

# ARM 2022 Changes

# Study Rules

# New Interface

The screenshot shows a software interface for managing study rules. The main area is titled 'Study Rules - Rule 2 of 7' and contains several tabs: Properties, Header, Treatment, Site Description, Assessment Data, Protocol Description, Settings, Trial, and Rule Sets. The 'Properties' tab is active, showing fields for 'Pest Description - Establishment Date', 'Type' (with options: Required, Recommended, Hidden Field), 'Permission to Edit Rule' (All protocol owners), and 'Owner ID' (XSZNAF). Below these are 'Active when' settings, including a 'Condition' dropdown set to 'Established' and radio buttons for 'Always' and 'Conditional' (selected). An 'Edit...' button and a text field containing 'Pest Description - Artificial Population = Y' are also present.

Callouts highlight specific features:

- Rules organized by editor**: Points to the 'Editor' column in the table below.
- Interface to view/add rules**: Points to the 'Type' dropdown menu.
- Same rules, just new visualization**: Points to the table of rules.

On the left side, there are buttons for 'Delete Rule', 'Load Set...', 'Save Set...', 'Previous', and 'Next'. At the bottom left, there are 'Print' and 'Help' buttons.

Rule	Type	Editor	Field	Condition
2	Required	Site Description	Pest Description - Establishment Date	Established
3	Required	Site Description	Pest Description - Stage at Establishment	Established
4	Required	Site Description	Pest Description - Establishment Rate	Established
5	Required	Site Description	Pest Description - Establishment Rate Unit	Established
6	Required	Site Description	Pest Description - Pest Depth	Established
7	Review	Site Description	Trial Location GPS	If not me

# New Interface

Study Rules - Rule 2 of 7

Properties  Header Treatment Site Description Assessment Data Protocol Description

New  Duplicate  Delete Rule

Field: Pest Description - Establishment Date Type: Required

Permission to Edit Rule: All protocol owners

Active:  Always  Conditional

Condition: Pest Description - Artificial Population = Y

Save Set...  Save All Current Tab

Previous  Next

Print  Help

Rule	Type	Editor	Field	Active	Columns/Trit Lines	Active	Permission to Edit Rule	Owner ID
2	Required	Site Description	Pest Description - Establishment Date	Conditional		Conditional	All protocol owners	XSZNAF
3	Required	Site Description	Pest Description - Stage	Conditional		Conditional	All protocol owners	XSZNAF
4	Required	Site Description	Pest Description - Establishment Date	Conditional		Conditional	All protocol owners	XSZNAF
5	Required	Site Description	Pest Description - Establishment Date	Conditional		Conditional	All protocol owners	XSZNAF
6	Required	Site Description	Pest Description - Pest	Conditional		Conditional	All protocol owners	XSZNAF
7	Review	Site Description	Trial Location GPS	Always		Always	All protocol owners	XSZNAF
8*								

Trial Review Study Rule

Require a visual confirmation of GPS coordinates when trialist is:  Not me  Not in my company

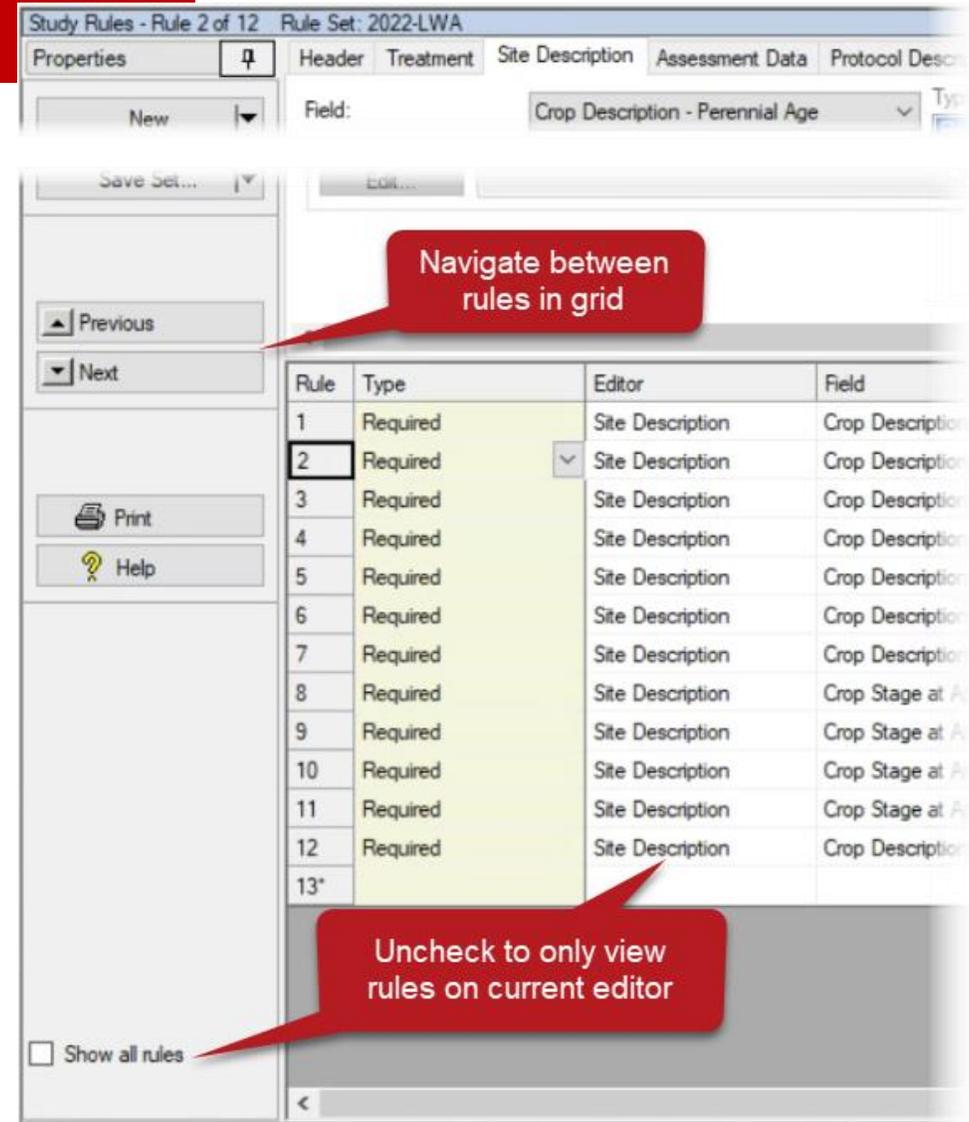
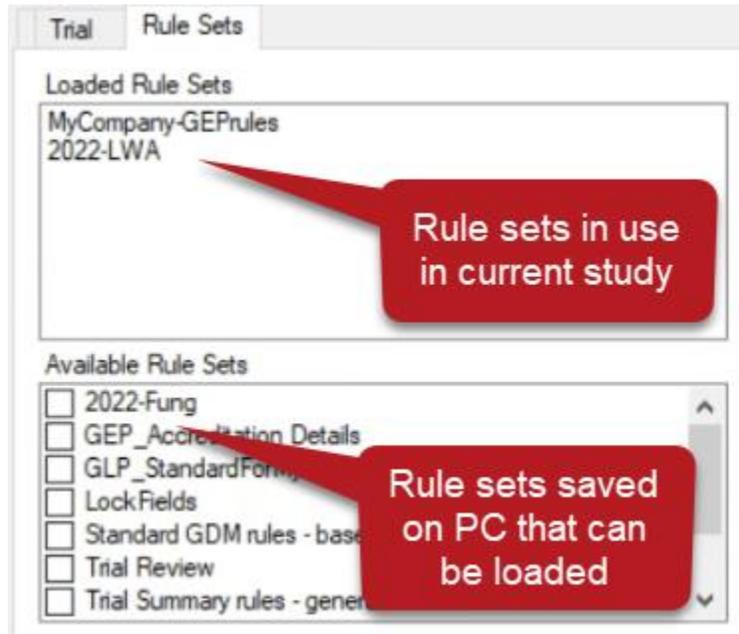
Permission to Edit Rule: All protocol owners Owner ID: XSZNAF

