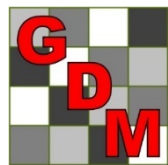




ARM 2018

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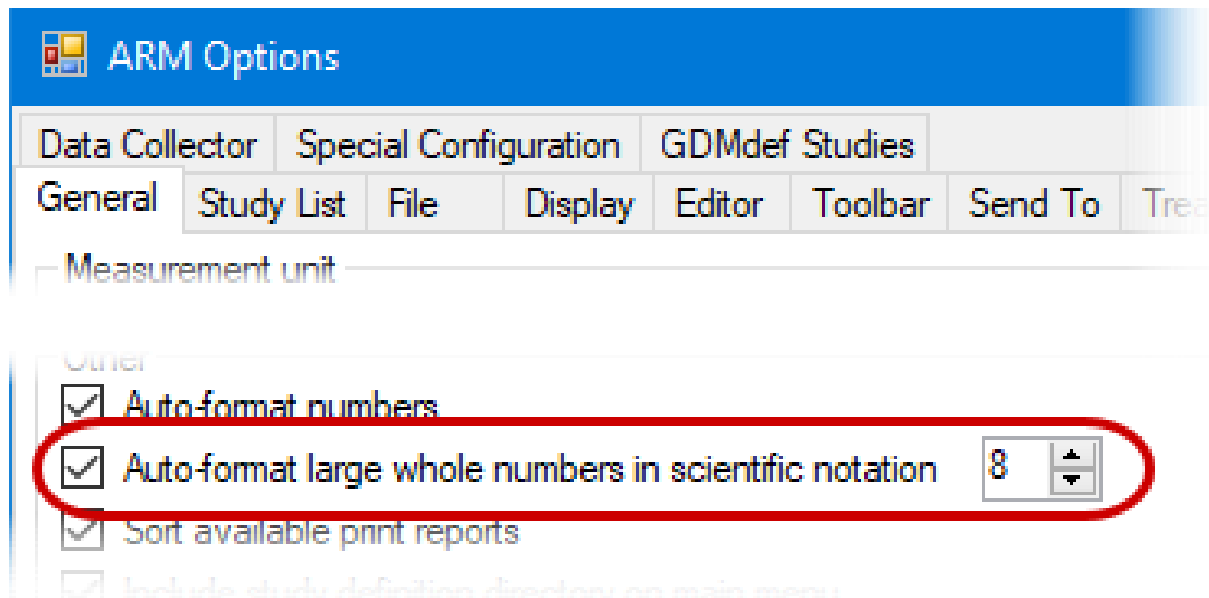
# Enhancements



Gylling Data Management, Inc.

# Auto-format large whole numbers in scientific notation

New option on General ARM Options tab to display large numbers on Treatments and Site Description editors in **scientific notation**.



Type	Treatment Name	Form Conc	Form Unit	Form Type
INSE	Test CFU	2570000000	CFU/ml	SC

Type	Treatment Name	Form Conc	Form Unit	Form Type
INSE	Test CFU	2.57E9	CFU/ml	SC

# New Site Description fields

## Minimum Mix/Treatment

Displays the minimum mix size needed for 1 treatment

## Mix Overage

Specify the portion of the Mix Size that is the overage for each application

### Application Equipment

	A	
Appl. Equipment:	AZO	
Equipment Type:		
Current:		
Spray Volume, Unit:	250	L/HA
Minimum Mix/Treatment:	2.5	liters
Mix Overage, Unit:	150	mL
Mix Size, Unit:	2.65	liters

# Mix Size Calculator

Calculate mix size based on current application settings

Press the Tool button in Mix Size field to open this dialog

Define **overage** so ARM can better auto-calculate product amounts

- Specify in mL\* or %

\* Recommended so ARM can better auto-adjust mix size in trials for multi-treatment applications or canopy height changes

Mix Size Calculator - Application A

Application volume: 200 L/ha

Mix Size

Treatments	1
Replicates	4
'Plot' EU size	38.75 m2
Application volume	200 L/ha
Mix size unit	liters
Minimum	3.1 liters
Overage	450 mL
Calculated mix size:	3.55 liters

User-defined mix size: 3.6 liters

OK Cancel

Mix Size, Unit: 3.6 liters

# Application Plan

Display all fields necessary for mix size and leaf wall area calculations.

Display from:

- Treatments editor
- Protocol/Site Description editor
- Spray/Seeding Plan report

Application Plan

Selected Applications	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D	<input type="checkbox"/> E	<input type="checkbox"/> F
<b>Settings</b>						
Treated Plot Width	3.1 m	3.1 m	3.1 m	3.1 m	3.1 m	3.1 m
Treated Plot Length	12.5 m	12.5 m	12.5 m	12.5 m	12.5 m	12.5 m
Replications	4	4	4	4	4	4
<b>Crop Information</b>						
Crop	1 MABSD	1 MABSD	1 MABSD	1 MABSD	1 MABSD	1 MABSD
Row Spacing, Unit	3.10 M	3.10 M	3.10 M	3.10 M	3.10 M	3.10 M
Rows per Plot						
Treated Canopy Height, Unit	2 m	2.5 m	2.5 m	2.5 m	2.5 m	2.5 m
Total Canopy Height, Unit						
Treated Leaf Wall Area, Unit	12903 m <sup>2</sup> /ha	16129 m <sup>2</sup> /ha	16129 m <sup>2</sup> /ha	16129 m <sup>2</sup> /ha	16129 m <sup>2</sup> /ha	16129 m <sup>2</sup> /ha
Treated Leaf Wall Area per Plot, Unit	50 m <sup>2</sup> /plot	63 m <sup>2</sup> /plot	63 m <sup>2</sup> /plot	63 m <sup>2</sup> /plot	63 m <sup>2</sup> /plot	63 m <sup>2</sup> /plot
<b>Application Information</b>						
Application Date	Apr-2-2014	Apr-12-2014	Apr-23-2014	May-3-2014	May-12-2014	May-21-2014
Row Sides Applied	2	2	2			2
Spray Volume, Unit	200 L/ha	200 L/ha	200 L/ha			200 L/ha
Mix Overage, Unit	450 mL	450 mL				
Calculated Mix Size, Unit	3.55 liters	3.55 liters	3.5 liters			3.5 liters
Mix Size, Unit	3.6 liters	3.9 liters				

Trt Line	Trt No.	Type	Treatment Name	Form Conc	Form Unit	Form Type	Specific Gravity	TGW g/100	Rate	Rate Unit	Other Rate	Other Rate Unit	Min # Appl	Appl Code	Crop ID Number
2	2	FUNG	Cyprodinil	750	G/KG	WG			0.20	kg/10000 m2 LWA				A-I	
3	3	FUNG	Cyprodinil	750	G/KG	WG			0.30	kg/10000 m2 LWA				A-I	
4	4	FUNG	Dodine 544 SC						0.05	L/ha/m CH				A-I	
5	5	FUNG	Syllit							L/10000 m2 LWA				A-I	
6	6	FUNG	Syllit							L/10000 m2 LWA				A-I	
7	7	FUNG	Cyprodinil							kg/10000 m2 LWA				A-I	
8	8	FUNG	Cyprodinil	750	G/KG	WG			0.75	kg/10000 m2 LWA				A-I	
9	9	FUNG	Syllit	400	G/L	SC			1.15	L/ha				A-I	
10	10	FUNG	Syllit	400	G/L	SC			1.5	L/ha				A-I	
11	11	FUNG	Cyprodinil	750	G/KG	WG			0.20	kg/ha				A-I	
12	12	FUNG	Cyprodinil	750	G/KG	WG			0.30	kg/ha				A-I	
1	1	CHK	Untreated												
15															

