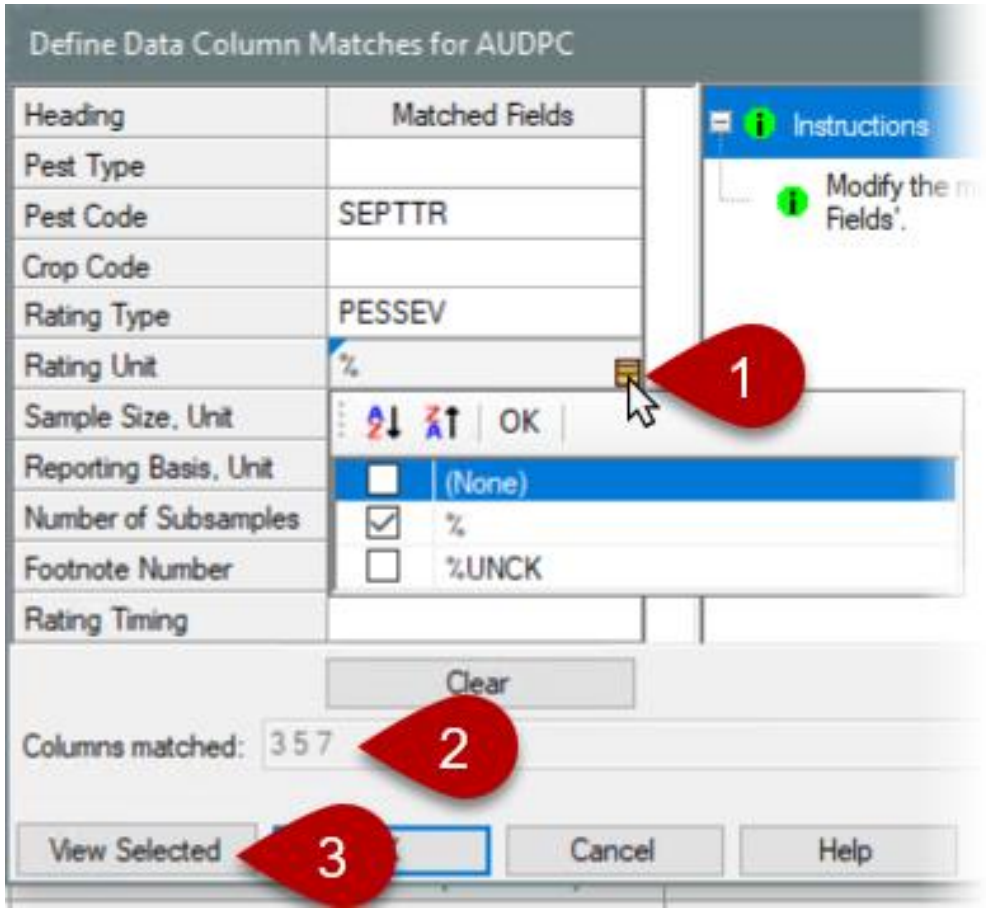
AUDPC Transformation

Enhancement during AUDPC

- Allows selecting multiple values for match fields.
- Lists columns currently matched.
- View only selected/matched columns on the assessment data editor.

Where is this feature?