**Make a copy of the current rule then edit for a new, similar rule**

**Pre-defined rules now simply a checkbox**

**Rule sets: can save rules from just 1 section**

# New Interface



# Conditional Rules

Define *when* a study rule should be activated, based on another field's contents

- *E.g. Require Crop Planting Rate, only when Planting Date is filled in*

The screenshot displays a configuration interface for a study rule. At the top, the 'Field' is set to 'Crop Description - Planting Rate' and the 'Type' is set to 'Required'. The 'Permission to Edit Rule' is set to 'Everyone in my company'. Under the 'Active when' section, the 'Conditional' radio button is selected, and the 'Edit...' button is highlighted with a red arrow. Below this, the 'Study Rule Condition' is defined as 'Crop Description - Planting Rate is Required when:'. The condition is set to 'Site Description' (dropdown), 'Crop Description - Planting Date' (dropdown), 'Not Equal' (dropdown), and a value of '1' (dropdown).

Boost your company's "global rule set", to address specific rules for certain trial types

# Conditional Rules

Condition can be based on multiple fields, or multiple values within single field

Study Rule Condition

General Trial - GPS Accuracy of LL Corner is Required when:

Condition: Site Description Site and Design - Site Type Equals FIELD +OR

ORCHAR +OR X

RESPLO +OR X

AND Header Trial Origin Equals C +OR X

+ AND

AND: multiple fields to evaluate

OR: multiple categories/values that rules applies to

OK Cancel

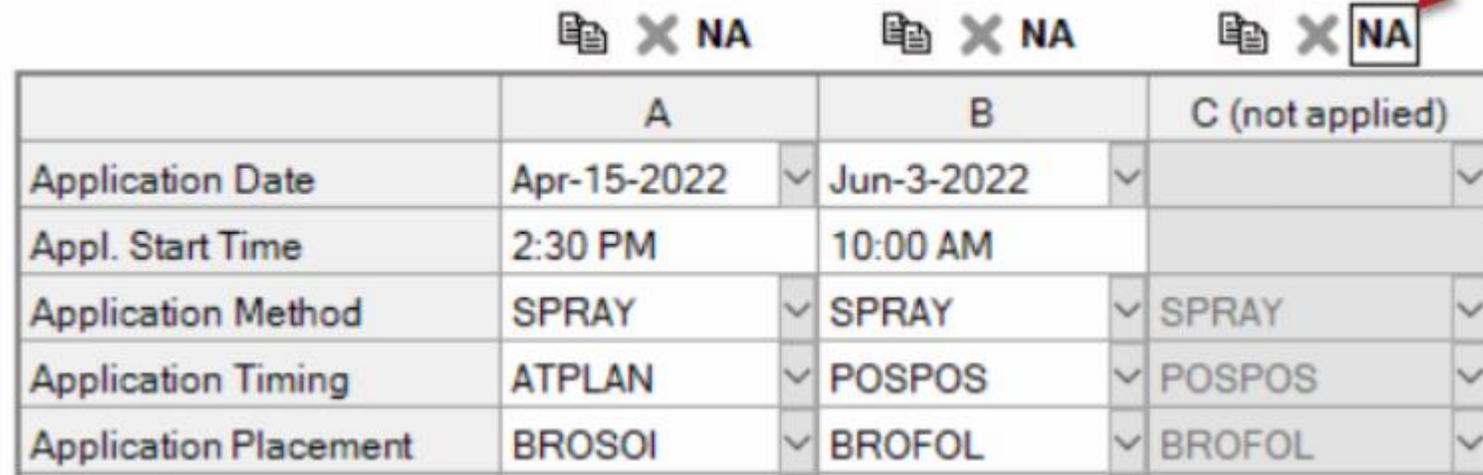
# Site Description

# Application Not Applied

Identify an application that is *not applied*

- **Purpose:** Retain a planned application code, but denote that it was not performed
- **Process:** Toggle **NA** button above application

## Application Description



The screenshot shows a table with three application entries. Above each entry is a button with a document icon and an 'X' followed by 'NA'. A red arrow points to the 'NA' button of the third entry.