Adjust mix size and product amounts for Treated Canopy Height when LWA Application Volume unit is selected and there is a calculated Leaf Wall Area  
 Identify entered Mix Sizes that are different from Calculated Mix Size +/- 5.0 %

Help Cancel Next



# Adjust product amounts for LWA

New option to adjust product amounts for Leaf Wall Area

- when LWA Application Volume unit is selected,
- and there is a calculated Leaf Wall Area

Application Plan				
Applications	A	B	C	D

Properties

- Copy protocol Application Plan information to created trial(s)
- Adjust mix size and product amounts for Treated Canopy Height when LWA Application Volume unit is selected and there is a calculated Leaf Wall Area
- Identify entered Mix Sizes that are different from calculated mix size +/- 5.0 %

# Leaf Wall Area in a protocol

Treated Leaf Wall Area not calculated in an ARM protocol

Enter an *estimate* of Leaf Wall Area instead

Press F9 for list of common estimated LWA values:

Crop Stage At Each Application

Treated Leaf Wall Area, Unit:		A					
Treated Leaf Wall Area, Unit Master List (LeafWallArea)							
Treated	Treated	Crop	Scientific Name	Crop Group	Category	Country	Mode LWA
25000	m2/ha	Stone fruits	Prunus sp.	12	high	PL, SK, UK	20000<
45000	m2/ha	Tomato in greenhouse	Solanum lycopersicum	8	low	PL, UK, DE,CZ, HU	35000-45000
65000	m2/ha	Tomato in greenhouse	Solanum lycopersicum	8	middle	AT	45000-65000

# Leaf Wall Area in a protocol

Information on Application Plan is not copied to the trial by default

- The trialist needs to fill in the fields with actual data

Select 'Copy protocol Application Plan information to created trial(s)' option if entered LWA-related values are the same in the trial

Application Plan				
Applications	A	B	C	D

Properties

- Copy protocol Application Plan information to created trial(s)
- Adjust mix size and product amounts for Treated Canopy Height when LWA Application Volume unit is selected and there is a calculated Leaf Wall Area
- Identify entered Mix Sizes that are different from calculated mix size +/- 5.0 %



# Mix Size for LWA

Mix Size is now entered as **total mix** for Leaf Wall Area and Canopy Height treatments,

- Previously was entered as the mix per 10000 m2 LWA, or per 1 meter canopy height.

Mix Size Calculator - Application A

Application volume:  L/10000 m2 LWA

Mix Size

for Application	A
Treatments	1
Replicates	4
'Plot' EU size	38.75 m2
Application volume	200 L/10000 m2 LWA
Mix size unit	liters
Minimum	4 L/200 m2 LWA
Overage	<input type="text" value="450"/> mL
<input checked="" type="radio"/> Calculated mix size:	4.45 L/200 m2 LWA
<input type="radio"/> User-defined mix size:	<input type="text" value="4.5"/> liters

# Spray/Seeding Plan report changes

When a LWA treatment is present:

- Include the **Treated Leaf Wall Area per Plot**
- The LWA portion of the mix size is now reported as **LWA per treatment**

Reps: 4      Appl Code: A      Plots: 3.1 by 12.5 meters      **Treated LWA per Plot: 50 m2/plot**  
 Spray vol: 200 L/ha      Mix Size: 3.5 L/200 m2 LWA (total for 4 plots, includes 400 mL overage)

Trt No.	Treatment Name	Form Conc	Form Unit	Form Type	Rate Rate Unit	Appl Code	Spray Volume Unit	Amt Product to Measure	Diluent	Rep 1	Rep 2
2	Cyprodinil	750 G/KG	WG	lwa	0.20 kg/10000 m2	A-I	200 L/HA	4.516 g/mx	3495.5 mL	102	206
3	Cyprodinil	750 G/KG	WG	lwa	0.30 kg/10000 m2	A-I	200 L/HA	6.774 g/mx	3493.2 mL	101	204
4	Dodine 544 SC	544 G/L	SC	ch	0.85 l/ha/m	A-I	200 L/HA	29.75 mL/mx	3470.3 mL	106	209



# Spray/Seeding Plan report changes

- Include the amount of **mix overage** present in the listed mix size

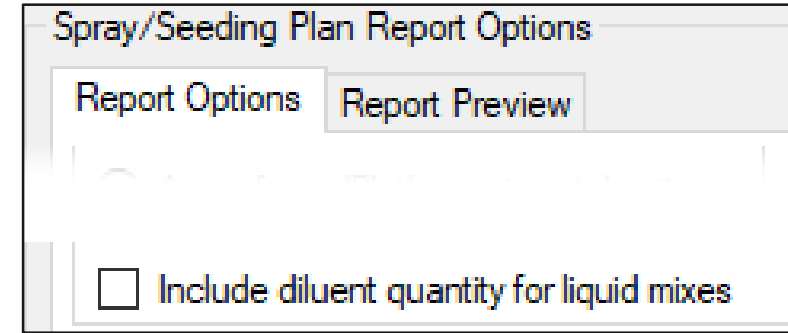
Reps: 4      Appl Code: A      Plots: 3.1 by 12.5 meters      Treated LWA per Plot: 50 m2/plot  
 Spray vol: 200 L/ha      Mix Size: 3.5 L/200 m2 LWA (total for 4 plots, **includes 400 mL overage**)

Trit No.	Treatment Name	Form Conc	Form Unit	Form Type	Rate Rate Unit	Appl Code	Spray Volume Unit	Amt Product to Measure	Diluent	Rep 1	Rep 2
2	Cyprodinil	750 G/KG	WG	0.20 kg/10000 m2 lwa	A-I	200 L/HA	4.516 g/mx	3495.5 mL	102	206	
3	Cyprodinil	750 G/KG	WG	0.30 kg/10000 m2 lwa	A-I	200 L/HA	6.774 g/mx	3493.2 mL	101	204	
4	Dodine 544 SC	544 G/L	SC	0.85 l/ha/m ch	A-I	200 L/HA	29.75 mL/mx	3470.3 mL	106	209	



# Spray/Seeding Plan report changes

- New option to print the **diluent quantity** for liquid treatments



Reps: 4      Appl Code: A      Plots: 3.1 by 12.5 meters      Treated LWA per Plot: 50 m<sup>2</sup>/plot  
 Spray vol: 200 L/ha      Mix Size: 3.5 L/200 m<sup>2</sup> LWA (total for 4 plots, includes 400 mL overage)

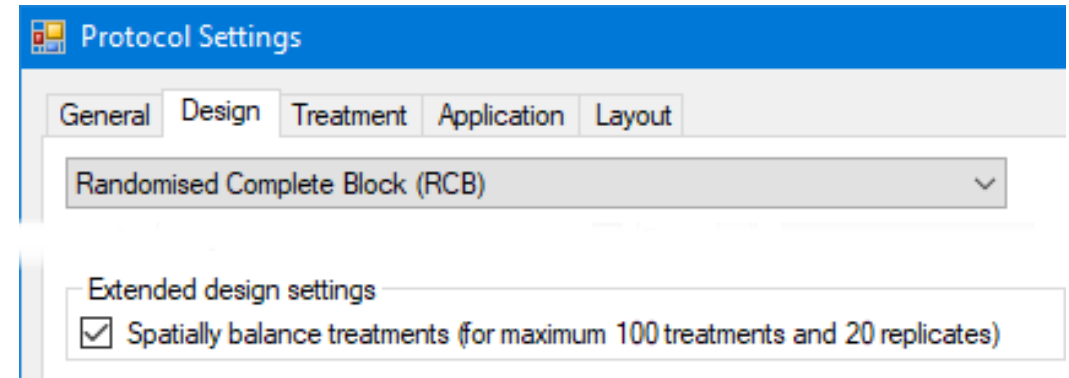
Trt No.	Treatment Name	Form Conc	Form Unit	Form Type	Rate Rate Unit	Appl Code	Spray Volume Unit	Amt Product to Measure	Diluent	Rep 1	Rep 2
2	Cyprodinil	750 G/KG	WG	WG	0.20 kg/10000 m <sup>2</sup> lwa	A-I	200 L/HA	4.516 g/mx	3495.5 mL	102	206
3	Cyprodinil	750 G/KG	WG	WG	0.30 kg/10000 m <sup>2</sup> lwa	A-I	200 L/HA	6.774 g/mx	3493.2 mL	101	204
4	Dodine 544 SC	544 G/L	SC	SC	0.85 l/ha/m ch	A-I	200 L/HA	29.75 mL/mx	3470.3 mL	106	209



