

Observations & Sub-Observations

BMS 12.0 Manual

About

Once the study design has been generated or imported, the Observations table is populated with independent study variables and sub-observation datasets can be created to record repeated measures.

Observations

The rows of Observations table represent the experimental units, which are randomized or non-randomized depending on design. Experimental units can be defined in many ways: plots, pots, individual plants, fruits, ect. The manual will use "plots" to describe the highest level of observation, as this is the most common experimental unit in breeding.

 Saving the trial will paginate the Observations table by environment. Select any environment to review the plot details.

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Manage Samples > BASIC DETAILS • INFORMATION MANAGEMENT Settings Germplasm & Checks Treatment Factors Environments Experimental Design Observations • STATISTICAL ANALYSIS # Observations # Observations Observations Image: Complasm & Checks Treatment Factors Environments Experimental Design Observations • DROGRAM ADMINISTRATION # Observation Details Image: Complasm & Checks Image: Complasm & Checks <th>anage Studies</th>	anage Studies
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Reveal/Hide Columns

Independent variables can be hidden and revealed in the tabular user interface. One important column, OBS_UNIT_ID, is hidden by default, because it is not meant to be human readable. OBS_UNIT_ID is an alphanumeric sequence designed for data capture that uniquely identifies the observation. The OBS_UNIT_ID is appropriate for barcoding the observation unit (plot, plant, pot, ect...) when the Study Book file is exported

• Make columns of data by visible/hidden by selecting the dotted rectangle.

 BREEDING ACTIVITIES Manage Germplasm 	< 🖪 VIGNA	VIVA			Site Admin	My Programs	? 夬 Shawn
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► INFORMATION MANAGEMENT				Records per page:	Showing 1 to 35 of 35 en	tries	
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PROGRAM ADMINISTRATION	Test entry	1000083	BMS-12	14	16	3	ENTRY_TYPE
	Check entry		CK-1	1	17	3	GID
	Test entry	1000076	BMS-5	7	18	3	DESIGNATION
	Check entry	1000098	СК-2	2	19	3	
	Test entry		BMS-20	22	20	3	ENTRY_NO
	Test entry	1000084	BMS-13	15	21	3	OBS_UNIT_ID
	Test entry		BMS-1	3	22	4	PLOT_NO
	Test entry		BMS-11	13	23	4	BLOCK_NO
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OBS_UNIT_ID is be revealed in the user interface after the selection.

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	Test entry	1000087	BMS-16	18	865d0787-30c5-4bef- 9df7-471400c69bb9	11	2	
	Test entry	1000073	BMS-2	4	5d0c1a9a-30db-4e56- a65a-6aa8f1351c35	12	2	
	Check entry	1000097	CK-1	1	3316e07d-7165-4fbf- a662-df1bc0acf3ed	13	2	
	Test entry	1000080	BMS-9	11	7e83ed87-3803-441a- a210-d578e623321c	14	2	
	Test entry	1000075	BMS-4	6	f1cdc54e-cd9f-4027-a0ba- db6b423bd969	15	3	
	Test entry	1000083	BMS-12	14	e10a7a67- c366-4b82-98eb-	16	3	

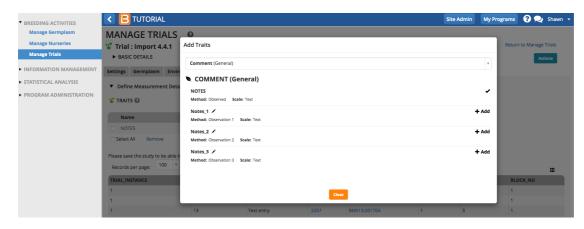
Add Traits

Traits and trait aliases are defined by the crop ontology. If you do not find a trait of interest from the drop down menu, see <u>Manage Ontology</u> for instructions on adding new traits. If the desired trait cannot be found, the new trait must be added to the crop ontology.

• Select the **Add** button to specify traits to measure, or the dependent variables. Type a word or part of a word that describes the trait that will be measured. You can search by name or the alias of the variable.

