

# **KDSmart Documentation**

Release 3.0.x

**DArT Team** 

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14.88 Version 2.0.4(7) : 2015/May/08
14.89 Version 2.0.3 : 2015/May/06
14.90 Version 2.0.2 : 2015/Apr/10
14.91 2.0.1 : 2015/Mar/30
14.92 2.0.alpha3 : 2015/Mar/27
14.93 2.0.alpha1 : 2015/Mar/12
14.94 2.0.alpha0 : 2015/Feb/25

#### **15 Glossary**

#### Index

Note: You are viewing the PDF version of the KDSmart User Guide.

- Some features such as video will not visible however links to them are provided. They can be selected if you have Internet access or manually typed if you're viewing a printed copy.
- Please email us at kdsmart@diversityarrays.com if you find any omissions, errors or have suggestions for improvement in this user guide.

Welcome to the KDSmart application user guides. This user guide provides comprehensive information on KDSmart, out data collection application. Navigate this help by using the left hand menu and return to this page using the logo at the top left. Some sections of this help are also available as on-board help within the KDSmart application.

KDSmart is available for standalone use however, it forms an integral part of a bigger **Integrated KDDart Platform** as seen in the following image:



Fig. 1: KDDart System Design Principles - Integrated Platform

Both KDSmart and KDXplore can operate remotely, away from office networks and the internet as shown in the "KDDart Application Network Dependency" illustration.



#### KDDart Application Network Dependency

Fig. 2: KDDart Application Network Dependency

These images will help you gain a basic understanding of the platform and how KDSmart fits within the *breeding cycle* before getting started. The "Example of the Trial Data Workflow" illustration depicts a simple trial data workflow for KDDart, however look to the centre of the illustration to see KDSmart and KDXplore's role in the workflow:



#### KDDart Trial Data Workflow

Fig. 3: Example of the Trial Data Workflow

KDSmart is available for free from the Google Play Store at the following link: https://play.google.com/store/apps/ details?id=com.diversityarrays.kdsmart. KDSmart also supports Android 4.4 Kit Kat (Android SDK 19) and above as the minimum.

Before diving into details we strongly suggest taking a look at two brief overviews:

- Of the KDDart environment at: Introduction to the KDDart Environment ; followed by
- The KDSmart Application

For more information please explore the following websites:

- http://www.kddart.org (hosting site of these help pages)
- https://www.diversityarrays.com

For KDSmart tutorials (along with tutorials for our other applications), please see the page.

#### Note:

- March 2019 We are constantly improving KDSmart and welcome any feedback or queries. You can contact us by email at kdsmart@diversityarrays.com if you want to get in touch.
- Sample files are now located on the *Sample Files* page.

#### CHAPTER

# **GETTING STARTED**

This page provides an introduction to the KDSmart application including its requirements and the basics of how to use it. Read this page first if you have not used KDSmart before. The following pages provide a more comprehensive guide to using KDSmart.

#### 1.1 Purpose

KDSmart is an application that is used to collect phenotypic data from plants that are a part of trials. It allows the user to add information about a plot or sub-plot that they have observed (e.g. plant height), and then save that information in the trial. Data can then be exported and saved in the KDDart database.

### **1.2 Requirements**

The following will be needed to run KDsmart:

- An internet connection to download or update the application (it can be used offline);
- Access to the Google Play Store;
- An Android device such as a phone or tablet with Android version 4.4 (Kit Kat) or above with the appropriate permissions accepted OR;
- A computer with Android SDK 19 or above installed.

**Warning:** Incorrectly set **Android permissions** will either prevent KDSmart completely from working or disable some features, e.g. taking pictures with the camera. Please see the *Android Permissions* topic for more information.

#### 1.3 Data

There are three main types of items that are found in KDSmart. These are trials, traits, and tags (sometimes referred to as TTT).

- **Trial** Contains data on the physical layout of a field and the plots and sub-plots within that field. Trials also have information such as planting date and traits that are included.
- **Trait** The quality or characteristic being inspected, measured and recorded for the organism e.g. plant height. There are traits for both plots and sub-plots and can be used in multiple trials.

• **Tag** - Short text codes that provide a quick method of applying predefined classification or annotation to Plots or sub-plots e.g. BD is a tag that can refer to bird damage.

Trials are generally created in KDManage or KDXplore and then loaded onto a device with KDSmart such as a mobile phone. Once the KDSmart device has a trial to work with, the user can go into the field and collect information on traits of the plot and sub-plots (this is known as *scoring*). Tags can be applied to each plot or sub-plot to define any characteristics that are not measured by traits. The data collected with KDSmart can then be loaded into KDXplore for curation and storage. A guide for this basic workflow is outlined in the KDTutorials section.

### 1.4 Home Screen

KDSmart will open on the screen that is shown below. Please refer to the following table to learn more about KDSmart.



Fig. 1: KDSmart Home Screen

Item	Icon/Image	Description
Num-		
ber	v3.0.12-beta(3012)	
1.	e o reci e an on onton e a t	Displays the version of KDS that is being used. Check Google Play to see if any up
		dates are available.
2.		Starts scoring of the selected trial.
3.	Ö	Changes the brightness settings from <i>Dark</i> <i>Mode</i> to <i>Light Mode</i> (Note that this has been deprecated in the current version - it is likely to come back in future versions).
4.		Locks editing so that trials may not be edited. A password will be needed to un- lock editing features.
5.	0	Provides an in-app Help Guide, an About page, and information on licenses.
6.		Navigates to the KDDart web page.
	Diversity 1	
7.	Technology	Navigates to the Diversity Arrays website.
8.	DEMO DB	Indicates that this is the Demo database.
	Tript Name Santhago Iocuintfa: AuS Gunnet Plut Range: 3 Row: 1 Pluming then 2018/Feb /0W	
9.	Trail Pagess	This is the selected trial.
10.	Trial Details	View more details on the selected trial.
11.		Various options for KDS. An explanation of the options will be displayed in the table be-low.

Table 1: KDSmart Home Screen

This link, https://youtu.be/PM\_lWMbHnBc , is to a short KDSmart tour video where you can learn about some of the UI elements and features of KDSmart.

### 1.5 What now?

The rest of the KDSmart Help Guide will provide a more in-depth explanation of the features and uses of KDSmart. Refer to the navigation bar on the left for more information on scoring trials, exchanging data with KDXplore, sample files, etc.

#### CHAPTER

# SAMPLE FILES

This page contains links to example files that will assist with both learning and getting started using KDSmart and KDXplore. As a resource, you can use these files as templates for replacing with your own data (trials, traits or tags) which can then be imported into KDSmart or KDXplore.

#### Tip:

- In KDSmart your own terminology may be used to define plot, column and row See Settings from the KDSmart Home Screen or Menu.
- From these sample files, choose one most similar to your trial's organisation, e.g. using col and row, block IDs, sub-plots, etc.
- The sample files can be used as templates by editing and substituting your own data.
- To save CSV files you may need to right click the link and choose Save Linked Content As....

# 2.1 Column and Row Trial

This example file contains a Column and Row Trial.

For this type of trial, the combination of column and row is **unique for every plot** in the trial.

To download *KDSXsample1\_Normal\_Trial\_X\_Y.csv* select the following link:

http://www.kddart.org/public/KDSXsample1\_Normal\_Trial\_X\_Y.csv

Trial Type:	Column & R	ow (X, Y)	
Description:	Each Colum is unique for	n & Row ( every plot	X, Y) combination in the trial.
2	,0 2,1	2,2	2,3
1,	,0 1,1	1,2	1,3
0	,0 0,1	0,2	0,3

Fig. 1: KDSmart Column and Row Trial Example

### 2.2 Traits File

To download the traits example file KDSXsample3\_wheat-traits.csv select the following link:

http://www.kddart.org/public/KDSXsample3\_wheat-traits.csv

Trait attributes that can be loaded in the file are described in the following table:

Attribute (CSV Column	Description		
TraitName	Must be <b>unique and short</b> for display in the <b>Scoring Screen</b> where space is limited		
	on smaller devices (i.e. phones).		
TraitAlias	An alternative trait name, useful when the trait name is too long for the screen.		
TraitDescription	This is an optional longer explanation of the trait to assist in data entry.		
TraitDataType	Constrains permitted values of traits. Types available are:		
	• CATEGORICAL;		
	• DATE;		
	• ELAPSED_DAYS;		
	• INTEGER:		
	• DECIMAL; or		
• TEXT (default).			
	For more details refer to Trait Data Types in the traits topic.		
TraitUnit	An arbitrary term for the <i>unit</i> of the trait to assist with what value to enter when		
	scoring (e.g. measurements in millimetres or centimetres).		
TraitValidation	The validation rule optionally restricts the values being entered. The nature of the		
	rule is dependent upon the selection of data type.		
Barcode	Used to identify the trait when using a barcode scanner for scoring.		

Table 1: Trait Attributes - CSV	Column	Headings and	Descriptions
---------------------------------	--------	--------------	--------------

More information about Traits can be found on the Traits help page.

Note: Traits loaded from CSV without a defined Datatype will default to TEXT.

#### 2.3 Tags File

The following is a tags example file containing a tag and description.

To download the file *KDSXsample2\_tags.csv* select the following link:

http://www.kddart.org/public/KDSXsample2\_tags.csv

An additional tags example is provided below Trial Containing Sub-Plot Tags which contains sub-plot data tags.

The following table shows the required and optional headings for a CSV file.

	U		
Heading	Alternatives	Mandatory	Description
Label	TagLabel, Com-	Yes	Name of the tag e.g. BD for bird damage
	ment		
Description	TagDescription,	Yes	Tag description
	Desc, CommentDe-		
	scription		
DatabaseLabelId	LabelId, Id	No	Useful for cross-reference to the originating
			database

Table 2: Tag Attributes - CSV Column Headings and Descriptions

# 2.4 Plot Id Trial

In this example, Plot ID is unique for every plot in the trial.

To download the file *KDSXsample4\_demo\_trial\_plot\_id.csv* select the following link:

http://www.kddart.org/public/KDSXsample4\_demo\_trial\_plot\_id.csv

Trial Type:	Plot ID
Description:	The <b>Plot ID</b> for every plot in the Trial is unique
	9 10 11 12
	5 6 7 8
	1 2 3 4

Fig. 2: KDSmart Plot Id Trial Example

#### 2.5 Block Trial

A Block Trial is where the combination of block, column, row is unique for every plot within the trial.

To download the file KDSXsample5\_Block\_Plots\_Right.csv select the following link:

http://www.kddart.org/public/KDSXsample5\_Block\_Plots\_Right.csv



Fig. 3: KDSmart Block Trial Example

### 2.6 Excel Workbook Example Format

If you are creating CSV files for import into KDSmart the following Excel workbook may be useful: To download the file *KDSmart\_CSV\_Import\_Format.xlsx* select the following link: http://www.kddart.org/public/KDSmart\_CSV\_Import\_Format.xlsx

# 2.7 Sub-Plot Data Examples

The following examples illustrate different ways of importing sub-plot data.

# 2.8 Trial With Sub-Plot Data For a Particular Sub-Plot

Trial with sub-plot data for a particular sub-plot.

The first three plots in this example file have values for the trait *Plant\_Height* for sub-plot 2. To download the file *KDSXsample6\_Specimen\_Value\_particular\_subplot.csv* select the following link: http://www.kddart.org/public/KDSXsample6\_Specimen\_Value\_particular\_subplot.csv

# 2.9 Trial with Sub-Plot Data For a Particular Sub-Plot and Trait Instance

This example file contains the first three plots with values for:

- The Trait Plant\_Height: Instances 1 and 2; and
- Sub-plots 1 and 2.

To download the file *KDSXsample7\_Specimen\_value\_particular\_subplot\_and\_instance.csv* select the following link: http://www.kddart.org/public/KDSXsample7\_Specimen\_value\_particular\_subplot\_and\_instance.csv

### 2.10 Trial with Sub-Plot Data For All Sub-Plots

The trial has a number of sub-plots specified by sub-plot count and contains data for every sub-plot. This example file contains the first three plots with values for:

- The trait *Plant\_Height:* Instances 1 and 2; and
- All sub-plots.

To download the file *KDSXsample8\_Specimen\_Count\_and\_data\_for\_every\_subplot.csv* select the following link: http://www.kddart.org/public/KDSXsample8\_Specimen\_Count\_and\_data\_for\_every\_subplot.csv

# 2.11 Trial Containing Sub-Plot Tags

This example trial illustrates importing tags to the sub-plot level.

- This feature is only available from version 3.0.
- If a new tag is being created with this trial import it will not have a description. If this is an issue, import (i.e. create) the tags first by importing using a tag definition file (see above *Tags File*).
- This Trial has no Traits.
- To import, at the import window the tags, be sure to select *Import As > Trait for Plot* for the Tags#1, Tags#2 and Tags#\* rows in the import window.

This is a trial example file containing some sub-plot tags:

To download the file KDSXsample9\_wheat-with-data.csv select the following link:

http://www.kddart.org/public/KDSXsample9\_wheat-with-data.csv

#### CHAPTER

#### THREE

#### TRAITS

KDSmart facilitates the recording or scoring of traits for trials and nurseries. Traits are usually phenotypic information although this arbitrary.

KDSmart scoring screens are designed to allow quick recording of measurements, usually with a single touch.

Traits can be defined with validation rules to facilitate strict data capture rules to assist in preventing recording errors. These rules can also be utilised to also make scoring more efficient by minimising the required keystrokes.

The **Traits Screen** (pictured below) provides a list of all available traits and options for management of traits including importing and exporting.

#### 3.1 What is a Trait?

Traits are the quality or characteristic being inspected, measured and recorded for the organism. Within KDSmart, traits have the following characteristics and features:

- User definable;
- Defined by six different data types;
- Optionally lockable once scored to prevent accidental change;
- Importable and exportable;
- · Can be grouped into bundles for easier management; and
- Are either plot level or sub-plot level.

A measurement is stored for each trait instance in each plot or sub-plot includes the:

- Date and time when the measurement was taken;
- GPS coordinates (if this is enabled); and
- Value of the measurement.

Some examples of traits include the height of a plant (this might be called Plant\_Height) or the date that a plot was irrigated (which could be called Irrigated).

# 3.2 Trait Attributes

Each trait contains a set of attributes that define its characteristics. The following table lists the attributes of a trait:

Attribute	Description
Trait Name	Must be unique and short for display in the Scoring Screen where space is limited on
	smaller devices (i.e. phones).
Alias	An alternative trait name, useful when the trait name is too long for the screen.
Description	This is an optional longer explanation of the trait to assist in data entry.
Data Type	Constrains permitted values of traits. Types available are:
	• CATEGORICAL,
	• DATE,
	• ELAPSED_DAYS,
	• INTEGER,
	• DECIMAL; or
	• TEXT;
	For details refer to Trait Data Types
Unit	An arbitrary term for the <i>unit</i> of the trait to assist with what value to enter when scoring
	(e.g. measurement in millimetres or centimetres).
Validation Rule	The validation rule optionally restricts the values being entered. The nature of the rule is
	dependent upon the selection of a data type.

Table 1	l: Trait	Attributes
---------	----------	------------

Tip: Within the Scoring Screen, a long press of any trait name will:

- Display the trait details; and
- Allow editing of the trait value if it is locked.

**Note:** Traits loaded from CSV all default to the *TEXT* data type unless they have previously been loaded or defined. Once loaded you may edit the trait definition to define its data type etc.

**Note:** Unless specified in the CSV, traits loaded from CSV default to the *TEXT* data type. If the Trait already exists and is not yet scored unless they have previously been loaded or defined. Once loaded you may edit the trait definition to define its data type etc.

# 3.3 Trait Instances

A trial consists of plots and sub-plots which have traits for scoring. Furthermore, KDSmart allows you to score each trait multiple times - this is called a *Trait Instance*. The benefit of instancing traits is that they are easier to create and manage because only one trait needs to be managed rather than separate ones. Having separate traits also creates more work for data analysis and curation in KDXplore.

For example, you may wish to score PH\_Soil three times: after 3 weeks, after 5 weeks and after 7 weeks. You can either:

- Define three different traits (e.g. PH\_Soil1, PH\_Soil2, and PH\_Soil3).
- Define three instances of the single trait (e.g. PH\_Soil #1, PH\_Soil #2, and PH\_Soil #3).

0			♥▲ Q 11:0
Section Configure			
Options	Trait/In	istance	Choose Tag B
* Select	None		5
🌟 (p) DF	FLPLOT		Ű
★ (p) DF	M_PLOT		ø
🖹 🌟 (p) PH	LSOIL	3 instances	đ
🌟 (p)	PH_SOIL	#1	1
🔶 (p)	PH_SOIL	#2	1
🌟 (p)	PH_SOIL	#3	1
🕤 🌟 (s) EP	Ħ	2 instances	ø
🔊 ★ (s) RL	IST	2 instances	đ
8 Tr	ait Insta [DEM	inces Act IO db]	ive
×		Start	Scoring
4			

Fig. 1: Trait Instances

# 3.4 Trait Naming

When preparing traits it is recommended that the use spaces in trait names are avoided and underscores are used instead. For example instead of Plant Height use Plant\_Height.

Should KDXplore software be used after scoring it has the ability to calculate trait values from other traits, however, is restricted if trait names contain spaces.

# 3.5 Trait Data Types

The following table describes the available data types for traits:

Data Type	Description	Data Entry Style	Example Valida-
	Description		tion Rule
TENT	NT.	A 4 4 1 1 1 1 1 C 1 1	
TEXT	No constraint	A text input field	No rule required.
	on what may be	with a full keyboard.	
	entered.		
CATEGORICAL	Value is constrained	A list of the allowed	Example:
	to be one from a	values is presented	CHOICE(BLUE YELLOW RED)
	list of allowed val-	and the user touches	There must be at
	ues. Translations to	the value desired.	least two values
	other languages are		provided in the
	supported.		pipe separated list
			(such as in the
			example above).
			In a later release.
			the format will
			support providing a
			description for each
			value This will
			likely be of the form
			value:description 10
			prevent future prob-
			lems you should
			not use the colon
			(:) character in any
			current value.
DATE	Value is a date.	A calendar is pre-	May be left blank or
		sented from which	specified as date.
		to choose a date.	

Table 2: Trait Data Types

Continued on next page

Data Type	Description	Data Entry Style	Example Valida-
,			tion Rule
ELAPSED_DAYS	Value is the num- ber of days since the trial's planting date. The range in the calendar is con- strained by the start date and an optional upper limit. KDS- mart stores the val- ues as a date but presents the value as a number when re- quired.	A list of days around the current date are presented and the user selects the desired value or chooses 'Other' to use a calendar to pick a date outside this range. The choices in the list (-3d, -2d, -1d, To- day, +1d, +2d, +3d) may be presented in different languages depending on locale	May be left blank or specified as elapsed_days. To enforce a maxi- mum value, use: elapsed_days_max=NN
INTEGER	Integer numeric values in a range specified. The range is specified as a lower and upper bound and whether or not the bounds are included in the range.	support. If the number of val- ues is 'small' then the entry is similar to the categorical data type. Other- wise, a numeric keypad is presented (excluding a dec- imal point key). The changeover from categorical style to numeric keypad may be altered in the <b>Settings Screen</b> . For Example: RERANGE(15) presents as a list of choices: 1,2,3,4 but RANGE(1500) presents a keypad.	Specify the range of values as: RANGE(minmax) or use <i>LERANGE</i> , <i>RERANGE</i> , <i>BE-</i> <i>RANGE</i> to exclude the left, right or both limits respec- tively. Example: RERANGE(-15) means the accepted values are -1, 0, 1, 2, 3, 4 <b>Note:</b> If you use a custom keyboard, this may affect the appear- ance of the numeric keypad.

Table 2 – continued from previous page

Continued on next page

Data Type	Description	Data Entry Style	Example Valida-
			tion Rule
DECIMAL	Specify a lower and upper bound and whether or not the bounds are included in the range and the number of digits of precision that will be recorded.	Entry is done using a numeric keypad that includes the decimal point. NOTE: If you use a custom keyboard, this may affect the appearance of the numeric keypad.	RANGE(minmax) or use LERANGE, RERANGE, BE- RANGE However, min and max must now contain a decimal point and at least one digit following the point. So: BE- RANGE(1.02.99) means accept values for x where 1.00 < x < 2.99 (the greater number of digits after the "." for min/max is the "precision" desired).
CALC	Calculated or De- rived Trait. See <i>Cal- culated or Derived</i> <i>Traits</i> below for fur- ther description.	Data entry is not permitted for this type. Traits with this data type <b>can- not</b> be scored during data collection.	A simple calcu- lated or derived trait is: CALC( max(PH_CM/5,1) ) This calculation references a trait named PH_CM, dividing the value by 5 and returning the maximum of the division or 1, whichever is the greater. So a value of 17 for PH_CM gives a result of 3. Alter- natively, CALC( max(PH_CM/5,1) , 1 ) will retain the result with one decimal place. In this case the value of 17 for PH_CM results in 3.4.

Table 2 - continued from previous page

# 3.6 Calculated or Derived Traits

The validation rule has either one or two components (with a comma separating them if required):

• The first component provides a formula that may reference other traits (by the trait name), using the operators

and functions listed below.

• If present, the second component indicates the number of decimal digits to retain in the computed result.

The functions available are in a table below. Arithmetic operators are:

\* / % (the last is the **modulo** operation) + - (unary minus is also supported) ^ \*\* (for exponentiation).

Note: The comparison operators:  $<\!<\!=\!=\!>\!=$  and the logical operators: && || evaluate to either 1 or 0 representing true or false respectively. This is relevant for the if(cond,a,b) function.

#### 3.6.1 Functions Available For CALC Data Type

The following table describes the functions available for the CALC data type.

Function	Description	Example
Name(s)		
sin cos tan asin acos	Trigonometric functions	
atan		
sinh cosh tanh	Hyperbolic functions	
abs round floor ceil	Unary mathematical functions: ROUND,	round(1.5) returns 2.0 round(1.4) returns 1.0
sqrt exp ln log sign	FLOOR and CEIL return an integral portion	floor(1.5) returns 1.0 ceil(1.5) returns 2.0
	of the input. LN is the natural logarithm	
	LOG is the logarithm to base 10	
pow min max	<b>Binary mathematical functions</b>	pow(2,3) returns 8.0 pow(3,2) returns 9.0
rnd deg(radians)	<b>Other functions:</b> rnd(a) returns the value	rnd(10) will return a value y satisfying: 0 <=
rad(degrees)	of a multiplied by a random number satisfy-	y < 10
	ing the constraint RERANGE(01.0) i.e. a	
	value x where: $0.0 \le x \le 1.0$ deg and rad	
	convert between degrees and radians.	
if(expr, a, b)	Conditional expression: If the value of	if(PH_CM $\leq 5$ , 1, 2) evaluates to 1 if the
	<b>expr</b> is <b>1</b> , the result is the expression <b>a</b> oth-	value of the trait PH_CM is 5 or less other-
	erwise the result is expression <b>b</b>	wise to 2

racie ci i anencio i ranacie i ci inco bata i pe	Table 3:	Functions	Available	For	CALC	Data	Type
--	----------	-----------	-----------	-----	------	------	------

Tip: Why can't I import my CALC trait?!

- Ensure validation rules using comma's (e.g. CALC( max(PH\_CM/5,1) , 1 )) are wrapped by double quotes (e.g. "CALC( max(PH\_CM/5,1) , 1 )"). Excel handles this automatically.
- Ensure the number of opening and closing brackets match (It's an easy thing to miss at a glance).
- Trait names that use white spaces in their names cannot be used for derived CALC traits.

# 3.7 Categorical Traits

At times during scoring, the precision level required can vary. This may be dictated by a number of factors, e.g. sheer volume of specimens, time frame for data collection, reduced/limited people to perform the scoring, etc. In these instances, the *Categorical Data Type* may prove useful.

Typically *Categorical* is used for constraining the data entered to a predefined list of values, such as the following definitions:

- CHOICE(BLUE | YELLOW | RED); and
- CHOICE(White | Yellow | Purple | Variegated | Brown | Orange yellow | Mottled | White top | Red | Sun red | Blue | Other).