	A	B	C (not applied)
Application Date	Apr-15-2022	Jun-3-2022	
Appl. Start Time	2:30 PM	10:00 AM	
Application Method	SPRAY	SPRAY	SPRAY
Application Timing	ATPLAN	POSPOS	POSPOS
Application Placement	BROSOI	BROFOL	BROFOL

# Application Not Applied

## Impact:

- Enter a deviation to explain circumstances
- Not included in product calc's
- 'NA' applications display with strikethrough
- Appl. Date field can be blank without failing validation if marked 'NA'

### Deviations

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

No. 1: Date: Jun-24-2022 By: Matthew Elsinger

Application C not applied

Deviations:

Reason why the application did not occur

Reasons:

Reps: 4 Plots: 2.5 by 10 meters  
 Appl. Amount: 200 L/ha Mix Size: 2.15 L

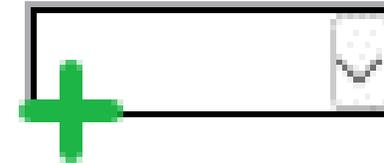
Trt No.	Treatment Name	Form Conc	Form Unit	Form Type	Rate Rate	Rate Unit	Appl Code	Amt Product to Measure
1	Untreated Check							
2	Tub	250 G/L	EC		0.5 l/ha		AB <del>C</del>	5.3 mL/mx
3	Tub	250 G/L	EC		1 l/ha		AB <del>C</del>	10.6 mL/mx
4	Tilt 250	250 G/L	EC		0.5 l/ha		AB <del>C</del>	5.3 mL/mx
5	Mico 60							

Trt No.	Type	Treatment Name	Form Type	Rate	Rate Unit	Appl Code
1	CHK	Untreated Check				
2	FUNG	Tub	EC	0.5	L/ha	AB <del>C</del>
3	FUNG	Tub	EC	1	L/ha	AB <del>C</del>
4	FUNG	Tilt 250	EC	0.5	L/ha	AB <del>C</del>
5	FUNG	Mico 60	EC	1.5	L/ha	AB
5	FUNG	Fungol	SC	1.25	L/ha	<del>C</del>

# New Fields

Many new fields added to editors in Protocols and Trials

- New Regulations tab with Harvest Destruction section
- More columns in Trial Location table
- Crop Description expanded in protocol
  - ...and now separate from Pest Description too



See ARM 2022.5 Field Changes PDF for more details:

[https://gdmdata.com/media/documents/Change\\_logs/ARM\\_2022.5\\_Field\\_Changes.pdf](https://gdmdata.com/media/documents/Change_logs/ARM_2022.5_Field_Changes.pdf)

# Repeating Sections

Empty record automatically added at end of repeating sections

- *Easier to add additional items without “Insert Repeating Section” command*
- *Excludes Application, Crop, and Pest sections*

General Trial														Regulations		Objectives/Conclusions		Contacts		Crop Description		Pest Description		Site and Design	
Maintenance																									
Insert row with Shift+F7, Delete current row with Shift+F8																									
No.	Date	Type	Maintenance Product Name	Form Conc	Form Unit	Form Type	Description	Rate	Rate Unit	Tank Mix															
1.	Oct-4-2022																								
2.																									

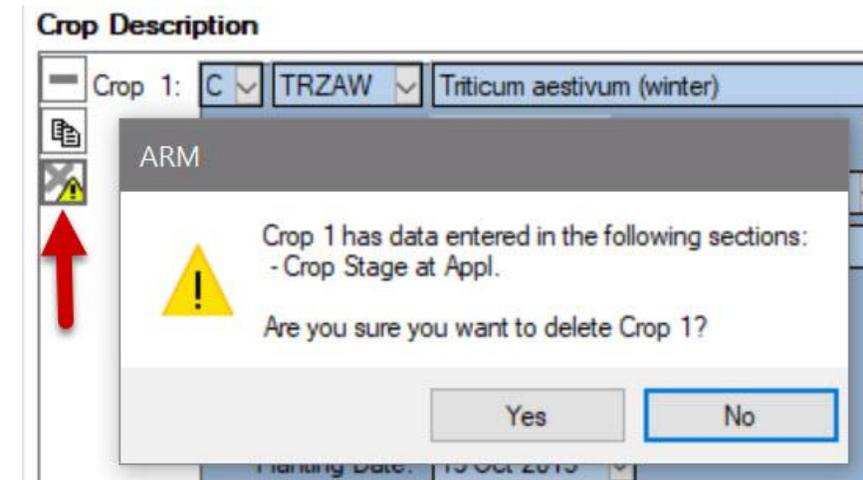
# Crop/Pest in use

Verification for whether a **crop/pest is used** in the trial

"In use" if:

- Information entered in Crop/Pest Stage at Appl sections, or
- Referenced in an assessment column that has data

