



# The Breeding Management System (BMS)

Software for plant breeding efficiency and innovation

General Overview

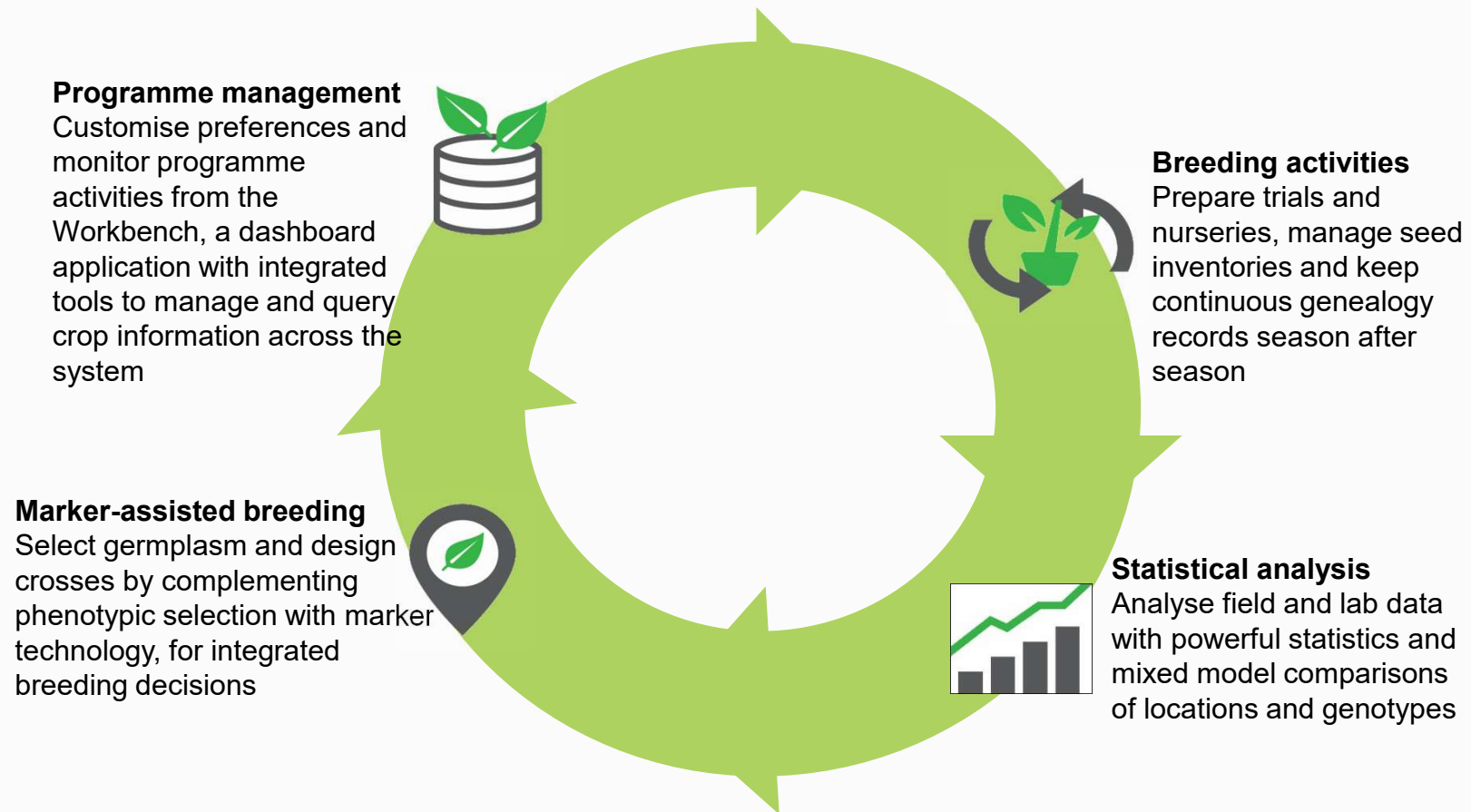


# BMS – What is it?

- **The BMS software is designed to support plant breeders manage a diversity of data:**
  - genealogy, inventory, nurseries, trials, genetic markers and data analysis.
- **Perpetual access to the BMS workbench and database**
- **It is available as a single-user desktop application, as well as in a multi-user server edition for deployment on LAN or in the cloud**

# Breeding Management System (BMS)

**A suite of interconnected software applications specifically designed to help breeders manage their day-to-day activities:**



# BMS – two different editions

## BMS Desktop

*A software package for your personal computer*

### BASIC

- All the basic core functions (trials & nurseries)
- No license fees
- [Download directly from this portal](#)

*\*no support or troubleshooting*

## BMS Server

*A multi-user solution for breeding networks and teams*

- All the basic core functions (trials & nurseries)
- No license fees
- Accessible on demand
- Pick and mix among available services (service fees apply)

### PRO

With a license fee:

- Includes all the basic core functions (trials & nurseries) and proprietary components: Breeding View for statistical analysis and Field Design functionality
- [Download directly from this portal](#)
- Full access to our Help Desk

With a license fee and service package\*:

- Includes all the basic core functions (trials & nurseries) and proprietary components: Breeding View for statistical analysis and Field Design functionality
- Accessible upon purchase
- Support and services package established on the basis of your specific needs

# BMS –Who is it for?

- **Public Institutions**

- Created by the not-for-profit Integrated Breeding Platform (IBP) for breeding programs in developing countries (subsidized users)

- **Cross-institutional projects**

- eg TLIII

- **Small-to-medium businesses** (paying clients)

- **Universities**

- for research and/or teaching

# Categories of users

- **Subsidized clients are people from public institutions in developing countries**

- receive the BMS PRO products and support services free of charge
- costs covered by external resources (donor funds, etc.).