Note: In these examples, the pipe character 'l' is shown with a space character either side to improve legibility.

#### 3.7.1 Using Categorical Traits

In some situations using a categorical data type may be more beneficial as this facilitates the use of selection ranges instead of data entry.

The following table illustrates the collection of plant height using both methods:

	Trait Defined as Integer	Trait Defined as Categorical
Entry Method	Plant height entered by selecting a value	Plant height entered by selecting a value
	buttons.	range from a list.
Conditions	Trait validation with a minimum of 5 and	Trait validation with six ranges defined (e.g.
	maximum of 50	The unit of measure may be 5 centimetres).
Validation Rule	5 <= x <= 50	CHOICE(5-10   10-15   15-20   20-25   25-
		30   30++).
Key Presses	Minimum 2 button press per sub-plot (single	Minimum 1 button press per sub-plot, un-
	digit) then Accept Button.	less a long condition list requires scrolling.

 Table 4: Comparison Scoring Integer VS Categorical Trait Type - Required Precision 5cm

Note: For a categorical trait, the number of choices may be limited to suit the circumstances of the trial stage.

#### CHAPTER

### TAGS

KDSmart scoring includes the use of tags for plots and sub-plots. This section provides more information on tags including how to create and use them.

# 4.1 What is a Tag?

Tags are short, text descriptions that are used to represent information about a plot or sub-plot (a cell) in a trial e.g. 'BD' which can mean 'bird damage'. They provide a quick method of applying predefined classifications or annotations to plots or sub-plots. They essentially work like reusable notes. such as.

Tags have the following characteristics:

- User definable;
- Consist of a short name and optional long description;
- New tags can be created in the field;
- Can be imported from a CSV file; and
- Are exportable to CSV file.

The main benefits of tags are that they:

- Are simple to use selectable from a list makes them quick and easy to assign;
- User or project definable;
- Provide consistent annotation, avoiding problems with spelling or language; and
- Deployable across multiple users, devices and locations.

This means that the:

- · Users spend less time writing and repeating notes in the field; and
- Data curators have more consistent, uniform recordings from multiple locations by different field workers.

When tags have been assigned to a plot or sub-plot they will appear as shown in the following image, which shows part of the **Scoring Screen** with two tags assigned at **1** which is above the trait column. Tags are assigned or reassigned

using the Assign Tag Button at 2.



Fig. 1: Example of Two Applied Tags on the Scoring Screen

A few tag examples are shown in the following table:

Tag (Short Name)	Long Description	
BD	Bird Damage	
LDG+	General Lodging in plots-mild	
LDG++	General Lodging in plots-moderate	
WET	Waterlogging	

Table 1: Example Tags

#### 4.2 Tag Management

Tags are managed from the **Tags Screen** which can be accessed by selecting the **V Tags Button** on the **Home Screen** or through the **Menu**. The following actions can be performed at the **Tags Screen**:

- Add a new tag;
- Edit a tag description;
- Delete selected tag(s) (Note: Assigned/in use Tags cannot be deleted);
- Import tags from a CSV file; and
- Export selected tags to a CSV file.



Fig. 2: Tags Screen

#### 4.2.1 Adding Tags

Tags can either be created in KDSmart or imported. Follow the instructions below to create a new tag.

	Table 2: Adding Tags	
Step	Action	
1.	Open the Tags Screen and select the	Add Tag Button.
		Continued on next page



Table 2 – continued from previous page

Step	Action			
3.	A description can be added once the tag name has been confirmed.			
	Enter the description into the text field and then select the <b>Confirm</b>			
	<b>Button</b> (the tick) to confirm the name and description of the tag.			
	Add Tag			
	Label			
	HD			
	Description			
	Human damage			
	×			
	Fig. 4: Tag Description			
4.	A dialogue box will open and you will need to choose to cancel,			
	edit, or confirm your new tag details.			
	and a second second			
	Contirm Save			
	Save Tag Details?			
	Fig. 5: Saving a Tag			

Table 2 – continued from previous page

#### 4.2.2 Editing Tags

Tags can be edited once they have been created. The instructions below outline how to edit a tag.

Table 3: Editing Tags					
Step	Action				
1.	Open the <b>Tags Screen</b> and select a tag that you would like to edit.				
2.	Select the Edit Button as in the image below. This will present a screen like the Add Tag Screen				
	Tig. 0. Eating a Tag				

Continued on next page

Step	Action				-		
3.	Edit	the	tag	name	and/	'or tag	g descrip-
	tion	and	selec	et t	he	Confirm	Button.
		<b>C</b> 7	🗧 Edit Tag				
		Labe					
		DI	ξ¥.				
		Desc	artigition				
		Dr	ought in plo	đ			
						100	
			×		<b>1</b>	<i>*</i>	
			Fig. 7: C	Confirmin	g an Edi	ited Tag	
4.	A dialo	gue bo	ox will	open ar	nd you	will nee	d to choose
	to can	cel, e	edit, or	confir	m the	edited	tag details.
			Confirm	Save			
			Coment	oave			
			Save Tag	Details?			
			×		24 I.	2	
			Fi	g. 8: Sav	ing a Ta	g	

Table 3 – continued from previous page

#### 4.2.3 Deleting Tags

Tags can be deleted by either multi-selecting tags and deleting them or just deleting a single tag. Once a tag is deleted it is not possible to undo the action so it is best to keep tags in a CSV file.



Table 4: Deleting Tags

Step	Action
4.	A message will be displayed that will list any tags that cannot be
	deleted because they are currently being used in a trial. Select the
	<b>Delete Button</b> to delete any tags that are not being used in a trial.

Table 4 – continued from previous page

# 4.3 Tag Bundles

Tags can be grouped into bundles to assist with management. Tag bundles can be created in KDSmart and imported/exported from other devices as well. There will always be a bundle that is automatically created called *All Tags* See the instructions below for how to create a new tag bundle in KDSmart.



Table 5: Creating a Tag Bundle and Adding to Tag Bundles
Step	Action
3.	Select the Add Bundle option from the menu items. This
	will take you to the Add Tag Bundle Screen which lists
	the selected tags and bundles that have already been created.
	🥳 Add Tag Bundle
	Bundle Name
	Enter Bundle Name
	Tags Selected
	Tag1
	Tag2
	Hoor Lodging Bundle
	*All Tags*
	Cancel
	LUTION.
	Fig. 11: Add Tag Bundle Screen
4.	Enter a bundle name and then select the Cre-
	ate/Add <u>Button</u> to create a new bundle.
	Add Tag Bundle
	Bundle Name
	Test Bundle
	Tags Selected
	Tag1
	1ag2
	Cancel Create/Add
	Fig. 12: Creating a New Bundle
5	Vou can also calcat a current bundle which will display a new <b>Add</b>
3.	<b>Button</b> Select that button to add the selected tags to an existing
	bundle
	5 Add Tag Bundle
	Bundle Name
	Root Lodging Bundle
	Tags Selected
	Tag1
	Tag2
	All Dundles
	Root Lodging Bundle
	Cancel Add
	$\mathbf{E}_{i} = 12$ , Adding Theorem 5. Let're $\mathbf{D}_{i} = 11$
	Fig. 15: Adding Tags to an Existing Bundle

Table 5 – continued from previous page

# 4.4 Assigning Tags

Along with scoring traits, assigning tags is a part of the scoring process. One or more tags may be assigned to a plot (or sub-plot) or reassigned if required. To assign a tag, follow these steps:

Step	Action
1.	Locate a plot or sub-plot to tag in the Scoring Screen.
	9.6
	🐨 Block Trial 💿 📰 🚦
	Block/Field Column/Field Row
	1 22
	/1,1
	Plot Type I Wet Check
	1/1,1 0+ +
	DRY LDG++ retest
	Advance Plot? 🔒 Advance
	BRIX 🖴 29
	INOCULATED -
	INOCULATED:2 -
	Inoculation Date -
	< • E
	Fig. 14: Tags on the Scoring Screen
2.	Select the Assign Tag Button.

Table 6: Assigning Tags

Continued on next page

Step	Action	1						-			
3.	Select	one	or	more	tags	to	assign	them	to	a	plot.
								P. 0.12			
		18									
			S	elect Ta	igs:1/	1,1					
			BI	D							
		ш	D	scard							
			D	RY				×.	N.		
			Đ	RT+							
		ш	Ð	RT++							
		н	E	RT+++							
		н	G	V+					I		
		ш	G	V++							
		ш	G	V+++							
		н	н	BCIDE							
			н	D							
			L	×		+		1			
				•		•	1				
									/		
				Fig.	15: A	ssign	ing Tags				
4.	Select t	he Co	nfiri	n Butto	on (ticl	$\frac{c}{c}$ to	save cha	nges an	d ret	urn	to the
	Scoring	g Scre	en.	This dis	splays	the t	ag short	name a	bove	the	traits
	for the	selecte	ed pl	ot.							

Table 6 – continued from previous page

Assigning tags is often an integral part of scoring. For more information about scoring see the page.

**Note:** Information on importing and exporting data such as tags can be found in the page.

#### CHAPTER

# PREPARING FOR SCORING

Trials that are scored in KDSmart will require some configuration so that users can score their trials in the way that that is best for their workflow. There are plenty of different configuration options in KDSmart so this section is a guide to preparing for scoring.

# 5.1 Demo vs Production - Where is Your Data Stored?

KDSmart contains two separate local databases on the device; the **Production Database** for your real work, and the **Demo Database** for experimenting with KDSmart.

KDSmart helps you identify which database is active in a number of ways:

- If you see the **Lockdown Button** at the top of the **Home Screen** then you are using the **Demo Database**.
- When the Scoring Configuration Screen is presented, there is a [DEMO db] label at the bottom.

The **Lockdown Button** sets KDSmart into **Lockdown mode**. This mode allows you to control the scoring task without enabling users the ability to change settings or trial attributes.

Use this mode when someone else is to perform the scoring and that is ALL they are to do.

To exit Lockdown mode, a four-digit passcode is required. When the Production Database is active, Lockdown

Mode is enabled from the **Settings Screen**.

Table 1: Demo vs Production Local Database

Demo	Pre-installed demonstration data provided with KDSmart to allow users data to experiment and test KDSmart functionality before working with <i>real</i> data.
	<ul> <li>The Demo Database can be reset at any time from the Settings Screen; use the Settings Button on the Home Screen or Main Menu to display the Settings and choose the Reset Demo Database Checkbox.</li> <li>On return from the Settings Screen, KDSmart changes to the Demo Database and reinitialises the demo data.</li> </ul>

Continued on next page

	Table 1 – continued from previous page
Production	
	• The local KDSmart database to store your real <i>Production</i> work.
	<ul> <li>KDSmart installs with an empty Production Database.</li> </ul>
	• Lockdown Mode can be used to prevent data loss - particularly when scoring is not performed
	by the breeder.

To change the database, select the **Settings Button** on the **Home Screen** or **Main Menu** to display the **Settings Screen**. Select the *Active Database* option then choose the *Production* or *Demo* radio buttons.

### 5.2 Trial Details

Trial details are the attributes of each trial such as trial layout, organism type, and traits. The **Trial Details Screen** can be accessed in two ways:

- Selecting a trial (with a short press) from the Trials Screen; and
- Swiping left/right on the **Home Screen** until the desired trial is found and then Selecting the **Trial Details Button**.

	● ♥▲ 1 9.07
	📑 🔁 Trials 🕨 📥 🗄
	Trial Name
	Example of Block Trial
	Abbreviation
	Block Trial
	Planting Date
	2019/Feb/18
	Plot & X/Y Axis Names
	-/BlockColumn/BlockRow
	Plot Identification
	Block/BlockColumn/BlockRow
When viewing trial details,	Trial Layout: Block, Block/Column empty; Block/Rewsempty
those trial attributes that can be edited will have an adjacent	Lower-Left, Vertical, Serpentine, 2, 1, Lower-Left
	Organism Type
. I 🖉	Generic
Edit Button.	Note
	Using trials with Blocks
	Traits Trait 123
	Advance Plot?: ★ BRIX: ★ INOCULATED: 1 ★, 1 ☆ Inoculation Date: ☆
	- • H
	Fig. 1: Trial Details Screen

The table below provides information on each trial attribute:

Trial Attribute	Description
Trial Name	What the trial will be named in KDXplore or KDSmart.
Abbreviation	An abbreviated trial name for display purposes.
Planting Date	The date that planting occurred for the trial. Planting date must be set before
	scoring can commence as the <i>Elapsed Days</i> trait data type will not work unless
	it has been set.
Plot & X/Y Axis Names	Determines the trial element names that are to appear on scoring screens. These
	will be names for Plot and X/Y axes, depending upon what was imported.
Plot Identification	How plots are identified e.g. Block/Block Column/Block Row.
Trial Layout	At a minimum, there will be an option for choosing the plot origin (starting plot
	for scoring). Depending on the trial, there may be more options such as block
	plot origin.
Organism Type	Provides a choice of the symbol to represent the organism on screen.
Note	A text note for the trial.
Traits	Trials may have many traits, however, it is not necessary or desirable for them
	all to be visible when scoring and traits can be made visible or hidden as re-
	quired. Select the Edit Button to change traits that are used. The blue high-
	lighted panel, near the bottom of the Scoring Configuration Screen lists the
	trait instances quallelle in the trial showing. Traits summative calested
	trait instances available in the trial showing.
	for scoring: M Not selected or hidden: and M Trait instance(s) se-
	lected.
Trial Attributes	Non-editable from import
Plot Types	Non-editable from import
Plot Attributes	Non-editable from import

Table 3: Trial Attributes

## **5.3 Collection Parameters**

Most of the important collection parameters (scoring options) can be found on the **Scoring Configuration Screen**. Swipe left and right between the tabs to view all of the options. The tables below outline the function or options available in each tab and the sections provide more in-depth information.

### 5.3.1 Options



Table 4: Options Tab Actions

#### 5.3.2 Trait/Instance



Table 5: Trait/Instance Tab Actions

Options	Example Image
Manage Trait Button:	See above image
Enabled management of traits that are to be scored.	
<ul> <li>Enabled management of traits that are to be scored.</li> <li>- Add a trait to the trial with the Add Trait Button;</li> <li>- The Move Up Button allows you to move the selected trait up in the scoring order;</li> <li>- The Move Down Button allows you to move the selected trait down in the scoring order;</li> <li>- The Move Down Button allows you to move the selected trait down in the scoring order;</li> <li>- Add a trait description with the Edit Description Button; and</li> <li>- Remove a trait from the trial with the Description</li> </ul>	
Keniove Button.	
Edit Trait Instance Button (the edit icon next to a trait instance): Options for editing or removing trait instances. - Add a trait instance description with the Edit Description Button; and - Remove a trait instance from the trial	See above image
with the <b>Remove Button</b> .	

#### Table 5 – continued from previous page

### 5.3.3 Choose Tag Bundle

Options	Example Image
Choose a Tag Bundle:	
• Any listed tag bundle can be added with the	
checkboxes. More tag bundles can be imported	
or created in the <b>Tags Screen</b> .	0 TA
	C A Configure
	Trait/Instance Choose Tag Bundle Briest Blocks
	278224210339 (PAD)
	✓ *All Tags*
	Domana Bundla
	<ul> <li>Damage Bundle</li> <li>(4)</li> </ul>
	6 Trait Instances Active; Swipe to Trait/Instance [DEMO db]
	-
	Fig. 4: Choose a Tag Bundle

Table 6: Choosing a Tag Bundle

### 5.3.4 Select Blocks

Options	Example Imag	je	
Select Blocks:			
• Any block trial will have all blocks listed and se- lectable with the checkboxes. At least one must			
be chosen. This option will only be available for			<ul> <li>■ &lt; 0.1246</li> </ul>
block trials.	C S Cord	qure	
	statistance	Choose Tag Bund	in Select Blocks
	Block no	No of plan	s Boore block
	Block 1		10
	Block 2		1
	Block 3		6
	6 Tr	ait Instances Al Trait/Inst [DEMO	ctive; Swipe to ance db]
		4 0	
		Fig. 5: Selec	t Blocks

Table 7: Selecting Blocks

# 5.4 Start Scoring

Scoring can be started in a variety of ways in KDSmart as outlined in the table below:

Mathad	Action
weinoa	ACTION
Quick-start from the <b>Home Screen</b>	Swipe left and right between the displayed trials until you find the trial that you want to
	score. Select the <b>Start Button</b> to immediately start scoring. If you have scored this trial before then this will resume scoring from where you were before. If this is a new trial you will be taken to the <b>Scoring Configuration Screen</b> where you need to confirm
	collection parameters, then select the <b>Start Button</b> to begin.
Trial Details from the <b>Home Screen</b>	Swipe left and right between the displayed trials until you find the trial that you want to score. Select the <b>Trial Details Button</b> and change any of the details if you wish then select the <b>Start Button</b> . If you have scored this trial before then this will resume scoring from where you were before. If this is a new trial you will be taken to the <b>Scoring Configuration Screen</b> where you need to confirm collection parameters, then select the <b>Start Button</b> again to begin
Quick-start from the <b>Trials Screen</b>	If there is currently a trial selected, select the <b>Start Button</b> to be taken to the <b>Scoring Configuration Screen</b> where you can choose collection parameters and then select the <b>Start Scoring Button</b> to begin scoring.
Trial Details from the <b>Trials Screen</b>	Select a trial to immediately display the <b>Trial Details Screen</b> . Select the <b>Start Button</b> to be taken to the <b>Scoring Configuration Screen</b> where you can choose collection parameters and then select the <b>Start Scoring Button</b> to begin scoring.

Table 8: Selecting Blocks

Once all configuration options have been set, scoring can begin. See the Scoring page at: http://www.kddart.org/help/kdsmart/html/kdsmarthelp.html for more information.

#### CHAPTER

# SCORING

Scoring is the collecting of data for a trial with KDSmart. It mostly involves applying values to predefined traits in that trial, but could also include adding tags, notes, and attachments to plots or sub-plots as well.

This page will provide information on how to score trials, as well as some scoring options and features.

For more information on scoring and how it works within the context of the KDDart Platform, see the *KDSmart* section of the Tutorials page at: http://www.kddart.org/help/kdtutorials/html/KDSTutorial.html

# 6.1 The Scoring Screen

The **Scoring Screen** that you will be presented with when you start scoring will depend on the *Scoring View* that you choose when configuring the collection parameters of your trial. For more information see the *Collection Parameters* section of the Trial Details Page at: http://www.kddart.org/help/kdsmart/html/preparation.html#collection-parameters

### 6.1.1 Sheet Scoring Mode

**Sheet Scoring Mode** is a simple-sheet style view, similar to CSV or Excel document. This mode presents all traits for plots and sub-plots in a spreadsheet and selecting a cell will allow for entering of data. It has limited plot navigation features and can be slower to score, but many users find the view familiar and easy to use.



Fig. 1: Sheet Scoring Mode

#### 6.1.2 Path Scoring Mode

In **Path Scoring Mode**, you will only select one plot at a time, for which you will be able to see all plot info, including plot traits, sub-plots, sub-plot traits, tags, etc. This mode is designed for easy navigation between plots as you physically walk through a field, score the traits, then move to the next plot on the **Scoring Screen**. This also allows the user to choose the **Auto-Advance Mode** which is the quickest way to score but will be explained further below. Additionally, **Path Scoring Mode** includes **Field View** which displays a top-down view of your field.

0				11:05
BSP-20	15-NN-A	5-EB (	•	
Plot				
				122
		12		
vvet Germolasm				
1 01 0010	22411/0	3EM3-003	0)-D-1	4
396256	55#117C	3EM3-003	5)-6-1	4
396256	1	3EM3-003	Ø+	4 Ø <sub>+</sub>
396256	1 RD	RLDG+++	I SLDG	4 Ø <sub>4</sub> ;+
LDG++	1 RD PLOT	RLDG+++	Ø+ SLDG	4 Ø <sub>+</sub> ;+
DFF_F	1 RD PLOT PLOT	RLDG+++	@_ SLDG -	4 Ø <sub>+</sub> ;+
LDG++ DFF_F DFM_J PH_S	1 RD PLOT PLOT	RLDG+++	//	4 Ø <sub>+</sub>
LDG++ DFF_F DFM_J PH_S	1 RD PLOT PLOT SOIL	RLDG+++	@+ SLDG - -	4 Ø <sub>+</sub> ;+

Fig. 2: Path Scoring Mode

### 6.1.3 Field Scoring Mode

Note: Coming soon with KDSmart version 3.1 in June 2019!

#### 6.1.4 Screen Orientation

The Scoring Screen in KDSmart (in Path Scoring Mode) can be oriented to best suit the user who is scoring. You can choose between Portrait or Landscape Orientation, and Left-handed or Right-handed Mode. The default is Right-handed/Portrait Orientation but this can easily be changed.

To change screen orientation, select the <sup>1</sup> Menu Button and then the Change Screen Orientation Button. You will have a few seconds to physically tilt your device into the Landscape or Portrait Orientation and the orientation will be set.

	( BSP-201	5-NN-A5-I	EB			۲	. 🛃 (m	( )
۹.	Plot					1	Ø+	Ø.,
	11		1		LDG++	RD	RLDG+++	SLD
•	Plot Type Wet				DFF_PLO	т		
	POP501C5	5#11/			DFM_PLO	т		
	GEMS-0050	)-B-14			PH_SOI	L	-	
	396256				PH_SOIL	.2 🔒		
	0.6	Fig.	3: Right-ha	nded/La	andscape Orien	itation	•	0 11:44
	● ► ( 🛃 BSP-201	Fig. 5-NN-A5-I	3: Right-ha	nded/La	andscape Orien	tation ©		Q 11:44
•	BSP-2011	Fig. 5-NN-A5-1 1	3: Right-ha EB	nded/La	andscape Orien	itation	) <b>(</b>	0 11:44 ( :
4	BSP-201	Fig. 5-NN-A5-I 1 RD	3: Right-ha	anded/La	Andscape Orien	itation ©		0 11:44 ( ] 23 23
4	BSP-201	Fig. 5-NN-A5-I 1 RD )T	3: Right-ha EB RLDG++++	anded/La	Plot	itation ©		0 11:44 ( : 23 23
< ●	DFM_PLO	Fig. 5-NN-A5-I 1 RD DT DT	3: Right-ha	anded/La	Plot Plot Plot Type Wet Gemplasm	tation		0 11:44 ( : 23 23
• •	DFF_PLC PH_SOI	Fig. 5-NN-A5-I 1 RD DT DT	3: Right-ha	nded/La	Plot Plot Plot Plot Type Wet Germplasm (POP501C5 GEMS-0050 GID	1 5#11/ 0)-B-14		0 11:44 ( : 23 23
< 0	BSP-2011	Fig. 5-NN-A5-I 1 RD DT DT CT L	3: Right-ha	anded/La	Plot Plot Plot Type Wet Germplasm (POP501C5 GEMS-0050 GID 396256	1 5#11/ 0)-B-14		0 11:44 ( : 23 33

Table 1: Landscape Orientations

Select the <sup>1</sup> Menu Button in the top right-hand corner of the Scoring Screen to be presented with menu options. Select the Swap Sides Button to swap between Right-handed and Left-handed Mode.



Table 2: Portrait Orientations

**Note:** Sheet Scoring Mode and the upcoming Field Scoring Mode can operate in Portrait or Landscape Mode but there is no Left-handed or Right-handed Mode.

## 6.2 Applying a Trait Value

Applying trait values is the primary function of scoring trials. Selecting a trait to score will be different depending on what scoring mode you are using, however applying traits will always be the same as each scoring mode utilises the same **Trait Measurement Screen**. Follow the instructions below to learn how to score a trait.



Table 3: Scoring



Table 3 – continued from previous page

Button	Action
X Cancel Button	Cancels the scoring of the selected trait. Cancelling will return the user to the <b>Scoring Screen</b>
Delete Value Button	Deletes a current value and returns the user to the <b>Scoring Screen</b> .
<b>?</b> Missing Value Button	Applies the value of <i>Missing</i> to a trait instance. This can be used if the actual value is missing.
NA Not Applicable Button	Applies the value of <i>Not Applicable</i> to a trait instance. This can be used when the trait does not need to be scored for the selected plot or sub-plot.
Accept Value Button	Accepts and applies a value that has been entered such as confirming a decimal trait.
<b>Date Button</b> (only available for <i>elapsed days</i> traits)	Opens a Date Picker so that a date can be chosen.
<ul> <li>Reverse Button (only available in Auto- Advance Mode)</li> </ul>	Navigates to the previous trait instance.
<b>Forward Button</b> (only available in <b>Auto-Advance Mode</b> )	Navigates to the next trait instance by skipping the current trait.

