

Best Practices for Companies using ARM

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ARM ST Examples

A well-defined ARM protocol vs. a textual Word document that only provides generalities can make a large difference in the efficiency of summarizing results across a trial series. This is especially applicable when trials are completed by multiple trialists with a company, or by external contract researchers or CROs (Contract Research Organizations).

Example ST Summary with consistent data headers

- CONTRO defined as 'Rating Type' and used consistently across multiple trials - 4 in this example

- Statistics show summary across the 4 experiments

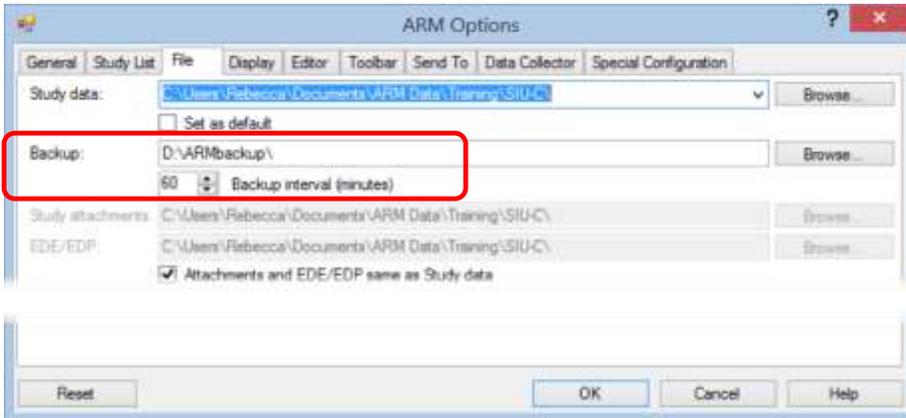
		1	ST-Exam1	ST-Exam2	ST-Exam3	ST-Exam5			
Summary properties		Every							
Pest Code		CHEAL	CHEAL	CHEAL	CHEAL	CHEAL			
Crop Code		ZEAMD	ZEAMD	ZEAMD	ZEAMD	ZEAMD			
Rating Date		*	Jun-3-2014	May-25-2014	Jun-1-2014	May-28-2014			
Rating Type		CONTRO	CONTRO	CONTRO	CONTRO	CONTRO			
Rating Unit		%	%	%	%	%			
Crop Stage Majority		*	16	14	16	16			
Pest Stage Majority		*	16	16	16	12			
Pest Density		*	12	10	12	12			
Pest Density Unit		*	M2	M2	M2	M2			
Trt-Eval Interval		10-30	17 DA-B	10 DA-B	15 DA-B	13 DA-B			
Trt No.	Treatment Name	Rate	Unit	Mean	Count				
1	Super Stomp	1.5	l/ha	76.25 c	(4)	54.50 c	95.50 a	89.25 a	65.75 b
				54.50	Min				
				95.50	Max				
				19.35	StDev				
2	Stamper C50220	4	l/ha	85.56 a	(4)	75.75 a	95.75 a	92.00 a	78.75 a
		0.5	l/ha	75.75	Min				
				95.75	Max				
				9.80	StDev				
3	Sure Kill C50220	2	l/ha	80.34 b	(4)	66.00 b	96.50 a	93.25 a	65.63 b
		1	l/ha	65.63	Min				
				96.50	Max				
				16.83	StDev				
4	Untreated			0.00 d	(4)	0.00 d	0.00 b	0.00 b	0.00 c
				0.00	Min				
				0.00	Max				
				0.00	StDev				
LSD P=.05				2.569		5.504	1.890	4.139	8.964
Standard Deviation				3.582		3.441	1.181	2.587	5.604
CV				5.92		7.01	1.64	3.77	10.67
Bartlett's X2						0.317	0.165	5.523	5.192
P(Bartlett's X2)						0.853	0.921	0.063	0.075