# Spatially balanced randomization

For RCB designs, use a randomization optimized to uniformly disperse treatments across the trial

Balances average distance between all treatment pairs across replicates (see Trial Map – Quality tab)

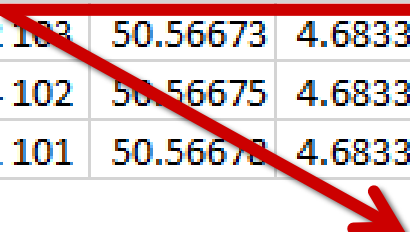


101 7	102 2	103 6	104 3	105 4	106 1	107 5
201 2	202 1	203 3	204 6	205 7	206 5	207 4
301 7	302 5	303 4	304 6	305 2	306 3	307 1
401 1	402 7	403 3	404 4	405 6	406 2	407 5
501 2	502 4	503 7	504 1	505 6	506 3	507 5

# Paste Extended 'Plot' Information

Include Alternative Plot ID, Barcode, and GPS coordinates in experimental unit 'plot' description copy/paste with Excel

	A	B	C	D	E	F	G	H	I
1	Rep	Blk	Col	Plot	Trt	Alt Plot ID	PlotCode	Lat	Long
2	1	1	1	104	3	P4	G-All7_Fung 3 104	50.56671	4.68332
3	1	1	2	103	2	P3	G-All7_Fung 2 103	50.56673	4.68332
4	1	1	3	102	4	P2	G-All7_Fung 4 102	50.56675	4.68332
5	1	1	4	101	1	P1	G-All7_Fung 1 101	50.56678	4.68332

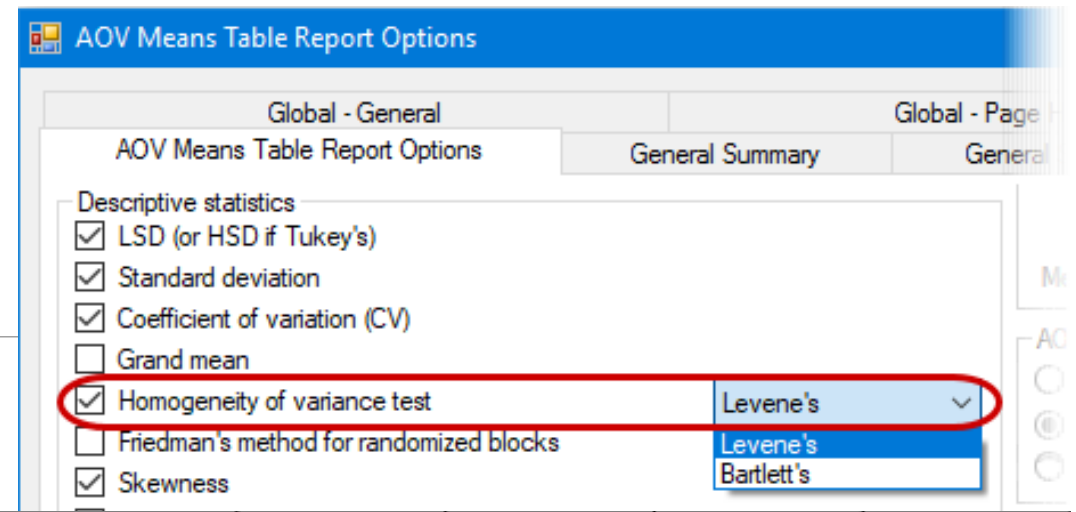


-	Sub	Rep	Blk	Col	Plot	Trt	Alt Plot ID	Barcode/RFID	Lat	Long
	1	1	1	4	P1	1	P1	G-All7_Fung 1 101	50.56678	4.68332
	1	1	1	3	P2	4	P2	G-All7_Fung 4 102	50.56675	4.68332
	1	1	1	2	P3	2	P3	G-All7_Fung 2 103	50.56673	4.68332
	1	1	1	1	P4	3	P4	G-All7_Fung 3 104	50.56671	4.68332

# Levene's test for Homogeneity of Variance

Perform Levene's test for homogeneity of variance on AOV Means Table report.

- Included as a descriptive statistic on the report
- Levene's test is less sensitive to departures from normality than Bartlett's test, so is generally preferred



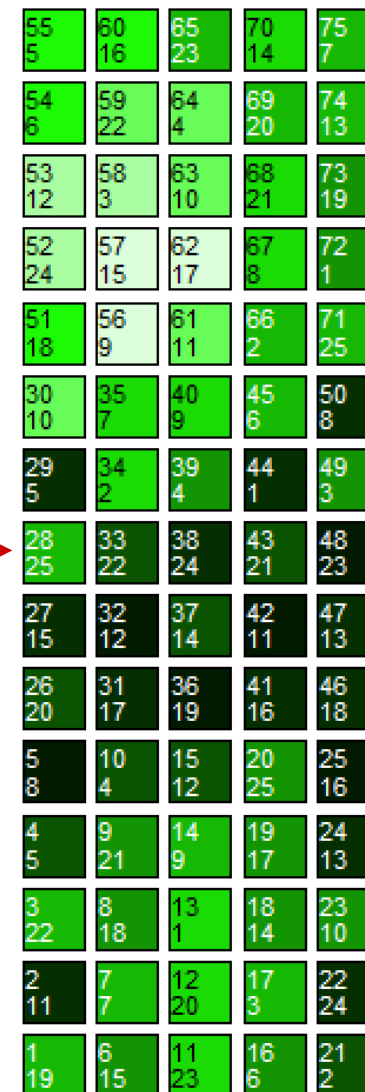
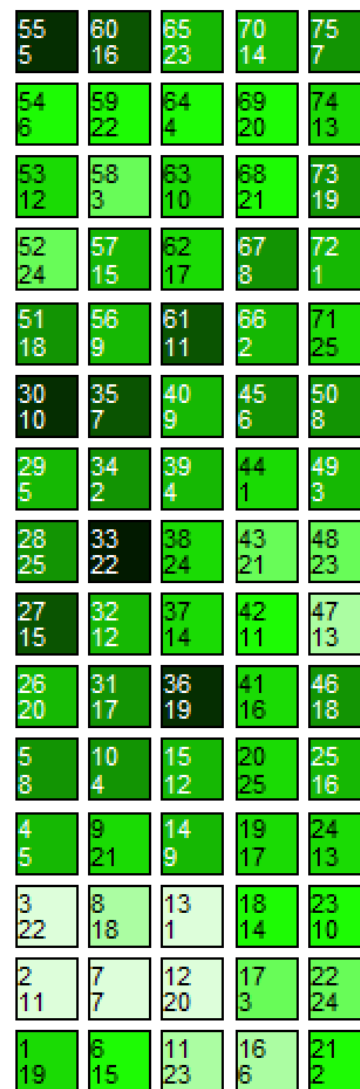
Pest Code	SEPTTR	SEPTTR	SEPTTR	SEPTTR	
Pest Name	Speckled leaf >	Speckled leaf >	Speckled leaf >	Speckled leaf >	
Part Rated	LEAF3 P	LEAF3 P	LEAF3 P	LEAF3 P	
Rating Type	PE SSEV	PE SSEV	PESSEV	PESSEV	
Rating Unit	%	%UNCK	%	%UNCK	
Number of Subsamples	10	1	10	1	
ARM Action Codes		TAB[3]		TAB[5]	
Number of Decimals	2	2	2	2	
Trt Treatment	Rate	Rate	Rate	Rate	
No. Name	Rate Unit	3	4	5	
1 Untreated Check		4.55 a	0.00 b	8.25 a	0.00 b
2 Tub	0.5 Vha	1.93 b	57.98 a	1.83 b	71.65 a
3 Tub	1 Vha	1.53 b	67.06 a	1.46 b	80.07 a
4 Tilt 250	0.5 Vha	1.83 b	59.52 a	2.30 b	70.60 a
5 Mico 60 Fungol	1.5 Vha 1.25 Vha	2.70 b	39.92 a	1.67 b	71.49 a
LSD P=.05		1.264	28.202	2.598	22.408
Standard Deviation		0.821	18.305	1.686	14.544
CV		32.76	40.77	54.39	24.75
Levene's F		1.153	1.352	3.29	0.856
Levene's Prob(F)		0.37	0.297	0.04*	0.512
Skewness		0.4943	-0.4657	1.8499*	-0.8631
Kurtosis		-0.8027	-1.0584	2.6407*	-0.9292