Table 4:	Scoring	Options	of the	Trait	Measurements Screen
raoie ii	Scoring	options	or the	IIuit	incubatements bereen

The video available at https://www.youtube.com/embed/2qilBe2xGwM is a demonstration of scoring at trial in KDSmart. You will be able to see how trait values are applied to trait instances. Please note that whilst this video demonstrates scoring in **Path Scoring Mode**, the application of trait values is done from the same **Trait Measurement Screen** in any scoring mode.

Additionally, the sections below provide further information on navigation between plots.

## 6.3 Navigating Between Plots

It is crucial that users are able to navigate between plots quickly so that trials can be efficiently scored. This is why there are plenty of options for navigating between plots. The video referenced above (Scoring a Trial in KDSmart) also outlines the navigation methods in **Path Scoring Mode**. See the sub-sections below for more information on navigation between plots.

BSP-2015	ANA.	548 (	Ð 🔒	0
Plat			_	
1		1		11
-	- 2			11
Wet				0
396256			1000	-
296256	. ,		1.	P.
100++		R.D.G+++	<i>4</i> , 11.00	R
UDG++ DFF_PU	, 40 07	R:DQ+++	4, 11.00 39	<b>R</b>
UDQ++ DFF_PU DFM_PL	ю рт от	REDG+++	4, 11.00 39 39	8
DFF_PU DFF_PU PH_SO	ee ot ot	RDG+++	4, 11.05 39 39 6	
DFF_PU DFF_PU PH_S0	HD OT OT	R(DQ+++ A A A	4, 11.05 39 39 6	

Fig. 9: Navigation Options

Table 5: Navigation Options in Path Scoring Mode

Button	Action
1	Advance/Retreat
2	Plot Selection
3	Field View

**Note:** The information in this section is about navigation in **Path Scoring Mode**. Scoring in **Sheet Scoring Mode** is simpler, as you only need to select a cell to score it, but it can also be slower than using **Path Scoring Mode**.

#### 6.3.1 Advance/Retreat

Advancing and retreating is moving to the next or previous plot that is determined by your collection order. For example, if you are starting on plot 1, you can advance to plot 2 and then retreat back to plot 1. The **Advance Button** will move you to the next plot and the **Retreat Button** will move you to the previous plot.

#### 6.3.2 Plot Selection

Plot selection is directly entering the number or x/y coordinates of a plot to navigate to it. Selecting the **Plot Button** as outlined in <sup>2</sup> in the image above will display the **Plot Selection Window** as below:

Use XY	C Pot
Column	Row
t	
11	- 2
×	60

Fig. 10: Plot Selection Window

You can navigate to a plot by either choosing it's x/y coordinates or the plot number and then selecting the **Go Button** to confirm.

#### 6.3.3 Field View

**Field View** is a top-down look at the field which offers an alternative way to navigate between plots, search plots, and produce heatmaps. It will provide different information depending on the level that it is being viewed at (how zoomed in/out you are). At a minimum, the collection order (the arrows in each plot) and the percentage of each plot scored



(the grey bar in each plot) will be displayed. Select the / Zoom In/Out Button to reach higher or lower level views. Lower level views have more information about tags, traits, trait values, etc. The image below is an example of **Field View** at the *highest* level:



Fig. 11: Field View

A *long press* on a plot will reveal a window with information on that plot. A *short press* will provide both plot information and options for selecting multiple plots and navigating to that plot (as seen in the image below). Select the **Go To Button** to navigate to the selected plot.

PR0616		
Plot Type: V	Vet	
Traits score	d: 8 of 16	
Specimens:	3	
Tags: BD LD	G+ RD RLD	G++ RLDG++
+ WET		
Traits (Plot)	100000	
DFF_PLOT	=39 days	
DFM_PLOT	r=39 days	
PH_SOL+6	5 ph	
PH_SOIL 2	-6 ph	
Traits (S#1)	E	
- EPH+0.2 m	itio	
EPH:2=0.2	ratio	
Traits (S#3)	E	
- RUST rus	it scale	
RUST:2+4	rust scale	
Attributes:		
Germplasn	n+ (POPS0)	C5#11/
GEMS-0019	0-B-26	
GID= 3961	88	_
		Anna

Fig. 12: Field View Plot Options

#### 6.3.4 Auto-Advance

The quickest way to score traits is to use the **Auto-Advance Mode**. Auto-advance also allows the user to concentrate on only those traits for which a measurement has not been provided.

When the user provides a value for a trait, KDSmart moves the focus to the next un-scored trait, skipping over those traits (and sometimes entire plots) which have already been scored. This is useful when starting scoring as it quicker and when scoring has been finished if the user needs to find any un-scored plots or traits. The following video and instructions demonstrate how to use *Auto-Advance*:

Image: Sep 2015 NN AS EB       Image: Sep 2015	
Plot Port Type Wet CPOP501C5#11/GEMS-0050)-B-14  Autoscoring  X All traits Unscored traits  LDG++ RD RLDG+++ SLDG+ DFF_PLOT DFM_PLOT PH_SOIL	o ili
Pert Type Wet CPOP501C5#11/GEMS-0050)-B-14 CPOP501C5#11/GEMS-0050)-B-14 CPU Autoscoring X All traits Unscored traits LDG++ RD RLDG+++ SLDG+ DFF_PLOT - DFM_PLOT - PH_SOIL -	
Autoscoring X All traits Unscored traits LDG++ RD RLDG+++ SLDG+ DFF_PLOT DFM_PLOT PH_SOIL	
x     All traits     Unscored traits       LDG++     RD     RLDG+++     SLDG+       DFF_PLOT     -       DFM_PLOT     -       PH_SOIL     -	
DFF_PLOT - DFM_PLOT - PH_SOIL -	
DFM_PLOT - PH_SOIL -	
PH_SOIL -	
DU COLLO D	

Fig. 13: Auto-Advance Options

Table 6:	Using	Auto-Advance
----------	-------	--------------

Step	Action
1.	Select the 🕑 Start Auto-Advance Button at the top menu of the Scoring
	Screen to turn on Auto-Advance Mode. This will provide auto-advance op-
	tions as seen in the image above.
2.	Choose either the All Traits option to score all traits within the dialogue box, or
	the Un-scored Traits option.
3.	Begin scoring by selecting the blank area next to an un-scored trait. This dis-
	plays a new screen with the data entry form for the trait on one side and the <i>Plot</i>
	Information on the other side (this is demonstrated in the image above).

Continued on next page

Step	Action
4.	The // Advance/Retreat Buttons are no longer available, but there are
	<ul> <li>*/* Backward/Reverse Buttons along the bottom that may be used if you want to skip to the next trait or revisit the previous one. If a plot is skipped, then KDSmart will let the user know this by:</li> <li>Vibrating the device;</li> <li>Posting a system notification; and</li> <li>Displaying a popup message for the user to confirm that they have reached the correct plot to continue scoring.</li> </ul>
5.	Return to the <b>Scoring Screen</b> and select the <sup>10</sup> <b>Stop Auto-Advance Button</b> then the <b>Cancel Button</b> to stop auto-advancing between traits.

Table	6 –	continued	from	previous	page
-------	-----	-----------	------	----------	------

The video available at https://www.youtube.com/embed/vsnCG3Ef40c is a demonstration and instructions on the use of *Auto-Advance*.

Note: The Auto Advance feature is only available in Path Scoring Mode.

## 6.4 Assigning Tags

Tags are short text descriptions that are designed to be like reusable notes that can be applied to plots or sub-plots. Along with scoring traits, assigning tags is a part of the scoring process. One or more tags may be assigned to a plot (or sub-plot) or reassigned if required. More information about tags and their management can be found in the *Tags* page at http://www.kddart.org/help/kdsmart/html/tags.html

To assign a tag in Path Scoring Mode, follow these steps:



Table 7: Assigning Tags

Step	Action					1		5-			
3.	Select	one	or	more	tags	to	assign	them	to	а	plot.
			0				•	211			
			P	Select T	ags:1						
				BD							
			Ш.	Discard							
			W	DRY				2	Ľ.,		
			E (F	ERT+							
			35	ERT++							
				ERT+++							
			H.	GV+							
				GV++							
				GV+++							
				HBCIDE							
				LDG+							
				×		+	1	·			
				. 4		•					
				Fi	g. 15: A	ssigni	ing Tags				
4.	Select the Screen	he <b>Con</b>	firm	Button (	(tick) to	save	changes a	and retur	n to t	he So	plot
	julien.	i mo u	ispidy	is the tag	SHOLT HA	ine at		uno 101 ti		ceieu	P <sup>10</sup>

Table 7 – continued from previous page

## 6.5 Adding Notes

Notes can be added on each plot or sub-plot in a trial. In any scoring mode, this can be done by selecting the

Plot/Sub-plot Button which will display some options such as an Edit Note Button. This can be seen in the image below (Path Scoring Mode).

0					2:43
BSP-	2015-NN-	A5-EB	(	•	1 :
Plot					
					22
Not Type					
POPSO	1C5#11	/GEN	15.005	0)-B-14	1
101-30		/ GLI	13.003		
196256		, och	13-003	i de la composición d	
396256		/ GEI	10.000		
396256		1	10.000	Ø <sub>+</sub>	Ø <sub>+</sub>
396256 Add Su	b-Plot	1	DG+++	Ø+ SLDG-	Ø <sub>+</sub>
Add Su Edit No	b-Plot te	1	.DG+++	Ø <sub>+</sub> SLDG- 39	Ø.
Add Su Edit No Deactiv	b-Plot te vate Plot	1	DG+++	Ø <sub>+</sub> SLDG- 39	Ø.,
Add Su Edit No Deactiv	b-Plot te rate Plot	1	DG+++	Ø <sub>+</sub> SLDG- 39 39	Ø.,
Add Su Edit No Deactiv	b-Plot te rate Plot _SOIL	1	DG+++	<ul> <li>𝑘<sub>+</sub></li> <li>SLDG</li> <li>39</li> <li>39</li> <li>6</li> </ul>	Ø.
Add Su Edit No Deactiv	b-Plot te rate Plot _SOIL SOIL:2	1	DG+++	<ul> <li>𝑘₄</li> <li>SLDG</li> <li>39</li> <li>39</li> <li>6</li> <li>6</li> </ul>	₽.

Fig. 16: Adding Notes

**Note:** The **Sub-plot Button** in this example is of maize but it may be different depending on your settings e.g. a leaf or DNA icon. You can see that you can also deactivate plots and sub-plots in this menu and add sub-plots if needed.

## 6.6 Adding Attachments

Both images and audio files can be attached to each plot and sub-plot in KDSmart and can be used instead of notes or

Attachment Button can be found on each plot and sub-plot (next to the Tag Button) and tags. The will open the Attachment Screen as seen below:

0		▼A 🛙 3:06
KDSmart De	IV	
Plot Id		
1		
(POP501C5#1	11/GEMS-00	(50)-B-14
GID		
396256		
Trial_70-Plot_1-3-		•
20190409_150150 Trial_70-Plot_1-3-	Jpg	
20190409_150207	.3gp	
	00.00	
	00:00	-
٢		Ø
4		

Fig. 17: Attachments Screen

There are two attachments currently saved in the example above; one is an image and one is an audio file. This can be seen by the .jpg and .3gp file extensions. There are two tables below with instructions on attaching images and audio files.

Table 8.	Attaching	and	Viewing	Image	Files
Table 6.	Attaching	anu	viewing	image	THUS

Step	Action
1.	Image files can be attached by taking a picture with the device camera. Select
	the <b>Camera Button</b> to open the device's camera application.
2.	Take a picture and select the Confirm Button. This will look different depend-
	ing on what device you are using.
3.	The new attachment should appear in the list of attachments as seen in the image
	above. Select the <b>View Button</b> to open the image.
L	

Continued on next page

Step	Action
4.	Select the <b>Delete Button</b> to delete the image. Please note that there is no way to reverse a deletion.

Table 8 – continued from previous page

Table 9: Attaching and Listening to Audio Files

Step	Action
1.	Audio files can be attached by making an audio recording with the device mi-
	Decord Brotton to start monding. The botton will
	crophone. Select the <b>Cord Button</b> to start recording. The button will
	turn red to indicate that recording has started.
2.	The <b>Pause Button</b> will now be available if you want to pause the record-
	ing of the audio file. If you pause the audio recording, the button will turn red
	to indicate that recording is currently paused. Press the <b>Pause Button</b>
	again to resume recording.
3.	Select the <b>Record Button</b> again (when it is red) to stop the recording.
4.	The new attachment should appear in the list of attachments as seen in the image
	above. Select the Play Button to listen to the recording and the
	<b>Stop Button</b> to stop the recording.
5.	Select the <b>Delete Button</b> to delete the recording. Please note that there is no way to reverse a deletion
	is no way to reverse a deletion.

CHAPTER

#### SEVEN

### **DATA IMPORT, EXPORT & BACKUP**

KDSmart contains three types of data that can be used in experiments: trials, traits, and tags. KDSmart manages it's own database located on your Android device which contains this data but they can also be imported, exported, and backed up.

Any trial that is imported or exported will also contain any traits or tags that is used in it. However, traits and tags can also be imported or exported in separate files if required.

To commence using KDSmart with your own trials, that trial data must first be imported into KDSmart.

**Note:** There is a separate *Data Transfer* page at http://www.kddart.org/help/kdsmart/html/exchangedata.html# data-exchange-kdxchange-method which provides examples for transferring data between KDXplore and KDSmart using the Google Drive and KDXchange methods. It is a separate page because it provides instructions on using both KDXplore and KDSmart. The objective of this page is to provide more information on the various options available for KDSmart.

## 7.1 Importing Data

KDSmart can be used as a standalone application or as a part of the integrated KDDart platform. This means that there is a need for several different methods for importing files and data depending on how KDSmart is used. There are also options for both offline and online imports which can be helpful depending on the user's location and access to the internet.

Since Android version 4.4, the Storage Access Framework (SAF) has been used for browsing and opening files. This has been implemented in KDSmart and makes it possible to import (and export) files from document providers such as Google Drive or Dropbox, or files that are stored internally on the device. This means that there are many options for importing files whether your device is offline/online and what file hosting services you use.

If you have exported a *scoring set* from KDXplore, it will be importable as a *trial* in KDSmart. There is only a distinction between the terms in KDXplore. KDSmart views scoring sets and trials as the same thing.

Depending on whether you are importing trials, traits, or tags, there will be different options available. These will be outlined in the following sections.

#### 7.1.1 CSV Import

Comma Separated Value (CSV) files are a common file format that many users collect data with prior to using KDDart. Some users also use CSV files if they use KDSmart as a standalone application. More information about formatting CSV files can be found on the *CSV Formats* page at http://www.kddart.org/help/kdsmart/html/kdsmart-app-b.html

After selecting a file to import, each column in the CSV must be assigned an attribute type. This determines how the data in the column will be interpreted. Columns can be selected as **Don't Import** as well as whether the data is related to the trial, a plot, or a trait name to be scored.

TO successfully import a CSV trial, the file must contain at least a Plot ID **OR** both Plot Column and Plot Row **OR** all three columns.

See the steps below on how to import CSV files:



Table 1: CSV Import (SAF)

Note: All types of CSV files (trials, traits, and tags) can be imported into KDSmart.

#### 7.1.2 KDX Import

KDX files contain all experiment information including a trial, traits, and tags. It is similar to a zipped folder and is much easier to transfer than a CSV because there is no import mapping. It is recommended to use KDX files when using KDXplore and KDSmart together as it reduces complexity of importing and the chance of errors. See the instructions below for how to import a KDX file:

Step	Action
1.	Open the Trial Screen, Trait Screen, or Tag Screen on KDSmart and select
	1 :
	the <b>Import Button</b> or the <i>Import As</i> option in the <b>Menu Options</b> .
2.	The Import Options will open. If you are importing traits or tags, there will be
	the following options:
	csv csv
	KDXplore
	CKDDart -
	Importing from the <b>Trials Screen</b> will result in an additional option to import KDX files:
	File csv
	File kdx
	KDXplore
	Noosii
3.	Select the <b>File KDX Button</b> This will open the Storage Access Framework for
	choosing files on the device internal storage or an application such as Google Drive.
	Continued on next page

Table 2: KDX Import (SAF)



Table 2 – continued from previous page


Table 2 – continued from previous page

The video referenced below is a part of our KDTutorial series which demonstrates how to import a scoring set (KDS-

mart views scoring sets as trials) from Google Drive to KDSmart.

**Note:** KDX files can contain all types of data (trials, traits, and tags) however, you will only be able to find the option to import a KDX file in the **Trial Import Options**.

## 7.1.3 KDXplore Import (KDXchange)

The KDXplore option will open KDXchange which is used for transferring data from KDXplore to KDSmart (and vice versa) over a Wi-fi connection when there is no cellular connection available. You will need access to a router or a mobile device that can host a Wi-fi hotspot.

Connecting to KDXchange requires both KDXplore and KDSmart to be configured. There is a separate *Data Transfer* page at http://www.kddart.org/help/kdsmart/html/exchangedata.html#data-exchange-kdxchange-method which gives specific instructions for how to use both Google Drive, and KDXchange for transferring data between KDXplore and KDSmart. See that page for more information on using KDXchange.

## 7.2 Exporting & Sharing Data

Exporting and sharing data files in KDSmart are similar but distinct actions that allow users to send trials, traits, and tags to the device internal memory or other applications. These differences will be outlined in the sections below.

Both of these methods have the same *Export Options* listed below:

- Full Data for KDXplore;
- Full Data in Zip;
- Only Scores: Plots (CSV); and
- Only Scores: Plots & Sub-Plots (CSV).

## 7.2.1 Exporting Data

*Exporting* allows the user to export a trial, trait, or tag to either the device internal memory (Tablet) or to KDXplore through KDXchange.

#### Tablet (Internal Memory)

The Export to Tablet option will export data to the internal storage of the KDSmart device.

The video available at https://www.youtube.com/embed/WJsHN0tApWo provides a guide and instructions to exporting data:

Note: The video provides an example of exporting trials but the same process can also be used for traits and tags.

Step	Action
1.	Depending on what sort of data you would like to export, navigate to the Trial
	Screen, Trait Screen, or Tag Screen. Choose a trial to export.
2.	Select the Export To Button. You will be presented with the Export To Op-
	tions.
3.	Select the <b>Tablet Button</b> to export a data file directly to the device that you are
	using. The Choose Export Option Window will appear with the options that
	are listed above these instructions.
4.	Choose an export option. The Storage Access Framework (SAF) File Chooser
	will open.
5.	Select a file location on your device to save the exported file to.
6.	Select the <b>Select Button</b> to finalise the export. There will be a notification on
	your device when the exported file has saved to that location.

#### Table 3: Exporting Data

#### **KDXplore Export (KDXchange)**

The KDXplore option will open KDXchange which is used for transferring data from KDXplore to KDSmart (and vice versa) over a Wi-fi connection when there is no cellular connection available. You will need access to a router or a mobile device that can host a Wi-fi hotspot.

Connecting to KDXchange requires both KDXplore and KDSmart to be configured. There is a separate *Data Transfer* page at http://www.kddart.org/help/kdsmart/html/exchangedata.html#data-exchange-kdxchange-method which gives specific instructions for how to use both Google Drive, and KDXchange for transferring data between KDXplore and KDSmart. See that page for more information on using KDXchange.

## 7.2.2 Sharing Data

*Sharing* allows the user to send a trial, trait, or tag through a 3rd party application such as Google Drive, Gmail, Drop Box, etc.

The video available at https://www.youtube.com/embed/VQPYOaGw8hY provides a guide and instructions on how to share data:

Note: The video provides an example of exporting trials but the same process can also be used for traits and tags.

Step	Action
1.	Depending on what sort of data you would like to export, navigate to the <b>Trial</b>
	Screen, Trait Screen, or Tag Screen.
2.	Select the Share Button. The Choose Export Option Window will appear
	with the options that are listed above these instructions.
3.	Choose an export option. A list of applications compatible with the Storage
	Access Framework (SAF) will open. These applications may include Google
	Drive, Gmail, Drop Box, etc.
4.	Choose an application that you want to share the file with. After making a
	choice, the application that you chose will open. What you do next will depend
	on what application you are using to share the file. See the video referenced
	above for an example of saving a file to Google Drive.

Table 4: Sharing Data

# 7.3 Data Backup

Any saved data on KDSmart including trials, traits, and tags, can be backed up improve data security and management.

There are various options for backing up KDSmart data:

- Trials as Zip best for saving files as CSVs;
- Trials as KDX best for using with KDXplore; and
- Database Files for backing up all data.

The video available at https://www.youtube.com/embed/3w8OAh\_amao provides a guide and instructions for backing up data with the *Trials as KDX* option:

Step	Action
1.	Navigate to the Manage Screen. On the Database Tab, there are options for
	backing up data and database fixes.
2.	Select the <b>Cutput to Folder Button</b> . This will open the device SAF.
3.	Choose a folder to save your backups to by navigating to the folder and then
	selecting the Select Button. You will be directed back to the Database Tab.
4.	Use the radio buttons to select a backup option such as <i>Trials as KDX</i> .
5.	Select the <b>Save Button</b> to confirm the backup. The files will now be available in the chosen location.

### CHAPTER

EIGHT

# DATA TRANSFER

Note: This is a common help topic for both KDXplore and KDSmart.

# 8.1 Introduction

There are several methods of moving data in to and out of KDSmart which can be found on the *Data* - *Import, Export, Backup* page at: http://www.kddart.org/help/kdsmart/html/data-import-export-backup.html# data-import-export-backup

This topic focuses on using KDXplore with KDSmart, which provides more time saving and productivity benefits for the user. Previously, inbuilt software called KDXchange was used to transfer data between KDXplore and KDSmart. Both applications have recently been updated to include integration with Google Drive which requires much less effort in setup. Whilst an internet connection is required, both devices do not need to be on the same Wi-Fi network. Google Drive is now the recommended method, however, there may still be a need to use KDXchange so both methods are outlined here. The following sections outline the steps required for exchanging data between KDSmart and KDXplore:

- · Setup Connecting KDXplore to KDSmart Devices; and
- Transfer Moving data (Trials, Traits and Tags) between KDSmart and KDXplore.

For more information on why you would need to transfer data, see the *KDSmart Home Page* at http://www.kddart.org/ help/kdsmart/html/index.html See the *KDXplore Home Page* at http://www.kddart.org/help/kdxplore/html/index.html to learn about how you can use KDXplore for data management and curation.

## 8.1.1 Data Transfer - Google Drive Method

Google Drive is a quick and easy way of exchanging data between devices and requires little setup time. The example provided will take you from exporting a Scoring Set from KDXplore to Google Drive, importing it into KDSmart, exporting the Scored Data file to Google Drive, and then importing that file into KDXplore for curation.

The process of exchanging data will be described in the following steps:

- 1. Connect to the Internet
- 2. Google Drive Setup
- 3. Transferring Files from KDXplore to Google Drive
- 4. Transferring Files into KDSmart from Google Drive
- 5. Transferring Files from KDSmart to Google Drive
- 6. Transferring Files into KDXplore from Google Drive

#### Step 1 - Connect to the Internet

Google Drive transfers will only work when devices are connected to the internet but they do not have to be connected at the same time. For example, a user on KDXplore may export a Scoring Set to Google Drive which is uploaded to their personal folder, turn off their computer, and then go out into the field and import that Scoring Set into to KDSmart. For users who do not have mobile data on their KDSmart device or are in an area that does not have signal, it will still be necessary to connect to WiFi.

For further information on setting up WiFi please see the Step 1 - Using WiFi section below.