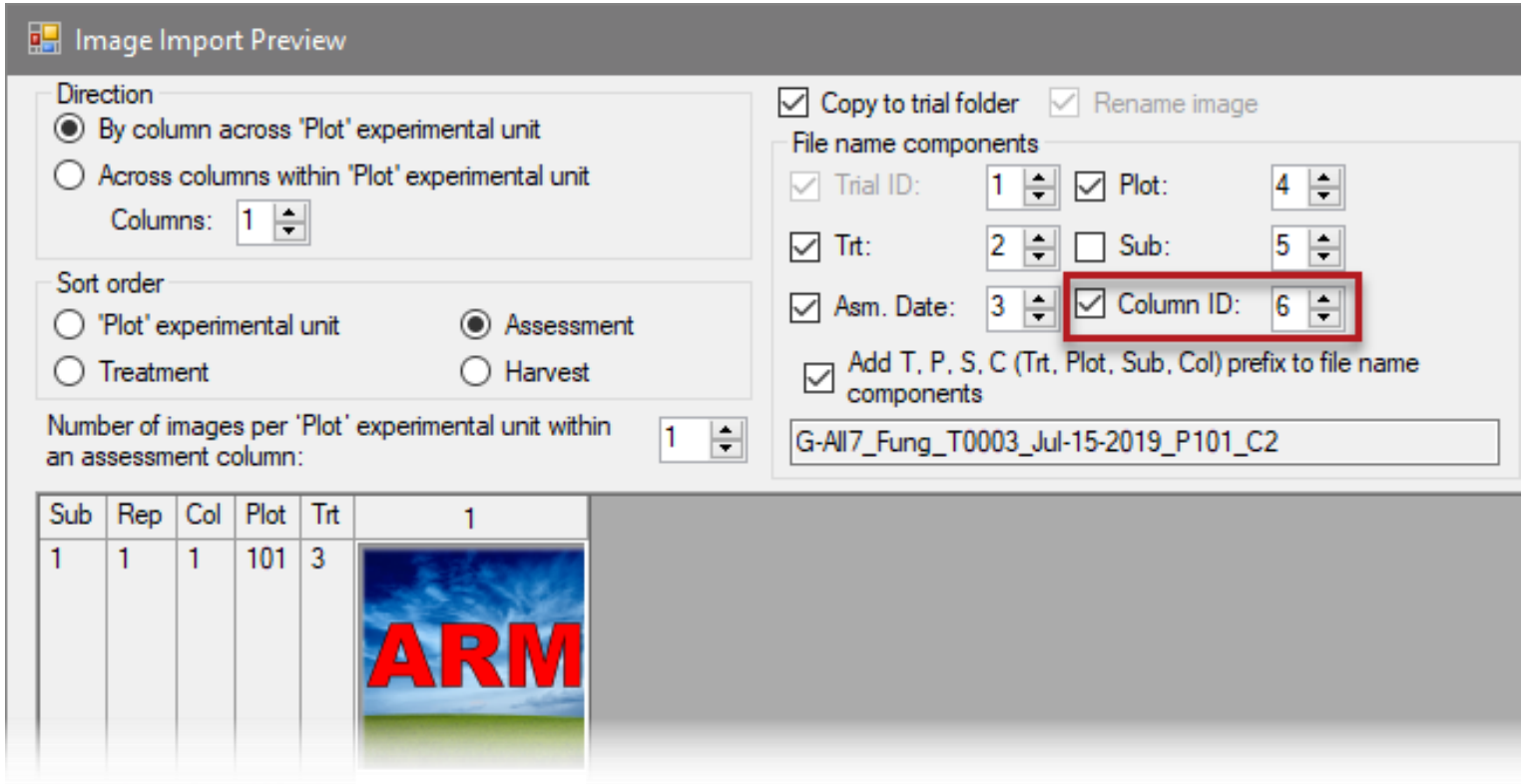
- Tools > Transform, select AUDPC



Plot Pictures

Include Column ID in assessment image file name

- Helpful when attaching images for multiple assessments taken on the same day



Where is this feature?

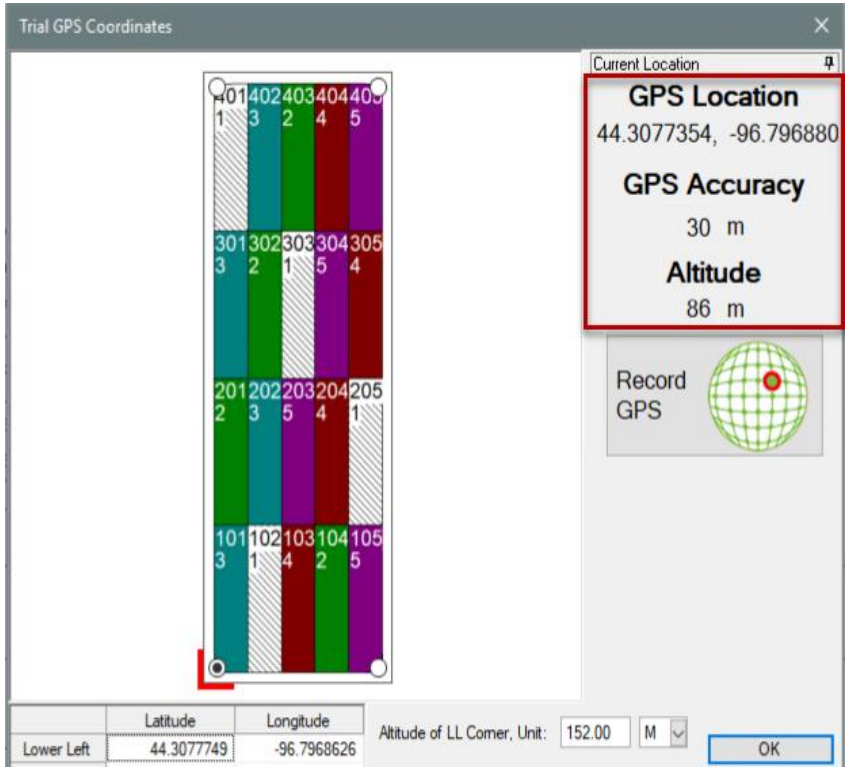
- Assessment data editor > Properties Panel > Attach