BREEDING ACTIVITIES	< 🖪 TUTORIAL					Site Admin	My Programs	😯 契 Shawn 👻
Manage Germplasm	MANAGE TRIALS	0					_	
Manage Nurseries	🐨 Trial : import 4.4.1	Add Traits					Return	n to Manage Trials
Manage Trials	BASIC DETAILS	Select a trait					_	Actions
► INFORMATION MANAGEMENT	Settings Germplasm Enviro	Q ear					_	
STATISTICAL ANALYSIS	Define Measurement Deta							
PROGRAM ADMINISTRATION	TRAITS @	 Ear length (Morphole ELng_M_cm 	ogical)					
	Name	 Ear number (Agrono EN_Ct_earpint 	mic)					
	NOTES	Ear position (Agrono	mic)					
	Select All Remove	(x) EPo_Cmp_ratio, EPo_E_					_	
	Please save the study to be able to	Ear rot incidence (B	iotic stress)				_	
	Records per page.							
	TRIAL_INSTANCE						BLC	OCK_NO
	1			Close			1	
	1	13	Test entry	2257	BMS13:201704	1 3	1	

Once selected, the traits of interest will appear as an empty column of data in the measurements table.



The saved study is ready for (1) data collection or the creation of a (2) sub-observation dataset to record repeated measures.

	MAIZE 3										Site Admin	My Programs	00
1	TRAITS 🕜					Add							Ad
	Name	Description				Input Variables	N	ame			De	escription	
	Silk_Date_ymd	Date of silking	g, 50% of plants	within a plot have	e silks visible								
	Ant_Date_ymd		esis, 50% of the east one visible	plants in the plot h anther	nave								
	GY_DW_kgPlot	Grain yield BY	Y DW GY - Meas	urement IN Kg/plo	ot								
	GY_DW_tha	Grain yield BY	/ DW GY - Comp	outation IN T/ha		PlotArea_m2 , GY_DW_kg Plot							
	Silk_DT_day	Silking time B	Y DTS - Compu	tation IN Day		SEEDING_DATE , Silk_Dat _ymd	e						
	Ant_DT_day	Days to anthe	esis after sowin	g		SEEDING_DATE , Ant_Dat e_ymd							
	ASI_Cmp_day	Anthesis silkir	ng interval BY A	SI - Computation I	N Day	Silk_DT_day							
	PH_M_cm_mean	Average plant	t height in cm			PH_M_cm							
	EH_M_cm_mean	Average ear h	neight in cm			EH_M_cm							
R	emove												
] c	Observations											ACCEPT	D PENDIN
ler	t Environment:	1 - Aurangabad 🏾 🔻	Filter by stat	us: All	•							Show Catego	rical Description
	e environmente.	1 - Aurangabau	The by sea	,us. ///								Show catego	inter bescriptic
• 1	Batch Actions												
NT	RY_TYPE 🔻 GID	T DESIGNATION T	ENTRY_NO	PLOT_NO Y	Silk_Date_ym	nd 🔻 Ant_Date_ymd 🔻	GY_DW_kgPlot	▼ GY_DW_tha ▼	Silk_DT_day 🔻	Ant_DT_day 🔻	ASI_Cmp_day 🔻	PH_M_cm_mean 🔻	EH_M_cm_
est	entry 73	HM11	1	1									
est	entry 74	EH43402	2	2									
est	entry 1	DH-001	3	3									
est	entry 2	DH-002	4	4									
est	entry 3	DH-003	5	5									
or+	onto: A	DH 004	6	4									

Add Selection

If you want to advance within plot selections a selection variate must be added to the study (see more or Advancement)

• Select Add Selections. Choose selection variate. Close popup.

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MANAGE STUDIE	S @		
Y Performance Trial Te	emp Add Selections		Return to Manage Studies
► BASIC DETAILS	Selections (Breedingprocess)		✓ Actions
Settings Germplasm & Check	SELECTIONS (Breedingpr	ocess)	
# Observations	nEarsSel		× .
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Define Observation Det	ails NPSEL /		+ Add
🖞 TRAITS 🔞	Method: Counted	Scale: Number	Add
	RELATED PROPERTIES		
Name	Desi Breeding method		ption
Silk_Date_ymd	Date have		elected
Ant_Date_ymd	Date		
GY_DW_kgPlot	Gral Kg/p	Close	
GY_DW_tha	Grain yield BY DW GY - Computation IN T/ha	PlotArea_m2, GY_DW_	

The selection variate is included as a column in the measurements table, and is ready to be filled with the number of ears selected from each plot.