#### Step 2 - Google Drive Setup

As well as having an internet connection, you will need to have a Google account which gives you access to Google Drive. A free account will provide 15gb of space which is more than enough for using with KDXplore and KDSmart. To sign up or access *Google Drive* see the following page: https://www.google.com/drive/.

This link will be usable on KDXplore, Android devices should have a Google Drive application that would usually be already installed by default but can also be found in the Google Play Store.

#### Step 3 - Transferring Files from KDXplore to Google Drive

Once a Trial, Trait or Tag has been created, it needs to be transferred to a KDSmart device for use in the field. The following instructions demonstrate how to transfer Trials (or other data) from KDXplore to Google Drive so that they can be used in KDSmart.



Fig. 1: Exporting a Scoring Set

Step	Action			
1.	Ensure that Goog open to prepare	gle Drive is opened for the transfer.	in an internet browse	r and have KDXplore
2.	Choose a Scorin	g Set such as the on	e at $\bigcirc$ and then sele	ect the <b>Export</b> button
3.	The <b>Export</b> wind the <i>Browse</i> butto to. Ensure that the used in KDSmar	dow displays (as at on to choose a location he radio button for <i>H</i> t.	3) which provides of on on the computer to <i>XDX</i> file is selected so	export options. Select b save the Scoring Set to that it is ready to be
4.	Select either the dow and the KE opens and asks you want to trans	<i>Export</i> or the <i>Expo</i> . DX file will be expo whether you want to sfer the file to Goog	<i>rt &amp; Close</i> options winted to your chosen open the containing le Drive immediately.	ithin the <b>Export</b> win- location. A dialogue directory - do this if
5.	Click+drag the fit to complete the and there is a m	file into the web bro the upload. The f nessage which conf	weser with Google D ile should now appoint it is should now appoint it	rive opened and drop ear in Google Drive has been completed.
		Fig. 2: Uploading	g Files to Google Driv	ve

Table 1:	Transferring a	Trial from	KDX to	Google Drive
14010 11			1101110	Coogle Dirie

### Step 4 - Transferring Files into KDSmart from Google Drive

Files that are uploaded to Google Drive from KDXplore need to be imported into KDSmart. The following steps will demonstrate how to open Google Drive on your device and choose files to be imported into KDSmart.



Fig. 3: Importing a Trial 1/3

	Table	2: 1	mporting	а	Trial
--	-------	------	----------	---	-------

Step	Action
1.	Navigate to the Trials screen and select the <b>Import</b> button at $\textcircled{1}$ .
2.	Select an import option - for this tutorial choose the <b>File KDX</b> option at <b>2</b> . This opens Google Drive.



Table 2 - continued from previous page



Table 2 - continued from previous page

### Step 5 - Transferring Files from KDSmart to Google Drive

Once data is collected by scoring with KDSmart, the data needs to be transferred to KDXplore for curation. Step 5 will demonstrate how to transfer scored data for KDXplore using Google Drive.

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Santiago Ixcuintle wcassemsa	Export To 🥠	-
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85P-2015 NH AS EB	Grouping	
Example of Block	Random Demo Data	
El Batan : Plotid,2 20/2015/01/07/08	Add Trial	
Rutherglen RDI : 1 M 2015-RDI H0	Help	4
Example of Nurser	ry Scoring	
Example of Block lock Trial	Trial	8
maize-with-data to Accord		
4		

Fig. 6: Transferring a Trial 1/5

Step	Action
1.	On the <b>Trials</b> screen in the above image, ensure that the Scored Trial that you
	want to transfer is selected and then choose the <b>Options</b> button at <b>1</b> and then the <i>Share</i> option at <b>2</b> .



Table 3 – continued from previous page

1 3



Table 3 – continued from previous page



Table 3 – continued from previous page



Table 3 – continued from previous page

### Step 6 - Transferring Files into KDXplore from Google Drive

The final step is to load the Scored Trial from Google Drive into KDXplore. This allows the user to curate and analysing the scored data.

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Fig. 11: Downloading a Trial from Google Drive

Step	Action
1.	Ensure that Google Drive is opened. If it is not, then there is a Google Drive
	button in KDXplore which opens it in a browser. This button is located at $\bigcirc$ in the above image.
2.	Choose any file such as the one located at <b>2</b> . <i>Right-click</i> this file and then choose the <i>Download</i> option. This downloads the file to the default location for your browser (e.g. The Downloads folder).



Table 4 – continued from previous page

## 8.1.2 Data Transfer - KDXchange Method

Whilst the Google Drive method is now the recommended method for exchanging data between KDXplore and KDSmart, KDXchange is still provided as a backup method for exchanging data.

## 8.1.3 Setup - Connecting KDXplore to KDSmart Devices

Connecting Devices has three steps.

#### Step 1 - Using WiFi

KDXplore and KDSmart devices connect and synchronise data using a WiFi network.

The KDSmart device(s) and the KDXplore laptop/PC **must** be connected and visible to each other on the **same network** (i.e. same wifi connection). This is a networking requirement and not a limitation of KDSmart/KDXchange.

**Note:** Depending on the network configuration, there may be times when your PC/Laptop is connected to a wired network (not on WiFi) yet will be able to connect to KDSmart devices on WiFi.

**Tip:** Many organisational IT policies lock computer settings preventing the setup or activation of your own WiFi Hotspot without needing Administrator user access on the computer. **Before** travelling to 'the field' we suggest you prepare, test and become familiarised with this means of connecting devices. Seek support in your organisation if needed.



Fig. 14: KDSmart - WiFi Connection Warning Example

If the message above is displayed try the **Connect Anyway** button, however, this may result in mixed success. Only a couple of tries is needed!

#### In the Field - Your Own WiFi Hotspot

When a WiFi network is unavailable at your location, a portable WiFi hotspot can be created on your Laptop (if it has that capability). The connection can then be shared with your other KDSmart devices using KDXchange (see the above tip).

#### The KDXchange Window

The KDXchange window can be found by opening KDXplore on a PC and then opening the Trial Manager module



by selecting the Trial Manager icon. Once the module is open, select the KDX change Server icon.

The following image displays a section of the KDXchange screen highlighted to show the following areas:

- **O** Connection panel is where the options to connect devices are located. This includes the IP Address where the KDXchange server will be created.
- **C KDXplore** panel links KDXplore from the user's computer. This means that the list of Trials, Traits, and Tags that are on the user's version of KDXplore are displayed. The user will need to choose between either the Trials, Traits or Tags to be selected.
- ③ KDSmart Devices is a list of all the KDSmart devices that are connected to KDXchange or are available for connection. The image demonstrates that a device named 'Galaxy S8+' from the user named 'Tester' is currently connected.
- **Operice** is a panel which displays data from the currently connected KDSmart device.

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			Novi Inc.	The sector of th

Fig. 15: KDXchange Main Window

**Note:** KDXchange server software in KDXplore and KDSmart enables them to communicate and needs to be kept running on the pc/laptop until any synchronisation tasks between the devices has completed. Also, the devices should be kept in close proximity whilst connected. Once tasks have completed the KDXchange server can be stopped.

## Step 2 - Prepare KDXplore/KDXchange

Step 2 involves preparing KDXplore on the laptop/pc to communicate with KDSmart devices. The following steps must be performed on the laptop/pc:

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Start @ Stop Start serve	er to see Address	0	Keep on top 🏩
Trials Trats Tags			
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KDSexart Devices	Please Confirm Network and Port Nur © LAPTOP RDB8226/30.8.8.12 Order 0/127.0.0.3 0/192.168.0.10 Select Device	rber X r Port: 11424 2 Cancel Ok for details	
- (1			0

Fig. 16: Confirm Network/IP Address and Port number

Fable 5: \$	Step 2 -	Starting the	KDXchange server	' in	KDXplore
-------------	----------	--------------	------------------	------	----------

Step	Action
<b>2.1</b> (KDX)	On the Laptop/PC start KDXplore and select the Trial Manager Trial Manager icon.
<b>2.2</b> (KDX)	Select the <b>KDXchange Server</b> icon at top of the Trial Manager window to open KDX- change.
2.3 (KDX)	Select the <b>Start</b> button ( or Shift Start to enter address and/or port number) which is located at ① on the above image.
	Continued on next page

-							
Step	Action						
2.4	The Network/IP Address and the Port number need to be confirmed. The selected Network/IP Ad-						
(KDX)	dress in this example is different to that of another computer. The IP address of the computer runnin						
	KDXplore (suggested by default), is usually fine but can changed if required. Select the <b>OK</b> button in						
	the mindem of 2 to confirm this ID Address. The Dart Number would be headd be left at the default						
	the window at $\checkmark$ to confirm this IP Address. The Port Number usually should be left at the default						
	setting, however, if it is changed, both KDSmart and KDXplore <b>must</b> have the same port number. Once						
	<b>OK</b> has been selected, the window will disappear and the program will start <i>listening</i> for devices which						
	means that it is scanning for available devices on the Wi-Fi network.						
2.5	Once KDX plore is <i>listening</i> for devices there will be a message displaying						
	once additional is usering for devices, there will be a message displaying						
(KDA)	the IP address and port number at 🖤 in the following image. By select-						
	ing the <b>Stop</b> button at <b>W</b> , the user can stop KDXplore listening for devices.						
	(the ) 2 Max ( ) per						
	Fig. 17: KDXchange connection to KDSmart devices						

Table 5 – continued from previous page

### Step 3 - Preparing KDSmart Devices For Upload/Download

Step 3 involves connecting one or more KDSmart devices via WiFi with KDXplore on the laptop/pc. These 'connection' steps are common to both **Upload** to KDXplore or **Download** from KDXplore and for Trials, Traits or Tags.

Table 6:	Step 3 -	Connecting	KDSmart	devices	to KI	OXplore's	KDX-
change s	erver						

L L	
Step	Action
3.1	Ensure that the KDXchange server is <i>listening</i> for any KDSmart device(s) from
(KDX)	the previous Part 2 steps (as demonstrated above).

Step	Action					
3.2	From the home screen on each KDSmart device, select the ap-					
(KDS)	propriate Trials, Traits or Tags panel then select the Connect					
	button as seen in $\textcircled{1}$ then choose the KDXplore icon at $\textcircled{2}$ .					
	9 Truts 🕨 土 1					
	All Trials					
	El File kds					
	BRDCI 3x4 📷 KDKplore					
	Santiago txcuintla:					
	El Batan : Plotid,6x10					
	El Batan : PlotId,20x15					
	Rutherglen RDI : 10x6					
	Example of Nursery Scoring					
	Example of Block Trial					
	maize-with-data					
	< No Trial type In					
	Fig. 18: Starting a Connection					
3.3	A dialogue box asking whether to continue will					
(KDS)	appear. Choose the <i>tick</i> at <b>1</b> to continue.					
	Fig. 19: Accept a Connection					
2.1	Paturn to KDV place on the PC/L option and at 1 the KDS most device should					
(KDX)	appear as <i>Pending</i> which means it is ready to connect. To connect the device.					
	salast the Allow butten shown at 2					
	select the Anow button shown at $\bigcirc$ .					
	Andre Dens Same Dense Time Of Pr					
	0					
	Fig. 20: Allowing KDSmart devices					
	If multiple KDSmart devices were to be connected and the same process was					
	performed on them, the <b>Device</b> panel at <b>1</b> would also list those devices.					
<u> </u>	Continued on next page					

Table 6 – continued from previous page

Step	Action				
3.5	A dialogue box then opens which asks for information about the device as seen				
(KDX)	in the following image:				
	Provide Device And Operator [_ X				
	Source: Callery Site = Add_				
	Cancel Of				
	the second se				
	Fig. 21: Allowing KDSmort devices				
	Tig. 21. Allowing KDSmart devices				
	Enter the name of the user in $\textcircled{1}$ and then select the <b>OK</b> at $\textcircled{2}$ .				
3.6	Once user information has been entered, the device connection				
(KDX)	is complete. KDXplore should look like the following image				
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	Subspin COM/CONTRACTOR     Subspin COM/COM/COM/COM/COM/COM/COM/COM/COM/COM/				
	• 101 Aut				
	= 54(5,6) = 171 = 171				
	1mm 0				
	Fig. 22: Allowing KDSmart devices				

Table	6 –	continued	from	previous	page
rabic	0	continucu	nom	previous	page

The **Device** panel displays the device as *Accepted* and the data from both the connected computer and KDSmart device will appear in panels and a.

## 8.1.4 Transfer - Moving data (Trials, Traits and Tags) between KDSmart and KDXplore

Transferring KDSmart data to/from KDXplore requires KDXplore and the KDSmart device(s) to be connected and waiting to transfer files.

The steps in the previous section, *Setup - Connecting KDXplore to KDSmart Devices* **must** be performed first before proceeding here.

#### **Battery - Power Saving**

When a WiFi connection between KDSmart device(s) and KDXplore is established the power saving options on the device(s) may be overridden and the devices could remain **on**. If needing to conserve battery power on the phone/tablet/laptop, it may be advisable to stop the connection once data transfers have been completed.

#### From KDXplore to KDSmart

The following image and table show the steps required to perform a KDXplore to KDSmart File transfer.



Fig. 23: Transfer Steps - KDXplore to KDSmart

Step	Action
1.	Select an item e.g. the Trial named 'wheat-with-data' that is shown at ① in the above image.
2.	Once the item is highlighted, select the <b>KDXchange Server</b> icon at to start the transfer of data. Another method of choosing files to transfer is to <i>click+drag</i> an item such as a Trial to the KDSmart device. This method of transfer can work for single files, or for bundles of Trials, Traits, or Tags.
3.	The <b>Dataset Upload</b> window opens and files that have been selected will appear in it. The purpose of this window is to confirm the upload of datasets. Select the checkbox as seen at 3 and then select the <b>OK</b> button at 4 to finalise the upload.

	1	UDV 1	VDC
Table 7: Transferring	data from	KDXplore to	KDSmart

### From KDSmart to KDXplore

The steps outlined in the following image and table describe how to transfer Trials, Traits, or Tags from KDSmart to KDXplore when they are connected using KDXchange.

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AR Trials			Confirm Trial Transfers: 1	
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Online	Frateal Verser: 2		- 1. Mar. 19 Mar.	

Fig. 24: Transfer Steps - KDSmart to KDXplore

Step	Action
1.	Select an item e.g. the Trial named 'wheat-with-data' that is shown at 1 in the above image.
2.	Once the item is highlighted, select the <b>KDXchange Server</b> icon at to start the transfer of data. As with the KDXplore to KDSmart transfer, files can be transferred by <i>click+drag</i> .
3.	A <b>Confirmation</b> window should appear. Select the <b>Collect</b> button at <sup>3</sup> which will confirm the transfer and the Trial is then be copied into KDXplore.

Table 8	8: '	Transfe	erring	data	from	KDSmart to	KDXplore
rable o	υ.	11 ansi	uning	uata	nom	KDSmart to	KDAPIOIC

#### **Finished - Disconnecting Devices**

When a KDSmart device is connected any touches to the KDSmart window, accidental or otherwise, may cause the following warning to display:



Fig. 25: Disconnection Warning

If disconnection is unintended, select the  $\mathbf{X}$  button to dismiss the message and continue, otherwise, select the tick to confirm.

Disconnection can also be achieved using the **Stop** button adjacent to the Run button in the below image. Either method will return KDSmart to normal operation and close the connection.



Fig. 26: Disconnection Warning

Tip:

- After disconnection of KDSmart device(s) the KDXchange server will still be running on the PC/Laptop. Whilst this is still running reconnection of a device can be quickly achieved.
- The KDX change server can be stopped when data transfers is finished.

### CHAPTER

## NINE

## **CSV FILE FORMATS**

These pages provide information and formatting assistance for the construction of valid CSV Trial/Nursery files for import into KDSmart and KDXplore.

KDSmart and KDXplore share the same import code base, designed to make the task easier. This introduction will help with understanding what needs to be prepared for a CSV import using either application.

**Note:** Other data import methods exist, instead of CSV files, for loading Trial/Nursery/Trait/Tag data into KDS-mart/KDXplore which can offer better and longer term advantages.

# 9.1 KDSmart/KDXplore Import Mapping

Importing a Trial using CSV format in KDSmart/KDXplore commences with an attribute mapping table, similar to the examples in the following illustration. This is an important step which helps you setup how your Trial or Nursery information is loaded and defined in each application.

**Note:** This method of attribute selection is employed to make the import task easier, rather than keep editing and adjusting the CSV file format.

Before the import proceeds, CSV Column Headings in the file need to be assigned an *Attribute Type* using the "Import As" column.

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11         OVL_0RedWill         Tmit         14 Stodg_pl_plot         0         Trait           10         Post Traits         15 REP_NO         1         Piot Attribute           10         Post Traits         16 PLOT_NO         1         Piot Attribute           11         Post Traits         17 COLLIAN_NO         1         *** Plot Column 00           x         Import         18 RANCE_NO         1         *** Plot Row (Y)		10	Moi set STD		1191	13 Rindg pl pk	of S	Trait		
11         000, g Resolve         11         11         13         REP_NO         1         Plot Attribute           10         Post Traine         16         PLOT_NO         1         Plot Attribute           10         Post Traine         17         COLUMN_NO         1         *** Plot Column 00           4         Import         18         RANCE_NO         1         *** Plot Row (Y)					2444	14 SLodg_pl_pic	t 0	Trait		
10 Pool Trains         16 PLOT_NO         1         Plot Attribute           17 COLUMN_NO         1         *** Plot Column 00           #         Import         18 RANCE_NO         1         *** Plot Row (0)		- 11	GWL0_RedWH		TIME	15 REP_NO	1	Plot Attribute		
IT COLUMN NO I *** Plot Column (0)  It column (0)					are set	16 PLOT_NO	1	Plot Attribute		
IS KANGE_NO I ** Pict Row (1)			TRANSPORT			17 COLUMN_NO	1	** Plot Column	00	
	1.00			in the	DOT 1	18 RANGE_NO	1	*** Plot Bow (Y)		
				1.000		-				
	Fig. 1: KDSmart	CON	Column r	viapping	g Example					
Fig. 1: KDSmart CSV Column Mapping Example										
Fig. 1: KDSmart CSV Column Mapping Example						Clear C Follow				
Fig. 1: KDSmart CSV Column Mapping Example						Com Proton				
Fig. 1: KDSmart CSV Column Mapping Example						Import				
Fig. 1: KDSmart CSV Column Mapping Example										
Fig. 1: KDSmart CSV Column Mapping Example						Fig 2. KDX1	nlore CSV (	<sup>r</sup> olumn M	ann	ino Exa
Fig. 1: KDSmart CSV Column Mapping Example Clear 2 Follow Import						Fig. 2: KDX	plore CSV (	Column Ma	app	ing E

Table 1: Trait Name Style Import Trial from CSV Column Mapping Example

The interface examples above illustrate the:

- File chosen to import is "maize-with-data.csv";
- Name of the CSV's column Headings;
- · First data row; and
- Blue (KDSmart) 'Import As' column.

Selecting the 'Import As' entry, for each row as necessary, reveals a drop down list of attributes that can be assigned to the column. KDSmart/KDXplore makes a 'best guess' of the attribute type where possible based upon the first row of data.

## 9.2 Trials and Plots

The following tables list each Attribute Type. Pay particular attention to the ones marked as blue text:

Attribute Type	Usage
<ul> <li>Trial At- tribute or</li> <li>Plot Attribute</li> </ul>	Indicates KDSmart must retain the value as an attribute, either for the Trial or for each Plot respectively.
<ul> <li>Trait or</li> <li>Trait for Sub- Plot</li> </ul>	Applying either of these Attributes to a column causes a <i>Trait</i> of that name to be added to the list of Traits for the Trial.
Ignore	Use this Attribute to ignore columns in the CSV file.

Table 2: Trait Name Style Attribute Type Usage

The Attribute Types listed above may be applied to ANY heading in the CSV file.

Any columns with a name starting with "Link:", "Date.", "Date\_", "Sub-Plot#.", or "Sub-Plot#\_" will be automatically assigned as *Ignore* (but you can always change that if you wish).

# 9.3 Trial & Plot Import Options

When importing a heading classified as Trait or Trait for Sub-Plot KDSmart/KDXplore uses hints in the heading to determine whether it is only a Trait Name or if the heading also identifies a Trait Instance.

This is designated as the Trait Name Style.

You may choose one of the following options:

Option	Base In- stance Num- ber	Format	Example / Description
No Trait Instance			All Trait headings will have a single Trait Instance created.
detection			Headings of: AMT1, AMT:1, AMT_1 will correspond to
			three different Traits with exactly the names provided.
Ends in colon fol-	1	<traitname> :</traitname>	AMT, AMT:2 results in Trait Instance numbers of 1 and 2.
lowed by digits		<instancenum-< th=""><th></th></instancenum-<>	
		ber>	
Ends in two under-	1	<traitname></traitname>	AMT, AMT_2 results in Trait Instance numbers of 1 and 2.
scores then digits		<instan-< th=""><th>Note: Don't include spaces - only depicted here for display</th></instan-<>	Note: Don't include spaces - only depicted here for display
		ceNumber>	purposes.

 Table 3: Trait Name Style options:

The other options you need to select are how KDSmart/KDXplore determines Sub-Plots from the CSV headings. This is described in the *Sub-Plot Count and Trait Instances* section below.

To specify that a column is for a particular Sub-Plot, add the following suffix #nn (i.e. # followed by digits, which must be an integer greater than zero) where the number identifies the individual.

You may specify whether or not "sub-plot" data is to be collected here or while scoring by touching the Plot icon:



The following three tables list, in turn, the headings that are used for different parts of a Trial Import. Abbreviations used: ID - Required for Identification OPT - Optional ATTR - Attribute.

## 9.4 Trial Specific Data

The first table lists the headings that pertain to Trial-specific data.

Attribute	Headings Automatically	Description
Туре	Recognised	
Trial Planting Date OPT	<ul> <li>PlantingDate</li> <li>TrialPlantingDate</li> <li>DatePlanted</li> <li>Planted</li> <li>DateSown</li> <li>Sown</li> <li>SownDate</li> </ul>	The base value used for computing ELAPSED_DAYS values for Traits, e.g. Days to Flowering. (Can be changed manually after import)
Trial Name OPT	Trial Name	If present, this is used as the name of the Trialin. If not present, the name of the CSV file will be used.
Trial Alias OPT	<ul> <li>Abbreviation</li> <li>TrialAbbreviation</li> <li>TrialAcronym</li> <li>Acronym</li> </ul>	A short name for the Trial that will be used on screens where there is limited space.
Trial Column Name OPT	<ul><li>ColumnName</li><li>NameForColumn</li></ul>	This is the word used for the X coordinate (see the at- tribute type X-Column in the Plot headings table be- low). Example: for "Range/Row" the value here would be "Range".
Trial Row Name OPT	<ul><li>RowName</li><li>NameForRow</li></ul>	This is the word used for the Y coordinate (see the at- tribute type Y-Row in the Plot headings table). Exam- ple: for "Range/Row" the value here would be "Range".
Trial Plot Name OPT	<ul> <li>CellName</li> <li>NameForCell</li> <li>PlotName</li> <li>NameForPlot</li> </ul>	This is the word used to describe each "cell". For many plant-related field trials this is likely to be "Plot". For other trials/experiments it may be "Panel", "Pond", "Test-tube" etc.
Trial Bundle OPT	<ul> <li>TrialBundle</li> <li>TrialGroup</li> <li>TB</li> <li>TG</li> </ul>	Assigns the name of a Trial Bundle for the Trial

Attribute Type	Headings Automatically Recognised	Description
Trial Database		May be provided to cross-reference to the originating
Id OPT	<ul><li> DatabaseTrialId</li><li> TrialId</li><li> TrialNumber</li></ul>	database.
Trial Attribute	May apply to any heading in the	Retain the value as an attribute of the Trial. If you apply
ATTR	file. See Trial Attribute Head-	this type to a column then every row must have the same
	ings below.	value.