Warning when deleting crop/pest in use



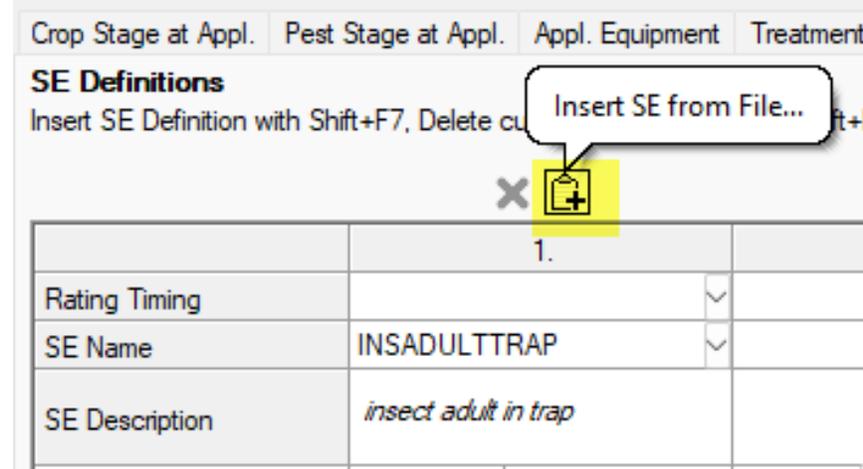
Validation warning for when not in use



# Insert SE from File

New shortcut button on SE Definitions: load an SE from your PC

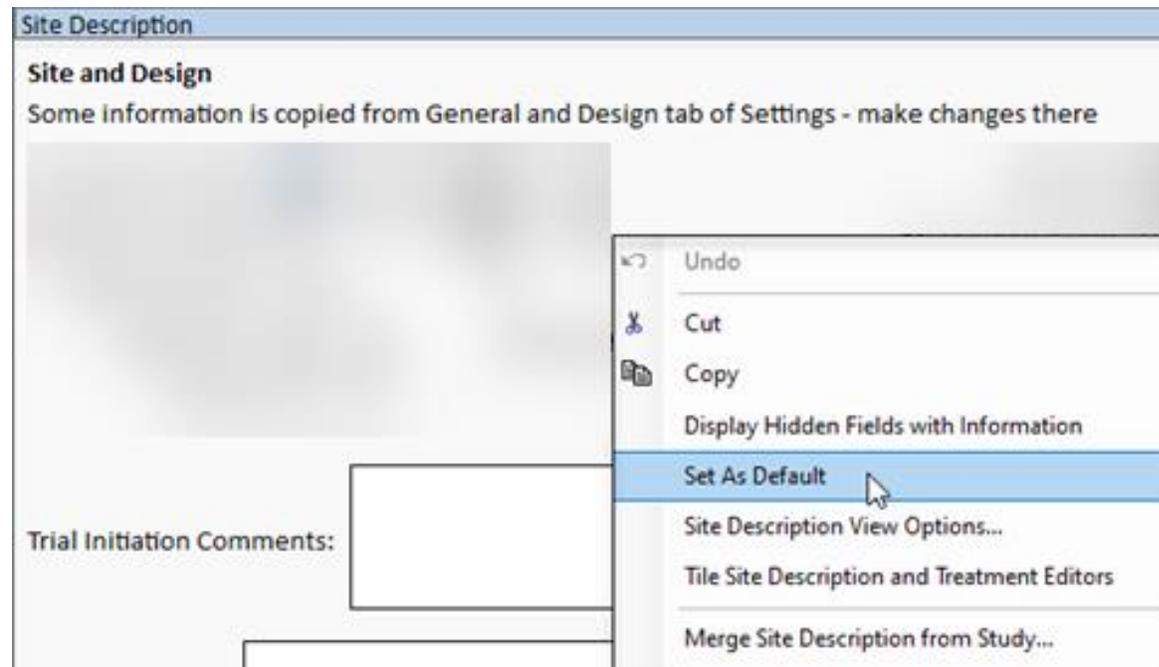
- Saves time after creating an SE from an existing assessment
- After loading from file once, the SE is added to the SE Name Favorites list



# Set as Default

“Set as Default” can be used in rich text fields

- *Can include default instructions / required language for reports*

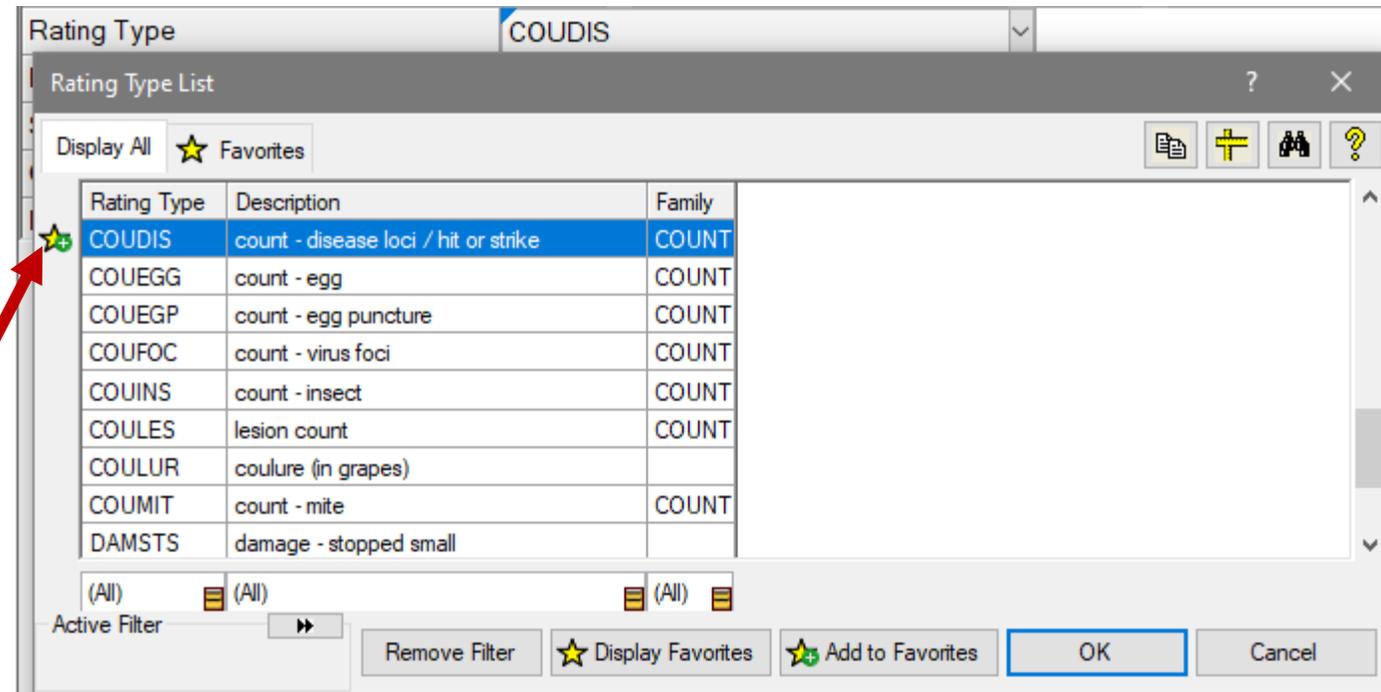


# Validation Lists

# Validation Lists

## *Personal List* is now **Favorites**

- Favorites tab on list window  
(no more Display Personal/Master)
- *Master List* is simply "Display All"
- Shortcut buttons add or remove  
from Favorites



# Validation Lists

## "User-built" lists are improved

- Shortcut "X" button to remove from the list
- Open list in "edit" mode to adjust existing items

Trt Line	Trt No.	Type	Treatment Name	Cost	Cost Unit	Identification
1	1	HERB	Sure Kill			

Treatment Name	Form Conc	Form Unit	Form Type	Lot Code	Specific Gravity	Registration Number	Re-Entry Interval
2,4-D Amine	4	LBA/GAL	L				
2,4-D Ester	4	LBA/GAL	SC				
2,4-DB Amine	1.75	LBA/GAL	SC				
2,4-DB Ester	2	LBA/GAL	SC				
2,4-DP	4	LBA/GAL	EC				
AAtrex	4	LBA/GAL	F				
AAtrex-DF	90	%AW/W	DF				

Active Filter: (All) (All) (All) (All) (All) (All) (All) (All)