Prepare ARM

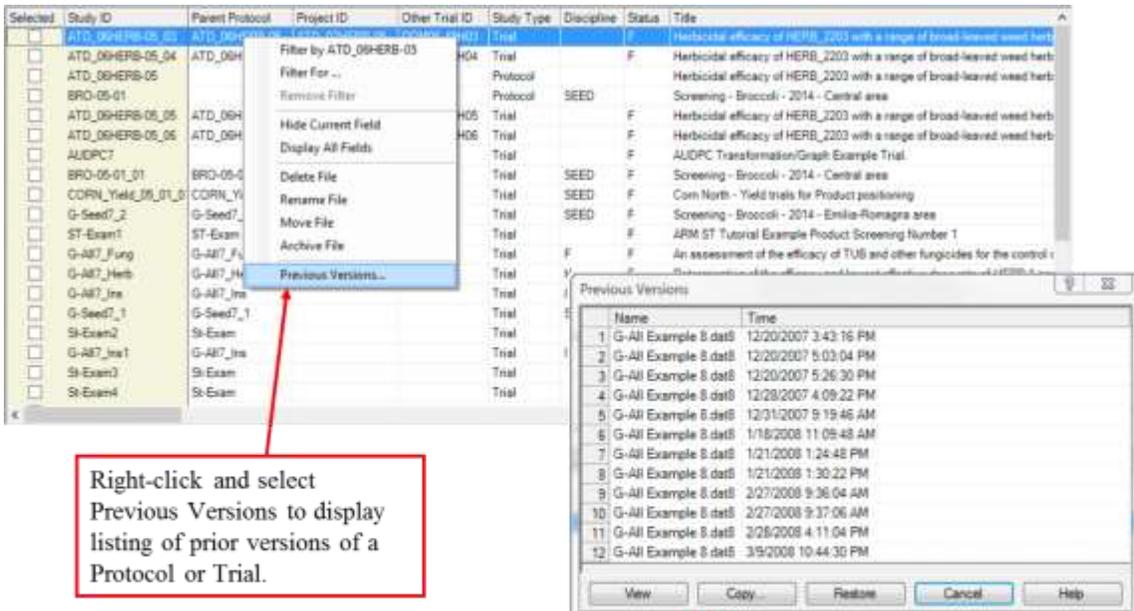
Use SD card to backup ARM

➤ Use SD card as ARM backup device to ARM can keep automatic previous versions of all protocol and trial changes.

1. Go to Tools - Options, File tab. In this example, 'D' is an SD card.
2. Set the 'Backup interval'.
3. Click OK



This feature maintains a history of all saved ARM study versions, providing security against losing information from mistakes or hardware failures.



Right-click and select Previous Versions to display listing of prior versions of a Protocol or Trial.

Use Previous Versions dialog to view or restore a previous saved version of the study from the backup folder.

Prepare ARM product dictionaries

Product dictionaries are the validation lists for Treatment names. ARM maintains a separate list for each Product Type, for example 'G-Herb.lst', 'G-Fung.lst', etc.

Trt Line	Trt No.	Type	Treatment Name	Form Conc	Form Unit	Form Type
1	1	CHK	CHECK			
2	2	FUNG	BAYLETON	1	%W/W	G
3	3	HERB	Salute	4	%A/W/W	DF
4	3	ADJ	INDUCE	998	GA/L	TK
5	4	INSE	DIMILIN	2		F
6	5	SDTR	Captan 30-DD	30	%A/W/W	FS

To add new entries to a product dictionary:

1. Enter the Type, Treatment Name, Form Conc, Form Unit, etc. into the treatment list.
2. Click in the 'Treatment Name' field
3. Select F9 or click on the drop-down
4. If this combination of treatment name, formulation, etc. do not match anything currently in the list, you will be prompted to add the item to the list. Select 'Yes' to add the item to the list.
5. Enter the active ingredient(s) and the amounts in the grid, then click 'OK'.

Trt Line	Trt No.	Type	Treatment Name	Form Conc	Form Unit	Form Type
1		HERB	Warrant	3	LB/GAL	SL
2						
3						

ARM - Information

No matches found.
Add item to list?

Yes No

No.	Active Ingredient	AI Conc.
1	Acetochlor	3
2		
3		
4		

Enter ingredient information to store with new list item
Warrant3LB/GALS

OK Cancel

Repeat this process for additional Treatment names.

If there are a large list of Treatment names to add to the product dictionaries, contact GDM support at GDM.ARM.Support@gdmdata.com for help entering.

GDM can also provide an optional Access database for maintaining and distributing product updates within a company.

Build personal lists for key master lists

Similarly, personal lists can be created from key master lists, such as Crop, Pest, Part Rated, etc., by adding to the personal list.

To add items to a person list:

1. In ARM, go to the field that a personal list is to be built, for example, Crop (in Protocol Description, Crop/Pest Description tab).