		E 3									Site Admin	My Program	ns i	0 🛛 🗩	e a
e Germplasm	🖞 TRAITS 🖗						Add							Add	
e Studies	Name		Description			Input Variables			Name			Description			
ATION MANAGEMENT	Silk_Date	ymd	Date of silking have silks visit	, 50% of plants i	within a plot				nEarsSel			Ears Selecte	ł		
CAL ANALYSIS M ADMINISTRATION	Ant_Date	_ymd		sis, 50% of the p luced at least or				Remov	e						
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	ASI_Cmp_	day	Anthesis silkin Computation l	g interval BY AS N Day	1-	Silk_DT_day									
	PH_M_cm	_mean	Average plant	height in cm		PH_M_cm									
	EH_M_cm	_mean	Average ear h	eight in cm		EH_M_cm									
	Remove		Aurangabad *	Filter by statu	IS: All	•								PENDING	
	► Batch Acti	ons													
	ENTRY_TYPE	GID 🔻	DESIGNATION 🔻	ENTRY_NO T	PLOT_NO T	nEarsSel 🔻	Silk_Date_y	/md 🔻 Ai	nt_Date_ymd 🔻	GY_DW_kgPlot	GY_DW_tha T	Silk_DT_day ₹	Ant_DT_	day 🔻	
	Test entry	73	HM11	1	1										
	Test entry	74	EH43402	2	2										
	Test entry	1	DH-001	3	3										

Create Sub-Observation Unit Dataset

Once experimental design has been generated and the Observation table established, you are able to create additional data collection tables for repeated measures (sub-observations units).

Common repeated measures include:

- Measure individual plants within a plot
- · Measure different quadrats within a plot
- Measure the same trait at multiple time points -Beta
- Create sub-observation units to take repeated measures.

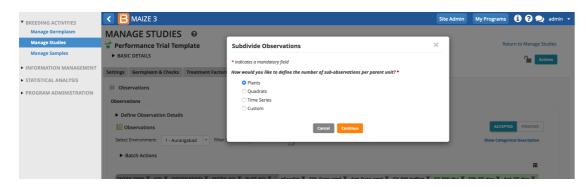
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	Test entry	73	HM11 EH43402	1	1								
	Test entry Test entry	1	DH-001	3	3								
	Test entry	2	DH-001	4	4								
	Test entry	3	DH-003	5	5								
	Test entry	-	DU 004	-	-								

Define Sub-Observation Units

Example Plant Sub-Sampling

In the following example, a maize breeder is planning to measure the height of 5 plants per plot at maturity.

· Select Plants as the sub-observation units.



 Give the sub-observation data set a unique name. Specify 5 plants per plot. Leave PLANT_NO as the default numbering variable. Choose to sub-sample all study locations and Save.

BREEDING ACTIVITIES	< 🖪 MAIZ	2E 3						Site	Admin My	Programs	i ? 오 admin 🗸
Manage Germplasm	MANAGE	STUD	IES Ø								
Manage Studies	👻 Performar	nce Tria	Template		Spee	cify Plants		×		Ret	turn to Manage Studies
Manage Samples	BASIC DETAI					cates a mandatory field					Actions
 STATISTICAL ANALYSIS 	Settings Germa	olasm & Cl	ecks Treatme	nt Factor	Name	e for plants dataset: *	5 Plants				
	# Observation	ıs									
 PROGRAM ADMINISTRATION 	Observations				Speci	fy a maximum number of plants for each	i parent unit (up to 25): *	5 🕄			
	Define Obs				Choo	se a variable to number the plants: * (a				
			Jetalis			NT NO					
	0bservat				PDA	MI_NO *				ACCEPTE	ED PENDING
	Select Environ	ment: 1	- Aurangabad	* Filter	Select	t the environments for which you would	like to generate plants: *			Show Categor	rical Description
	Batch Ac	tions			10	•	Search:				
						TRIAL INSTANCE	LOCATION NAME				
	ENTRY_TYPE	T GID T	DESIGNATION	Y ENTRY		1	Aurangabad - (AUR)		tha 🔻 Silk_DT	_day 🔻 An	nt_DT_day 🔻
	Test entry	73	HM11	1		2	Bengaluru - (BENG)				
	Test entry	74	EH43402	2		3	Davangere - (DAV)				
	Test entry	1	DH-001	3		4	Hydrerabad - (HYD)				
	Test entry	2	DH-002	4		5	Jalandhar - (JALA)				
	Test entry	3	DH-003	5		6	Udaipur - (UDAI)				
	Test entry	4	DH-004	6		ing 1 to 6 of 6 entries					
	Test entry	5	DH-005	7	Snow	ing 1 to 6 or 6 entries					
	Test entry	6	Hyb19-001	8		ج ا	1 >				
	Test entry	7	Hyb19-002	9		_					
	Test entry	8	Hyb19-003	10		Back	Save				
	Test entry	9	Hyb19-004	11							