# Spatial Analysis

Attempts to recover information about hidden variables across a field

CRD + Quadratic spatial trend AOV For TRZAW Winter wheat GRAIN C					
Source	DF	Sum of Squares	Mean Square	F	Prob(F)
Total	18	5.170991 <sup>A</sup>			
Treatment Type III	4	1.441301	0.360325	7.676	0.0056
Blk	1	3.181476	3.181476	67.778	0.0001
Col	1	0.004818	0.004818	0.103	0.7560
Blk^2	1	0.053378	0.053378	1.137	0.3140
Col^2	1	0.055852	0.055852	1.190	0.3037
Blk:Col	1	0.011706	0.011706	0.249	0.6295
Error(adj)	9	0.046940			



Original

Neighbor-adjusted  
Fertility



# Spatial Analysis

## Trend analysis

- Analyze effects across whole field

## Nearest Neighbor analysis

- Analyze effects only in space adjacent to individual plots

## Automatic – ARM will select best-performing model

- AIC – estimates relative quality of available models (lower is better)



AOV - Spatial Report Options

Report options: AOV Means Table | General Summary | Report Preview

Spatial Method: Automatic

Mean comparison test: LSD

Descriptive statistics


Spatial AIC

Crop Name	Part Rated	Rating Type	Rating Unit	ARM Action Codes	Winter wheat GRAIN C YIELD T-MET TY1
Trt No.	Treatment Name	Rate	Rate Unit		12*
1	Untreated Check				7.84 b
2	Tub	0.5	l/ha		8.53 a
3	Tub	1	l/ha		8.45 a
4	Tilt 250	0.5	l/ha		8.70 a
5	Mico 60	1.5	l/ha		8.48 a
LSD P= .05					0.347
Standard Deviation					0.217
CV					2.58
Randomized Complete Block (RCB) AIC					5.1456
Spatial AIC					SPa 3.6037
SPa = Quadratic spatial trend					



# Collapsible Repeating Sections

 Collapse repeating sections to fit more sections on-screen

 Copy button copies all information in the section to clipboard

Site Description

General Trial | Objectives/Conclusions | Contacts | Crop Description | Pest Description | Site and Design | Maintenance | Soil | Moisture | Appli

Crop Description

+ Crop 1: TRZAS Triticum aestivum (spring) Spring wheat

Variety: Marvel BBCH Scale: BCER Crop Group: [ ]

Description: [ ] Maturity Group: [ ]

Seed Size, Unit: [ ] [ ] Nursery Date: [ ]

Seed Shape: [ ] Planting Date: Mar-20-2018

- Crop 2: GLXMA Glycine max Soybean

Variety: Dekalb 1234 BBCH Scale: BSOY Crop Group: [ ]

Description: [ ] Maturity Group: [ ]

Seed Size, Unit: [ ] [ ] Nursery Date: [ ]

Seed Shape: [ ] Planting Date: Mar-30-2018

Plant Shape: [ ] Planting Method: DIRDRI *direct drilled*

Planting Rate, Unit: 50 KG/HA Planting Equipment: [ ]

Depth, Unit: 2.5 CM Emergence Date: Apr-8-2018

Row Spacing, Unit: 40 CM Harvest Date: Sep-25-2018

Spacing within Row, Unit: 4 CM Harvested Width, Unit: [ ] [ ]

Rows per Plot: [ ] Harvested Length, Unit: [ ] [ ]

Planting Density, Unit: [ ] [ ] Harvest Equipment: [ ]

Soil Temperature, Unit: 13 C % Standard Moisture: [ ]

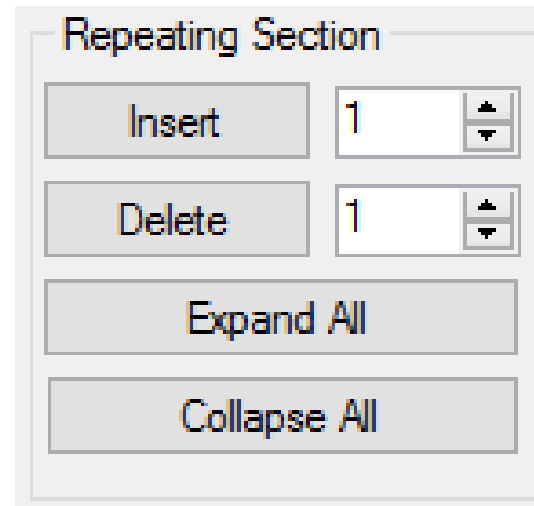
Soil Moisture: SLIDRY *slightly dry* Moisture Meter: [ ]

# Collapsible Repeating Sections

---

Faster load time when there are many sections on the tab

Expand or Collapse all sections at once from the Properties Panel



# New Study List fields

Added new fields to the study list:

- Soil %OM
- Soil pH
- Treatment Description
- Treatment Identification Code
- Number of Treatments
- Number of Assessment Columns
- Number of Assessment Columns with Data

Selected	Study ID	Soil %OM	Soil pH	Trial	Cost	Treatments	Replicates	Assessment Cols	Assessment Cols With Data	Damaged
<input type="checkbox"/>	G-All7_Fung	1.3	4.9			5	4	13	13	5
<input type="checkbox"/>	G-All7_Herb_02	0.7	6.2			5	4	19	19	0





# ARM Options

---

Common ARM options now remain consistent when switching between sponsor customizations, including:

- Measurement unit and program language
- Date and time format, GPS coordinate format
- Fonts, color options
- Most Editor options
- Most Assessment Data View options

Previously ARM maintained separate options for each customization 'profile', allowing user preferences to differ between sponsor customizations. Now, user preferences will be consistent for entering and reporting dates, times, GPS coordinates, language, fonts, and colors.