Tablet Data Collector (TDCx)

Record GPS

Display the current position in real-time

- Researchers now can determine the accuracy of the GPS device while documenting coordinates.
- TDCx will display: GPS coordinates, accuracy and altitude.



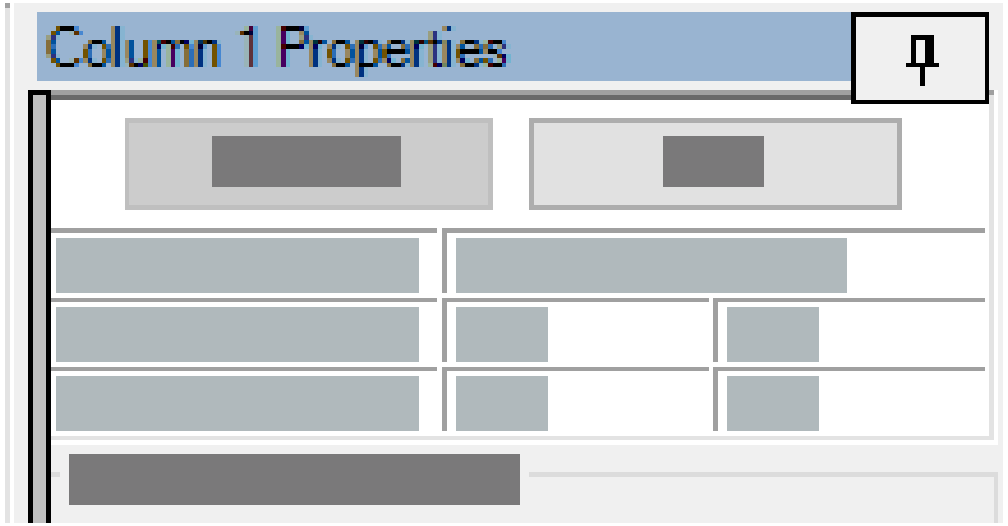
Where is this feature?

Choose “Tablet Read GPS Editor”

Properties Panel

Increased size of Pin button

- Previously was hard to click on the small Pin button to unlock a Properties panel when using a stylus (or finger) on a tablet