• Select Add to add plant level trait details.

BREEDING ACTIVITIES	< 🖪 MAIZE 3				Site Admin	My Programs 🤅 🤶 a	admin
Manage Germplasm Manage Studies Manage Samples	MANAGE STUDIE		Save			Return to Manage Stud	_
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	Define Observation Def TRAITS @ Name	Descri	otion Input Variables	Add SELECTIONS		Add	
	Observations Select Environment: 1 - A Batch Actions	urangabad 🔻 Filter b	y status: All			ACCEPTED PENDING Show Categorical Description	
	ENTRY_TYPE T	GID 🔻		ENTRY_NO T	PLOT_NO T	PLANT_NO T	
	Test entry	73	HM11	1	1	1	
	Test entry	73	HM11	1	1	2	
	Test entry	73	HM11	1	1	3	
	Test entry	73	HM11	1	1	4	
	Test entry	73	HM11	1	1	5	

Each plot now contains 5 rows corresponding to 5 plants per plot.

• Select the traits and/or selection variables of interest to include as columns in the sub-observation dataset.

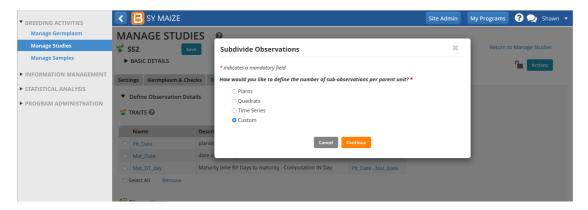
BREEDING ACTIVITIES	< 🖪 MAIZE 3							Site Admin	My Programs	i) ? 契 a
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	5 Plants									
	 Define Observation 	Details								
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	Name	Desc	ription		Input Variables	Name	2		Description	
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	EH_M_cm	Ear h	eight BY EH - Measureme	ent IN Cm						
	Remove Conservations Select Environment: Batch Actions	- Aurangabad	• Filter by status:	All	·				ACCEPTE Show Categor	P PENDING
	ENTRY_TYPE T	GID 🔻		E	NTRY_NO T	PLOT_NO T	PLANT_NO T	PH_M_cm ▼	EH_M_cm	Ŧ
	Test entry	73	HM11	1		1	1			
	Test entry	73	HM11	1		1	2			
	Test entry	73	HM11	1		1	3			
	Test entry	73	HM11	1		1	4			
	Test entry	73	HM11	1		1	5			
	Test entry	74	EH43402	2		2	1			

In this sub-observation dataset plant and ear heights (cm) will be measured from 5 representative plants in each plot. Each plant in the sub-observation dataset receives a unique OBS_UNIT_ID (see above for more info) suitable for barcoding individual plants within the plot.

Example Custom Sub-Sampling

In the following example, a maize breeder is planning to gather ears of interest from experimental plots to take ear-specific measurements. The breeder doesn't know in advance how may ears will be collected, but expects to collect no more than 7 per plot.

• 'Ears' is not a default sub-sampling option. Select the Custom option and Continue.



- Give the sub-observation data set a unique name.
- Specify 7 ears as the maximum collected per plot.
- Choose a numbering variable. In this case, Obs_NO. Note: custom sub-observations units will not have a corresponding numbering variable until you create one (see details in blue info box below).
- Choose to sub-sample both study locations.
- Save.