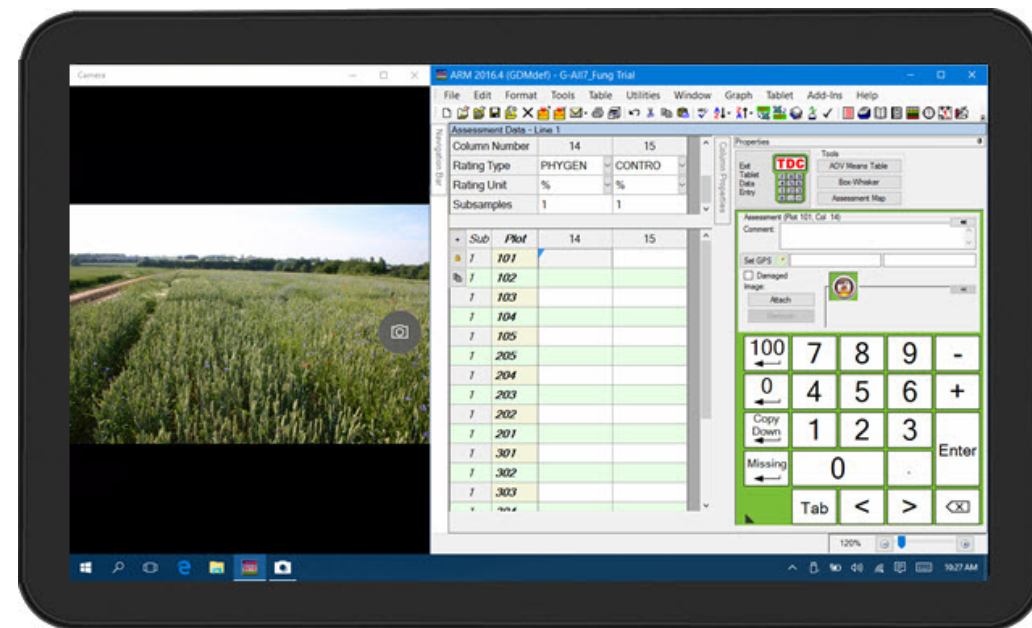
# Tablet Data Collector (TDC<sub>x</sub>) Add-In

Includes Tablet Data Collector (TDC) features for:

- An activated ARM license serial number
- on your touch-enabled Windows tablet

The "x" in "TDC<sub>x</sub>" indicates that you:

1. Purchase a touch-enabled Windows tablet, then
2. Install and activate your ARM license on this tablet - either:
  - a) Transfer your current ARM license to computer and purchase TDC<sub>x</sub> Add-In, or
  - b) Purchase **NEW** ARM Field license to obtain ARM field data entry license plus TDC<sub>x</sub>



Recommended minimum requirements to use TDC<sub>x</sub>:

Camera (6+ megapixel)  
SD card or micro flash (backup)  
64+ GB Internal Storage

GPS  
Stylus  
4+ GB RAM



# Edit - Delete Treatment

Delete Treatment dialog highlights the Trt. No column showing which treatments will be deleted when OK is selected

Remember "Undo" if any wrong treatments are accidentally removed

Trt No.	Type	Treatment Name	Fom Conc	Form Unit	Fom Type	Descr
1	CHK	Untreated Check				not treat
2	HERB	Rookie30	180	G/L	EC	
2	ADJ	DriftReduction	100	gA/kg	EO	
3	H					
3	A					
4	H					
4	A					
5	H					
5	A					
6	HERB	Rookie682	396	G/L	EC	
6	ADJ	DriftReduction	100	gA/kg	EO	

Delete Treatment dialog box:

Number to delete: 2

Starting at number: 3

Select OK to delete

Buttons: OK, Cancel, Help



# Crop Growth Stage Scales: VR and Feekes

VR and Feekes are new Crop Stage Scales in GDM Definitions

- Crop Stage at Application (in Site Description)
- Assessment Header

Contacts | Crop Description | Pest Description | Site and Design | Maintenance | So

Crop Stage At Each Application

Use Crop Description tab to insert  
Use Application Description tab to insert

	A		B	
<i>Application Date:</i>	4/27/2017		6/1/2017	
<i>Crop 1 Code, BBCH Scale:</i>	GLXMA	BSOY	GLXMA	BSOY
<i>Stage Scale Used:</i>	▼ VR		▼	
<i>Stage Majority, Percent:</i>	▼	V1	▼	75
<i>Stage Minimum, Percent:</i>	▼	VC	▼	5
<i>Stage Maximum, Percent:</i>	▼	V2	▼	20

Stage Scale Used Master List (SART)

Stage Scale Used	Description
BBCH	BBCH uniform plant stages
DESC	descriptive growth stages
FEEKES	Feekes cereal growth stages
VR	Vegetative/Reproductive growth stages



# Crop Growth Stage Scales: VR and Feekes

## VR for corn (BCOR)

Stage Majority, Percent Master List (BBCH\_GS)

Stage Majority, Percent	Description 1	Scale	Online Description
VE	Emergence (BBCH 9 = Emergence: coleoptile penetratessoil surface)	BCOR	<a href="https://extension.entm.purdue.edu/fieldcropsipm/com-sta">https://extension.entm.purdue.edu/fieldcropsipm/com-sta</a>
V1	First Leaf (BBCH 11 = First leaf unfolded)	BCOR	<a href="https://extension.entm.purdue.edu/fieldcropsipm/com-sta">https://extension.entm.purdue.edu/fieldcropsipm/com-sta</a>
V2	Second Leaf (BBCH 12 = 2 leaves unfolded)	BCOR	<a href="https://extension.entm.purdue.edu/fieldcropsipm/com-sta">https://extension.entm.purdue.edu/fieldcropsipm/com-sta</a>
V3	Third Leaf (BBCH 13 = 3 leaves unfolded)	BCOR	<a href="https://extension.entm.purdue.edu/fieldcropsipm/com-sta">https://extension.entm.purdue.edu/fieldcropsipm/com-sta</a>
V4	Fourth Leaf (BBCH 14 = 4 leaves unfolded)	BCOR	<a href="https://extension.entm.purdue.edu/fieldcropsipm/com-sta">https://extension.entm.purdue.edu/fieldcropsipm/com-sta</a>
V5	Fifth Leaf (BBCH 15 = 5 leaves unfolded)	BCOR	<a href="https://extension.entm.purdue.edu/fieldcropsipm/com-sta">https://extension.entm.purdue.edu/fieldcropsipm/com-sta</a>
V6	Sixth Leaf (BBCH 16 = 6 leaves unfolded)	BCOR	<a href="https://extension.entm.purdue.edu/fieldcropsipm/com-sta">https://extension.entm.purdue.edu/fieldcropsipm/com-sta</a>
V7	Seventh Leaf (BBCH 17 = 7 leaves unfolded)	BCOR	<a href="https://extension.entm.purdue.edu/fieldcropsipm/com-sta">https://extension.entm.purdue.edu/fieldcropsipm/com-sta</a>
V8	Eighth Leaf (BBCH 18 = 8 leaves unfolded)	BCOR	<a href="https://extension.entm.purdue.edu/fieldcropsipm/com-sta">https://extension.entm.purdue.edu/fieldcropsipm/com-sta</a>
V9	Ninth Leaf (BBCH 19 = 9 or more leaves unfolded)	BCOR	<a href="https://extension.entm.purdue.edu/fieldcropsipm/com-sta">https://extension.entm.purdue.edu/fieldcropsipm/com-sta</a>
V10	Tenth Leaf (BBCH 19 = 9 or more leaves unfolded)	BCOR	<a href="https://extension.entm.purdue.edu/fieldcropsipm/com-sta">https://extension.entm.purdue.edu/fieldcropsipm/com-sta</a>
V11	Eleventh Leaf (BBCH 19 = 9 or more leaves unfolded)	BCOR	<a href="https://extension.entm.purdue.edu/fieldcropsipm/com-sta">https://extension.entm.purdue.edu/fieldcropsipm/com-sta</a>
V12	Twelfth Leaf (BBCH 19 = 9 or more leaves unfolded)	BCOR	<a href="https://extension.entm.purdue.edu/fieldcropsipm/com-sta">https://extension.entm.purdue.edu/fieldcropsipm/com-sta</a>
V13	Thirteenth Leaf (BBCH 19 = 9 or more leaves unfolded)	BCOR	<a href="https://extension.entm.purdue.edu/fieldcropsipm/com-sta">https://extension.entm.purdue.edu/fieldcropsipm/com-sta</a>
V14	Fourteenth Leaf (BBCH 19 = 9 or more leaves unfolded)	BCOR	<a href="https://extension.entm.purdue.edu/fieldcropsipm/com-sta">https://extension.entm.purdue.edu/fieldcropsipm/com-sta</a>
V15	Fifteenth Leaf (BBCH 19 = 9 or more leaves unfolded)	BCOR	<a href="https://extension.entm.purdue.edu/fieldcropsipm/com-sta">https://extension.entm.purdue.edu/fieldcropsipm/com-sta</a>
VT	Tassel (BBCH 51 = Beginning of tassel emergence)	BCOR	<a href="https://extension.entm.purdue.edu/fieldcropsipm/com-sta">https://extension.entm.purdue.edu/fieldcropsipm/com-sta</a>
R1	Silking (BBCH 61=tassel visible)	BCOR	<a href="https://extension.entm.purdue.edu/fieldcropsipm/com-sta">https://extension.entm.purdue.edu/fieldcropsipm/com-sta</a>
R2	Blister (BBCH 71 = Beginning of grain development)	BCOR	<a href="https://extension.entm.purdue.edu/fieldcropsipm/com-sta">https://extension.entm.purdue.edu/fieldcropsipm/com-sta</a>
R3	Milk (BBCH 73 = Early milk)	BCOR	<a href="https://extension.entm.purdue.edu/fieldcropsipm/com-sta">https://extension.entm.purdue.edu/fieldcropsipm/com-sta</a>
R4	Dough (BBCH 83 = Early dough: kernel content soft)	BCOR	<a href="https://extension.entm.purdue.edu/fieldcropsipm/com-sta">https://extension.entm.purdue.edu/fieldcropsipm/com-sta</a>
R5	Dent (BBCH 85 = Dough stage: kernels yellowish to yellow, about 55% dry matter)	BCOR	<a href="https://extension.entm.purdue.edu/fieldcropsipm/com-sta">https://extension.entm.purdue.edu/fieldcropsipm/com-sta</a>
R6	Black Layer (Physiological Maturity) (BBCH 87 = Physiological maturity)	BCOR	<a href="https://extension.entm.purdue.edu/fieldcropsipm/com-sta">https://extension.entm.purdue.edu/fieldcropsipm/com-sta</a>