Table 4 – continued from previous page

# 9.5 Plot Specific Data

Attribute	Headings Automatically	Description
Туре	Recognised	
Plot Id ID In- teger	<ul> <li>CellId</li> <li>PlotId</li> <li>EntryId</li> <li>Plot</li> </ul>	If present, uniquely identifies the Plot in the Trial. Must be unique.
PlotBlock ID Integer	<ul><li>PlotBlock</li><li>BlockNo</li></ul>	If present uniquely identifies the Block in the Trial.
Plot Column (X) ID Integer	<ul> <li>PlotColumn</li> <li>X</li> <li>Column</li> <li>Col</li> <li>ColumnX</li> <li>X-Column</li> <li>Column_No</li> <li>BlockX</li> </ul>	The X–coordinate of the Plot within the Trial. If present, the (X,Y) pair must uniquely identify the Plot in the Trial, OR If PlotBlock is selected the (X,Y) pair must be unique within the Block.
Plot Row (Y) ID Integer	<ul> <li>PlotRow</li> <li>Y</li> <li>Row</li> <li>RowY</li> <li>Y-Row</li> <li>Range_No</li> <li>Range</li> <li>BlockY</li> </ul>	The Y-coordinate of the Plot within the Trial. If present, the $(X,Y)$ pair must uniquely identify the Plot in the Trial, OR If PlotBlock is selected the $(X,Y)$ pair must be unique within the Block.

Table 5:	Headings	For Plot	Specific Data
----------	----------	----------	---------------

Attribute	Headings Automatically	Description
Туре	Recognised	
Plot Note OPT	<ul><li> PlotNote</li><li> Note</li><li> TrialUnitComment</li></ul>	A description or information for the imported plot.
Plot Type OPT	PlotType	If present, this specifies the type of plot (e.g. Control, Check, etc.).
Plot Barcode OPT	<ul><li> PlotBarcode</li><li> Barcode</li><li> TrialUnitBarcode</li></ul>	If Plot Barcode column provided it must not be blank. See the User Guide section on Barcode Scanning for further details of how the data in this column is used.
Plot Tags OPT	<ul><li>Tags,</li><li>PlotComments,</li><li>Comments</li></ul>	Additional comments for the imported plot. A list of pipe-separated ( ) Tag labels.
Plot Database Id OPT	<ul> <li>DatabasePlotId,</li> <li>TrialUnitId,</li> <li>TrialUnitNumber</li> </ul>	May be provided to cross-reference to the originating database.
Sub-Plot Count OPT Integer	<ul><li>SpecimenCount,</li><li>IndividualCount,</li><li>Plant Count</li></ul>	Number of Sub-Plots or plants present within the plot to be imported. Please read the section below <i>Sub-Plot</i> <i>Count and Trait Instances</i> .
Plot Attribute ATTR	May be applied to any head- ing in CSV. See <i>Plot Attribute</i> <i>Headings</i> below.	Retain the value as an attribute of the Plot. Each row may have a different value (including blanks). Choose any subset to display as Plot Info while scoring.

Table 5 – continued from previous page

# 9.6 Sub-Plot Specific Data

Attribute Type	Headings Automatically Recognised	Description
Sub-Plot Id ID Inte-		If present, uniquely identifies the Sub-Plot
ger	• SpecimenDatabaseId	in the Trial. Must be unique.
	• Sub-PlotDatabaseId	
	<ul> <li>Sub-PlotDbId</li> </ul>	
	<ul> <li>PlantDatabaseId</li> </ul>	
	<ul> <li>IndividualDatabaseId</li> </ul>	

Attribute Type	Headings Automatically Recognised	Description
Sub-Plot Tags OPT		Additional comments for the imported Sub-
	Sub-PlotTags	Plot. A list of pipe-separated ( ) Tag labels.
	• SPTags	
	PlantTags	
	<ul> <li>IndividualTags</li> </ul>	
	SpecimenTags	
Sub-Plot Traits OPT		Any heading with # that is not matched to
		one of the above Sub-Plot specific head-
		ings will default to a Sub-Plot Trait. E.g
		Plant_Height#6 will default to Sub-Plot
		Trait.

Table 6 – continued from previous page

# 9.7 Attribute Types for Trait Variations

This table continues from the two above but lists the Attribute Types for Trait variations and for *excluding* a column from import.

Attribute	Section	Headings Automatically	Description
Туре		Recognised	
Trait	Trait	May be applied to any heading	Marks this column as representing a Trait that is scored
OPT		in the CSV file.	only for Plots.
			The Trait Name Style governs if a Trait Instance is being
			referenced or not.
Trait	Trait	May be applied to any heading	Marks this column as representing a Trait that is scored
for Sub-		in the CSV file.	only for Sub-Plots.
Plot			The Trait Name Style governs if a Trait Instance is being
OPT			referenced or not.
Ignore		May be applied to any heading	Indicates that this column should <b>not</b> be imported.
		in the CSV file.	

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For an example see the following A Simple Example topic.

## 9.8 Sub-Plot Count and Trait Instances

Multiple instances for a Trait can be imported by including the instance number in the heading. For example, importing the second instance of the Trait 'Plant\_Height' can be achieved by including a colon Plant\_Height:2.

Alternatively using the Sub-Plot Count column instructs KDSmart/KDXplore to create the specified number of Sub-Plots in each plot.

When Sub-Plot Count is present and non-blank, the integer value in this column will cause creation of the given number of Sub-Plots in the Plot.

This will apply to all of the columns that have an Attribute Type of Trait or Trait for Sub-Plot.

If a column is **NOT** marked as Sub-Plot Count, no Sub-Plots will be created during the import of the data file; in this

case, if you wish to add a Sub-Plot to a plot, use the popup menu that appears when you touch the Plot icon: (during the scoring activity) and choose the Add Sub-Plot option. This presents a list of all the Traits that are defined as Trait for Sub-Plot and one of these may be selected to score for the new *Sub-Plot*.

## 9.8.1 Notes For Importing Subplot Data

The TRAIT FOR SUB-PLOT column heading requires a suffix of # with the Sub-Plot number the value is referring to.

For example, importing a Plant\_Height value for Sub-Plot three have a heading Plant\_Height#3. To import for all of the Sub-Plots available (Number seen in Sub-Plot count column) use #\*. If the trait is a specific instance, the instance number can be imported as you would typically just with the Sub-Plot number appended e.g. Plant\_Height:2#3.

## 9.8.2 Conditions For Importing Subplot Data

The Sub-Plot Count column import will create the provided number of empty Sub-Plots for the specified plots.

- Trait for Sub-Plot will create the required number of Sub-Plots for the value ('#Number').
- Trait Sub-Plot numbers ('#Number') cannot be higher than the Sub-Plot Count if both are being imported.
- Sub-Plot Count column is required if #\* (for all Sub-Plots) is used.
- There cannot be two identical column names with Trait for Sub-Plot (e.g. Plant\_Heigh#1, Plant\_Height#1).
- If #\* is used for the same Trait as #Number (e.g. Plant\_Height#\*, Plant\_Height#1) the numbered column (Plant\_Height#1) takes priority for the specified Sub-Plot.

## 9.9 Plot Attribute Headings

The items below identify headings that are automatically classified as Plot Attributes by KDSmart.

- Treatment
- SelectionHistory, Selection\_History
- ReplicateNumber, Replicate, Rep, Repeticion, REP\_NO
- GenotypeName, Genotype, GID
- Origin, Origin (that's a "zero")

- Designation
- Type
- CID, SID, CROSS, SOURCE, ENTRY\_NO, SUB\_BLOCK, PLOT\_NO
- PedigreeName, Pedigree, BreedersPedigree
- Type

**Note:** This list will be replaced by the *CSV Import Profile* functionality at a later release. Also the spelling of 'Repeticion' is required as it is within the 'code'.

## 9.10 Trial Attribute Headings

The following are automatically classified as Plot Attributes by KDSmart:

- SiteName, Site, Location
- SiteYear, Year
- TrialType, TrialTypeName
- TrialStartDate, StartDate

## 9.11 Values in CSV files

CSV files may contain data in the various data "columns".

For columns marked to be imported as Traits, the following rules apply:

- 1. Blank values will be treated as un-scored Traits as will the word UNSCORED (the latter is not required unless you want to make un-scored trait values very obvious in a CSV file).
- 2. The word MISSING will be imported as a special token denoting a missing value.
- 3. The word NA will be imported as a special token denoting "not-applicable" or "not-available" (whatever you take it to mean).

**Note:** All other values will be checked using the **validation rule for the trait**. Any failure to pass the validation check will cause the entire import to fail.

If you select a column to be used as the *Trial Name*, the value in the first data line may not be the same as any existing *Trial* in the database.

Similarly, if you have not chosen a column as the *Trial Name*, the name of the file (excluding anything from the last "." onwards) will be used to check for a pre-existing trial in the database.

Note: Trial Name checks are not case sensitive.
# 9.12 A Simple Example

2

#### 9.12.1 Example File Construction

For this simple example (line no.s shown for clarity) the CSV file with three lines consists of:

```
date sown,Row,Range,MZC,MZP,#Sub-Plots,LLEN
2014-12-15,23,4,,,2,
2014-12-15,21,5,,,0,
```

Using the "After Sub-Plot Count", described in *Sub-Plot Count and Trait Instances*, the following definition could be used in KDSmart:

Note: In the following table, the top heading row is NOT part of the data file.

 Table 8: Simple Example: Three Row CSV File (Header Row and Two Data Rows)

 Plating Date
 X Y-Row
 Trait
 Sub 

Attribute Type	Plating Date	x- Column	Y-Row	Irait	Irait	Sub- Plot Count	Irait for Sub- Plot
CSV Line 1	date sown	Row	Range	MZC	MZP	#Sub-	LLEN
						Plots	
CSV Line 2	2014-12-15	23	4			2	
CSV Line 3	2014-12-15	21	5			0	

#### 9.12.2 Example Result

The result of importing this diminutive Trial will be:

- Only two plots at positions (23,4) and (21,5);
- Two Traits, MZC and MZP, are being scored for each Plot;
- The first Plot (CSV Line 2) has two Sub-Plots for which the trait LLEN (leaf length) will be scored;
- The second Plot (CSV Line 3) has no Sub-Plots requiring scoring. However, if while Scoring a Sub-Plot was added to the latter Plot, you will then be asked to score the LLEN Trait for the new Sub-Plot.

Additionally, as no columns in this example were designated as X-Column-Name or Y-Row-Name, the default names of "Column" and "Row" is used to describe the Plot coordinates. Following import, the Trial Details can be edited in KDSmart and the row/column names changed to your choice e.g. "Row" and "Range" respectively, if required to make the nomenclature align more closely to your usual vocabulary. Best practice however, is to name them in the CSV file rather than change them in KDSmart.

# 9.13 Spaces, Case Sensitivity and Blank Lines

When reading and parsing the headers, KDSmart removes all spaces and performs a case-insensitive comparison to match CSV headings with the automatically recognised built-in headings.

It also skips over any blank lines and takes the first non-blank line as the headings line.

# 9.14 Traits

The following table describes the required and optional Trait headings for a CSV file that contains details of Traits that will be used by *Trials*.

Heading	Alternatives	Notes
TraitName	Name	This column heading must be present. All others are optional. The
		value should be kept short and, if you wish to use the name in KDX-
		plore with CALC <i>Traits</i> no spaces are permitted and the name <b>must</b>
		begin with a letter. We recommend using the underscore ( _ ) char-
		acter or CamelCase to improve readability. See also the description
		of the import option regarding Trait Name Style.
TraitAlias OPT	Alias	If provided, should be a shorter form of the <i>TraitName</i> to use during
		scoring.
TraitLevel OPT	Level	Default: Plot. Versions before (KDSmart V3.0.3, KDXplore
		Beta1.1.4 or Prod 2.1.4) TraitLevel could specify only <i>Plot</i> or <i>Sub</i> -
		Plot. For versions equal to or above, TraitLevel can specify the
		trait is either for the: <i>Plot Level</i> by using "Plot" or "TrialUnit"; or
		the Sub-Plot level by using "Sub-Plot", "Sub-Plot", "Individual" or
		"Plant".
TraitBarcode OPT	Barcode	Used to identify the Trait when using a barcode scanner for scoring.
TraitUnit	Unit, Unit-	You can provide anything you like that will assist you in remember-
	Name,	ing what to enter while Scoring.
	TraitUnit-	
	Name	
TraitDescription	Description,	A longer description of the Trait.
	Desc	
TraitDatatype	Datatype	One of CATEGORICAL, DATE, ELAPSED_DAYS, INTEGER,
		DECIMAL or TEXT. See <i>Traits</i> for further details.
TraitValidation	TraitValRule,	See <i>Traits</i> for further details.
	Validation,	
	Validation-	
	Rule	
DatabaseTraitId	TraitId	If you provide this column, KDSmart will record the value and ex-
		port it on request (a reference to the originating database). See Pro-
		tected Traits below.

Table 9: Required and Optional Trait CSV File Headings

**Note:** A new Trait can be created directly in KDSmart. If you do this and are also uploading or synchronising your data to KDXplore or KDDart you may have to reconcile the differences if there is already a Trait of the same name (compared in a case-insensitive manner).

#### 9.14.1 Overwriting Existing Traits

Entries for existing Traits can be specified in a CSV file. The Traits are matched by Trait Name (ignoring case) and incoming Traits with the same name as one already in the database will be checked for compatibility:

Trait in	Trait in CSV	Action Taken
Database	File	
Data Type is	Any Data	The Trait Data Type in the CSV file will replace the data type in the database.
TEXT	Туре	
Any other	Data Type is	A warning is issued identifying the line and the import continues excluding the
data type	TEXT	line from the CSV file.
Any other	Data Type is	A warning is issued if the data types are not the same (and the import continues)
data type	not TEXT	
Description	Description	Descriptions are truncated to the current database limit then compared for equal-
		ity.
		If they are the same (ignoring case), a warning will be issued but the new Trait's
		description will replace the current one in the database. Otherwise:
		• CHOICE: must have the choices or the old choices must be a subset of
		the new choices
		• INTEGER and DECIMAL: the limit "exclusions" must be identical, how-
		ever the new Trait's limits may be "wider" than the current Trait in the
		database
		If any of incompatibilities above are identified, a warning is issues and the im-
		port continues without altering the current Trait in the database.

Table 10: Trait Import Overwriting Behaviours

#### 9.14.2 Protected Traits

If a Trait has been imported with a DatabaseTraitId, it is deemed to be "protected".

In this case you may only edit the Trait Alias and changes to the validation rule are not permitted except for INTEGER and DECIMAL Traits where you may change the range of acceptable values but only to make the range smaller.

For example, if an INTEGER Trait has been defined to have values from 0 to 100 you may only change the lower limit to be 1 or more and the upper limit to be 99 or less.

#### 9.14.3 Calculated Traits

These have the Trait Data Type of CALC. No measurements are collected by KDSmart for these Traits.

The value may only be viewed in KDXplore during data curation. KDXplore is able to calculate Trait values from other Traits via entering a formula (similar to Excel).

**Note:** New Traits cannot be derived from Trait names containing spaces. Recommendation that underscores are used in place of spaces for Trait names, especially if they are intended for use in calculations.

See: Calculated or Derived Traits

# 9.15 Tags

The following details the required and optional headings in a CSV file that contains details of Tags that will be used to annotate Plots and Sub-Plots when Scoring a Trial.

Heading	Alternatives	Mandatory	Description
Label	TagLabel, Com-	Yes	Name of the Tag e.g. BD for bird damage
	ment		
Description	TagDescription,	Yes	Tag description
	Desc, CommentDe-		
	scription		
DatabaseLabelId	DatabaseLabelId LabelId, Id		Useful for cross-reference to the originating
			database

# 9.16 Sub-Plot Level Trait Import Examples

The following six cases illustrate part of the input CSV file and how the Trait will be represented in KDSmart. The last example, case 7, shows what not to do!

#### Case 1 - Two Specimen Level Traits CSV Example

CSV Row	CSV Row Contents							
Header - 1	×	Y	SpecimenCount	PHght#*	PWdth#*			
2	1	1	5	15.0	2			
з	1	2	3	13.0	3			

In this example at the second CSV row, five specimens are defined for a plot at (1,1) which will set the initial value to 15.0 for the specimen level trait PHght.

When performing the Import in KDSmart Traits such as these two traits must be be set to **Trait for Specimen** when performing the CSV import mapping.

#### Import Result in KDSmart

Plot:	1,1	
Specimen:	PHght	PWdth
1	15.00	2
2	15.00	2
3	15.00	2
4	15.00	2
5	15.00	2

# **Case 2 - Two Specimen Level Traits**

# **CSV** Example

CSV Exa	mp	ble				Specimen:	PHght	PWdth
CSV Row			CSV Row Co	ntents	21) 21	1	-	-
						2	15.00	-
Header - 1	x	Y	SpecimenCount	PHght#2	PWdth#3	3	-	3
2	1	1	5	15.0	3	4		
3	1	2	3	13.0	3	5	-	-

Rule Note: SpecimenCount Value Must be >= Trait Instance Numbers

# Case 3 - One Specimen Level Trait

#### **CSV** Example

CSV Row	CSV Row Contents							
Header - 1	x	Y	SpecimenCount	PHght:1#*	PHght:1#2			
2	1	1	5	15.0	17.0			
3	1	2	3	14.0	16.0			

#### Import Result in KDSmart 14.4 Diate

PIOC	1,1	
Specimen:	PHght	
1	15.0	
2	17.0	
3	15.0	
4	15.0	
5	15.0	

# Case 4 - One Specimen Level Trait

CSV Exa	mp	ble		Two Instances of Tra				
CSV Row	CSV Row Contents							
Header - 1	x	Y	SpecimenCount	PHght:1#*	PHght:2#*			
2	1	1	5	10.0	20.0			
з	1	2	3	9.0	19.0			

# Import Result in KDSmart

Plot:	1,1	
Specimen:	PHght	PHght:2
1	10.0	20.0
2	10.0	20.0
3	10.0	20.0
4	10.0	20.0
5	10.0	20.0

# Import Result in KDSmart

1,1

Plot:

PHght

Case 5 - Specific Specimen Level Trait							Import Re	esult in	KDSmart
CSV Exa	m	pl	e		Two Instanc	es of Trait PHght	Plot:	1,1	0.000000000
CSV Row			CSV Row	Contents	/ ~		Specimen:	PHght	PHght:2
Header - 1	Header - 1 X Y Specim	SpecimenCount	PHght:1#	PHght:1#2	PHght:2#*	1	12.0	16.0	
14				12.0	19.0	10.0	2	* 13.0	16.0
2		2	3	12.0	12.0	15.0	3	12.0	16.0
	Ľ	-			16.10	10.0	4	12.0	16.0
2 3	1	1 2	5	12.0 11.0	13.0	16.0 15.0	2 3 4	13.0 12.0 12.0	

### Case 6 - No Specimen Count Used CSV Example

CSV Row	CSV Row Contents				
Header - 1	x	Y	SpecimenCount	PHght:1#1	PHght:1#2
2	1	1	5	12.0	13.0
з	1 2		3	10.0	11.0

#### Import Result in KDSmart

16.0

5 12.0

Plot:	1,1
Specimen:	PHght
1	12.0
2	13.0
3	-
4	•
5	

# Case 7 - Error in CSV

This portion of a CSV has an error. It will not import into KDSmart or KDXplore.

# **CSV** Example

CSV Row	CSV Row Contents				
Header - 1	x	Y	SpecimenCount	PHght:1#*	PHght:1#4
2	1	1	20		2.0
3	1	2	2		2.0
4	1	3	2		2.0
5	1	4	2		2.0
6	1 5 20		20		2.0

This fails because of the formula: SpecimenCount Value Must be >= Trait Instance Numbers.

CSV Rows 3, 4 and 5 show a SpecimenCount of 2. This value is less than the value '4' indicated in the last column header.

# 9.17 Excel Formula for Converting ISO-8601 Timestamp to Excel Date

When KDXplore or KDSmart use a timestamp for a scored trait value the timestamp is recorded in .

Using this format means that you can correctly compare data collected in different time zones.

Unfortunately Microsoft Excel does not automatically recognise this format. However, using the formula below, you can easily convert the date/time string in ISO-8601 format into an Excel date/time value and render this in a more useful form by using an appropriate cell format (e.g. yyyy-mm-dd hh:mm:ss).

The formula is:

```
=DATEVALUE (LEFT (A1,10))
+ TIMEVALUE (MID (A1,12,8))
+ IF ("Z"=MID (A1,20,LEN (A1)-19),0, (INT (MID (A1,20,LEN (A1)-19)/100) *60+MOD (MID (A1,20,
→LEN (A1)-19),100))/1440)
```

If you wish to know what the formula is doing, the explanation is below. The formula above is split across three lines to facilitate the following explanation.

Excel's internal date time format is a *real* number where the part before the decimal point is the *number* of days and the portion after the decimal point is the *fraction* of a day.

The first line of the formula extracts the year/month/day portion and converts it into the full days portion of the result

The second part of the formula extracts the hours/minutes/seconds portion and converts it into the day fraction portion.

The third and final part obtains the time zone portion of the ISO-8601 timestamp and converts it into another day fraction part. It checks for the special *Z time zone* that indicates a zero offset. If it is not *Z*, the time zone is in  $\pm$ HHMM format so the formula extracts the HH portion separate from the MM portion, computes the total as a number of minutes and divides by 1440 (the number of minutes in a day) to arrive at a final day fraction component that is added to the amount determined by the first two parts of the formula. Any leading plus or minus sign is used to correctly perform this computation.

#### CHAPTER

#### TEN

# **TIPS & TROUBLESHOOTING**

This page contains a few general usage tips for KDSmart.



# 10.1 Tips

## **10.1.1 Determining The Android Version**

For support purposes, you may be asked to provide the version number of Android you are using. This is a simple check to perform on your phone or tablet by performing the following:

Step	Action
	<b>^</b>
1.	From the phone's <b>Home Screen</b> (not in KDSmart) select <b>Settings</b> .
2.	Scroll down to the bottom and select either About Phone or About Device.
3.	Earlier versions the Android Version will appear in this list.
	← About phone 👩 🤉
	System update
	Status Phone number, signal, etc.
	Legal information
	Model number Android SDK built for x06
	Android version 5.1.1
	マージーマーマーマーマー We Jan (1・12 /9, JD)
	Fig. 1: About Phone (Select to zoom)
	Continued on port page

Table 1: Determining Android Version

Continued on next page

Step	Action	
4.	Later versions select the Software Info pear at the top. Softungs SEASCH C Lock screen and securi.	<ul> <li>item and Android Version should ap-</li> <li>Software info</li> <li>Android version</li> <li>Kernel version</li> <li>Contraction</li> </ul>
	About device 0	Android security patch level 1 May 2017
	Fig. 2: Android Vers	ion (Select to zoom)

Table 1 – continued from previous page

#### **10.1.2 Continue Scoring The Previous Trial**

The name of the trial being scored is displayed on the KDSmart **Home Screen**. Just touch the **Start Scoring Button** or the trial name to continue from where you were previously scoring. KDSmart remembers the position or plot when you last exited the scoring activity for the trial (see the next section) and will present that plot to you.

#### 10.1.3 Quick Stop for a Break



#### **10.1.4 Android Permissions**

Android has introduced more stringent application security which affects KDSmart and any other Android application. Permission is required at the initial application installation, and may be requested again following installing any application updates.

Without allowing permissions an application will not work, or be unable to use all its functionality.

Upon initial KDSmart installation, a message similar to the following example will be displayed. Selecting **Allow** will enable KDSmart to work.



Fig. 3: Android Permission Request (Select to zoom)

If *Deny* is selected, KDSmart will display an advisory message (appearing in background of above image) with a **Cancel Button** and an laccept-btn2l **Accept Button**. Selecting:

- Cancel will stop KDSmart; and
- Accept will cause Android to redisplay the approval request message again.

Selecting *Don't ask again*, if it is displayed, and *Deny* will require a visit to Android settings to restart the request process. See *Restoring/Changing Permissions* below for instructions.

The next example shows the permission request following an update to KDSmart, which must be accepted before the application will open.



Fig. 4: Android Access Permissions Request (Select to zoom)

#### 10.1.5 Why Must I Grant Access?

Applications, including KDSmart, need to access the storage/memory on the device be able to:

- Load your trial/nursery data;
- To add to or make changes to that data; and
- To save your data.