- **All non-subsidized users can access the BMS PRO products as paying clients.**

- Prices and conditions for license and services are scaled in accordance with the institution's nature, size and region.

# BMS as a support tool for education

- **Specific BMS training version**

- Installation on a local or web server
- Concomitant use by multiple users
- Backup and restore
- Training data sets

- **Implementation of academic learning**

- Tutorials and practical exercises available
- Test and compare different breeding approaches
- Simulate breeding programme activities
- BMS course can be part of the student accreditation

- **Added value to students an Universities:**

- Exposure to modern and comprehensive analytical pipeline
- Facilitate integration into private companies
- Same installation can include a production version for **student practical work** and/or **teacher breeding activities**.

# Functionality



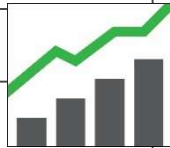
# Core Applications

## Programme & information management



- [WorkBench](#) (dashboard view)
- Breeder Queries
- Ontology Manager (9 crops)
- Germplasm import tool
- Data import wizard

## Statistical analysis – Breeding View:



- Single-site analysis
- Multi-site analysis
- Multi-year multi-site analysis;
- Single trait (single environment) QTL analysis

## Breeding activities



- Germplasm List Manager
- Crossing Manager
- Nursery Manager
- Seed Inventory
- Trial Manager
- Field maps and label printing

## Marker-assisted breeding



- Integrated Breeding Planner
- Genotypic data management
- MBDtool
- OptiMAS

# Roles and Permissions

**Administrators control user access to the system by assignment of customizable roles and permissions**

✓ Admin, Breeder or Technician

The screenshot displays the 'IBP MAIZE' Site Administration interface. A modal window titled 'Add User' is open, allowing the creation of a new user. The modal contains the following fields and options:

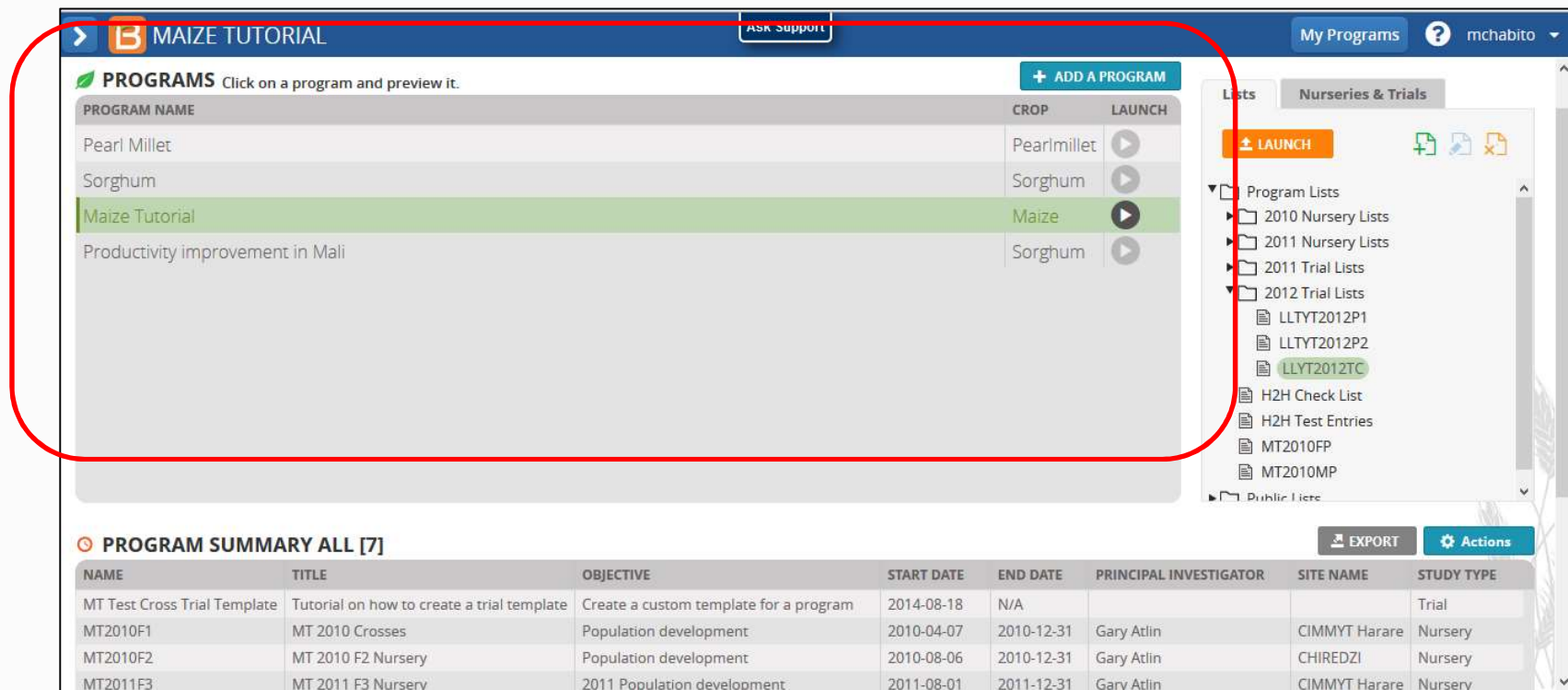
- Name:** Two input fields with 'Gregor' and 'Mendel' entered.
- username:** Input field with 'Gregor' entered.
- Email:** Input field with 'ilovepeas@gmail.com' entered.
- Role:** A dropdown menu with 'Breeder' selected.
- User status:** Radio buttons for 'Active' (selected) and 'Inactive'.
- Send an invitation email:** A checked checkbox with the label 'Send an invitation email for the user to set their password'.
- Buttons:** 'Cancel' and 'Add user' buttons at the bottom.