Buttons: Remove Filter, Edit..., Delete, OK, Cancel

	Treatment Name	Form Conc	Form Unit	Form Type	Lot Code	Re-Entry Interval	Description	Co
1	2,4-D Amine	4	LBA/GAL	L				
2	2,4-D Ester	4	LBA/GAL	SC				
3	2,4-DB Amine	1.75	LBA/GAL	SC				
4	2,4-DB Ester	2	LBA/GAL	SC				
5	2,4-DP	4	LBA/GAL	EC				
6	AAtrex	4	LBA/GAL	F				
7	AAtrex-DF	90	%AW/W	DF				

Buttons: OK, Cancel

# Assessment Data

# Assessment Image

New dialog for previewing and zooming assessment images

- Improves performance for high-resolution photos
- Workflow improved for using image to review or take ratings

The screenshot displays the 'Assessment Data - Line 25' window. The main area is a table with columns for 'Column Number' (1, 2, 3) and rows for various assessment parameters. The 'Properties' dialog is open on the right, showing 'Assessment View' options and 'Hidden Fields' (Crop Variety, Description, Rating Time, SE Group No., SE Name). The 'Views - Hide empty fields' section is also visible.

Column Number	1	2	3
Pest Type			D Disease
Pest Code			SEPTTR
Pest Scientific Name			Zymoseptoria tritici
Pest Name			septoria leaf blotch
Crop Type, Code	C TRZAW	C TRZAW	C TRZAW
BBCH Scale	BCER	BCER	BCER
Crop Scientific Name	Triticum aestivum (winter)	Triticum aestivum (winter)	Triticum aestivum (winter)
Crop Name	Winter wheat	Winter wheat	Winter wheat
Rating Date	15 Jul 2014	15 Jul 2014	13 May 2014
Part Rated	LEAF C	PLANT C	LEAF3 P
Rating Type	PHYGEN	VIGOR	PESSEV
Rating Unit/Min/Max	% 0 100	% 0 100	% 0 100
Sample Size			10 LEAF
Reporting Basis			
Number of Subsamples	1	1	10

Sub	Rep	Blk	Col	Plot	Tit	1	2	3
1	1	1	1	101	3	0	100	1.00
1	1	1	2	102	1	0	100	10.00
1	1	1	3	103	4	0	50	1.00
1	1	1	4	104	2	0	100	0.00
1	1	1	5	105	5	0	100	10.00
1	2	2	1	201	2	0	100	0.00
1	2	2	2	202	3	0	100	2.00
1	2	2	3	203	5	0	100	0.00
1	2	2	4	204	4	0	100	5.00
1	2	2	5	205	1	0	100	3.00
1	3	3	1	301	3	0	100	0.00
1	3	3	2	302	2	0	100	0.00
1	3	3	3	303	1	0	100	0.00
1	3	3	4	304	5	0	100	0.00

# Data Review

# Column Diagnostics

Now highlights values that indicate a failure of data to meet AOV assumptions

- P-values < 0.05 imply failure of data to meet tested assumption*

Column 5 Diagnostics				
Diagnostics				
Raw Graphs				
Show...		Layout: 4 X 2		
Statistics (P)	Raw <input checked="" type="checkbox"/>	IID <input type="checkbox"/>	AL <input type="checkbox"/>	AS <input type="checkbox"/>
Treatments	11	11	11	11
Levene's	0.0136	0.0059	0.0003	0.0014
ShapiroWilks	0	0.8081	0.1525	0.5179
Skewness	0	0.6599	0.5744	0.6345
Kurtosis	0	0.6530	0.0251	0.2111

# Column Diagnostics

Recognizes “selected treatments”  
Action Codes (EC, ETn)

- *Recommended actions now calculated after excluding the data*

Column Number	4 (Calculated)		Column 4 Diagnostics	
Pest Type	D	Disease	<b>Diagnostics</b>	
Pest Code	SEPTTR		<input type="checkbox"/> Include spatial models	
SE Group No.	4		Missing	0
Part Rated	LEAF3	P	Empty	0
Rating Type	PESSEV		Damaged	0
Rating Unit/Min/Max	%UNCK		MinRep	4
Sample Size	10	LEAF	MaxRep	4
Trit-Eval Interval	28 DA-A		Treatments	4
ARM Action Codes	TAB[3] EC		Levene's	0.619
Number of Decimals	2		Shapiro-Wilk	0.364
			Skewness	0.336
			Kurtosis	0.752
			MaxStdRes	1.528
<b>Recommendations</b>				
Basis: Assessment Values				
IID Graphs: Show... Layout: 4 X 2				
	Code	Test Statistic	Value	
1	IID	Levene's	0.222	Does no
2	IID	Shapiro-Wilk	0.954	Does no
3	IID	Skewness	-0.481	Does no
4	IID	Kurtosis	-0.46	Does no

+ Sub	Rep	Blk	Col	Plot	Trit	4 (Calculated)
1	1	1	2	102	1	0.00
1	2	2	5	205	1	0.00
1	3	3	3	303	1	0.00
1	4	4	1	401	1	0.00
1	1	1	4	104	2	74.00
1	2	2	1	201	2	80.49
1	3	3	2	302	2	15.22
1	4	4	3	403	2	62.22
1	1	1	1	101	3	54.00
1	2	2	2	202	3	73.17
1	3	3	1	301	3	52.17
1	4	4	2	402	3	66.66

# Normality Tests

Include all info used on Column Diagnostics in AOV report

- Added Shapiro-Wilk test to report
- Choose how statistical tests are reported
  - Test statistic, **p-value**, or both

Trt No.	Treatment Name	Rate Unit	3*
1	Untreated Check		4.55 a
2	Tub	0.5 l/ha	1.93 b
3	Tub	1 l/ha	1.53 b
4	Tilt 250	0.5 l/ha	1.83 b
5	Mico 60	1.5 l/ha	2.70 b
LSD P=.05			1.264
Standard Deviation			0.821
CV			32.76
Levene's Prob(F)			0.73
P(Shapiro-Wilk) <sup>^</sup>			0.5027
P(Skewness) <sup>^</sup>			0.2652
P(Kurtosis) <sup>^</sup>			0.8741

AOV Means Table Report Options

Report Options | Descriptive Statistics | General Summary | Report F

LSD (or HSD if Tukey's)