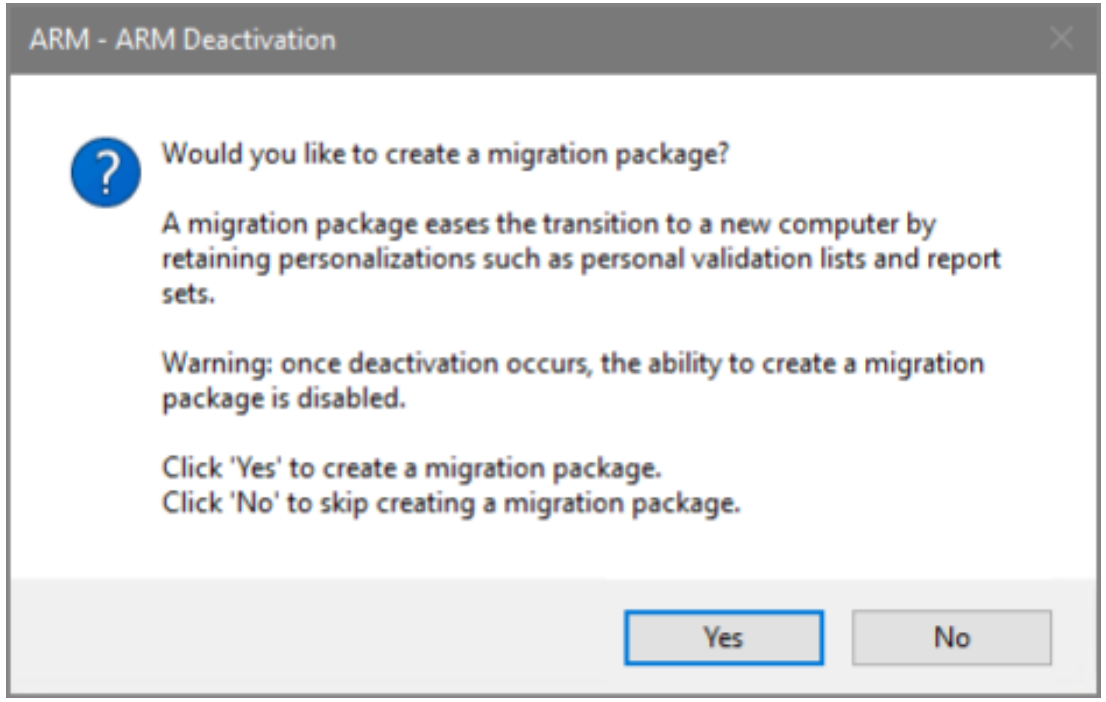
ARM Migration

*Coming in ARM 2019.1

Migrate Settings*

Copy settings when moving to a new PC

- Copy personal lists, report sets, ARM settings to new computer



What's new?

Prompt to create package *before* deactivating the old PC.

Reports

Spray Seeding Plan

Why minimum mix size calculator?

- This helps determine the minimum mix needed.
- Proactively plan for your trial with this calculation.

Reps: 4 Appl Code: A Plots: 2.5 by 10 meters
Spray vol: 250 L/ha Mix Size: 2.65 L (total for 4 plots; minimum=2.5 L, overage=150 mL)

Trt No.	Treatment Name	Form Conc	Form Unit	Form Type	Rate	Rate Unit	Appl Code	Spray Volume	Volume Unit	Mix Size	Mix Unit	Amt Product to Measure	Rep 1	2	3	4
3	Tub	250	G/L	EC	1	l/ha	ABC	250	L/HA	2.65	L	10.6 mL/mx	101	202	301	402
1	Untreated Check						ABC						102	205	303	401
4	Tilt 250	250	G/L	EC	0.5	l/ha	ABC	250	L/HA	2.65	L	5.3 mL/mx	103	204	305	404
2	Tub	250	G/L	EC	0.5	l/ha	ABC	250	L/HA	2.65	L	5.3 mL/mx	104	201	302	403
5	Mico 60	600	G/L	EC	1.5	l/ha	AB	250	L/HA	2.65	L	15.9 mL/mx	105	203	304	405

Enhancement

- ARM reports the bare minimum mix size needed to cover the area of all 4 reps.

SE Definitions

SE Definitions*

*Coming in ARM 2019.1

Plan and define standard evaluations (SEs) and tasks to use in the study

- Simpler than importing SEs from file into assessment data editor

Use Tools > 'Build Header, Tasks' to create the SEs and tasks defined in this tab