Protocol Description

Trial Establishment Guidelines Crop/Pest Description Soil Application Crop Sta

Crop Description

Insert Crop/Pest with Shift+F7, Delete current C

Crop 1:

Variety:

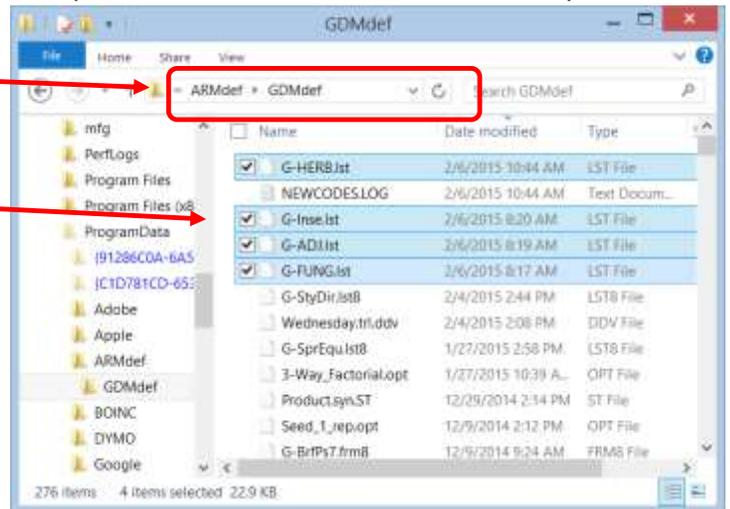


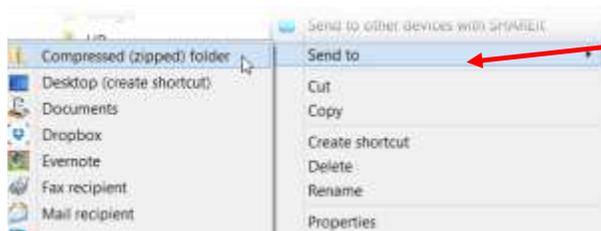
2. Select F9 to open the validation list for Crop.
3. Begin typing the first few letters of the crop to display.
4. Once the crop of interest is found, select the 'Add to Personal' button.
5. To add additional crops to person list, continue searching for crops and selecting 'Add to Personal' button.
6. To view items added to Personal list, select 'Display Personal' button.

Distribute product dictionaries and personal lists

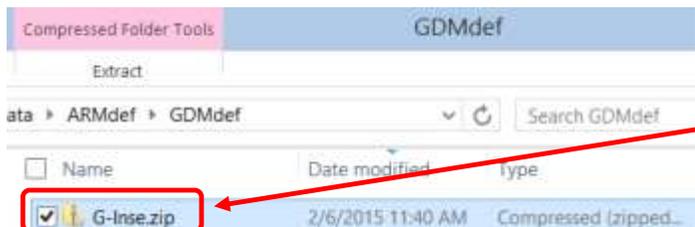
Once product dictionaries and personal lists have been updated, distribute them to other users in your organization. To do this, follow these steps:

1. In Windows Explorer, go to C:\ProgramData\ARMdef\GDMdef folder.
2. Select the updated dictionary (list) files to be distributed to others.



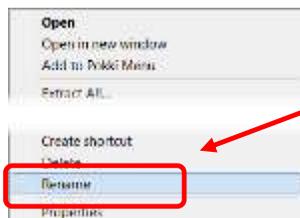


3. Right-click and select 'Send to - Compressed (zipped) folder'.



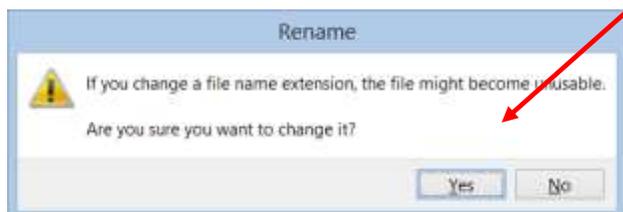
4. A 'ZIP' file is created that contains the list files.

5. Re-name the file by right-clicking on the file and selecting 'Rename'. Rename to 'GDMdef.a7z'.



6. Select 'Yes' to Rename.
Note: The 'GDMdef' tells ARM where to place the list files, and the 'a7z' file extension requires simply double-clicking for ARM to apply the lists.