Standard deviation

Post-hoc power analysis

Normality tests

Calculate normality tests from:  Residuals  Assessments

Homogeneity of variance test Levene's

Shapiro-Wilk

Skewness

Kurtosis

Show in report: p-value only

Diagnostic report

Graph Layout: 4 X 2

Both statistic and p-value

Statistic only

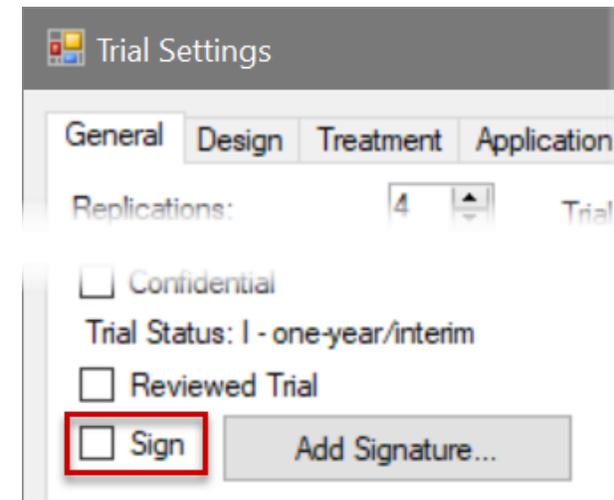
p-value only

# Trial Signature

# Trial Signature

Updates to the new Trial Signature feature:

- Trial can be signed at **any** trial status (previously only for 'Final')
- Signing a trial with status = Final (or later) starts an **Audit Trail**
  - All further changes are logged and prompted to provide a reason



Trial Settings

General Design Treatment Application

Replications: 4

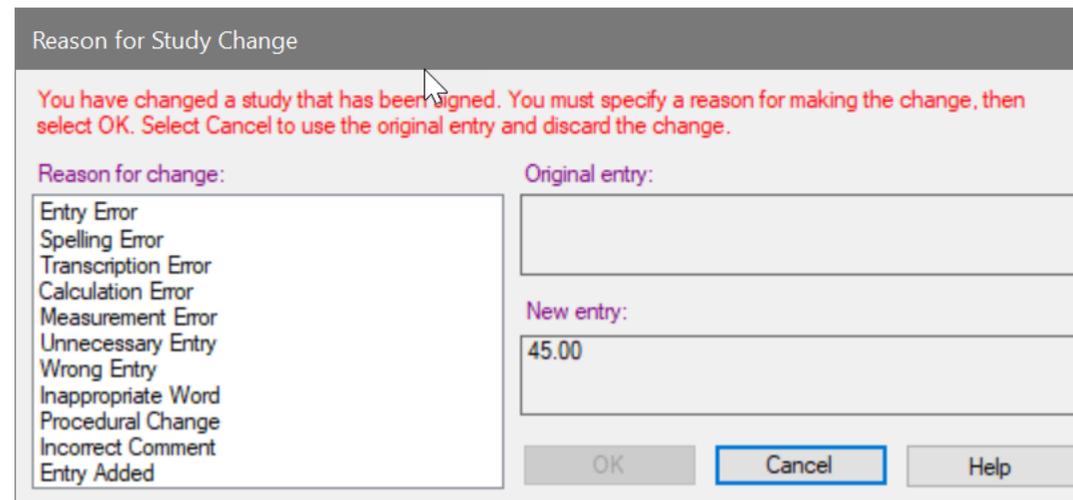
Confidential

Trial Status: I - one-year/interim

Reviewed Trial

Sign

Add Signature...



Reason for Study Change

You have changed a study that has been signed. You must specify a reason for making the change, then select OK. Select Cancel to use the original entry and discard the change.

Reason for change:

- Entry Error
- Spelling Error
- Transcription Error
- Calculation Error
- Measurement Error
- Unnecessary Entry
- Wrong Entry
- Inappropriate Word
- Procedural Change
- Incorrect Comment
- Entry Added

Original entry:

New entry:

45.00

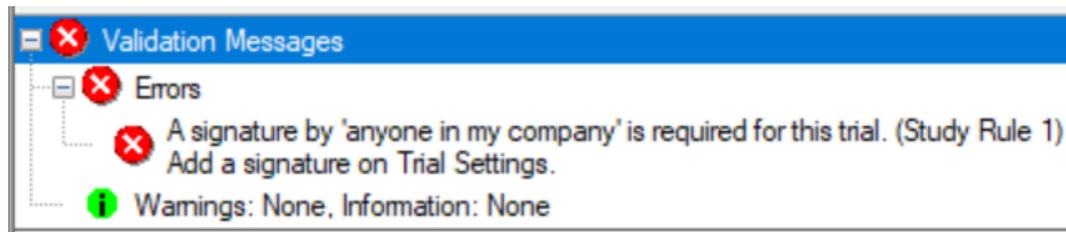
OK Cancel Help

# Trial Signature

## New study rule to require a signature at particular Trial Status

- Field determines what status triggers rule
- Condition determines who needs to sign

Study Rules - Rule 1 of 1				
Rule	Rule ID	Editor	Field	Condition
1	Sign	Trial		
2*				Required at Trial Status one-year/final or canceled (Validation) Required at Trial Status reviewed and reported or canceled (Validation) Required at Trial Status archived or canceled (Validation)



- ARM prompts for signature when trial status is set (if validation passes)



# Validation

# Trial Status

Validation is performed automatically when Trial Status is changed

**Purpose:** Study rules may become active with a different Status

**Impact:** Resolve validation issues before adding your signature to trial (or printing, sending, etc.)

The screenshot displays the 'Site Description' software interface. The main window is titled 'Site Description' and contains several tabs: 'General Trial', 'Objectives/Conclusions', 'Contacts', 'Crop Description', 'Pest Description', 'Site and Design', 'Maintenance', and 'Soil'. The 'General Trial Information' tab is active, showing fields for 'Study Director', 'Investigator' (with a dropdown menu showing 'First M Name'), 'Title', 'Discipline', 'Trial Status' (with a dropdown menu showing 'E' and 'established'), 'Data Location', and 'Trial Reliability'. Below these are fields for 'ARM Trial Created On' (4 Oct 2019), 'Initiation Date' (26 Apr 2019), 'Planned Completion Date', 'Interim Data Due', and 'GEP Accreditation Number'. A 'Trial Location' section includes fields for 'City', 'State/Prov.', 'Postal Code', 'Country' (USA - United States), 'Region', and 'Climate Zone' (USWARM - US Warm Continental). To the right, a 'Properties' panel shows 'View Options...' and 'Hidden Fields' (Trial Status Date, Last Export Date, Last Changed By, Trial Usage/Type, Protocol Revision Nu). Below the main form is a 'Study Rules - Rule 4 of 4' table.