Quite simply, without allowing any permission, KDSmart Will Not Work.

Other features KDSmart can use on the device, such as the camera, microphone, etc. are also affected. The following table shows KDSmart permission requirements for the application or specific features to work:

Permission Required	Description	
Camera	Required if the camera is to be used by KDSmart.	
Location	Required if the location option has been enabled.	
Microphone	Required to record any audio notes using the microphone in KDSmart.	
Storage	KDSmart will not work without being given storage permission. This is re-	
	quired to store any data on the device e.g. sample data, trial import or export,	
	traits, tags, etc.	
Bluetooth	Required if Bluetooth barcode scanners or scales are to be used.	

Table 3: KDSmart Permission Requirements

#### 10.1.6 Restoring/Changing Permissions

At some stage you may have denied KDSmart access, e.g. to the camera, or *Never ask again* has been selected. These settings can be changed by using the following procedure.

Step	Action		
	<b>*</b>		
1	On the Android device, select the system <b>Settings Button</b>		
2	Select Applications		
3	Select KDSmart		
4	Select Permissions		
5	Enable the required permission. Remember Storage is mandatory to use		
	KDSmart and the other settings are needed if that functionality is required.		
	App permissions		
	KDSmart		
	🖸 Camera 🌑		
	Q Location		
	· countries		
	Microphone		
	🖿 Storage		
	Fig. 5: Permission Settings (Select to zoom)		
	Note: Selecting More or the highlighted menu button illustrated at (1) displays		
	All permissions. These additional settings will also affect KDSmart behaviours		
	for certain features.		

#### Table 4: Procedure to change KDSmart Permissions

#### **10.1.7 Database Integrity Check**

This database check and repair is mainly relevant in a situation where the following error occurs:

PlotVisitlist construction failed	
java.lang.lllegalArgumentException: Duplicate Sample: old=Sample[ID=9505, plot/plant=595/1 : trait=31 inst=1 val=null] new=Sample[ID=18191, plot/plant=595/1 : trait=31 inst=1 val=null]	

Fig. 6: Example Error Requiring DB Integrity Check/Repair

This function checks the KDSmart database for the existence of duplicate samples for a trait instance, plot, sub-plot in each trial and removes the sample *if the Trait Value is null*.

If any duplicate samples are found containing a value, the following error message will appear: "Duplicate Samples with a value Please contact Diversity Arrays and send them your Database" will be displayed and the check/repair processing will stop.

Should repair display this message and is unable to proceed, please export the database and report the issue separately attaching the database in the email, or use an alternative file transfer method if the file is too large for email. The option to export the database is located just above the **Database Integrity Check Button**.



Table 5: Steps to execute the Database Integrity Check

**Note:** Depending upon the size of trials within the KDSmart database, this check could take more than 10-15 minutes. The check can be cancelled, however, any errors present may not be repaired.

### 10.1.8 Navigation Within KDSmart

Standard Android application navigation is used in KDSmart. The table below outlines some of the UI elements related to navigation.

Button	Description			
$\bigcirc$ or $\bigcirc$ or $<$	Back Buttons to return to the previous screen.			
- Married	Selecting the <b>Back</b> area (highlighted) surrounds the top left corner containing the logo and trial name or similar region on one of the edit screens (e.g. edit trait, tag etc.).			
=	trait, tag etc.). Side Menu Screens with three blue menu bars have a slide out a menu at the top left as illustrated. Select the menu bars to display or hide the menu.  Trials Home Trials Togs Devices Settings			
	Fig. 8: Slide Out Menu (select to zoom)			

#### 10.1.9 Screen Orientation/Rotation



Android is able to lock or prevent the screen from rotating for all apps on the device. KDSmart behaves in accordance with this Android device setting.

If Android Screen Rotation Is	Then KDSmart will
Enabled	Respond to changes in the screen orientation.
Disabled	Not detect or respond to changes in the screen orientation.

**Note:** Automatic rotation is intentionally disabled within the **Scoring Screen** to prevent undesirable screen changes. Various movements of the user and device in the field, such as bending down to inspect a sub-plot would cause frequent and unnecessary screen changes.

Table 8: Steps to rotate the scoring screen (Landscape to Portrait, Portrait to Landscape)

Step	Action
1	Ensure Android Screen Rotation is enabled.
2	In KDSmart, exit from the scoring screen to another screen.
3	Turn the device to the required position (portrait or landscape).
4	Return to the Scoring Screen which should now display with the desired orien-
	tation.

#### 10.1.10 Lists and Select Mode for Multiple Selection

This is a generic tip for KDSmart trials, traits and tag selection lists. The example shown is the trial list.

Trials	🗸 xxxx Selected:3 👩
El Batan : Plotld,20x15	ci Batan : Plotid,20x15
El Batan : Plotid,6x10	el Batan : Plotid,6x10
Example of Nursery Scoring	example of Nursery Scoring
Hunter -Salinity effects on BRIX: 3x4 #6301546-017-MF	Hunter -Salinity effects on BRIX: 3x4
Ruthergien RDI : 10x6 JM 2015-RDI-RG	Suthergien RDI : 10x6 ekatronene

Fig. 9: Multiple Selection Example (Select to zoom)

When a list of items is displayed, as the trial list in the left-hand image **1** above, a *long press* on any Trial item will invoke **Select Mode**.

Once in **Select Mode**, multiple items may be selected, by touching them as illustrated in the right hand *image* image above where three trials have been selected. The number of items selected is indicated at the top right, in this example

Selected:3 appears.

Selecting the item(s). Action Button in the Action Bar (not shown), will perform the chosen action for the selected

**Caution:** Please be take care when using the delete function which will remove the selected trials. Backup your data regularly to prevent any loss as delete is final.

#### 10.1.11 What Data Transfer Method is Best?

This is dependent upon several factors influenced by your organisation's implementation of KDDart platform components either fully, partially or not at all. For example, if KDSmart is being used 'standalone' without any other KDDart software, CSV files are required to load your data.

The following table outlines

Best When	Description
KDSmart is to be used on its	Using KDSmart standalone, without any other KDDart software, means CSV
own	files must be used to import and export all your trial, traits and tag data.
	Also useful if you want to try KDSmart with some of your trial data just to see
	how it works in the field.
Several KDSmart devices	Using KDXplore with KDSmart when a direct connection can be established
used to score the same trial	for data transfer, or if a connection is not possible either CSV or KDX files can
and KDXplore is being used	be used.
Your Trials are stored in KD-	This functionality is returning to KDSmart to directly connect with the KDDart
Dart's data layer and a direct	database layer for trial selection and download or upload.
connection is available	

# 10.1.12 Symbols and Buttons

The button	symbols use	d in	KDSmart are	shown i	in the	following	table:

Button	Term	Description
	Trials	Trials or nurseries refer to the experiments or research being con- ducted. Select <i>Trials</i> on the <b>Home Screen</b> to display the list of trials that have been loaded into KDSmart. <i>Demonstration Trials</i> are preloaded for familiarisation of KDSmart and training.
Ø	Tags	Manage the tags used in the trials.
	Traits	Manage the traits used in the trials.
-		
ata 👑	Devices	Manage devices (scanners, scales, etc.), Bluetooth, and database.
	Settings	Manage the device settings and those that apply to all trials.
	Information	Contextual help for KDSmart, information about KDSmart, and li- censing.
	Start	Start or Run button.
	Run (Demo DB)	Start the active trial. A white border indicates the current setting is for a <i>Demonstration</i> database trial ( <i>Demo DB</i> ).
	Run (Production DB)	Start the active trial. A yellow border indicates the current setting is for a <i>Production</i> database trial (sometimes referred to as <i>Prod DB</i> ).

Continued on next page

Button	Term	Description
ŶŶ	Advance	Step forward and advance to the next plot.
<b>J</b>	Retreat	Step backward and retreat to the previous plot.
	Plot	Either a plot ID or a column and row pair that uniquely identifies an area (i.e. plot) within a trial. Within a trial, each combination or column/row must be unique.
Organism Type Generic C SS Plant Maize Maize C SS Maize DNA	Organism Types	Within settings, the type of organism being measured can be speci- fied. This appears in the <b>Scoring Screen</b> . Each setting has a differ- ent image representation for the organism type.

Table	10 - continued	from	previous	page
Tubic			provious	puge

# **10.2 Troubleshooting**

#### 10.2.1 Block Trial Issues

The 3.0.28 update has resolved some database issues with block trials. However, some users may find that after updating KDSmart, their block trials do not work anymore. This is due to the trials not being compatible with the new database version. The following instructions outline a quick fix for this issue:

Step	Action
1.	Navigate to the Devices Screen. The image below shows how to
	get there from the Home Screen. Select the Devices Button at ①.
	9
	KDSmart Dev 🕨 💕 🔘
	Via 6 200 2000 Provide Lange Control (10)
	[Test Device] 00M0.08
	El Batan : Plotid,6x10
	- Current Plat
	No Current Plot
	2018/Nov/05
	The Property
	the Alexandra
	Trial Details
	Allow College
	- 📰 🔛 🥢 📰 💶
	4 6 8
	Fig. 10: Devices Screen

Table 11: Fixing Block Trials

Continued on next page



Table 11 – continued from previous page

#### 10.2.2 Plot Attribute Alias Issues

The 3.0.28 update to KDSmart has involved a change in the way that block trials are handled. Some users may experience issues with the plot attribute alias of a block trial if they try to import a block trial to KDSmart 3.0.28 if it was exported from an earlier version of KDSmart.

If you have this issue, KDSmart will present options for setting the correct plot attribute alias which can be seen in the below image. Choose the field that should match up with the plot attribute alias and the file will be converted for you.



Fig. 12: Fixing Plot Attribute Alias

#### CHAPTER

#### **ELEVEN**

## **BLUETOOTH SCANNING**

Important: It is advisable before taking KDSmart and a Bluetooth scanner or scales to the field to test:

- 1. The scanner is configured correctly;
- 2. The tablet/phone with KDSmart can operate successfully with it; and
- 3. Your barcodes work as expected.

Barcode scanning in KDSmart can assist with quick, easy and accurate scoring. Barcode scanning can be used for plot or sub-plot location labels and for traits.

This page contains information for enabling Bluetooth scanner devices in Android, making it available for KDSmart. An introduction to scoring using barcodes with a Bluetooth barcode scanner is also provided.

KDSmart is designed to take advantage of a Bluetooth scanner when:

- Bluetooth is available on the tablet or phone; and
- The tablet/phone can successfully connect with the Bluetooth device; and
- Trial(s) or traits have been prepared for barcode use before importing into KDSmart.

Barcode values must be present in the trial before it is imported into KDSmart from KDXplore or CSV file. KDXplore can generate barcodes for the trial and traits. For trials with KDXplore generated barcodes, the option *Use KDXplore Barcodes* found in KDSmart settings needs to be enabled.

Non KDXplore barcodes can be used with a trial. These need to be:

- Included with a Trial CSV file for plot/sub-plots;
- Must be unique A not unique error for plot barcodes would result upon import;
- · Trait import CSV file with barcodes would need to be imported first; and
- The option Use KDXplore Barcodes in KDSmart Settings needs to be disabled.

The following sections describe how to connect a Bluetooth device, provide information about the barcode types, examples of how to score and some tips.

## 11.1 Connecting the Tablet/Phone

**Note:** Bluetooth scanners generally have two modes: HID and SPP. (More details on this page: ) Your scanner **must** be set to **SPP mode before connecting** it with KDSmart. Instructions should be available in your Scanner's Manual.

Before connecting to and using a Bluetooth device, the tablet/phone with KDSmart installed, must first be introduced to the device, referred to as *pairing*. Sometimes the device may have a pin number associated to enable pairing to occur.

The first connection and subsequent connections will require the devices to be *paired*. Pairing may need to repeated when disconnection occurs which can be:

- After a period of time has elapsed;
- After devices 'go to sleep' (they enter sleep mode to extend their battery life);
- If the device is too far apart from the tablet/phone;
- Signal is interrupted due to obstacles (e.g. walls, etc.); or
- A combination of all of the above.

The following instructions show how to enable Bluetooth on the tablet/phone and pair with a scanner.

Step	Action							
1	On	the	Android	tablet/p	hone	go	to	An-
1.	droid	Setti	ngs 🎗	th	ien	Select	Blue	tooth
		- 0				****	55	
		Se	ttings			<u> </u>		
		We	elece & metworks	-		_		
		•	W1-F1	*	Bluetooth			
		0	Data usage		More			
		0er	Alexa.					
		۲	Display		Sound & no	dification		
			Арря	=	Storage & L	58		
			Battery		Memory			
		-	Users					
		Per	winat					
		0	Location	â	Security			
		8	Accounts	G	Google			
		0	Language & input	•	Backup & n	eset		
			Q	0				
			Fig. 1	: Android	Settings		-	
	<b>Note:</b> T	he versior	n in this image w	as Androi	d Marshl	Mallow v 6 ndroid ver	5.0.1, whic	h may
	nuve u u	uj	Presidence to the	settings i		Continue	d on next	nad

Table 1: Steps to Enabling Bluetooth on the Tablet/Phone

Step	Action
2.	<ul> <li>If not already powered on:</li> <li>a. Turn on Bluetooth on the tablet/phone;</li> <li>b. Ensure the scanner/scales to be connected is also switched on and in accordance with the device instructions is <i>discoverable</i> (it may need switching off and on again if it is not detected).</li> <li>c. When the tablet/phone successfully <i>discovers</i> the Bluetooth device, it should appear in the list of Available Devices on the tablet/phone.</li> <li>d. Once it has appeared it is ready for pairing. If not repeat the process.</li> </ul>
3.	Select the required device in the list of <b>Available Devices</b> and enter the pin number of the device if requested to complete the pairing. Once success- fully paired, the device will appear in the list of <b>Paired Devices</b> as illustrated:
4.	With the device paired and connected, it is ready for use by any Android applications, such as KDSmart. As noted previously, the distance or proximity required to successfully maintain a Bluetooth connection between the device and the KDSmart tablet can and will vary. If disconnection occurs, reconnecting could be necessary.

Table 1 – continued from previous page

# 11.2 KDSmart - Scanner On

-

Once the Android tablet/phone has been connected KDSmart can be connected to the scanner as outlined in the following steps.



Table 2: Steps to Set Scanner On In KDSmart

Tip: To verify the scanner is working correctly use some prepared trait barcodes, if they are available. Try the following:

- 1. Within Path View for your trial select Scanner On from the menu
- 2. Go to Manage Traits and select the required trait;
- 3. Select the Test Validation Button;
- 4. Try entering values using the scanner. They should appear as if manually entered.

# 11.3 Using Barcodes in KDSmart

Note: Current Plot refers to the specific location (i.e. plot, sub-plot, etc.) selected and displayed in KDSmart Path View ready for scoring.

KDSmart can use barcode input to assist with streamlining scoring. Barcodes can be used for the following:

- · Location barcodes used to position and display the current plot for the trial associated with the scanned barcode location
  - Plot: or
  - Sub Plot;
- Trait barcodes used for the current plot to set either the:
  - Trait with value; or
  - A value for the selected trait.

This different functionality/behaviour is outlined in the following table (Note: The barcodes displayed and human readable text are for illustration only):

Prefix	Barcode Type	Example	Result When Scanned
PL/	Plot	PL/nnnnn	KDsmart will position the scoring window to the <i>plot</i> at the barcode location.
SP/	Sub Plot	SP/nnnnnn	KDsmart will position the scoring window to the <i>sub plot</i> at the barcode location.

Table 3: B	Barcode T	Types in	<b>KDSmart</b>	/KDXplore
------------	-----------	----------	----------------	-----------

Continued on next page

Prefix	Barcode Type	Example	Result When Scanned
TR/	Trait Name	TR/nnnnnn	<ul> <li>For the current plot KDSmart:</li> <li>Selects the trait (<i>SEM</i> in the example) ready for a value to be entered.</li> <li>A value may be manually entered or in some cases entered using a barcoded value (see value below).</li> </ul>
TR/	Trait Name: Value	GC_1: Brown	<ul> <li>For the current plot KDSmart: <ol> <li>Selects the specified trait (GC_1 in the example); and</li> <li>Sets the value to the barcode value (brown).</li> </ol> </li> <li>These are possible for traits with a categorical data type or those with a specific and possibly short range. (See below Example - Trait and Value Barcodes).</li> </ul>
	Value	IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	For the current plot and selected trait <i>wait- ing for a value to be entered</i> , KDSmart will enter the value of the barcode(s). In this example the value '7' would be entered as if entering the digit '7' from the keyboard. <b>Note:</b> When using value barcodes an <i>end- input</i> barcode maybe required to signify the end of input (See illustration in <i>Example -</i> <i>Trait and Value Barcodes</i> ).

Table 3 – continued from previous page

#### **11.3.1 Example - Categorical Trait Barcodes**

The following example shows a categorical trait barcode for the trait instance  $GC_{-1}$ .



#### 11.3.2 Example - Trait and Value Barcodes

The following example shows a trait barcode for the trait SEM.



# 11.4 Using a Scanner – Examples

In KDSmart trials containing barcodes can utilise scoring using a barcode scanner. To facilitate barcode scoring in KDSmart preparation is required, such as generating barcodes in KDXplore.

For a description of barcode types that can be used in KDSmart, refer to the table *Barcode Types in KDSmart/KDXplore* in the previous topic *Using Barcodes in KDSmart*.

The following scenarios illustrate barcode assisted scoring.

#### 11.4.1 Navigating To A Specific Plot Or Sub-Plot

Scanning a plot barcode (prefixed PL/), or sub-plot barcode (prefixed SP/), will directly reference or display the location in KDSmart (i.e. the current plot).

For example if a barcode was located at the plot, it could be scanned and KDSmart will position the current plot at this location for the record to be viewed, trait(s) scored, tagged, etc.

The following table outlines the steps required:



Table 6: Navigating by Scanning a Plot or Sub-Plot Barcode

Step	Action			Description
		9P-2015-NN-A5-EB	• • • •	
		1#1	- d. k.	
	Dis	scard		
		EPH		
		EPH;2		
		RUST	* C	
		RUST;2	+	
		GC_1	Brown	
		1#2	- 1. 0.	
5.	Porso 396224	ICSFIT/GEMS-0039)-0-1	P rait Barcodes	The current plot in KDSmart is positioned at the matching plot or sub-plot record ready for scoring or viewing.

Table 6 – continued from previous page

#### 11.4.2 Scanning a Trait Barcode with Value – Categorical Data Type

For the currently displayed plot location, scanning a trait barcode with value (prefixed TR/) will set the value of the trait to the value represented by the barcode.

The example shown next will set the Trait *GC\_1* to *Brown* at the current location (i.e. plot 1):

Step	Action	Description
1.		A scanner, connected and ready, with the trial open in KDSmart, in <b>Path View</b> , positioned with the current plot at the required plot/sub-plot. Also have a trait barcode ready to scan. This maybe a printed sheet of trait barcodes (see example above <i>Example - Categorical Trait Barcodes</i> ).

Table 7: Scanning Trait Values - Categorical

Continued on next page



Table 7 – continued from previous page

#### 11.4.3 Scanning a Trait Name Barcode – Numeric Data Type

The difference here is a value is not associated with the trait barcode. When the trait scoring window is presented (as if you manually touched the trait for the current plot), it can either be entered either via the numeric key pad or by scanning value barcodes. (see example above Example - Trait and Value Barcodes )

Depending upon the data type, your barcodes and what value needs to be entered, several barcodes may need to be scanned to perform the data entry.



Table 8: Scanning Trait Values - Numeric Data Type

# 11.5 Suggestions

A few suggestions follow for practical usage and also how trait datatypes and their validation could improve data collection, both manually or with barcodes.

#### 11.5.1 Trait Value Barcodes

Using barcodes for traits requires the operator to carry those codes in some manner, possibly in laminated form to the field. In many situations using a barcode will be much quicker to record a trait, however in some instances it maybe slower or less convenient. The suggestions are to inspire some thought as to how best define and manage traits to ensure efficient and accurate data collection.

Traits can be represented with a barcode (TR/ trait barcodes) to streamline data recording. For these one of the most applicable datatypes is canonical. Barcodes for these traits can also be associated with a value, so scanning with a trait value barcode is a single operation.

The simple canonical example described earlier, repeated below, is for a trait grain colour GC with values of: white, purple, red, etc. (12 bar codes). At the current plot in KDSmart, just scanning one of these barcodes records the specific value for the trait.


Fig. 8: Example Trait Barcodes - Categorical

An integer example could be for a trait *Soil\_PH* with 14 values would have 14 bar codes: PH1, PH2, PH3, ....., PH14. Scanning one of these barcodes would set that trait to the value scanned for the current plot.

For some situations traits may have too many barcodes to make them worthwhile e.g. an integer trait with a valid range of 50 which would involve carrying a sheet of 50 trait barcodes. Locating and scanning the correct one could be more cumbersome and impractical, so either scanning value barcodes or manual entry could be more convenient.

Alternatively for this scenario, the most frequent trait values could be carried and entered using trait value barcodes and the less frequent values recorded manually.

#### **11.5.2 Trait Preparation**

When preparing traits consider alternative datatypes. Data collection could be made easier, with or without barcodes as selection of a value from a list can be easier than always needing to enter values.

#### CHAPTER

#### TWELVE

### **PRIVACY POLICY**

### 12.1 What information is collected?

KDSmart can potentially collect:

- The location of your device;
- · Pictures or audio that you take to record more information about your scoring activity; and
- The device identifier to help you separate the source of data when performing data curation from multiple devices.

### 12.2 Is it used by Diversity Arrays Technology?

The information that KDSmart collects is not used by Diversity Arrays Technology except if and when you decide to upload the data you have scored to a database that is, by formal agreement, managed and located on Diversity Arrays Technology servers.

### 12.3 When is the information collected?

KDSmart will only capture Location information if you have decided to turn on that facility. In this case, each value scored for a trait is recorded along with the date-time stamp and the Location.

Audio and pictorial information is only captured when you, the user, decide to make use of that functionality. The media data is saved in relation to the plot (or sub-plot) item and will only be exported, uploaded or transferred as and when you request that to happen and to the destination you decide.

The device identifier is available to you to identify the device used to capture the phenotypic data when you export it. However, this is only used to initialise the data item and you are able to change that to whatever value you decide if you do not wish to make public the device identifier.

When KDSmart connects to KDXchange, the device identifier is used to ensure that devices are uniquely identified but this information is not permanently recorded by the KDXchange server.

### 12.4 When/where is the information shared?

The data collected is shared only to a location that you decide and only when you decide to perform this operation.

Share destinations are either:

- a CSV, ZIP or KDX file on your tablet;
- a KDX change server (running on a desktop or laptop system); or
- a KDDart server, when enabled and only to the server destination that you choose.

KDSmart provides a Lockdown facility to further protect the integrity and privacy of your data. However, if you choose to use a data sharing application, your data is subject to the data security and privacy provisions of that application.

# CHAPTER

#### THIRTEEN

### **VERSION 3.0 CHANGES**

This topic describes the major changes in KDSmart Version 3.0 which reached production status on 28th April 2018.

### 13.1 What's New In Release 3.0

KDSmart Version 3.0 introduces a number of new features aimed to further assist in making scoring in the field easier. We are grateful to all the feedback and suggestions from our users. Some of the following improvements are as a direct response to user suggestions.

This topic provides an overview of some of the main new features, namely:

- A new Home Screen more information at hand;
- The Spreadsheet View underlying functionality is still the same as for trial scoring;
- Addition of trait instances easy to add or remove trait instances to a trial;
- · New trait and tag bundles for easier management; and
- Progress tracking for all trials (samples scored / total number of samples).

### 13.2 The Home Screen

The Main or Home window has undergone changes to include more trial information for the selected trial without a need to first visit the trials window.

Features of the updated Home Screen include:

- Scroll through the trials in KDSmart by swiping left or right in the Home Screen.
- Page indicator bars, above the trial name, indicate current position in the list of trials and whether scrolling left or right will reveal more trial.
- Restarting KDSmart or returning to the main window will display the name of the last *Trial* displayed (possibly the last being scored).
- The **Start Scoring Button** now has dual functions:

#### Long Press

- Displays the Scoring Configuration Screen.