In the background, the 'Manage users' section is visible, showing a table of existing users and their roles.

User Name	First Name	Role	Status
admin	Admin	Admin	Deactivate
Akintunde	Akinola	Admin	Deactivate
j.backlund	Jan Erik	Admin	Deactivate
Magni	Magni	Admin	Deactivate
val	Val	Admin	Deactivate
val2	Val	Admin	Deactivate
vboir	Val	Admin	Deactivate

# BMS Workbench – Multiple programs

**The Workbench offers access to multiple breeding programs and allows users to add and remove programs as required.**



The screenshot displays the BMS Workbench interface. At the top, there is a navigation bar with a 'MAIZE TUTORIAL' header, a 'Ask Support' button, and a 'My Programs' dropdown menu. Below the navigation bar, the 'PROGRAMS' section is highlighted with a red circle. It features a table with columns for 'PROGRAM NAME', 'CROP', and 'LAUNCH'. The 'Maize Tutorial' program is selected and highlighted in green. To the right of the 'PROGRAMS' section, there is a sidebar with a 'Launch' button and a list of 'Program Lists' including '2010 Nursery Lists', '2011 Nursery Lists', '2011 Trial Lists', '2012 Trial Lists', 'LLTYT2012P1', 'LLTYT2012P2', 'LLTYT2012TC', 'H2H Check List', 'H2H Test Entries', 'MT2010FP', and 'MT2010MP'. Below the 'PROGRAMS' section, there is a 'PROGRAM SUMMARY ALL [7]' table with columns for 'NAME', 'TITLE', 'OBJECTIVE', 'START DATE', 'END DATE', 'PRINCIPAL INVESTIGATOR', 'SITE NAME', and 'STUDY TYPE'.

NAME	TITLE	OBJECTIVE	START DATE	END DATE	PRINCIPAL INVESTIGATOR	SITE NAME	STUDY TYPE
MT Test Cross Trial Template	Tutorial on how to create a trial template	Create a custom template for a program	2014-08-18	N/A			Trial
MT2010F1	MT 2010 Crosses	Population development	2010-04-07	2010-12-31	Gary Atlin	CIMMYT Harare	Nursery
MT2010F2	MT 2010 F2 Nursery	Population development	2010-08-06	2010-12-31	Gary Atlin	CHIREDDI	Nursery
MT2011F3	MT 2011 F3 Nursery	2011 Population development	2011-08-01	2011-12-31	Gary Atlin	CIMMYT Harare	Nursery

# List Manager

MANAGE LISTS

View Lists

View Germplasm

List Details

Browse or search for a list to work with, or import a new list.

Hide List Builder

Build a New List

Build or revise your list by dragging in entries from the left.

CB15WSF1

List Entries

Total Entries: 22 Selected: 4

View List Details

ACTIONS

✓	#	DESIGNATION	CROSS	LOTS AVAILABLE
<input checked="" type="checkbox"/>	1	CGM10	CMS015404 CML50/CMS015406 CML337/CML50	-
<input type="checkbox"/>	2	CGM11	CML503Q/CML502=(CML176^CML264)	-
<input type="checkbox"/>	3	CGM12	CML503 RE/CML502=(CML176^CML264)	-
<input type="checkbox"/>	4	CGM13	CML501=(CL-02709^V)/CML501=(CL-02709^V)-B-B-B	-
<input type="checkbox"/>	5	CGM14	CML502=(CML176^CML264)/CMS015406 CML337/CML50	-
<input checked="" type="checkbox"/>	6	CGM15	CML501=(CL-02709^V)-B/CML502=(CML176^CML264)-16	-
<input checked="" type="checkbox"/>	7	CGM16	CML502=(CML176^CML264)-16/CML502=(CML176^CML264)-16-2	-
<input type="checkbox"/>	8	CGM17	CML501=(CL-02709^V)-B-B/CMS015404 CML50	-
<input checked="" type="checkbox"/>	9	CGM18	CML502=(CML176^CML264)-16-2/AC8078-2-4-1-B	-
<input type="checkbox"/>	10	CGM19	CML501=(CL-02709^V)-B-B-B/CML502=(CML176^CML264)-16-2-3	-
<input type="checkbox"/>	11	CGM20	CML502=(CML176^CML264)-16-2-3/CML503 RE	-
<input type="checkbox"/>	12	CGM21	CML501=(CL-02709^V)-B-B-B-1/CML503Q	-
<input type="checkbox"/>	13	CGM22	CML502=(CML176^CML264)-16-2-3-2/CML502=(CML176^CML264)-16-2	-
<input type="checkbox"/>	14	CGM23	CML501=(CL-02709^V)-B-B-B-1-1/CML501=(CL-02709^V)	-
<input type="checkbox"/>	15	CGM24	CML502=(CML176^CML264)-16-2-3-2-B/AC8078-2-4-1-B	-
<input type="checkbox"/>	16	CGM25	AC8078-2-4-1-B/CML503 RE	-
<input type="checkbox"/>	17	CGM26	CMS015406 CML337/CML50/CML503Q	-