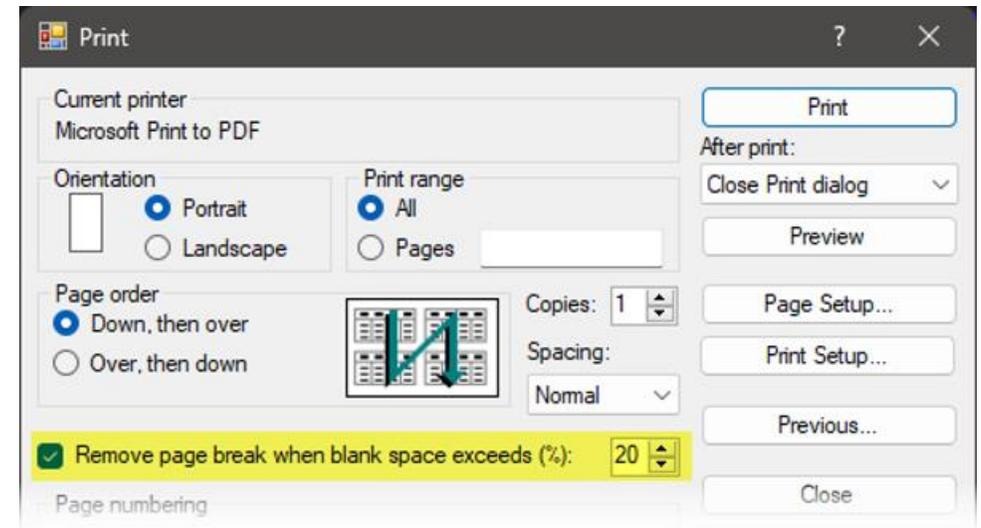
Rule	Rule ID	Editor	Field	Condition	Columns/Trt Lines	Permis
1	Required	Assessment Data	Rating Date	With assessment data	All	Every
2	Required	Site Description	General Trial - Latitude of LL Corner *	One-year/final/Multi-year/final		Every
3	Required	Site Description	General Trial - Longitude of LL Corner *	One-year/final/Multi-year/final		Every
4	Recommended	Site Description	General Trial - GPS Accuracy of LL Corner	One-year/final/Multi-year/final		Every
5*						

# Print Reports

# Summary Reports

Summary reports now always start on a **new page** in report

- *Summary reports = AOV Means, Assessment Data Summary, etc.*
- *Select 'Remove page break...' to combine report sections on same page when there is room*
- Summary reports take up most of a page, so do not fit well if combined with other reports

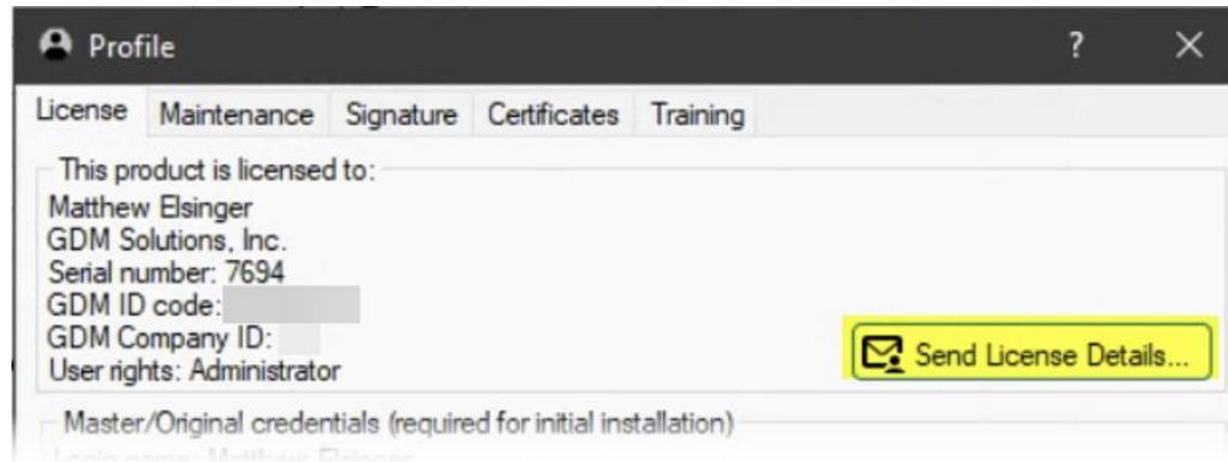


# Profile

# Send License Details

## New 'Send License Details' button

- Find it on the Profile and Request Customization dialogs
- Share ARM license details in an email