7. Distribute the 'a7z' file to other users in your organization.



The Importance of a well-designed Protocol

Header

Protocol ID

- Identify an ID system the company will use for all protocols, such as 2016-XYZ-Soy-FR
 - Year
 - Project or product
 - Sometimes crop or pest
 - Location code such as country or region

Trial ID

- Identify a similar ID system the company will use for trials. Typical components:
 - Year
 - Project or product
 - Sometimes crop or pest
 - Location code such as country or region
 - Trialist

Title

- A brief statement of trial objectives, including crop, product and goal

Example Header below:

Header	
Title:	
Test STRA_15 as insecticide in brassica against Brevicoryne brassicae	
Protocol ID:	Example Best Practice PRT
Location:	Central and South EU
Trial Year:	2015
Trial ID:	
By:	Dr. Bernd Stratmann
Project ID:	Example PRT Best Practice
Study Director:	Dr. Bernd Stratmann
Sponsor Contact:	Sponsor name

Detailed Treatment List

Product names

- Entered consistently with accurate formulation concentration

Application rates and timings

- Include for all products

Application Codes

- Use to identify treatments with repeated applications
- Identify what each code means
- This also helps ensure Protocol Product Amount Totals report includes product for each planned application

Example Treatments below:

Trt Line	Trt No.	Type	Treatment Name	Form Conc	Form Unit	Form Type	Registration Number	Description	Rate	Rate Unit	Other Rate	Other Rate Unit	Appl Code	Appl Description	Crop Destruction	Spray Volume	Volume Unit	Comment 1
1	1	CHK	Untreated Check					not treated										
2	2	INSE	Micula	777	GAL	EC	033743-00	spray incl underside leaf	2	% WV	1.2	ml/m2	A	directed spray		600	L/ha	see application comments!
3	3	INSE	STRA_01	700	GAL	EC		spray incl underside leaf	1.33	% WV	0.8	ml/m2	A	directed spray	X	600	L/ha	see application comments!
4	4	INSE	STRA_01	700	GAL	EC		spray incl underside leaf	1.83	% WV	1.1	ml/m2	A	directed spray	X	600	L/ha	see application comments!
5	5	INSE	STRA_01	700	GAL	EC		spray incl underside leaf	1.33	% WV	0.8	ml/m2	A.B	directed spray	X	600	L/ha	see application comments!
6	6	INSE	STRA_01	700	GAL	EC		spray incl underside leaf	1.8	% WV	1.1	ml/m2	A.B	directed spray	X	600	L/ha	see application comments!

Key Assessments

Identify fields at minimum for key assessments:

- Part Rated
- Rating Type
- Rating Unit

Others may include:

- Pest
- Pest Density Unit
- Evaluation timing

➤ ARM Action Code

Column Number	1	2	3	4	5	6	7	8	9
Pest Type	Insect	Insect	Insect	Insect	Insect				
Pest Code	BRVCBR	BRVCBR	BRVCBR	BRVCBR	BRVCBR				
Pest Scientific Name	Brevicoryne brz								
Pest Name	Cabbage aphid								
Part Rated	INSECT P	PLANT P	PLANT P	PLANT P	PLANT P				
Rating Type	COUINS	COUINS	COUINS	COUINS	COUINS	PHYGEN	PHYGEN	PHYGEN	PHYGEN
Rating Unit	NUMBER	NUMBER	NUMBER	NUMBER	NUMBER	%	%	%	%
Sample Size, Unit	1 PLC	1 PLC	1 PLC	1 PLC	1 PLC				
Collection Basis, Unit	20 PLA	20 PLA							
Reporting Basis, Unit	20 PLA	20 PLA							
Number of Subsamples	1	1	1	1	1	1	1	1	1
SE Group No.	7	2	3	4	4	14	15	17	18
Rating Timing	A0	A1	A2	A3	A4	A1	A2	A3	A4
Tt-Eval Interval	0 DA-A	3 DA-A	7 DA-A	7 DA-B	14 DA-B	3 DA-A	7 DA-A	7 DA-B	14 DA-B
Number of Decimals	1	1	1	1	1	1	1	1	1

Use Study Rules

Clearly identify key trial information fields to complete

- Required fields
- Recommended fields
- Timing of the rule

Example set of Study Rules below:

Rule	Rule ID	Editor	Field	Condition	Columns
40	Strict Validation	Assessment Data	Part Rated	Always	
41	Strict Validation	Assessment Data	Part Rated	Always	
42	Strict Validation	Assessment Data	Rating Type	Always	
43	Strict Validation	Assessment Data	Rating Unit	Always	
44	Strict Validation	Assessment Data	Reporting Basis	Always	
45	Strict Validation	Assessment Data	Reporting Basis Unit	Always	
46	Required	Assessment Data	Rating Timing	With assessment data	
47	Recommended	Site Description	Appl. Equipment - Spray Volume	established	
48	Recommended	Site Description	Appl. Equipment - Equipment Type	established	
49	Required	Site Description	Soil - Soil Name	established	
50	Required	Site Description	Soil - % OM	established	
51	Required	Assessment Data	Crop Stage Majority	With assessment data	1
52	Required	Assessment Data	Pest Stage Majority	With assessment data	1
53	Required	Assessment Data	Crop Code	With assessment data	1
54	Required	Assessment Data	Crop Variety	With assessment data	1
55	Required	Site Description	General Trial - Climate Zone	setup	
56	Required	Assessment Data	Pest Density	With assessment data	1-5

Use well-written protocol to identify other key information for conducting the trial

When preparing protocol, be aware that frequently the person who is actually performing trial work is **not** the person with whom the sponsor contact is typically working. The trialist is often a technician who is instructed by the primary contact in the contractor organization. The better that requirements are

described in a protocol, the better the actual trialist is equipped to know and understand how to conduct and describe the trial.

Objectives

- Clearly state the objectives of the trial.
- May include background information on the purpose of the study.

An example of a desirable objective is listed below:

In the past few years, generic alternatives to name brand herbicides have begun to appear on store shelves in Anywhere, USA. These generic herbicides usually have the exact same active ingredient as the name brand product, although the “inerts” as described on the label may differ. “Inerts” are simply additives to the herbicide that may help the products solubility, stability over time, tolerance to cold temperatures, etc. Generic herbicides often differ as compared to their name brand counterparts in terms of these additives. Generic herbicides also may differ in the solvent used. An example would be the name brand using vegetable oil as a solvent as compared to a generic herbicide using petroleum based solvent. Differing inerts and/or solvents can impact performance of herbicide in the field. Finally, generics may differ in the quantity of active ingredient contained within the product. This is easily checked by referring to the label. GenericHerbicides, Inc. is a company that produces many generic alternatives to common name brand herbicides. Examples include HerbiSyde which is similar to the herbicide CLAIM1, and their herbicide SilverSyde which is similar to the herbicide CLAIM2. Both HerbiSyde and SilverSyde contain the same active ingredient, at the same concentration, as their name brand counterparts, but the “inerts” are probably not the same, although it is impossible to know from the information presented on the herbicide label. The objective of these herbicide trials is to compare the effectiveness of HerbiSyde and SilverSyde to their trade name competitors CLAIM1 and CLAIM2, when applied as individual plant leaf sprays or stem sprays to weedy place.

Application details

- Special equipment
- Timing of applications
- Type of application

Below is a partial example ARM protocol Application details in Protocol Description, Application tab:

Trial Establishment Guidelines	Crop/Pest Description	Soil	Application	Crop Stage at Appl.	Pest Stage at Appl.	Site Information	General Comments
Ground Speed, Unit:							
Incorporation Equip.:							
Hours to Incorp.:							
Incorp. Depth, Unit:							
Carrier:	WATER						
Water Hardness (ppm CaCO3):							
Spray Volume, Unit:							
Mix Size, Unit:							
Spray pH:							
Propellant:							

Equipment Comment: Sprayer - ensure sufficient coverage of the underside of the leaves

Normal Arial 10 B I U [Color Picker] [Font Size] [Bold] [Italic] [Underline] [Text Color] [Background Color] [List] [Link] [Unlink] [Indent] [Outdent] [Align Left] [Align Center] [Align Right] [Justify] [Undo] [Redo] 100%

Application Directions:

- Do NOT apply at temperatures above 25 oC and do NOT apply in bright sunshine situations
- Adjust Spray volumes in the treatment list according to the size and volume of the crop. It needs to be adopted to ensure a complete moistening of the target insects. The insects need to be "hit between the eyes" to achieve required effects. It is advised to test the spray equipment with pure water on an average size target plant to find a spray volume that allows full coverage until start of "run-off"
- Typically the following spray volumes should be considered.
 - plants < 50cm: 1000 l/ha spray volume
 - plants 50-125 cm: 1500 l/ha spray volume
 - plants > 125 cm: 2000 l/ha spray volume

Crop Information

- Specific variety or hybrid to plant
- Seeding depth
- Seeding rate
- Seed size
- Use of seed treated seed or 'naked' seed