#### Single Tap

- Recommence interrupted scoring for a trial; or

- Displays the Scoring Configuration Screen if the trial is yet to be scored.
- For the displayed trial, using the top **Start Scoring Button** button recommences scoring from the last plot or position where the scoring stopped.
- The Trial Progress Bar provides a quick visual guide for the displayed trial.
- The new Trial Details Button is a fast path to the details of the displayed trial.
- When screen space is limited (e.g. with a phone) the Lower Menu Bar now has left/right scrolling to reveal any additional function buttons.

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Example of Block	k Trial		
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2017/14/05			
	-		
Trial Details			
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•	•		

Fig. 1: New Home Screen

### **13.3 The Spreadsheet View**

**Spreadsheet View** is a new option in Version 3.0 for scoring providing a 'spreadsheet style' view of a trial. Some scoring situations will benefit from this alternative to the original and default **Path View**. It is easy to alternate between the two as views as your needs dictate in the field.

The following illustration shows the Spreadsheet View Scoring Screen (no scored traits visible):

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	1/1,1 @		-	-	1	
+	1/1,3#1	:	2759. S		-	No. 10
1	1/1,1#2	:	101		-3)	
	16/21 @0	I		-		
	31/3,1 @	1	-	-	-	
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+	31/3,1#2	:	5 <b>.</b>	•		No.
	46/4,1 @	i	<u>ن</u>	-	-	
	46/4,1#1 0	:	046		- 21	
1	46/4,1#2	:	•	•	5	
•	61/5,1 @0	I		-	-	
		Z				

Fig. 2: The Spreadsheet View Menu

**Note:** When first selecting **Spreadsheet View**, the first column is partially collapsed, designed to accommodate small phone screens. It can easily be adjusted by:

.

Menu Button at top right.

- 2. Select Adjust First Column Width Checkbox to display a sizing slider at the bottom of the screen.
- 3. Adjust the width as required then switch off the resizer by deselecting the **Adjust First Column Width Check-box**.

1. Selecting the

#### 13.3.1 How to Select Spreadsheet View

Spreadsheet View can be selected in the Scoring Configuration Screen for a trial as illustrated next.



Fig. 3: Scoring View Selection

The default view can also be chosen in the Settings Menu.

### 13.3.2 Spreadsheet View Window Elements

The following image shows a cropped and annotated version of the previous example **Spreadsheet View**. A description of the window elements is provided in the following table.



Fig. 4: Annotated Spreadsheet View

Item	Description
1.	Select the <b>Location Button</b> to return to the last scored sample.
2.	Active Trait Columns, scrollable left to right. Note: Traits that are inactive for the scoring session are not displayed.
3.	The <b>Plot Column</b> i.e. plot ID/ column, row. Also shows indicators for tags, notes, photos and menu selector.
4.	Symbolises the plot. Downward pointing indicates the plot is expanded displaying the contained sub-plots. Sideways pointing indicates the sub-plots for the plot are hidden from view.
5.	A sub-plot belonging to the plot above.
6.	The dash '-' symbolises an un-scored trait. Touch the cell to score the trait for this plot.
7.	The dot '.' symbolises a value cannot be entered e.g. this is a plot level trait. In this example, it is a plot level trait and it is at the sub-plot row, hence not scorable.
8.	The green arrow indicates plots are vertically scrollable.
9.	The yellow arrow indicates the traits are horizontally scrollable.
10.	Blue arrow indicates this area can be expanded or contracted by selecting Adjust First Column Width Checkbox from the Settings Menu (at circle 11) then using the resizing bar.
11.	The Settings Menu. There are significantly different menu items in Spread- sheet View compared to Path View. See the <i>Settings Menu</i> topic below.

Table 1: Annotations for the illustration above

To enter or replace a score for a sub-plot touch the required row and column position for the trait. The displayed dialogue is dependent upon the trait's data type e.g. the following example is for a date data type.

	validation	messape	1.2	Current Valu
		Trait		Plot Info
-3				0
-2				0
-1				0
0				ò
+1				0
+2				0
+3				0
×	•	7	NA	
	•			

Fig. 5: Date Data Type Trait Entry

**Note:** If the *Lock Scored Traits* option is enabled, subsequent attempts to edit the existing value will display a warning with an option to continue or stop to prevent accidental changes as illustrated next.

16/2,1:1	OFF_PLOT	
Value alre	ady set	
×	Next Unscored	•
F	ig. 6: Trait Already S	et

Note: Entry of Trait values is the same for both Spreadsheet and Path views.

# 13.4 Trait Levels

Previously, trait levels could only be specified as either plot or sub-plot. With KSDSmart version 3.0.3, trait level can be set to:

Plot Level by using plot or trial unit; or

**Sub-Plot Level** by using *sub-plot*, *individual* or *plant*.

### **13.5 Trait Instances**

Trait instances can be added to a trial when viewing the traits for a trial. In the following example the **Add Trait Instance Button** has been selected to reveal the highlighted menu.

★APEXING ∧ Move Up ★DRTE ∨ Move Down ★DRTE / Edit Description	* Select N	4 -	Add Instance
★ DRDE ✓ Move Down ★ EQ.10 ★ EQ.10 ★ EQ.10	APEXIN	~	Move Up
* Edit Description	*	-	Move Down
THE REPORT OF A DESCRIPTION OF A DESCRIP	# 10,19	1	Edit Description
X Remove Trait	* 10.0	×	Remove Trait
	* PH_80K		Indexes
THE BOK Induces	🔶 Pi	LSOIL	
+ PH_SOIL 2 metaroos	~		

Fig. 7: Trait Instance Menu

The menu options for trait instances, as appearing in the above illustration, are:

Item	Description
Add Instance	A new instance can be added to a trait which is associated with the trial. Trait instances
	appear with naming of #1, #2, #3, etc.
Move Up/Down	A trait, always with its instances, can be moved up or down relative to other traits. By
	default, the traits appear in alphabetic order.
Edit Description	The description of the trait instance can be edited. The <b>Edit Button</b> appears next to a trait instance to perform this.
Remove Trait	A trait or a trait instance can be removed from a trial only if it is <i>not scored</i> . Use the <b>Edit Button</b> adjacent to the trait instance to remove the trait.

Table 2: Menu options for trait instances

**Note:** In a situation of multiple trait instances, e.g. #1, #2 and #3, the removal of #1 from a trial will leave instances #2 and #3. If an instance is added it will be instance #4 (i.e. #1 is not replaced). However, in this example, if #3 is removed then an instance is added, it will be #3. An instance cannot be removed if it contains any scored values.

# **13.6 Displaying Trait Attributes**

Selecting the trait name at the top of the trait column displays the trait's attributes. These include trait:

- Alias;
- Description;
- Datatype;
- Validation rule;
- Units; and
- Level.

The following illustration from **Spreadsheet View** shows the trait DFF\_PLOT (at '1') was touched to display the highlighted information:



Fig. 8: Trait Attributes Display

# 13.7 Additional Plot or Sub-Plot Attributes and Actions

3	1/3,1#2
Plot 1	lype
We	t
Gerr	plasm 🕴
(PC	P501C5#10/GEMS-0039)-B-8
GID	
396	207

A short press on the plot or sub-plot identifier/coordinate displays the plot or sub-plot attributes.

Fig. 9: Plot Attributes Display

A long press on the plot or sub-plot identifier/coordinate displays further attributes and functions. These are:

- Deactivate or activate the plot/sub-plot;
- View, add or remove tags;
- Add a note (typed entry) for the plot/sub-plot;
- Add photos;
- Add an audio note; and
- Add a sub-plot to the plot.

The following example shows the sub-plot has two tags assigned, GV+++ and MD and no images are attached, as the **Attachment Icon** is disabled.

31/	3,1#1	0:	Э.		. 10
31/	3,1#2	1		- 14	•
31/3	,1				
-	31/	3,1#1	æ	Ø+	Ø <sub>+</sub>
G	/+++	MD			
6	1/5,1	201	1931	-	-

Fig. 10: Long Press

With attributes displayed as in the above example, a short press of either the plot/sub-plot icon or identifier/coordinate will display the menu which is both illustrated below.

Plot Menu	Sub-Plot Menu
	Continued on next page



Table 3 – continued from previous page

# 13.8 Settings Menu

5 Settings Menu Button in Spreadsheet View displays a menu as illustrated. The menu Selecting the top right items are different from those in **Path View** See the following table for a brief description of these menu options:



Fig. 11: The Spreadsheet View

Item	Description
Text Size	Adjust the text size of the sample values.
Adjust First Col-	Displays a slider at the bottom of the screen allowing adjustment of
umn Width	the first column width which is helpful for small phone screens with
	limited space.
Location	Enable or disable location services.
Scanner On	Displays the Paired Devices Screen to allow connecting or recon-
	necting to a scanner.
Configure	Configure the information to appear in the plot attributes.
Elapsed Days	Checkbox to change the display of elapsed days from a date to the
Count	number of days since the trial planting date.
Unlock Scored	Unlocks scored traits, enabling modification without warning step.
Traits	

Continued on next page

Item	Description
Change Screen	Change the screen orientation, e.g. change from landscape to por-
Orientation	trait. A three-second delay allows the tablet to be turned to the
	desired orientation before the rotation lock is reactivated.
Choose Plot	Three colours are available for plots and traits and more can be
Colours	added on request.
Show/Hide Sub-	Hides or shows all the sub-plots, useful for scoring only plot traits.
Plots	
Fixed Plot Info	Enables selection for column display of inactive traits and plot at-
	tributes.
Help	Displays the inbuilt KDSmart help.

Table 4 – continued from previous page

### 13.9 Trait and Tag Bundles

Bundles are a mechanism for sorting either traits or tags into logical, usable groups. This may assist with their use and management, e.g. it may be helpful to bundle traits for a type of crop, season or a specific experiment. They can also assist with distribution to multiple KDSmart devices for efficiency and to ensure consistency.

Some features of bundles are:

- A trait or tag can exist in multiple bundles;
- Every trait or tag is a member of the All Traits or All Tags bundles;
- Bundles make the selection of traits or tags easier for export or import;
- Traits or tags can be added or removed from bundles (except All Traits or All Tags);
- It is easy to select multiple traits/tags and create a new bundle; and
- Bundles can be deleted, except for the *All Trait* and *All Tag* bundles.

The example below shows a trait bundle named *Dates Bundle* expanded to show the contents. Note the circled number, at the right of the bundle name, indicating it contains ten traits. When expanded the traits in the bundle appear below the bundle name (dotted highlight).



Fig. 12: Trait Bundle

Remember bundles are logical groupings, so there is only ever one instance of a trait defined in KDSmart.

Note: for Bundles, Tags work in the same manner as Traits.

#### 13.9.1 Creating Bundles

Viewing traits or tags the procedure is the same. Traits are used here to illustrate.

To create a bundle, at least one trait or tag needs to be selected to invoke the menu, however, a bundle can exist without traits/tags.

A long press on a trait will reveal a different set of actions



Table 5: Example of Trait Menu Bar on different sized devices

Table 6:	Steps to	Create,	Add to	or Delete	e from a	Bundle
----------	----------	---------	--------	-----------	----------	--------

Step	Action				
1.	In the <b>Trait/Tag Screen</b> , <i>long press</i> a trait/tag to be added to the bundle.				
2.	The top bar of the display will change to be similar to the previous trait window examples for phone and tablet. This also indicates the number of traits/tags selected. More traits/tags can be selected or deselected with a single press.				
3.	Select either the <b>Setting Menu Button</b> , the <b>Trait Bundle Button</b> , or				
4.	Enter a unique bundle name. The display will assist in providing a unique name.				
5.	Select the <b>Create/Add Button</b> to create the new bundle or if delete has been selected con- firm by selecting the <b>Delete Button</b> .				

Note: Deleting a Bundle does not delete the Traits.

#### 13.9.2 Export Bundles

Bundles can be exported as either a CSV file or to KDXplore which will require a connection.

Step	Action
1.	In the <b>Trait/Tag Screen</b> , <i>long press</i> the bundle to be exported.
2.	At the top bar of the display select the <b>Export Button</b> .
3.	Select the <i>Tablet</i> option to export a CSV file or KDXplore if you have a current connection to the KDXplore application.
4.	Confirm and a message will indicate success and location of the CSV file.

Table 7: Steps to Export a Bundle

# CHAPTER FOURTEEN

### **CHANGE HISTORY**

See below for version change history of the KDSmart application. For more information on the features introduced in Version 3, see the KDSmart Version 3 Changes page.

**Please note:** Whilst this page is regularly maintained it may not always be aligned with the current Google Play Store version.

### 14.1 Version 3.0.33 : 2019/March/2

- We apologise for any issues that have been experienced in the last few weeks, especially in regards to failed file imports that some users have reported.
- It is very unfortunate that we only came to know about this major drawback a few days ago but it is resolved now.
- If you are experiencing similar issues, or anything else, please feel free to email us at kdsmart@diversityarrays.com. We promise that all feedback is taken seriously at DArT.

### 14.2 Version 3.0.33 : 2019/February/13

- This release gets rid of an important and hard to find bug of Block trials with attachment.
- Ever imported a trial which had -1 as Block on import? We did too and took it very seriously. We at DArT believe finding bugs and testing regularly is a good thing.
- Secret Announcement: there is a 3.1 beta coming.

### 14.3 Version 3.0.32 : 2019/January/18

- Block Selection bug fixes.
- Scoring configuration related bug fixes.

### 14.4 Version 3.0.31 : 2019/January/06

• Same fixes as 3.0.30 but fixed patch release.

### 14.5 Version 3.0.30 : 2019/January/06

• Google permissions compliance.

### 14.6 Version 3.0.29 : 2018/December/18

- Resolved issue with Plot IDs in Block Trials.
- Other small bug fixes.

### 14.7 Version 3.0.28 : 2018/December/05

- Improved stability of KDSmart.
- Resolved several issues with Block Trials.
- Some Block Trials will need to be converted to the new type. Please see http://www.kddart.org/help/kdsmart/ html/kdsmart-tips#troubleshooting.html for more information.
- Language settings now update properly.

### 14.8 Version 3.0.27 : 2018/November/21

- KDSmart can now support Traits and Tags CSV import from Google Drive.
- We have also made some improvements related to Field View.
- Updated Translations for German and Spanish.
- Unfortunately we don't support Jellybean devices anymore.

# 14.9 Version 3.0.26 : 2018/October/29

• Same fixes a 3.0.25 but fixed patch release.

# 14.10 Version 3.0.25 : 2018/October/27

- KDSmart can scan barcodes with your phone camera in path view.
- Trait delete crash is fixed.
- Export and bundle related bug fixes.

### 14.11 Version 3.0.24 : 2018/September/26

- Google Drive support for .KDX files with images is now available.
- We have also made several bug fixes for better user experience.

### 14.12 Version 3.0.23 : 2018/September/03

- Audio Recording is now available in KDSmart to record and listen to your recordings.
- Bug fixes relating to non scrolling layouts.
- Trial Bundle bug fix.

### 14.13 Version 3.0.22 : 2018/August/01

• Bug fix on file name causing a crash, found very rare.

### 14.14 Version 3.0.20 : 2018/June/25

- Fixed issue with serpentine traversal in trials with missing plots.
- Fixed Off-By-One Number Picker in plot navigation dialog.
- Google Drive, Dropbox, OneDrive import implemented.
- Tags Crash fixed.

### 14.15 Version 3.0.19 : 2018/May/18

- Auto scoring skipping scored traits on "all-traits" bug fix.
- Auto scoring continuation bug fix.

### 14.16 Version 3.0.18 : 2018/May/03

- Fix database upgrader from version 2.0.73 or earlier to current version
- Fix incomplete database upgrades due to this issue.

### 14.17 Version 3.0.17 : 2018/April/28

- Bug fix for Android 7.1
- Fixes with help and Online playstore content.

### 14.18 Version 3.0.16 : 2018/April/28

• First Release of KDSmart 3.0 in production.

### 14.19 Version 2.0.78 : 2018/April/06

- Only Database upgrade, Upgrade to this version is highly recommended.
- There were few bugs in 2.0.74 and 2.0.75 with demo trials, which are now resolved, you might see a dialog asking you to reset demo database to get rid of those bugs.
- Moving from beta to production for earlier versions is deprecated. Which means 3.0.9 can be moved to 2.0.78 but cant be moved back. To move back to beta, 3.0.10 is needed.
- Plot Tags and Specimen Tags can be imported with Trial CSV.

### 14.20 Version 2.0.77 : 2018/March/19

- Crash with Tone Generator sorted.
- Maximum number of plots in a new trial is 1000 \* 1000
- Crash associated with Auto scoring sorted
- New Trial creation will not block user interface

### 14.21 Version 2.0.76 : 2018/March/18

- Some new Translations.
- User interface to ask for resetting Database.

### 14.22 Version 2.0.75 : 2018/March/17

- RESET DEMO Database from Settings, to get rid of Demo Trials Problem.
- Crash associated with Demo Trials will instead show an error.

### 14.23 Version 2.0.74 : 2018/March/13

• Block Trials not available in KDS 2.0

### 14.24 Version 2.0.73 : 2018/January/21

• Only Database upgrade

### 14.25 Version 2.0.72 : 2017/August/01

- KDXchange bug fix for moving KDXplore Traits to KDSmart devices.
- KDXchange bug fix for moving KDXplore Tags to KDSMart devices.

### 14.26 Version 2.0.71 : 2017/July/28

- TagBundle and TraitBundle support for KDSmart 3.0 beta.
- Database upgrade to support coming release 3.0.

### 14.27 Version 2.0.70 : 2017/June/26

- Csv import functionality for specimens import can now use #N or #\* for all specimens.
- Using SpecimenCount with #\* or #N.
- Importing a trial checks for Specimen level trait of format #N.

### 14.28 Version 2.0.69 : 2017/June/17

- Auto Scoring can score all traits or un-scored traits.
- Block Traversal bug fixed.
- Improved Spanish and German translations.
- Help for selecting a Trial Layout is added in Trial screen page.

### 14.29 Version 2.0.68 : 2017/May/25

- Refresh KDSmart Demo Database to use a demo Block Trial
- Trials with Blocks can be used with KDSmart. Trials with blocks need unique X and Y pair for every block number.
- Bug with field traversal fixed.
- Bug with CsvImport fixed.
- Trial can belong to different Trial Types.

### 14.30 Version 2.0.67 : 2017/Mar/28

- KDX export files now use the preference value for databaseVersion
- The KDSmart process for KDXchange now uses the first address on the same network as KDXplore. This fixes an issue with some Android OS versions.

### 14.31 Version 2.0.65 : 2017/Mar/08

- Export to CSV now emits PlotAttributes.
- Fixed "GoTo Plot" for X,Y values beginning from N greater than 1.
- FieldView Search results for filtered values now works.

- More German and Spanish translations.
- If a Trait Alias exists, it is displayed instead of the Name (this helps in multi-lingual environments).
- Prepare database for Beta testers of KDSmart version 3.

#### 14.32 Version 2.0.64 : 2017/Feb/20

- Fixes bluetooth device reconnect when Android puts the app to sleep.
- Provide a link to the Privacy Policy on the Information/Help page.
- Backup database files before upgrading to a new version.
- Provide an indicator of the DEMO database on the home screen.
- "Preparing..." dialog persists until ready for scoring.
- · Online documents are now at

#### 14.33 Version 2.0.63 : 2016/Nov/16

- · Allow LockDown mode unlock in some edge cases
- · Fix a bug relating to Attachment removal
- Support Sub-plot numbers in CSV headings for import/export (Trait#number)
- Prepare for improved Attachment support in KDXchange
- Improvements to Demo database examples
- · Add timestamp to generated snapshots in Demo database

#### 14.34 Version 2.0.62 : 2016/Nov/01

- · Correct some phrases in German and Spanish-Mex localisation
- Fix Trait and Tag transfers from KDXchange
- · Orientation change in Settings no longer changes back to the System Language

#### 14.35 Version 2.0.61 : 2016/Oct/26

- Localisation for Spanish-Mexican
- · Online documentation now links to www.kddart.org
- Allow Trait Description to be blank
- Normalise GPS Location serialisation

### 14.36 Version 2.0.60 : 2016/Oct/18

- Display Trait Alias in Auto-Advance mode
- Add Trial with just a TrialName and X,Y size
- Reinstate scrolling in FieldView
- Trial data export data uses trialname.csv and trialname\_SubplotData.csv
- Provide battery usage logging via Settings

### 14.37 Version 2.0.59 : 2016/Oct/16

• Fix for Specimen Data output which is now available in a different file.

### 14.38 Version 2.0.58 : 2016/Oct/05

- Fix for Daylight saving in Elapsed days
- Fix for 4.3 inches keypad screen in Autoscoring.

### 14.39 Version 2.0.57 : 2016/Oct/03

- Crashes on coming back to KDSmart from another application resolved.
- Field View can be zoomed using fingers.
- Small screens up to 4.3' can install and score using KDSmart.
- Better user experience with Pane Layout to adjust Height allocated for Scoring and Plot information.

### 14.40 Version 2.0.56 : 2016/Aug/24

- KDSmart White background made consistent.
- Trait information color bug for Android Versions <= 20 solved.
- Trait Level information saving solved.

# 14.41 Version 2.0.55 : 2016/Aug/05

• A version released specifically for Tilapia build of Nexus 7 2012, the version failed to support the device.

### 14.42 Version 2.0.54 : 2016/Jul/24

- KDXchange support for KDDart Trials.
- Upload KDDart Trials support KDXplore -> KDSmart.
- Download KDDart Trials support KDSmart -> KDXplore.

### 14.43 Version 2.0.53 : 2016/Jul/08

· Fixed Autoscoring bug

### 14.44 Version 2.0.52 : 2016/Jun/27

- Add Example of how to do Nursery scoring
- · Show TraitLevel prefix when changing sort order
- Correct and add more German 110n
- Show Heatmap colour/value assignments on long-click in FieldView cell
- "Tip" for the above
- Ensure "Clear Selection menu is visible when required
- Default display of EDAYS is now day count
- Fix crash in Settings when Language set to German

### 14.45 Version 2.0.51 : 2016/Jun/22

- · Fix PlotInfo sync when skipping backwards in auto-advance
- · Provide blue, orange and magenta shades for heatmap

### 14.46 Version 2.0.50 : 2016/Jun/20

- Fix intermittent loss of synchronisation of PlotInfo in auto-advance mode
- Use Flags for easier Language selection
- Acknowledgement for Partners/Collaborators

### 14.47 Version 2.0.49 : 2016/Jun/14

- Add Settings option to choose Language
  - System Setting
  - English

- German

- Fix text rendering in Help for non-English languages
- More translations.