Multiple rating timings create columns for each timing code

- Two-column SE F097_C2 times 3 rating timings A1-A3 = 6 total data columns

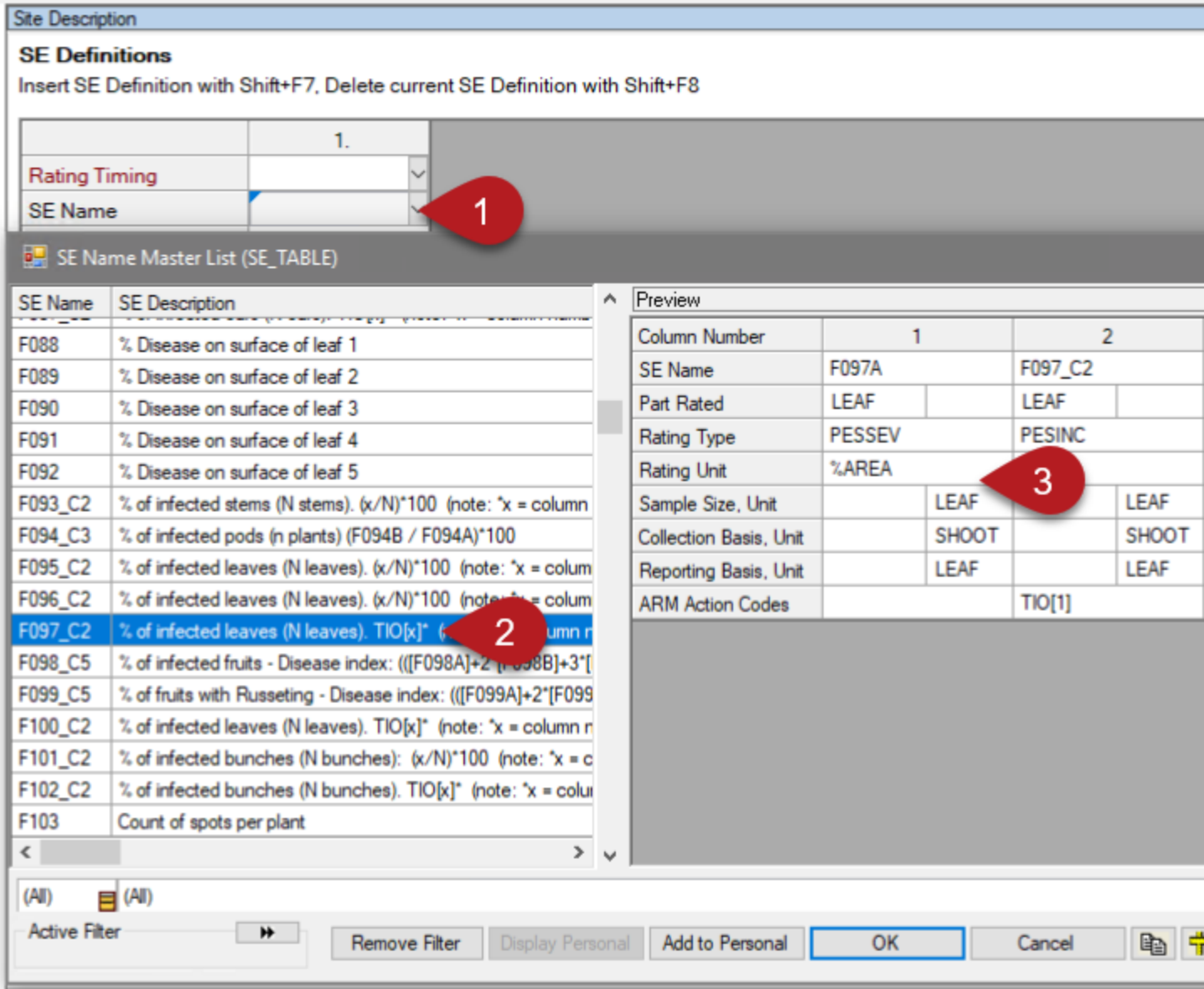
SE Definitions

Insert SE Definition with Shift+F7, Delete current SE Definition with Shift+F8

	1.		2.	
Rating Timing	A1-A3		H1	
SE Name	F097_C2		Y085	
SE Description	% of infected leaves (N leaves). TIO[x]* (note: *x = column nb of infected leaves in F097A)		Fresh yield grain in kg / ... m2	
Part Rated	LEAF		GRAIN	
Rating Type	PESINC		WEIFRE	
Rating Unit	%		KG	
Sample Size		LEAF		M2
Collection Basis		SHOOT	1	PLOT
Reporting Basis		LEAF		M2
Number of Subsamples				
ARM Action Codes	TIO[1]			
Pest Type, Code				
Crop Code				

SE Definitions*

*Coming in ARM 2019.1

1. Display SE Name list
2. Select an SE, can search/filter descriptions
3. Preview assessment columns defined in SE

Can also define tasks on this tab to add to Schedule editor