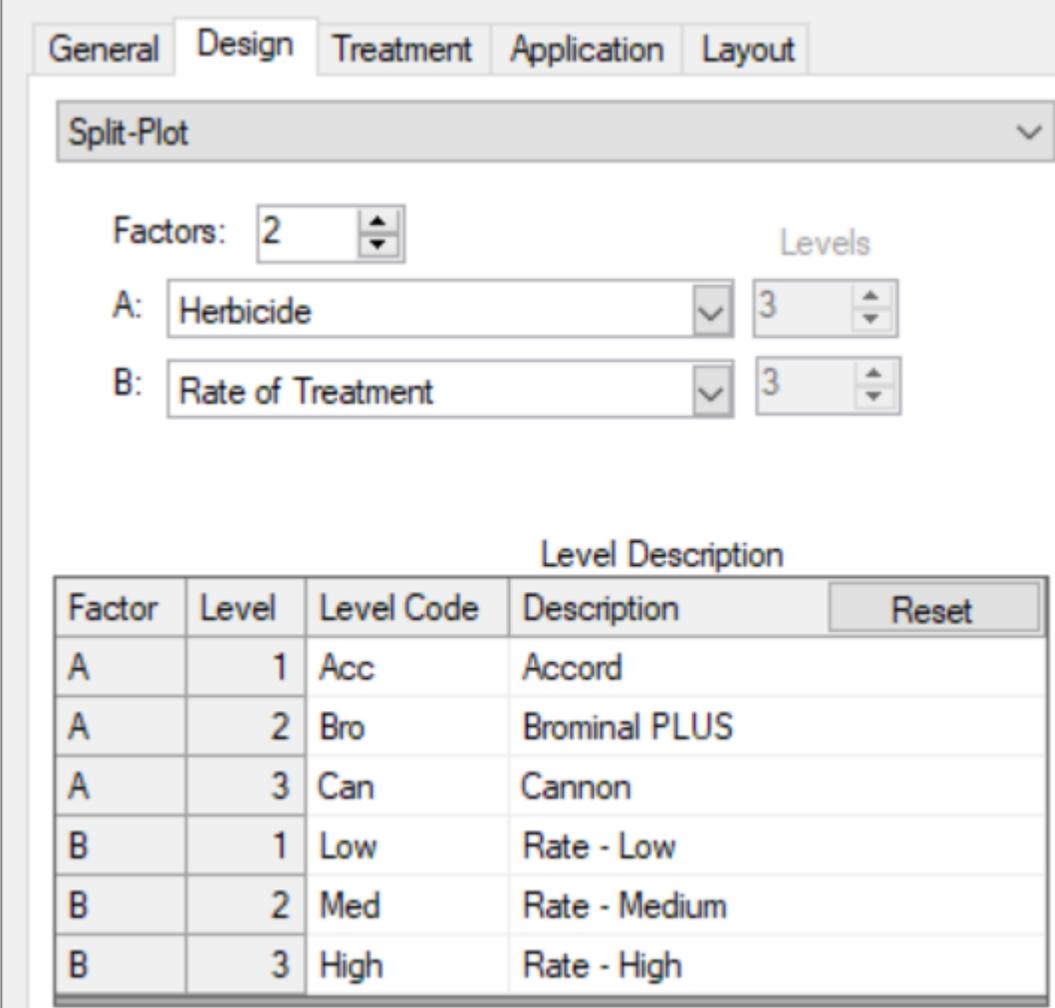


# Multi-factor Designs

# Multi-factor studies

## Level Description added to Settings dialog

- Same information on the Trial Map dialog
- Now available in a protocol, too!



General Design Treatment Application Layout

Split-Plot

Factors: 2 Levels

A: Herbicide 3

B: Rate of Treatment 3

Factor	Level	Level Code	Description	Reset
A	1	Acc	Accord	
A	2	Bro	Brominal PLUS	
A	3	Can	Cannon	
B	1	Low	Rate - Low	
B	2	Med	Rate - Medium	
B	3	High	Rate - High	

# Treatments

# Validation updates

Added support for **Biological Entity Dispensers** as treatments

- **Treatment Type:** BIOENT
- **Formulation Units:** BIOEN/D (biological entities per dispenser)
- **Formulation Type:** BD (biological entity dispenser)
- **Rate Units:** dispensers per area or per number of plants
  - D/A, D/ha, D/1000 FT2, D/100 m2, D/1000 plants, D/10000 m2 LWA

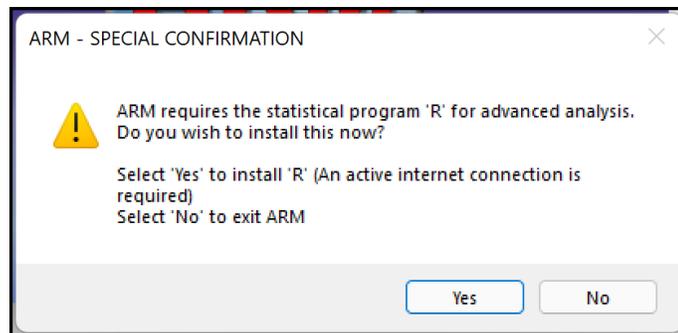
Trt No.	Type	Treatment Name	Form Conc	Form Unit	Form Type	Rate	Rate Unit	Other Rate	Other Rate Unit
1	BIOENT	Biological Entity Dispenser	1000	BIOEN/D	BD	15	D/1000 FT2	16.1	D/100 m2

# Data Analysis

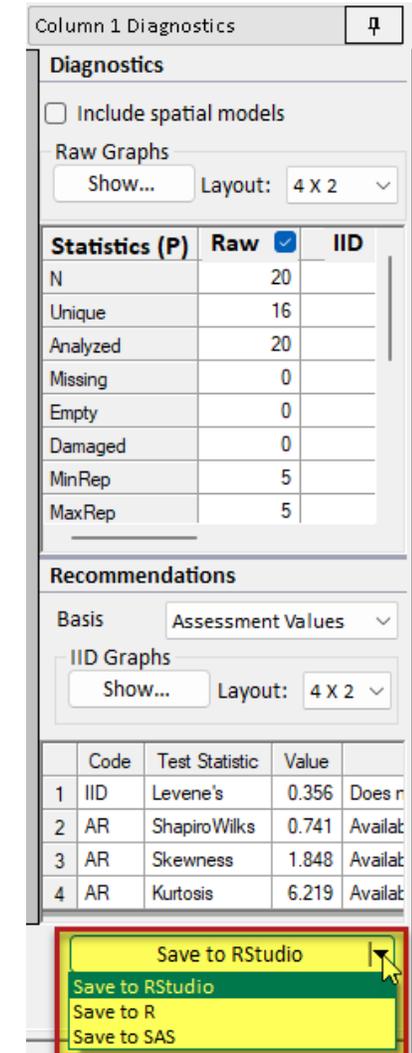
# R software update

ARM now supports R versions 4.2.0 and newer

- *No additional installation/update needed at this time*
- R is used behind-the-scenes for analysis, reporting
- R users – export Column Diagnostics script to R:



- Previously would give an error if R version was too new.



Column 1 Diagnostics

Diagnostics

Include spatial models

Raw Graphs  
Show... Layout: 4 X 2

Statistics (P)	Raw <input checked="" type="checkbox"/>	IID
N	20	
Unique	16	
Analyzed	20	
Missing	0	
Empty	0	
Damaged	0	
MinRep	5	
MaxRep	5	

Recommendations

Basis: Assessment Values

IID Graphs  
Show... Layout: 4 X 2

	Code	Test Statistic	Value	
1	IID	Levene's	0.356	Does r
2	AR	ShapiroWilks	0.741	Availat
3	AR	Skewness	1.848	Availat
4	AR	Kurtosis	6.219	Availat

Save to RStudio  
Save to RStudio  
Save to R  
Save to SAS

# ARM Mobile

# Export images

Export images from ARM Mobile with or without data

- **Purpose:** Allows user to export images, comments, or GPS during or after assessment export.
- **Example:** One researcher can enter only data, another can take plot pictures. Both can export the same assessment data column – images will import “on top of” data.