Select All

List Entries

Total Entries: 4 Selected: 0

Edit List Details

ACTIONS

✓	#	DESIGNATION	CROSS	LOTS AVAILABLE
<input type="checkbox"/>	1	CGM10	CMS015404 CML50/CMS015406 CML337/CML50	-
<input type="checkbox"/>	2	CGM15	CML501=(CL-02709^V)-B/CML502=(CML176^CML264)-16	-
<input type="checkbox"/>	3	CGM16	CML502=(CML176^CML264)-16/CML502=(CML176^CML264)-16-2	-
<input type="checkbox"/>	4	CGM18	CML502=(CML176^CML264)-16-2/AC8078-2-4-1-B	-

Select All

Save

Reset

# Germplasm details and Pedigree tree

**BREEDING ACTIVITIES**

- Manage Lists
- Make Crosses
- Manage Nurseries
- Manage Trials

**INFORMATION MANAGEMENT**

- Import Germplasm
- Manage Genotyping Data
- Browse Studies
- Head to Head Query
- Adapted Germplasm Query
- Manage Ontologies
- Trait Donor Query

**STATISTICAL ANALYSIS**

- Single-Site Analysis
- Multi-Site Analysis
- Multi-Year Multi-Site Analysis
- Breeding View Standalone

**MANAGE LISTS**

Germplasm Details: MARINGA (GID: 2900)

+ Add to list

**Pedigree Graph**

```
graph TD; P1[ ] --> P2[ ]; P1 --> P3[ ]; P2 --> P4[ ]; P3 --> P4[ ]; P4 --> P5[ ]; P5 --> P6[ ]; P6 --> P7[ ]; P7 --> P8[ ]; P8 --> P9[ ]
```

Breeding Management System 3.0.9

# Crossing Manager or Export template

MANAGE CROSSES ?

MAKE CROSSES

1.CHOOSE SETTING

2.CREATE CROSSES

Select Parents

Browse for a list to work with.

FingerPLines x

LIST ENTRIES

Total Entries: 23

View List Header

ACTIONS

✓	#	DESIGNATION	PARENTAGE	ENTR
<input checked="" type="checkbox"/>	1	TVU 12802		UCRT
<input checked="" type="checkbox"/>	2	TVU 7971		UCRT
<input type="checkbox"/>	3	IT98K-1103-13		UCRT
<input type="checkbox"/>	4	58-77		UCRT
<input checked="" type="checkbox"/>	5	Lenteja		UCRT
<input checked="" type="checkbox"/>	6	Gorda		UCRT
<input type="checkbox"/>	7	CC-85-2		UCRT
<input type="checkbox"/>	8	05066-002		UCRT
<input type="checkbox"/>	9	Namurua		UCRT

☐ Select All

Parent Lists

Select and drag entries from a list on the left to modify a parent list.

Female Parents

Male Parents

LIST ENTRIES

Total Entries: 2

ACTIONS

✓	#	DESIGNATION
<input checked="" type="checkbox"/>	1	TVU 12802
<input checked="" type="checkbox"/>	2	TVU 7971

CROSS LIST

View List Details

ACTIONS

Export Cross List

#	DESIGNATION	PARENTAGE	ENTRY CODE	GID	SEED SOURCE	FEMALE PARENT	FGID	MALE PARENT	WID	
1	CPT001	TVU 12802/Lenteja	1	-1348	Female Parents:1/Male Parents:1	TVU 12802	6536	Lenteja	1000004	Th
2	CPT002	TVU 12802/Gorda	2	-1349	Female Parents:1/Male Parents:2	TVU 12802	6536	Gorda	1000005	Th
3	CPT003	TVU 7971/Lenteja	3	-1350	Female Parents:2/Male Parents:1	TVU 7971	15006	Lenteja	1000004	Th
4	CPT004	TVU 7971/Gorda	4	-1351	Female Parents:2/Male Parents:2	TVU 7971	15006	Gorda	1000005	Th
5	CPT005	Lenteja/TVU 12802	5	-1352	Male Parents:1/Female Parents:1	Lenteja	1000004	TVU 12802	6536	Th
6	CPT006	Lenteja/TVU 7971	6	-1353	Male Parents:1/Female Parents:2	Lenteja	1000004	TVU 7971	15006	Th
7	CPT007	Gorda/TVU 12802	7	-1354	Male Parents:2/Female Parents:1	Gorda	1000005	TVU 12802	6536	Th
8	CPT008	Gorda/TVU 7971	8	-1355	Male Parents:2/Female Parents:2	Gorda	1000005	TVU 7971	15006	Th

FEMALE PARENT LIST DETAILS

Saved as: Program Lists > Female Parents

Description: F1 cross for manual

List Type: GERMPPLASM LISTS

Date: 20140703

HARVEST DETAILS

Harvest Location: IITA IBADAN

Date: 2014

Done

MALE PARENT LIST DETAILS

Saved as: Program Lists > Male Parents

Description: F1 cross manual

List Type: GERMPPLASM LISTS

Date: 20140703

BMS server edition: Export template for designing crosses

MANAGE NURSERIES

Nursery: Oct28\_MW

Save

Return to Manage Nurseries

BASIC DETAILS

Nursery Settings

Germplasm & Checks

Measurements

Advance List: [New F2s] X

This Nursery has saved observations, germplasm list cannot be modified.