Below is an example of Crop information from an ARM protocol, Protocol Description, Crop/Pest Description tab:

Protocol Description

Trial Establishment Guidelines | **Crop/Pest Description** | Soil | Application | Crop Stage at Appl. | Pest Stage at Appl. | Site Information | General Con

Crop Description

Insert Crop/Pest with Shift+F7, Delete current Crop/Pest with Shift+F8

Crop 1:

Variety: Description:

BBCH Scale: BVHF

Planting Rate, Unit: Row Spacing, Unit:

Target Pest Description

Pest 1 Type: Code:

Common Name:

Description:

Artificial Population: Establishment Date:

Establishment Rate, Unit:

Concentration, Unit:

Establishment Method/Description:

Site Requirements

- Crop rotation details
- Irrigation requirements
- Drainage
- Soil types, texture, pH range

Soil Sampling

- Timing of sampling
- Handling of samples
- Types of analysis to be completed on soil samples

Date for Final results

- Date final results are needed.
- If interim results, dates as well.

Below is an example of Site requirements from an ARM protocol, Protocol Description, Site Information tab:

Protocol Description

Trial Establishment Guidelines | Crop/Pest Description | Soil | Application | Crop Stage at Appl. | Pest Stage at Appl. | Site Information | General Comments

Geographic Area/Environmental Considerations: Greenhouse in Europe

Cropping Considerations: typical crop planting density

Date to Collect: Count aphids 3 and 7 days after treatment as well as 14 days after the final treatment. 0, 3, 7, 14 DA-A
Calculate Efficacy as to Henderson-Tilton based on the counts. For these efficacy columns insert "EC" for Exclude untreated check from the AOV analysis table. Use AOV means table report for reporting

Statistical Analysis: Tukey 0.05%

Summarize and Submit Study By (Date): May-31-2015

Clearly identify expectations of what information the trialist must provide

- Photographs
- Raw data
- Whether trialist should provide interim results (or next day results posted on a cloud site such as Dropbox)
- Whether to notify the Sponsor Contact immediately if trialist observes something "unusual or noteworthy"
- Whether trialists' conclusions are expected as part of the finalized trial

Product planning

- Complete the trial distribution table in Protocol Description, Trial Establishment Guidelines to calculate and fill Total Trials (or at least manually enter the expect Total Trials).

Protocol Description

Trial Establishment Guidelines | Crop/Pest Description | Soil | Application | Crop Stage at Appl. | Pest Stage

Project ID: Example PRT Best Practice Developer: B Stratmann

Revision Number: 1.0 Revision Status: F Final

Revision Date: Oct-9-2015 Issue Date: Oct-2-2015

Research Stage: Site Type: GREENH I

Insert row with Shift+F7, Delete current

Trial ID	Responsible	Number of Trials	Site Requirements
BPD_01	<input type="checkbox"/>	2	Fallow 2 years
BPD_03	<input type="checkbox"/>	3	Fallow 1 year
BPD_06	<input type="checkbox"/>	1	Fallow 3 years

- Print a Protocol Spray/Seeding Plan to get details for all applications for one protocol.

ADC GmbH

Test STRA_15 as insecticide in brassica against Brevicoryne brassicae

Protocol ID: Example Best Practice PRT Location: Central and South EU Trial Year: 2015
 By: Dr. Bernd Stratmann
 Project ID: Example PRT Best Practice Study Director: Dr. Bernd Stratmann
 Sponsor Contact: Sponsor name

Reps: 4 Appl Code: A Plots: 1.5 by 4 meters
 Spray vol: 600 L/ha Mix Size: 2.65 liters (calculated mix size 1.69)

Trt No.	Treatment Type Name	Form Conc	Form Unit	Form Type	Registration Number	Rate Unit	Other Rate	Other Rate Unit	Appl Code	Amt Product to Measure
2	INSE Micula	777	GA/L	EC	033743-00	2 % v/v	1.2	ml/m ²	A	53.0 ml/mx
3	INSE STRA_01	700	GA/L	EC		1.33 % v/v	0.8	ml/m ²	A	35.25 ml/mx
4	INSE STRA_01	700	GA/L	EC		1.83 % v/v	1.1	ml/m ²	A	48.5 ml/mx
5	INSE STRA_01	700	GA/L	EC		1.33 % v/v	0.8	ml/m ²	A B	35.25 ml/mx
6	INSE STRA_01	700	GA/L	EC		1.8 % v/v	1.1	ml/m ²	A B	47.7 ml/mx