BREEDING ACTIVITIES	< 🖪 SY M	MAIZE					Site Admin	My Programs	😯 喿 s	Shawn 🖣
Manage Germplasm	MANAGE									
Manage Studies	🗑 SS2	Save	Spe	cify Sub-Observa	tion Units		×	Return t	o Manage Stud	lies
Manage Samples	► BASIC DETA	ILS		-					Action	ns
► INFORMATION MANAGEMENT	Settings Germ	nplasm & Checks		cates a mandatory field e for sub-observation		Ears19A			Action	
 STATISTICAL ANALYSIS PROGRAM ADMINISTRATION 	 Define Observation TRAITS O 	ervation Details		ify a maximum numb o 25): *	er of sub-observatio	on units for each parent unit	7 3			
	Name	Desc	Choo	se a variable to numl	per the sub-observa	tion units: * 🕜				
	Plt_Date	plant	ob:	s_NO	*					
	Mat_Date	date / / Matu	Color	t the environments fe	on units: *					
	Select All	Remove	10	•		Search:				
	Dbservation	15		TRIAL_INSTANCE		LOCATION_NAME				
	Select Environme	nt: 1 - Ibadan 🔻		2		Winters - (Wint)		Show Categorical	Description	
	ENTRY_TYPE GID Test entry 351021 Test entry 351061			ing 1 to 2 of 2 entries				Mat_DT_d		
BMS 10.4.2	Test entry	351046			Back	Save				

Customize Observation Unit Variable

The observation unit variable, Obs_NO, provides a generic way to number any observation. Alternatively a more specific term, like EAR_NO, could be created via <u>Manage Ontologies</u>.

BREEDING ACTIVITIES	< 🖪 SY MAIZ	ZE			Site Admin	My Programs	? 2	Shawn 🔻
Manage Germplasm	Name	Property	🖈 Obs_NO					× Close
Manage Studies	DATE_NO	Observation Date						
Manage Samples	DAY_OBS	Observation time	Name	Obs_NO				
▼ INFORMATION MANAGEMENT	DTS_daysobs	Days to silking	Description	observation number				
Import Germplasm Manage Genotyping Data	MONTH_OBS	Observation time	Property	Observation				
Browse Studies	NDVI1	Normalized difference vegetation index		_				
Head to Head Query	NDVI2	Normalized difference vegetation index	Method	Enumerated				
Manage Ontologies	NDVI3	Normalized difference vegetation index	Scale	Number				
Import Datasets	Notes_1	Comment	Variable Type	Observation Unit				
Weighted Multi-trait Query	Notes_2	Comment	Expected Range	All values allowed				
STATISTICAL ANALYSIS	Notes_3	Comment	Expected runge	_				
PROGRAM ADMINISTRATION	Obs_NO	Observation		Edit				
	Spad1	Chlorophyll content	Metadata					
	Spad2	Chlorophyll content						
	YEAR_OBS	Observation time						

• The Ears sub-observation dataset is now ready to accept 7 ear measurements per plot. Add ear traits to the dataset and Save.

BREEDING ACTIVITIES	< 🖪 sy	MAIZE									Site Admir	My Pr	ograms	? 2	
Manage Germplasm	🍟 TRAITS (2							Add						
Manage Studies	- INAII34								Add						
Manage Samples	Name		Descript	ion					Input Variables						
INFORMATION MANAGEMENT	C EDmg_	E_1to5	Ear dama	ige BY EDmg	- Estimatio	on IN 1-5 dam	nage scoring	scale							
	EDia_M_cm		Ear diam	Ear diameter BY EDia - Measurement IN Cm											
STATISTICAL ANALYSIS	ELW_M	g	Ear leaf v	Ear leaf weight BY ELW - Measurement IN G Ear length BY ELng - Measurement IN Cm											
PROGRAM ADMINISTRATION	C ELng_M	I_cm	Ear lengt												
	EndoCo	ol_E_1to6	Endosper scale	rm color BY E	ndoCol - E	stimation IN	1-6 Endospe	rm color							
	PericCo	I_E_1to5	Pericarpo	Pericarpcolor BY PericCol - Estimation IN 1-5 Pericarp color scale											
	Select All	Remo	ve				r enter p con	, scale							
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