#### 14.48 Version 2.0.48 : 2016/Jun/13

- · German localisation
- DeviceName and OperatorName visible on main screen
- If initially empty, an "Edit" pic appears touch to enter values.
- · If not initially empty, Long press to edit.
- Remember the last folder used for database save.
- FieldView Search: "Find Recent Scores" presents list of "n minutes ago"
- FieldView Search: HeatMap available (with Context Help)
- · Attachments button now provides option to delete
- · Keyboard Text size also applies to the "input" field
- Don't use Keyboard Text LARGE setting for small/landscape screens
- Use correct INT/DEC format for stored sample values (e.g. 2.00 if 2. is entered)

#### 14.49 Version 2.0.47 : 2016/May/21

- Show current Preference Setting for:
  - Device Name
  - Operator Name
  - Default Name for Plot, X-Coord, Y-Coord
- · Display ElapsedDays "no-limit" when relevant
  - Fix a problem with ElapsedDays scoring.
  - Add preference to choose what to use on small screens for ElapsedDays calendar (Use Spinners, Use Calendar, Use Both)
- Ensure that "button" is visible when ElapsedDays value is greater than "+3d" option

#### 14.50 Version 2.0.46 : 2016/May/19

- · Fix intermittent problem saving KDX/ZIP/CSV
- GPS Location available in scoring
- Review Elapsed Days scoring
- · Trial CSV Import
  - Don't "check" blank values

- correct report of invalid TraitDataType
- Handle CALC Traits in KDX import
- Settings
  - Add OperatorName, DeviceName
  - Add Allow Inactive Trait Edit
- Confirm Edit of Inactive Trait
- More Date formats for PlantingDate import
- New icon for default Organism Type
- Fix creation of Unscored samples for SubPlot
- Miscellaneous bug fixes

### 14.51 Version 2.0.45 : 2016/May/06

- Traits must now be defined as Plot or SubPlot
- · Adding Specimen to Plot only uses SubPlot Traits
- "Add Trait" now enabled
- Fixed Trial data Export for some ZIP and KDX situations
- Allow MISSING, NA and UNSCORED as CSV data input values
- Improve checking of first line data values for CSV import
- Ensure that current Trait Value is visible in auto-advance
- · Increased size of Integer/Decimal input text field

### 14.52 Version 2.0.44 : 2016/Apr/15

- Menu "Add Tag" is immediately visible for Auto-Advance for Phone in Portrait mode
- KDXchange behaviour on current WiFi network:
  - Auto select if only one address
  - Auto-connect (with choice) if saved addresses found
- Improve explanation when on different WiFi network
- Planting Date entry on small screens can now change the Year
- Notify about non-adjacent Plots when skipping back during Auto-Advance
- · Restore ability to skip forward in Auto-Advance
- Miscellaneous Bug fixes

### 14.53 Version 2.0.43 : 2016/Mar/17

• TEXT traits scored after DECIMAL or INTEGER now show the keyboard

### 14.54 Version 2.0.42 : 2016/Mar/16

- Auto-Advance scoring in the last Sample provides a message
- KDX files support for import from Tablet
- Improved KDXchange support
- Display folder path in FileChooser instead of just the folder name
- · Accept "Trial Abbreviation" as preferred name for "Acronym" in CSV Import
- Database export folders use a DB\_ prefix
- Internal: Prepare for internationalisation
- Internal? Remove "TRAILING\_DIGITS" TraitNameStyle
- Internal: EDAYS as integer

### 14.55 Version 2.0.41 : 2016/Feb/10

- Enable "value:description" for CATEGORICAL traits
- Allow non-TEXT traits to replace TEXT when importing a WorkPackage
- KDXchange can now remove Trials from a Tablet
- Importing protected traits uses the original validation rule for checking
- Provide a "Cancel" button when scanning for KDXchange servers
- Provide sorting for lists of Trials, Traits and Tags
- Baseline support for alternate Locales for numeric Measurements

### 14.56 Version 2.0.40 : 2016/Jan/25

• Skip over de-activated Plots or Specimens when looking for next un-scored Samples.

### 14.57 Version 2.0.39 : 2016/Jan/24

• Fix Trial data transfer via KDXchange when the scoring sort order has not been previously set in KDXplore (apply usedForScoring and SSO from workPackage)

# 14.58 Version 2.0.38 : 2016/Jan/24

• Fix Trial data transfer via KDXchange when the scoring sort order has not been previously set in KDXplore.

#### 14.59 Version 2.0.37 : 2016/Jan/20

- When exporting a Trial to the Tablet, the KDXplore option now appears first.
- Changing to high-visibility mode now applies to Trial, Trait and Tag management as well as Trait Instance selection and collection order.
- When auto-advance scoring skips a plot you now get a notification and must confirm that you are at the correct location to continue scoring.
- · Improve cleanup of unused records during Trial deletion

### 14.60 Version 2.0.36 : 2015/Dec/14

- · Fixes some issues when Trials are transferred from KDXplore
- · Removes trailing YMD timestamp when constructing Trial Name from CSV import file

### 14.61 Version 2.0.35 : 2015/Dec/02

- Importing Traits and Tags into an empty database now shows details without having to exit/re-enter the Trait/Tag management page.
- Exporting Traits/Tags to Tablet displays destination in a dialog on completion.
- Export Folders are now timestamped.

### 14.62 Version 2.0.34 / 2015/Nov/18

- Negative INT/DEC range limits are now supported.
- Typing the decimal point for a DECIMAL trait value automatically inserts a leading zero.
- Changes to range limit inclusion for INT/DEC Traits are now persisted.
- Walk Section changes during Auto-Advance scoring now produce a notification.
- · Simplified user interface for "Export to KDXplore" for Trials.
- KDXplore format option now available in "Export to Tablet".

### 14.63 Version 2.0.33 : 2015/Nov/18

- · Fixes a problem using skipBack/skipForward during Auto-Advance
- Clear the number of selected plots in FieldView subtitle (as well as the selections).

### 14.64 Version 2.0.32 : 2015/Nov/17

- Fixes a Race condition in FieldView initialisation
- Fix use of ZIP files with Storage Access Facility

### 14.65 Version 2.0.31 : 2015/Nov/17

• Decimal points are now re-enabled in the Keypad entry method.

# 14.66 Version 2.0.29 : 2015/Nov/16

- Sun/moon control on main screen to toggle hi-vis mode
- Screen orientation change during Scoring via menu option
- Resolved a database upgrade problem
- Resolve KDXchange server life-cycle issues

### 14.67 Version 2.0.28 : 2015/Nov/12

- Revert export menu invoking multi-select mode
- Barcode scanning not in Auto-advance mode
- Portrait Orientation:
  - Split Line removed from FieldView
  - Restore PlotInfo display in auto-advance
- Allow server restart in KDXchange
- Enable KDXchange Trial transfer from desktop
- Support white background for scoring setup and main screen
- Misc bug fixes

### 14.68 Version 2.0.27 : 2015/Nov/01

- Import works for NA, MISSING
- No duplicate trial imports
- Import warnings
- CSV: Column\_No and Range\_No
- Export/Import ELAPSED\_DAYS as int
- Export Tags in CSV
- Plot Info displays Inactive Trait
- Field View TINY
- Plot Type in Plot Finder
- Resizable split views
- Delete button invokes select-mode
- Display Trial- and Plot- attributes

- Protected Trait support, Valid-for-CALC indicators
- Introduce Barcode support
- Show file modification time
- Icons in Scoring Setup
- Misc bug fixes

### 14.69 Version 2.0.26 : 2015/Oct/11

- · User interface readability improvements
- · Attachments and Tags available during auto-advance
- Create new Tag while selecting Tags
- Show Plot Type (i.e. "Checks") in plot information
- Miscellaneous fixes

### 14.70 Version 2.0.25 : 2015/Oct/08

- Max 2 lines for Trait desc
- Don't delete in-use Traits
- TrialName/Trait location swap
- · Elapsed days display option
- Text size options for Plot Info
- Keypad for INT and DEC traits
- Suppress unnecessary export folders
- Improvements to ZIP export
- Change Plot Info Alias via long touch
- Larger buttons for Trait Scoring
- Buttons at top for Tablet/Portrait
- CALC validation rule support
- CSV Import improvements
- Fix Scoring Config Defaults
- Preference Icons for Default Visit Order
- Miscellaneous fixes

### 14.71 Version 2.0.24 : 2015/09/25

- · Jump to Plot available from main scoring window
  - Touch on current Plot Button

- Long touch on other Plots (2- or 4-Plots Per Group)
- Fixed issue when exporting Trial as ZIP
- Improved barcode generation (Demo database reset)

### 14.72 Version 2.0.23 : 2015/Jul/24

#### KDXchange:

- Export To KDXchange supports file export (.kdx)
- Work Package Fixes
- Barcode data field support
- Settings to retain KDXchange addresses
- Refresh of Trial Details after edit
- Auto-Scoring issue fixed
- Fixed Changing Demo/Prod databases
- · Barcodes and Trait Alias CSV import
- · Attachments import to Pictures/KDSmart
- · Home/Back navigation fixed for Scoring and Config
- Back button in File Chooser goes "up"
- Multi-Trial exports supported
- Remove refs to "Old Scoring Dialogs"

### 14.73 Version 2.0.22 2015/Sep/16

- Fix Trait Details Validation
- Scoring auto-advance enhancements
  - transitions between Plots
  - units and validation visible
  - skip/back functionality
  - numeric keypad auto-show for INT/DEC
- About/Help available
- Database Save
  - defaults to ZIP of CSVs
  - use timestamped folder name
- Don't lockdown if no PlantingDate
- Persist FieldView plot selections
- Network checks for KDXchange/KDXplore
- UI visibility improvements

Check at http://software.kddart.com/KDSmart/ for more information.

### 14.74 Version 2.0.21 : 2015/Sep/15

- Scoring auto-advance enhancements
  - transitions between Plots
  - units and validation visible
  - skip/back functionality
  - numeric keypad auto-show for INT/DEC
- About/Help available
- Database Save
  - defaults to ZIP of CSVs
  - use timestamped folder name
- Don't lockdown if no PlantingDate
- Persistent FieldView plot selections
- Network checks for KDXchange/KDXplore
- UI visibility improvements

Check at http://software.kddart.com/KDSmart/ for further information.

### 14.75 Version 2.0.20 : 2015/Sep/07

### 14.76 Version 2.0.19 : 2015/Jul/03

#### 14.76.1 Lockdown mode

- Available from main screen for DemoDatabase.
- Preferences screen allows setting of Lockdown Password.

#### 14.76.2 Import Trial/Trait

- Importing Integer values will also accept a decimal point with only trailing zeroes.
- Use default Plot/Column/Row names from Preferences
- Improve support for CIMMYT CSV headings (e.g. Designation)
- Allow import of Traits created from a prior Trial import to update validation rules.
- Display first line of data when importing Trial to assist import configuration.
- Detect and ignore "empty" lines.
- · Validate Trait Scores when importing Trial CSV containing data.
- Add "No Instances" Trait Name option.

#### 14.76.3 Preferences Screen:

- Improve heading/sub-heading visibility.
- Add default Plot/Column/Row names for Import
- Use images for OrganismType selection

#### 14.76.4 Scoring:

- Make all Scoring screen icons use black on white.
- Field View: improve visibility. Improve placeholder functionality (before main version after 2.0.10)
- · Notifications on successful attachments
- Long press on the main screen Score button brings up the Scoring Configuration Screen.
- Require confirmation of exit from Scoring.
- Require Trial Planting Date if ELAPSED\_DAYS traits selected for Scoring.
- Prevent jump to a non-existent Plot
- 'Remove Trait' option available on Plot icon.
- Add 'Trait Alias' (always user-editable) to assist in use of screen space.

#### 14.76.5 Other

- Use context-sensitive images for Trial Layout configuration.
- Extend use of user-defined names for Plot/Column/Row.
- Performance improvements when switching databases.
- Trait scores now timestamp with yyyy/MM/dd HH:mm:ss
- Export timestamps option for UTC or local; ISO-8601 format used: yyyy-MM-dd'T'HH:mm:ssZZ
- Add instructions for formula to convert ISO-8601 timestamp to Excel.
- Improve Main screen layout
- Improve small screen support.
- Initial support for Trait re-ordering.
- Add barcode support for Plots and Specimens.
- Add planting date support for Plots and Specimens.
- Current Trial/Trait/Tag is highlighted (and stays highlighted).
- Remember import and export directories separately in FileChooser.
- Reinstate FileChooser access to "root" directory.
- Don't delete Traits that are still in use.
- · Added Wheat and Maize icons
- Foundation work for normalising Trait Score buttons:

[Cancel | Clear | N/A | Missing | Set ] (but use icons where possible)
• Miscellaneous bug fixes.

#### 14.76.6 Documentation:

• Updated UG Appendices for TraitDataType, CSV Import and CSV Export file formats.

#### 14.76.7 Internal:

• Architectural Changes to aid KDXplore data interchange (e.g. BMS FieldLog XLS files)

#### 14.77 Version 2.0.18 : 2015/Jun/04

- TraitInstances Select All/None fixed
- FileChooser should now only show .CSV and .TXT files (again)
- Don't allow duplicate Tags to be imported
- Trait values are now loaded if present (date of 1970-01-01 00:00:00)
- Added Trait:123 mode for instance number detection
- PlotId, X, Y are scanned during import affects PlotIdentOption
- PlotIdent edit values depend on the X,Y,PlotID values in data
- Plot/X/Y name editing also affected by X,Y,PlotId
- Can now edit Trial Note
- Move all "Edit" buttons next to Headings
- Preparation for Comment exports (target for 2.0.19)
- Import Traits reports # not loaded (already in Database)
- Using "Link:" prefix for the join ids in ZIP export
- Preference (Settings) changes

#### 14.78 Version 2.0.17 : 2015/Jun/02

- Fix for Database upgrade issue re "TagPlotUseId"
- Add LinkPlotId columns to relate the rows in the various CSV files
- · Source database id columns now identified with "Source" prefix
- · Fix crash on Landscape/Portrait orientation change while editing TrialLayout
- Known issue: the "Source" prefix is missing from the samples.csv file so it has two "SampleId" columns

## 14.79 Version 2.0.16 : 2015/Jun/02

- Build date/time now in About
- Settings: Scoring with white bg
- Support work for KDXplore
- TrialLayout: "Origin Plot Id" and X/Y "Corner"
- Trial SiteName now an Attribute
- TRAITnnn mode for Import and Trait/Instance names
- Fix bug that stopped Tag saves
- Make DeleteTrial work in Portrait
- Import enabled for PlotId trials (Scoring still disabled)
- Add DemoDB indicators to "Play" button and "Start Scoring"
- Enable DatabaseId for Export
- Improve error reporting (instead of crashes)

### 14.80 Version 2.0.15 : 2015/May/29

- Many changes in this release.
- Too many to fit into the 500 character limit.
- Details on Forum

#### 14.80.1 Application

#### Database

- Improve robustness of database upgrades
- Added Trial Features:
  - OrganismType
  - TrialLayout
- Support for generic TrialAttributes
- Support for generic PlotAttributes and transfer existing
- specific ones (GenotypeName,Pedigree,etc) to PlotAttributes
- Backup copy of database before upgrade

#### Import

- Allow selection of .TXT as well as .CSV for CSV import
- Exclude Empty/Blank Headings from Import Setup
- Consolidate Trait and Tag import

- Relax constraints on ValidationRule import
- Allow import into DemoDatabase (AFTER user confirmation)
- Enforce required headings
- · Error when duplicate headings encountered
- · Prevent import of pre-existing records for Tags and Traits
- · Error when duplicate records for Tags and Traits
- · Cancel works faster
- Improved performance Phase 1

#### Export

- Provide Trial Export variants
  - CSV: Plots-Only
  - CSV: Plots & Specimens
  - ZIP: All data (includes Attachments)
- Normalise headings for all CSV exports
- Coordinate formats for KDXplore data exchange
- Persist folder choice for export
- Allow export from Demo database
- Provide Export All if no Traits/Tags selected

#### **Manage Traits**

- Add Display of TraitUnit
- Correct selection of TraitDataType of ELAPSED\_DAYS
- Include short TraitDataType next to TraitName in list
- Ensure buttons are visible for Delete Tags/Traits
- TrialLayout editing [KNOWN ISSUE: Small screens]
- Require TrialLayout and Planting Date before scoring

#### **Other Issues**

- Fix navigation issues when scoring on small screens (Phone sized)
- Allow clearing of Active Trial (long press on Trial Name)
- Added yyyy/DDD and DDD/yyyy date format options

#### **FieldView**

- Reduce size of PlotCell in placeholder FieldView
- · Architectural work for future VisitOrder improvements
- Include TraitUnit in dialog titles for Scoring
- Miscellaneous User Interface cleanup
- General Code Cleanup

#### 14.80.2 Documentation

- Updates to Appendices:
- A: Trait Data Types
- B: CSV Import Formats
- C: CSV Export Formats
- In particular, describe SpecimenCount options for Trial Import.

## 14.81 Version 2.0.14 : 2015/May/22

- Increase PlotInfo font size
- Update PlotInfo
- Settings summary in 4.0.3 now updating
- · Fix boundary value problem when Scoring
- Handle null Acronyms
- Report import errors
- Allow date import format of dd/mm/yy as well as ISO yyyy-mm-dd
- Export directory now user choice
- skipped 11,12 to bring version code into alignment with fix-number

## 14.82 Version 2.0.10 : 2015/May/20

- Fix bug in Scoring
- Use Plot Identification in Scoring UI
- IsControlPlot boolean changed to PlotType as a String
- Enforce PlotId integer during CSV Import
- Until schema migration is complete you MUST provide PlotRow and PlotColumn
- and you MAY also provide PlotId. After migration you will be able to provide
- PlotId INSTEAD OF Row/Column.

### 14.83 Version 2.0.9 : 2015/May/15

- Add Trial.NameForPlot
- PlantingDate replaces StartDate
- Begin standardising Scoring buttons: Cancel/Unset/NA/Missing/Set
- Handle orientation change for Trait and Tag Editing
- Preparing for Trial/Plot Attributes
- Tag description now Mandatory
- · Audible and Haptic feedback and notifications
- Also for Range errors during Trait value entry
- FieldView display available for Phones
- Plot/Add Specimen enabled
- Auto-advance for Tags when no Traits scored
- CSV Import UI
- Documentation updates

## 14.84 Version 2.0.8 : 2015/May/15

• 2.0.7 changed an Image to an ImageButton in Trait Instance setup and this unexpectedly affected all functionality.

## 14.85 Version 2.0.7 : 2015/May/15

- Export Trial available for DemoDB
- Export Trait available for DemoDB
- Trait Instance Choice: menus to Add Trait, Add Instance, Change Order (temporarily disabled)
- Simplify Export Traits and Trials
- Add Select All for Trait long-click Selection
- Disable screen rotation for Scoring Activity
- Remove extra prompt for Specimen Activate/Deactivate

## 14.86 Version 2.0.6 : 2015/May/13

- · Improve demarcation on Plot/Specimen Header Rows
- Reduce font size for "Plot Info"
- Improve error reporting for CSV import
- Defer Trait insertion in database until after validation

- · Disable notification on invalid numeric until after redesign
- Repair an NPE logic trap
- · Fix incorrect navigation when travelling "down" in Serpentine
- Change Kill/Revive to Deactivate/Activate
- · Sample Rows are now hidden when a Specimen is deactivated
- Disable menu items that aren't currently activated

#### 14.87 Version 2.0.5 : 2015/May/12

- Jump to Plot highlights the correct button
- · Improve confirmation before deleting Traits
- Fix Trait/Tag Edit/Add issue introduced in 2.0.4
- · Fix error when taking photo annotation
- · Audio annotation menu item temporarily disabled
- Map updated to show active Plot and Group
- · Reverse order of button labels when required for Serpentine
- Note that the Map is a temporary placeholder and will be replaced by a fully functional version in a future alpha release.

#### 14.88 Version 2.0.4(7) : 2015/May/08

- Fix some issues on 4.0.3 on Samsung GT-P3110 for CIMMYT
- · Tabs for Manage Trial/Tags in the ActionBar for increased visibility
- · Tabs for Scoring Configuration in the ActionBar
- · Increase visibility of Trait Instance Message on Scoring Config
- · Improve behaviour consistency of Select All/None in Trait Instance selection
- "Up" navigation for Scoring works for Android 4.0.3
- · Fix unreadable layout for Edit Trait dialogs
- Scrollbar is always visible in Trial Details
- Display progress when initialising Scoring
- Preparatory work to fix orientation change for Scoring (still more to do)
- · Lock icon is now between Trait Name and Value
- Add "Planting Date" to CSV import (defaults to Trial Start Date)
- Prepare support for MISSING option (not yet visible in UI)
- === Below is what fits in 500 chars Version 2.0.4(7)
  - Fix issues on 4.0.3 on Samsung GT-P3110 for CIMMYT
  - · Improve Tab visibility for Trait/Tags and Scoring Config

- · Increase visibility of Trait Instance msg on Scoring Config
- Behaviour consistency of Select All/None in Trait Instance select
- "Up" navigation for Scoring on 4.0.3
- Fix layouts for Edit Trait
- Scrollbar always visible in Trial Detail
- Display Scoring setup progress
- Lock icon between Trait Name and Value
- Add "Planting Date" to CSV import
- Add MISSING value (not yet in UI)

## 14.89 Version 2.0.3 : 2015/May/06

- Fixed navigation to target plot from Map
- Fix Interrupted Scoring on Phones (e.g. to answer a call)
- Update Context Help
- Improve Sample detection for AutoAdvance
- Resume Scoring from previous position
- Fix plot/specimen for demo data generation
- · Re-included some Android devices
- Implement workaround for Lollipop bug on Trait Instance selection
- Remove Group Indicator for single instance Traits
- Move Select/All and Select/None to the head of the Trait Instance list

## 14.90 Version 2.0.2 : 2015/Apr/10

- Help menu on all screens
- Trait Instance Selection
- Tablet screen reconfiguration from usability testing
- Plot Options, Plots Per Group 1,2,4 and Organism Type
- Use System Notification on invalid numeric input
- Base Auto-Advance in place needs feedback
- Edit/Add for Trait and Tag available
- CSV Import design changes
- Import From and Export To menus
- Demo Database reset included in Settings
- · Architectural changes to database for enhanced attribute support
- Increased tablet support

• ... and lots more!

- 14.91 2.0.1 : 2015/Mar/30
- 14.92 2.0.alpha3 : 2015/Mar/27
- 14.93 2.0.alpha1 : 2015/Mar/12
- 14.94 2.0.alpha0 : 2015/Feb/25

#### CHAPTER

#### FIFTEEN

### GLOSSARY

The following terms are used within the KDDart platform:

- Accept/Suppress Values Either accepting values as being valid, or suppressing values that the user deems as invalid. This is useful when multiple users have collected data on the same trait and have differing values.
- Attachments Photos/video captured from the devices camera, audio from the microphone or file(s) uploaded and attached.
- Auto-Advance Scoring A KDSmart feature which allows the user to concentrate on only those Traits for which a measurement has not been provided. It automatically advances to the next un-scored trait to be scored which allows for quicker and more efficient scoring.
- **Bundles** A mechanism for grouping traits and tags to assist with their management e.g. a bundle of tags for varying degrees of bird damage: BD, BD+, BD++, etc.
- Collection Order The way of progressing or walking through a trial or area in which data is to be collected.
- **CSV** Comma Separated Values A widely used, simple text format for transferring data usually created in a spreadsheet and saved in the CSV format. The first row of the file provides the column names and each row following is a data record.
- **Curation** The management of data including accepting, changing, or deleting values that are collected i.e. changing a value for a trait that was entered incorrectly.
- Data Exchange Exchanging data between KDXplore and KDSmart. A connection can be established with KDXchange.
- **Days Since Planting** Ability to enter a date (i.e. by selecting 'Today') which is automatically converted to the number of days since planting, e.g. for recording anthesis.
- **KDDart** Refers to the KDDart Knowledge Discovery System which features centralised database storage for storing phenotypic trial data.
- **KDXchange** The server software within KDXplore and KDSmart which enables them to communicate, for example to copy trials, traits or tags between the devices. This is not a separate application.
- **Phenotypic** Observable characteristics of an individual specimen i.e. The collection of phenotypic data involves recording observable characteristics such as plant height.
- Plots and Sub-Plots Trials contain multiple 'plots' areas, spaces or even pots, uniquely identified by a plot ID or by coordinate (Column/row ID) pairs, or both. Sub-plots are individual specimens within a plot.
- **Scoring Set** A scoring set is a set of trait instances and samples that can be sent from KDXplore to a KDSmart device for scoring. When the data is scored and returned to KDXplore, it appears in the scoring set as a progress meter. Scoring sets can be named and only the trait instances needed to score have to be added (only those trait instances specified for the set in KDXplore are sent to KDSmart).

- **Specimen** The single *unit* or *entity* under investigation and refers to a *sub-plot* or an *individual*. Multiple specimens can be scored within a plot and not all specimens need to be scored.
- Tags Shorthand labels to enable quick annotation of a specimen from a pre-set selection list.
- Traits The phenotypic characteristic being monitored or scored for each plot or specimen (e.g. height, colour, etc.).
- **Trait Instance** A single occurrence of a trait being used. Multiple trait instances can be used in a trial so that one trait can be used more than once.
- Trait Order The order that traits are scored within KDSmart. This order can be changed in KDXplore and KDSmart.

Trial or Nursery This refers to a study, experiment, nursery, project, etc. Multiple trials may be loaded into KDSmart.

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