Reps: 4 Appl Code: B Plots: 1.5 by 4 meters
 Spray vol: 600 L/ha Mix Size: 2.65 liters (calculated mix size 1.69)

Trt No.	Treatment Type Name	Form Conc	Form Unit	Form Type	Registration Number	Rate Unit	Other Rate	Other Rate Unit	Appl Code	Amt Product to Measure
5	INSE STRA_01	700	GA/L	EC		1.33 % v/v	0.8	ml/m ²	A B	35.25 ml/mx
6	INSE STRA_01	700	GA/L	EC		1.8 % v/v	1.1	ml/m ²	A B	47.7 ml/mx

Reps: 4 Appl Code: Plots: 1.5 by 4 meters
 Spray vol: 1000 L/ha Mix Size: 2.65 liters (calculated mix size 2.65)

Trt No.	Treatment Type Name	Form Conc	Form Unit	Form Type	Registration Number	Rate Unit	Other Rate	Other Rate Unit	Appl Code	Amt Product to Measure
1	CHK Untreated Check									

Amount to measure for each treatment

Sort Order: Application Code, Treatment

- The Protocol Amount Totals Report lists total product requirements for all planned trials (Total Trials is a multiplier).

Product quantities required for listed treatments and applications of trials included in this table:

Amount*	Unit	Treatment Name	Form Conc	Form Type	Lot Code
66.250	ml	Micula	777	EC	
312.038	ml	STRA_01	700	EC	

Amount of each product needed for one trial

- * 'Per area' calculations based on spray volume= 1000,600 L/ha, mix size= 2.65 liters (mix size basis).
- * Product amount calculations increased 25 % for overage adjustment.
- * 'Per volume' calculations use spray volume= 1000,600 L/ha, mix size= 2.65 liters.
- * Adjusted for multiple applications in treatment list.

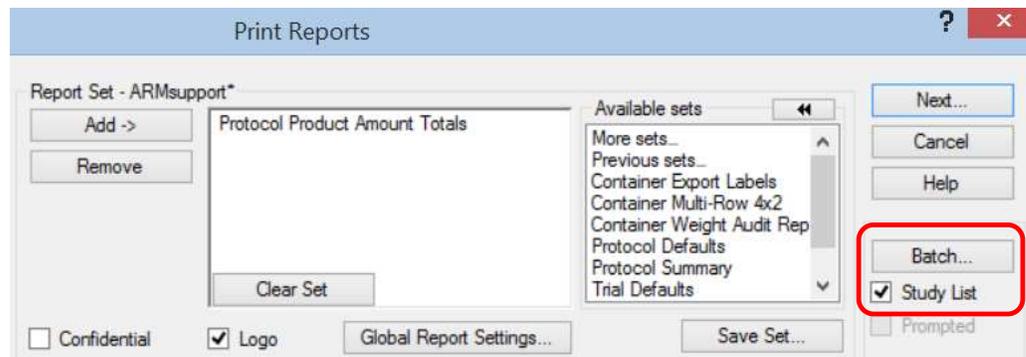
Product quantities required for listed treatments and applications across multiple studies:

Amount*	Unit	Treatment Name	Form Conc	Form Type	Lot Code
397.500	ml	Micula	777	EC	
1,872.225	ml	STRA_01	700	EC	

Amount of each product needed for entire protocol (6 trials)

- C:\Users\Rebecca\Documents\ARM Data\Example Best Practice.prt
- * 'Per area' calculations based on spray volume= 1000,600 L/ha, mix size= 2.65 liters (mix size basis).
 - * Product amount calculations increased 25 % for overage adjustment.
 - * 'Per volume' calculations use spray volume= 1000,600 L/ha, mix size= 2.65 liters.
 - * Adjusted for multiple applications in treatment list.
 - * Product amounts adjusted for the 6 trials planned for this protocol.

- To obtain product amount totals across several protocols, use Select Batch to choose the group of protocols, and use Protocol Product Amount Totals report. Product amount totals are across all protocols for all planned trials.



Validate protocol

- Validate the protocol to ensure consistency in spelling and the use of proper terms from validation lists.
- The keyboard shortcut: CTRL + A performs checks of the current protocol, and refreshes field entries for copy default fields. ARM may also perform additional checks depending on which study definition the current protocol uses.
- The keyboard shortcut: CTRL + E performs the same checks as validate, but does not stop at the first error. This option displays a log of all validation errors when validation is completed.