Nursery List

Total Entries: 342 View Header

Position	ENTRY_NO	DESIGNATION	GID	CROSS	SEED_SOURCE	ENTRY_CODE
1	1	GLS crosses001	353601	CML503Q/CLQ-6203/CML144	Female list testing MW-1/Mak 1	
2	2	GLS crosses002	353602	CML503Q/CLQ-RCWQ38=(CM	Female list testing MW-1/Mak 2	
3	3	GLS crosses003	353603	CML503Q/CLQ-RCWQ39=(CM	Female list testing MW-1/Mak 3	
4	4	GLS crosses004	353604	CML503Q/CML144=P62C5F1	Female list testing MW-1/Mak 4	
5	5	GLS crosses005	353605	CML503Q/CML492=P62C3HC	Female list testing MW-1/Mak 5	
6	6	GLS crosses006	353606	CML503Q/CLQ-RCWQ13=(A8	Female list testing MW-1/Mak 6	
7	7	GLS crosses007	353607	CML503Q/CML491/CML503 R	Female list testing MW-1/Mak 7	
8	8	GLS crosses008	353608	CML503Q/ICML146/CLQ-620	Female list testing MW-1/Mak 8	
9	9	GLS crosses009	353609	CML503Q/ICML146/CLQ-620	Female list testing MW-1/Mak 9	
10	10	GLS crosses010	353610	CML503Q/ICLQ-6203XCML14	Female list testing MW-1/Mak 10	
11	11	GLS crosses011	353611	CML503Q/CLQ-RCWQ38=(CM	Female list testing MW-1/Mak 11	
12	12	GLS crosses012	353612	CML503Q/ICL-04935/CML147	Female list testing MW-1/Mak 12	
13	13	GLS crosses013	353613	CML503Q/ICL-04935/CML147	Female list testing MW-1/Mak 13	
14	14	GLS crosses014	353614	CML503Q/ICML144/CML384	Female list testing MW-1/Mak 14	
15	15	GLS crosses015	353615	CML503Q/ICML144/CML384	Female list testing MW-1/Mak 15	
16	16	GLS crosses016	353616	CML503Q/ICML144/CML384	Female list testing MW-1/Mak 16	
17	17	GLS crosses017	353617	CML503Q/ICML144/CML384	Female list testing MW-1/Mak 17	

Selected Checks

Add Types

ENTRY_TYPE	DESIGNATION
Check entry	CML144/CML384-B-1-2-2-3/CML503
Check entry	CML144/CML384-B-3-2-2-1/CML503
Check entry	CML144/CML384-B-3-2-2-2/CML503

SPECIFY CHECKS

Specify the position where the first check will be inserted: \*

1

Choose how checks should be inserted:

Insert all checks at each position

Specify the number of rows between insertion points: \*

24

# Advance Nurseries

BREEDING ACTIVITIES

Manage Germplasm

Manage Nurseries

Manage Trials

INFORMATION MANAGEMENT

STATISTICAL ANALYSIS

PROGRAM ADMINISTRATION

IBP MAIZE

Site AdminMy Programs? admin

MANAGE NURSERIES

Nursery:

BASIC DATA

Nursery Settings

Cross List: F1

Total Entries: 75

100

ENTRY\_NO DES

1	IB2
2	IB2
3	IB2
4	IB2
5	IB2
6	IB2
7	IB2
8	IB2
9	IB2
10	IB2
11	IB2
12	IB2

Advance nursery

\* indicates a mandatory field

METHODS

☒ Breeding Method is the same for each advance

Single seed descent - DSD

☒ Derivative and Maintenance methods

☐ All methods

☐ Show only favorite methods Manage Methods

LINES

☒ Same number of lines is selected for each plot

Lines Selected per Plot:

1

HARVEST DETAILS

Harvest Location:

Breeding locations

All locations types

☒ Show only favorite locations Manage Locations

Harvest Date:

2017

07

CancelFinish

BMS 6.1

# Seed Inventory: track seed stocks

BREEDING ACTIVITIES

Manage Germplasm

Manage Nurseries

Manage Trials

INFORMATION MANAGEMENT

STATISTICAL ANALYSIS

PROGRAM ADMINISTRATION

IBP MAIZE

Site Admin

My Programs

admin

MANAGE NURSERIES

Nursery: Crossing Nursery 2017

Save

Return to Manage Nurseries

BASIC DETAILS

Nursery Settings

Germplasm & Checks

Measurements

Designed Crosses: [F1]

Stock List: [F1]

Actions

Cross List: F1

Notes:

Total Entries: 75 Selected: 0

100 Showing 1 to 75 of 75 entries

ENTRY_NO	DESIGNATION	CROSS	FEMALE PARENT	FGID	MALE PARENT	MGID	GID	SEED_SOURCE
1	IB2589	BMS1/BMS6	BMS1	651	BMS6	656	12960	Crossing Nursery 2017:1/Crossing Nursery 2017:6
2	IB2590	BMS1/BMS7	BMS1	651	BMS7	657	12961	Crossing Nursery 2017:1/Crossing Nursery 2017:7
3	IB2591	BMS1/BMS8	BMS1	651	BMS8	658	12962	Crossing Nursery 2017:1/Crossing Nursery 2017:8
4	IB2592	BMS1/BMS9	BMS1	651	BMS9	659	12963	Crossing Nursery 2017:1/Crossing Nursery 2017:9
5	IB2593	BMS1/BMS10	BMS1	651	BMS10	660	12964	Crossing Nursery 2017:1/Crossing Nursery 2017:10
6	IB2594	BMS1/BMS11	BMS1	651	BMS11	661	12965	Crossing Nursery 2017:1/Crossing Nursery 2017:11
7	IB2595	BMS1/BMS12	BMS1	651	BMS12	662	12966	Crossing Nursery 2017:1/Crossing Nursery 2017:12
8	IB2596	BMS1/BMS13	BMS1	651	BMS13	663	12967	Crossing Nursery 2017:1/Crossing Nursery 2017:13
9	IB2597	BMS1/BMS14	BMS1	651	BMS14	664	12968	Crossing Nursery 2017:1/Crossing Nursery 2017:14
10	IB2598	BMS1/BMS15	BMS1	651	BMS15	665	12969	Crossing Nursery 2017:1/Crossing Nursery 2017:15
11	IB2599	BMS1/BMS16	BMS1	651	BMS16	666	12970	Crossing Nursery 2017:1/Crossing Nursery 2017:16

Lot Details for BMS1 (GID:651)

Lot 77

Location : Default Seed Store

Scale : SEED\_AMOUNT\_g

Creation Date : 20170119

Lot Status : Active

Actual Balance : 2075.0g

Available Balance : 2050.0g

The table below shows the transaction details for lot 77

DATE	TYPE	AMOUNT	SEED SOURCE	LIST NAME	USER
20170119	Deposit	2465.0g		Parental Germplasm	admin
20170119	Withdrawal	-200.0g		Parental Germplasm	admin
20170317	Withdrawal	-100.0g		Parental Germplasm	Shawn
20170405	Withdrawal	-90.0g		Parental Germplasm	Michel
20170728	Reservation	-25.0g		Parental Germplasm	admin

# Trial Manager: Field Testing

## ■ **Field trials generated**

- describe the trial
- select a list of germplasm for testing
- specify the trial environment(s)
- specify the trial design and generate the layout
  - (or import your own design)
- specify traits to be measured and produce fieldbooks

## ■ **collect data**

- check and store data

# Field Plan

## FIELD PLAN ?

### MAKE A FIELD PLAN

1. ENTER FIELD DETAILS

2. ENTER PLANTING DETAILS

3. GENERATE FIELD MAP

#### SUMMARY OF TRIAL, FIELD AND PLANTING DETAILS

Selected Trials:

Order	Trial	Instance	# of Entries	# of Reps	Plots Needed
1	Trial457-3	2	55	2	110

Total Number of Plots : 110

#### FIELD AND BLOCK DETAILS

Field Location: CIMMYT Harare

Field Name: Field 1

Block Name: Block 2

#### FIELD MAP

Arrows indicate direction of travel of the planting

#### ROW, RANGE AND PLOT DETAILS

Block Capacity: 80 Rows, 50 Ranges

Rows per Plot: 4

#### PLANTING DETAILS

Starting Coordinates: Column 1, Range 1

Plot Layout Order: Row/Column

Range 4	Trial457-3-61 Entry 20 Rep 2				Trial457-3-62 Entry 14 Rep 2			
Range 3	Trial457-3-41 Entry 25 Rep 1				Trial457-3-42 Entry 16 Rep 1			
Range 2	Trial457-3-21 Entry 23 Rep 1				Trial457-3-22 Entry 9 Rep 1			
Range 1	Trial457-3-1 Entry 32 Rep 1				Trial457-3-2 Entry 6 Rep 1			
	Column 1				Column 2			
	↑				↓			
Rows	1	2	3	4	5	6	7	8

# Labels

## CHOOSE LABEL FIELDS

Your labels can include up to five rows, with two fields per row. Drag items from the Available Fields into the Left or Right Side Fields to design your label layout.

### Available Fields

Parentage

Year

Season

Location

Trial Name

Trial Instance #

Rep

Plot No.

### Left Side Fields

Entry #

Germplasm Name

### Right Side Fields

GID

## BARCODE OPTIONS

Do you need barcodes on your labels? ☒ Yes ☐ No

You can use a single field for your barcode, or join up to three fields to create a unique ID value of your labels

First barcode field:

Trial Name

Second barcode field:

Trial Instance #

Third barcode field:

Plot No.