# Crop Growth Stage Scales: VR and Feekes

Can now change between VR and BBCH or Feekes and BBCH, and stages are auto-updated:

1


VR	Stage Scale Used Master List (SART)	
V1	Stage Scale Used	Description
VC	BBCH	BBCH uniform plant stages
V2	DESC	descriptive growth stages
	FEEKES	Feekes cereal growth stages
	VR	Vegetative/Reproductive growth stages

2

	A	B
Application Date:	4/27/2017	6/1/2017
Crop 1 Code, BBCH Scale:	GLXMA BSOY	GLXMA BSOY
Stage Scale Used:		BBCH
Stage Majority, Percent:		11 75
Stage Minimum, Percent:		10 5
Stage Maximum, Percent:		12 20

# Crop Growth Stage Scales: VR and Feekes

VR for corn (BCOR) and soybean (BSOY) growth stage lists:

 Stage Majority, Percent Master List (BBCH\_GS)

Stage Majority, Percent	Description 1	Scale	Online Description
V1	First Trifoliolate (BBCH 11 = First pair of true leaves unfolded)	BSOY	<a href="https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf">https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf</a>
V2	Second Trifoliolate (BBCH 12 = Trifoliolate leaf on the 2nd node unfolded )	BSOY	<a href="https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf">https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf</a>
V3	Third Trifoliolate (BBCH 13 = Trifoliolate leaf on the 3rd node unfolded)	BSOY	<a href="https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf">https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf</a>
V4	Fourth Trifoliolate (BBCH 14 = Trifoliolate leaf on the 4th node unfolded)	BSOY	<a href="https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf">https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf</a>
V5	Fifth Trifoliolate (BBCH 15 = Trifoliolate leaf on the 5th node unfolded)	BSOY	<a href="https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf">https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf</a>
V6	Sixth Trifoliolate (BBCH 16 = Trifoliolate leaf on the 6th node unfolded)	BSOY	<a href="https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf">https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf</a>
V7	Seventh Trifoliolate (BBCH 17 = Trifoliolate leaf on the 7th node unfolded)	BSOY	<a href="https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf">https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf</a>
V8	Eighth Trifoliolate (BBCH 18 = Trifoliolate leaf on the 8th node unfolded)	BSOY	<a href="https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf">https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf</a>
V9	Ninth Trifoliolate (BBCH 19 = Trifoliolate leaf on the 9th node unfolded)	BSOY	<a href="https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf">https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf</a>
R1	Beginning Flowering (BBCH 60 = First flowers opened)	BSOY	<a href="https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf">https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf</a>
R2	Full Flowering (BBCH 65 = Full flowering: about 50% of flowers open)	BSOY	<a href="https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf">https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf</a>
R3	Beginning Pod (BBCH 69 = End of flowering: first pods visible)	BSOY	<a href="https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf">https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf</a>
R4	Full Pod (BBCH 75 = About 50% of pods have reached final length)	BSOY	<a href="https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf">https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf</a>
R5	Beginning Seed	BSOY	<a href="https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf">https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf</a>
R6	Full Seed (BBCH 79 = Approx. all pods have reached final length)	BSOY	<a href="https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf">https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf</a>
R7	Beginning Maturity (BBCH 80 = First pod ripe, beans final colour, dry and hard)	BSOY	<a href="https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf">https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf</a>
R8	Full Maturity (BBCH 89 = Full maturity; pods are ripe, harvest)	BSOY	<a href="https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf">https://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf</a>

# Crop Growth Stage Scales: Feekes

For Cereals (BCER) - can also interchange with BBCH

Stage Majority, Percent Master List (BBCH\_GS)

Stage Majority, Percent	Description 1	Scale
1.0	First leaf through coleoptile (BBCH 10 = First leaf through coleoptile)	BCER
1.1	First leaf unfolded (BBCH 11 = First leaf unfolded)	BCER
1.2	2 leaves unfolded (BBCH 12 = 2 leaves unfolded)	BCER
1.3	3 leaves unfolded (BBCH 13 = 3 leaves unfolded)	BCER
1.4	4 leaves unfolded (BBCH 14 = 4 leaves unfolded)	BCER
1.5	5 leaves unfolded (BBCH 15 = 5 leaves unfolded)	BCER
1.6	6 leaves unfolded (BBCH 16 = 6 leaves unfolded)	BCER
1.7	7 leaves unfolded (BBCH 17 = 7 leaves unfolded)	BCER
1.8	8 leaves unfolded (BBCH 18 = 8 leaves unfolded)	BCER
1.9	9 leaves unfolded (BBCH 19 = 9 or more leaves unfolded)	BCER
2.0	Main shoot and one tiller (BBCH 21 = Beginning of tillering)	BCER
3.0	Main shoot and six tillers (BBCH 26 = 6 tillers detectable)	BCER
4.0	Beginning of the erection of the pseudo-stem (BBCH 30 = Begin stem elongation)	BCER
5.0	Pseudo-stem strongly erected (BBCH 30 = Begin stem elongation)	BCER
6.0	First node of stem visible at base of shoot (BBCH 31=Node 1 cm above tillering)	BCER
7.0	Second node visible (BBCH 32 = Node 2 at least 2 cm above node 1)	BCER
8.0	Flag leaf visible, ear beginning to swell (BBCH 37 = Flag leaf visible, rolled)	BCER
9.0	Ligule of flag leaf visible (BBCH 39 = Flag leaf stage)	BCER
10.0	Ear swollen but not yet visible (BBCH 45 = Late boot stage)	BCER
10.1	First spikelet of head visible (BBCH 51 = Beginning of heading)	BCER
10.2	25% of heading completed (BBCH 53 = 30% of inflorescence emerged)	BCER
10.3	50% of heading completed (BBCH 55 = Middle of heading)	BCER
10.4	75% of heading completed (BBCH 57 = 70% of inflorescence emerged)	BCER
10.5	Heading completed (BBCH 59 = End of heading: inflorescence fully emerged)	BCER
10.51	Beginning flowering (BBCH 61 = Beginning of flowering: first anthers visible)	BCER
10.52	Flowering complete to top of head	BCER
10.53	Flowering complete at bottom of head	BCER
10.54	Kemel watery ripe (BBCH 71 = Watery ripe)	BCER
11.1	Milky ripe (BBCH 75 = Medium milk: grain content milky)	BCER
11.2	Mealy ripe: contents of kemel soft but dry, soft dough (BBCH 85 = Soft dough)	BCER
11.3	Kemel hard: difficult to divide with thumbnail (BBCH 89 = Fully ripe)	BCER
11.4	Ripe for harvest, straw dead (BBCH 92 = Over-ripe: grain very hard)	BCER