Best Practice - Merge - From ARM Study

- Use Tools - Merge - From ARM Study to include information from previously written similar protocols, rather than attempting to remember what information to include, or copy/pasting the information.
- See this detailed [document](#) for instructions and examples of using the Merge feature.

Use 'Send To - External Sponsor/Cooperator'

- Use the 'Send to - External Sponsor/Cooperator' to provide CROs with protocols.
 - Include a protocol report set that is printed as a pdf
 - In the email created by ARM, open the report pdf and verify that all needed information is included, and that the information is correct and complete.
- See this website link for [details](#)
- It is risky to send a PRT file attached to an email message, because the protocol may not have been validated, and thus the CRO may be prevented from using it to create a trial.

CROs should use 'Send To - External Sponsor/Cooperator'

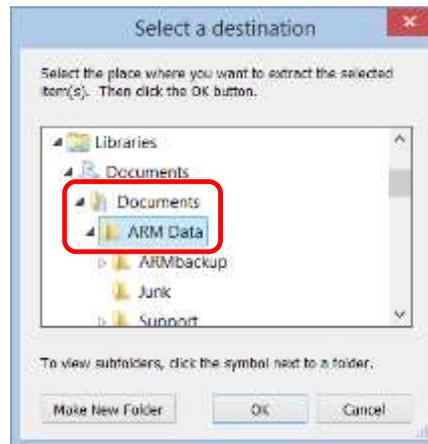
- CROs should use the 'Send To - External Sponsor/Cooperator' to provide sponsors with interim or final trial results.
- See this website link for [details](#)

- CROs should send interim or next-day results to sponsor in order for sponsor to track progress of each trial.
- CRO sends actual ARM trial, and sponsor overwrites previous interim trial and opens in study list. Previous versions of the past interim trials are kept automatically in the ARM backup folder.

Sponsor receives trial from CRO

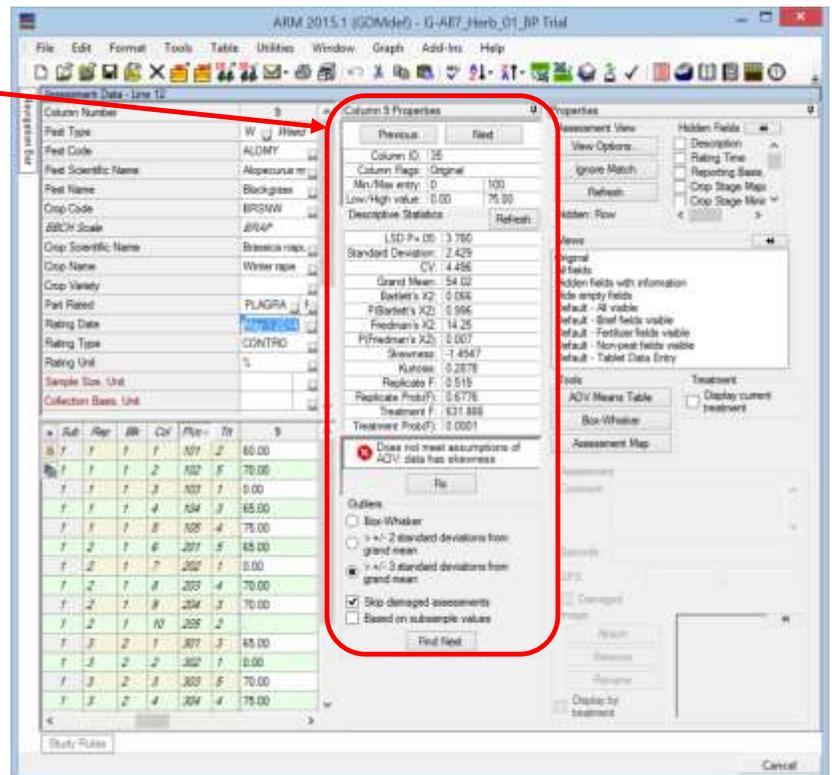
➤ When the sponsor receives a trial from the CRO, either interim or final:

1. Open Zip file from email and save files to an ARM data directory, such as My Documents\ARM Data.



2. In ARM, open the trial. You may need to use the 'Browse...' button in the Study List to direct ARM to the newly saved trial.

3. Use Data Assessment Column Properties to review the data in each column.



4. Use a ST criteria to check consistency of data entries in assessment headers and/or treatments.