Trial457-3 | 1 | 1

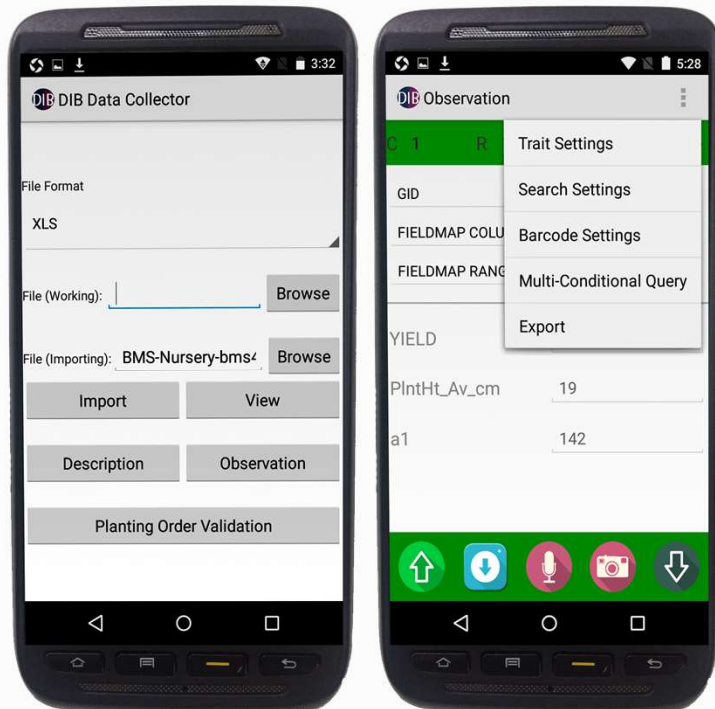
45

CKT025025

311580

# Electronic data capture

**Connect to Android-based tablet devices for data collection in the field and laboratory; e.g.:**



## **DIB Data Collector**

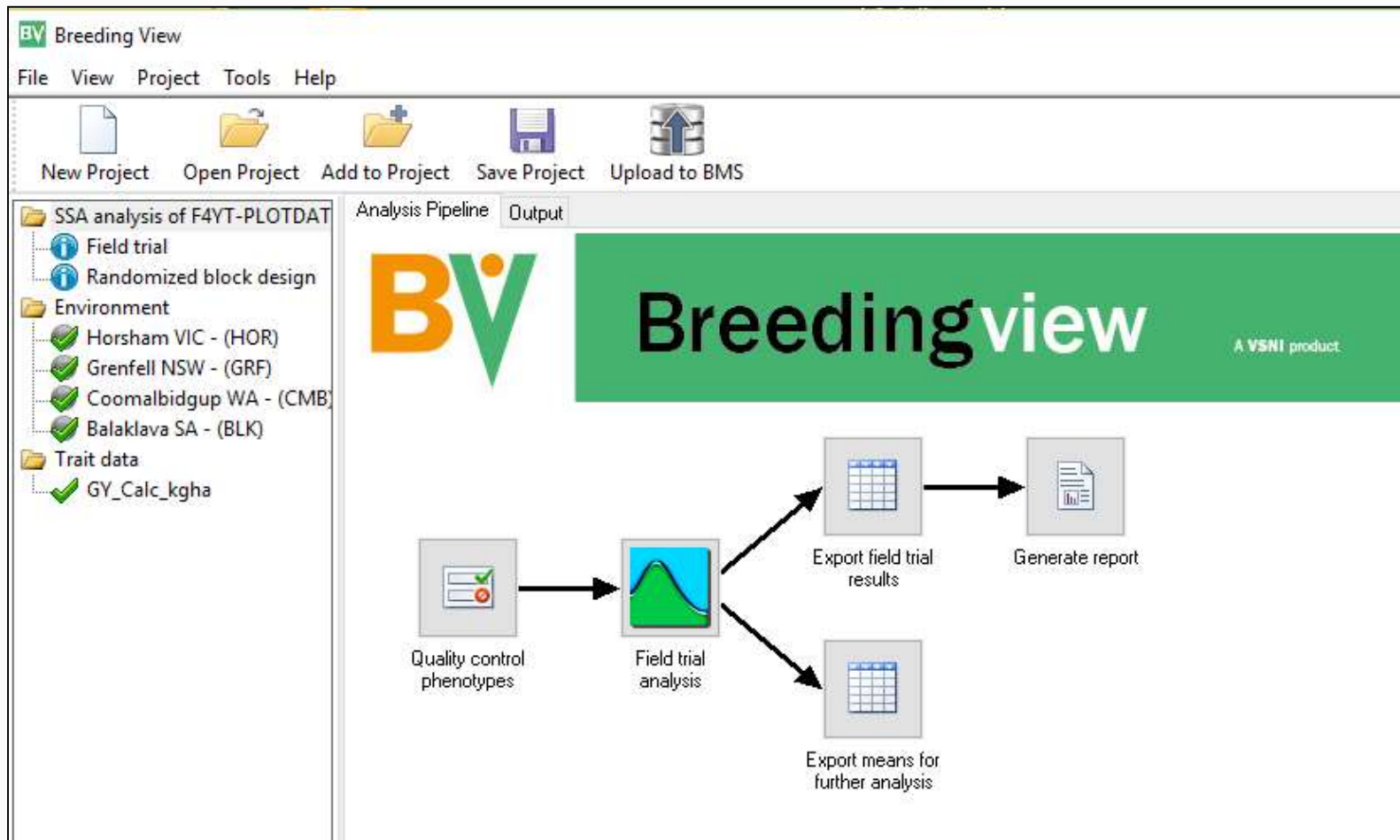
(from BioSci Thailand, a DataLive partner)