# Crop Growth Stage Scales - BBCH

BBCH growth stage lists also include the VR and Feekes stages in the Description column for relevant crops, such as the VR stages in soybean (BSOY) list:

Stage Majority, Percent Master List (BBCH\_GS)

Stage Majority, Percent	Description 1	Scale
11	First pair of true leaves unfolded (V1 = unifoliolate leaves on the first node)	BSOY
12	Trifoliolate leaf on the 2nd node unfolded (V2 = Second Trifoliolate)	BSOY
13	Trifoliolate leaf on the 3rd node unfolded (V3 = Third Trifoliolate)	BSOY
14	Trifoliolate leaf on the 4th node unfolded (V4 = Fourth Trifoliolate)	BSOY
15	Trifoliolate leaf on the 5th node unfolded (V5 = Fifth Trifoliolate)	BSOY
16	Trifoliolate leaf on the 6th node unfolded (V6 = Sixth Trifoliolate)	BSOY
17	Trifoliolate leaf on the 7th node unfolded (V7 = Seventh Trifoliolate)	BSOY
18	Trifoliolate leaf on the 8th node unfolded (V8 = Eighth Trifoliolate)	BSOY
19	Trifoliolate leaf on the 9th node unfolded (V9 = Ninth Trifoliolate)	BSOY
21	First side shoot visible	BSOY
22	2nd side shoot of first order visible	BSOY



# ARM Options

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Common ARM options now remain consistent when switching between sponsor customizations, including:

- Measurement unit and program language
- Date and time format, GPS coordinate format
- Fonts, color options
- Most Editor options
- Most Assessment Data View options

Previously ARM maintained separate options for each customization 'profile', allowing user preferences to differ between sponsor customizations. Now, user preferences will be consistent for entering and reporting dates, times, GPS coordinates, language, fonts, and colors.

# Weather Data Integration

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Weather analysis explains varying product performance within efficacy trials (year, location)

Sponsors may require it

Increased emphasis on developing biostimulants, plant health products – highly responsive to weather conditions.



# Weather Data Integration

## Iteris ClearAg Collaboration

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Iteris ClearAg weather and environmental content is now available by subscription to GDM clients

Directly import ClearAg's **historical** and **current weather** information and **soil** data from around the world through ARM software

Request more information about ClearAg at:

<http://info.clearag.com/ARMinfo.html>





# Weather Data Integration

## Site Description – new fields added

Daily and 30-Year average:

- Precipitation
- Air Temperature – Min/Max/Average
- Wind speed – Min/Max/Average
- Sunlight (Shortwave Radiation)

Others:

- % Cloud Cover
- Soil Temp – Average
- Soil Moisture – Scaled 0-10cm or 0-200cm

Moisture	Unit	Type	30Y	Unit	Min	Max	Avg	Temp	30Y	30Y	30Y	Unit
Total			Precipitation		Temp	Temp	Temp	Unit	Min Temp	Max Temp	Avg Temp	
0.4	mm	RAIN	1.3	mm	17	29	22	C	13	23	18	C
17.4	mm	RAIN	1.4	mm	16	24	19	C	13	22	17	C

Min	Max	Avg	Unit	% Cloud	Avg Shortwave	Unit	Avg	Unit	0-10 cm Scaled	0-200 cm Scaled
Wind	Wind	Wind		Cover	Radiation		Soil Temp		Soil Moisture	Soil Moisture
1	14	6	kph	58	143	W/m2	24	C	0.08	0.34
2	21	10	kph	62	152	W/m2	21	C	0.49	0.39

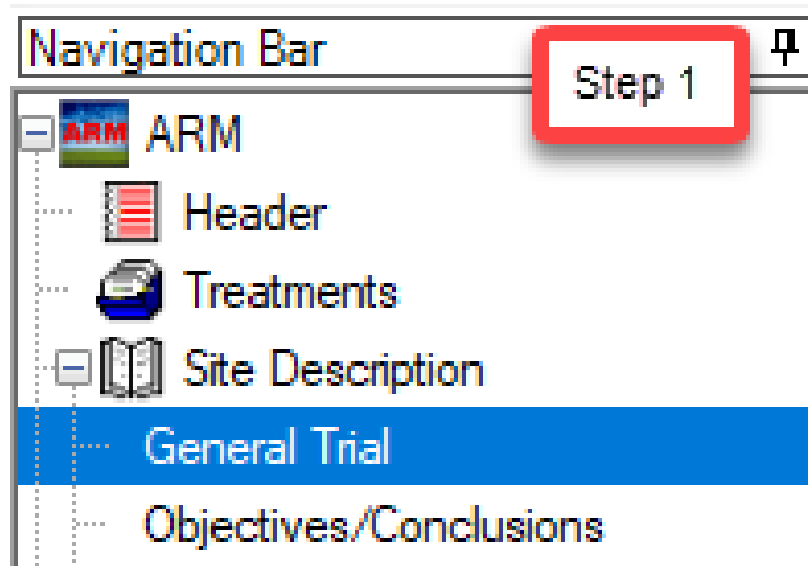
# Weather Data Integration

## Trial GPS Coordinates

Required fields:

Site Description editor > General Trial tab >

Latitude of LL Corner° and Longitude of LL Corner°



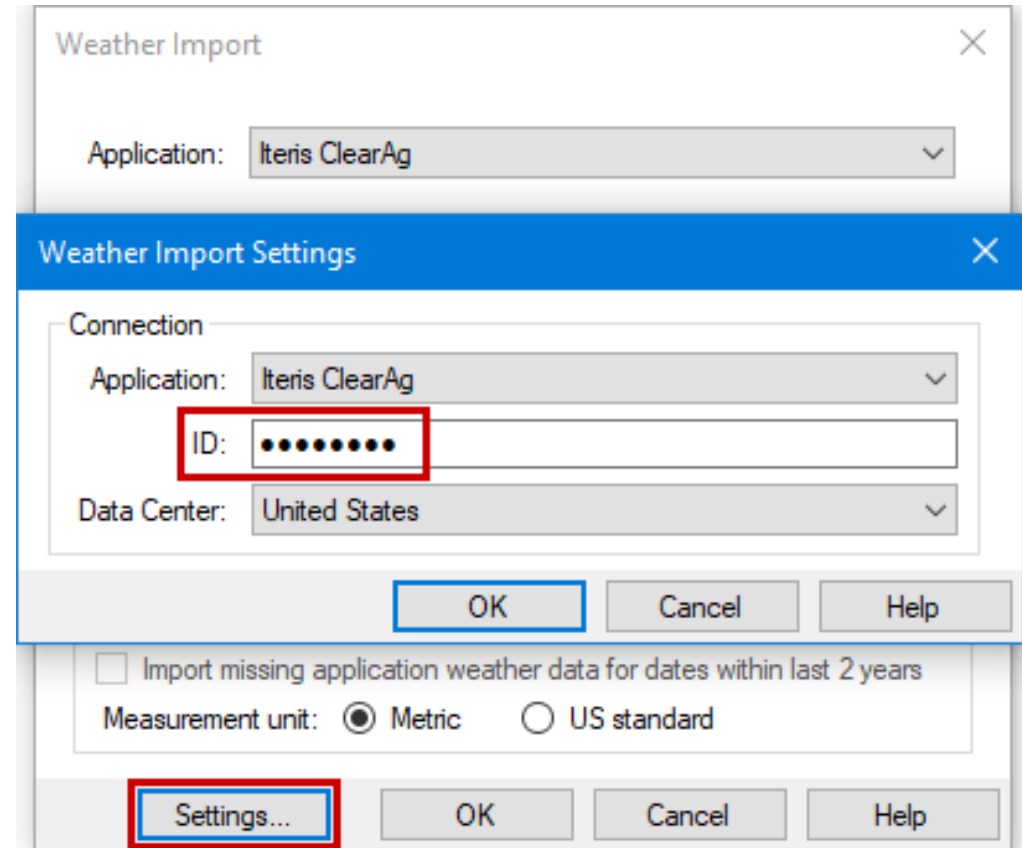
Latitude of LL Corner °:	<input type="text" value="50.539096"/>	<input type="button" value="🔑"/>	<input type="button" value="N"/>
Longitude of LL Corner °:	<input type="text" value="4.677259"/>	<input type="button" value="🔑"/>	<input type="button" value="E"/>

# Weather Data Integration

## Weather API provider subscription

Tools > Import Weather Data

Settings > enter License ID (from subscriber) and Data Center



# Weather Data Integration

## Import current weather conditions

Fill in today's Application with current weather conditions

	D
Application Date:	May-8-2017
Appl. Start Time:	
Appl. Stop Time:	
Interval to Prev. Appl., Unit:	

Import Weather Data...

Insert Repeating Section...

Delete Weather Import

Save

Application: Iteris ClearAg

Import current weather data to application D (May-8-2017 12:00 PM)

Import weather data to blank weather fields

Import weather data from a specified date range

Import missing application weather data for dates within last 2 years

Measurement unit:  Metric  US standard

Settings... OK Cancel Help

	D
Application Date:	May-8-2017
Appl. Start Time:	11:15 AM
Appl. Stop Time:	
Application Method:	SPRAY
Application Timing:	POSPOS
Application Placement:	BROFOL
Applied By:	Bob Spray
Air Temperature, Unit:	14.0 C
% Relative Humidity:	66.0
Wind Velocity, Unit:	26.0 kph
Wind Direction:	WSW
Dew Presence (Y/N):	Y yes
Soil Temperature, Unit:	11 C
Soil Moisture:	MOIST
% Cloud Cover:	74.5
Next Moisture Occurred On:	
Time to Next Moisture, Unit:	

# Weather Data Integration

## Import hourly historical weather data

Fill in previous Application with hourly weather conditions at the specified date and start time.

Weather Import

Application: Iteris ClearAg

Import weather data to blank weather fields  
 Import daily weather data for specified date range

Options

Import daily weather data prior to starting date 14 days  
 Import daily weather data after ending date 1 days  
 Import missing application weather data for dates within last 2 years

Measurement unit:  Metric  US standard

Settings... OK Cancel Help

	D	
Application Date:	May-8-2017	
Appl. Start Time:	10:00 AM	
Appl. Stop Time:		
Application Method:	SPRAY	
Application Timing:	POSPOS	
Application Placement:	BROFOL	
Applied By:		
Air Temperature, Unit:		3 C
% Relative Humidity:		97
Wind Velocity, Unit:		12 kph
Wind Direction:		E
Dew Presence (Y/N):		
Soil Temperature, Unit:		4 C
Soil Moisture:		
% Cloud Cover:		100
Next Moisture Occurred On:		
Time to Next Moisture, Unit:		
Moisture 1 Week after Appl.:		0 mm

# Weather Data Integration

## Import daily historical weather conditions

Add a row to the Weather table in Site Description for each day in the specified range.

Imports daily averages or totals for moisture, temperature, wind, and soil conditions.

Weather Import

Application: Iteris ClearAg

Import weather data to blank weather fields

Import daily weather data for specified date range

From: Apr-15-2017

To: Aug-7-2017

Options

Import daily weather data prior to starting date 14 days

Import daily weather data after ending date 1 days

Import missing application weather data for dates within last 2 years

Measurement unit:  Metric  US standard

Settings... OK Cancel Help

# Weather Data Integration

Import daily historical weather conditions

No.	Date	Moisture Total	Unit	Precipitation	Unit	Type	Min Temp	Max Temp	Avg Temp	Temp Unit	% Relative Humidity	Min Wind	Max Wind	Avg Wind	Unit	% Cloud Cover	Avg Shortwave Radiation	Unit	Avg Soil Temp
1.	Apr-1-2018	0	mm	0	mm	RAIN	-15	4	-4	C	68	0	14	6	kph	31	217	W/m2	-4
2.	Apr-2-2018	0	mm	0	mm	RAIN	-8	0	-4	C	85	1	37	13	kph	51	128	W/m2	-4
3.	Apr-3-2018	0	mm	0	mm	RAIN	-13	1	-6	C	83	0	14	6	kph	36	186	W/m2	-4
4.	Apr-4-2018	0	mm	0	mm	RAIN	-9	4	-2	C	82	4	32	17	kph	54	131	W/m2	-4
5.	Apr-5-2018	0	mm	0	mm	RAIN	-4	-2	-4	C	92	2	26	15	kph	100	61	W/m2	-4
6.	Apr-6-2018	0	mm	0	mm	RAIN	-4	2	-1	C	89	0	20	7	kph	100	107	W/m2	-3





# Weather Data Integration

## Batch import historical weather

Import weather data into multiple trials, based on Trial Initiation and Trial Completion dates of each trial.

Selected	Study ID	Initiation Date	Completion Date
<input checked="" type="checkbox"/>	G-All7_Weather	5/3/2017	9/29/2017
<input type="checkbox"/>	LWA	4/20/2017	
<input checked="" type="checkbox"/>	G-Seed7-Broccoli_Var_1	5/20/2015	10/30/2015
<input type="checkbox"/>	ST-Exam4	5/2/2014	10/30/2014
<input type="checkbox"/>	ST-Intermediate4	5/2/2014	
<input type="checkbox"/>	ST-Exam2	4/30/2014	
<input type="checkbox"/>	ST-Intermediate2	4/30/2014	
<input type="checkbox"/>	ST-Exam3	4/28/2014	
<input type="checkbox"/>	ST-Intermediate3	4/28/2014	
<input type="checkbox"/>	ST-Exam1	4/25/2014	
<input type="checkbox"/>	ST-Exam5	4/25/2014	
<input type="checkbox"/>	ST-Exam6	4/25/2014	
<input type="checkbox"/>	ST-Intermediate1	4/25/2014	

Context menu options:

- Delete File
- Rename File
- Move File
- Archive File
- Clear Field Map Link
- Import Weather Data For Selected Trial(s)...
- Previous Versions...

Weather Import

Application: Iteris ClearAg

Import daily weather data from trial initiation to trial completion

Import weather data to blank weather fields

Options

- Import daily weather data prior to starting date 14 days
- Import daily weather data after ending date 1 days
- Import missing application weather data for dates within last 2 years

Measurement unit:  Metric  US standard

Buttons: Settings..., OK, Cancel, Help