### **Features**

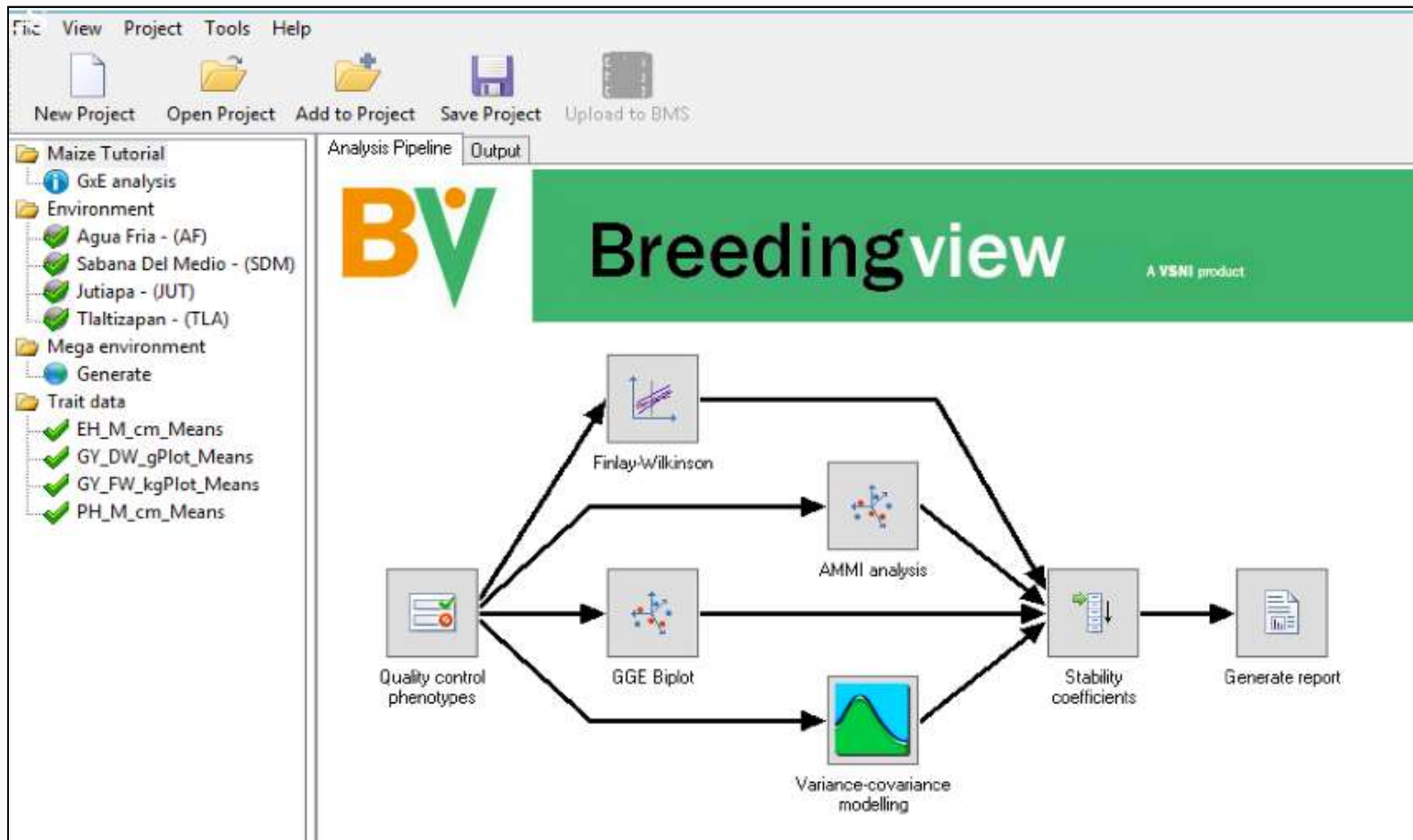
- Robust
- Anti-sunglare
- Waterproof
- Anti-Dust
- Long life battery
- Built in barcode reader

**Interfaces directly with the BMS**

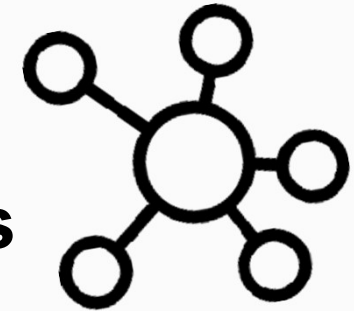
# Stats Analysis – Single Site



# Stats – Multi site Analysis



# BMS Plugins



- **Developed with partners, these tools are fully integrated with the BMS:**

- **Integrated Breeding Planner**

Lists all molecular breeding programs within an open project. Three distinct programs can be considered: MARS, MABC and MAS for gene pyramiding.

- **Molecular Breeding Design Tool (MBDT)**

Designs ideotypes based on QTL target regions (foreground markers) and recovers recurrent parent genome (background markers) in backcross breeding applications. The graphical display facilitates the comparison of germplasm based on genotype.

- **OptiMAS**

Helps making decisions on the basis of the marker-assisted breeding plan generated by the Breeding Planner, by predicting the probability of allele transmission in different MAS schemes and mating designs (intercrossing, selfing, backcrossing, double haploids, RIL).

- **Integrated SNP Mining and Utilisation Pipeline (ISMU)**

A Graphical User Interface (GUI)-based software application that is used to perform SNP discovery and developing genotyping assays (version 1.0), and to facilitate the conduct of Genomic Selection (version 2.0).

# Associated services



# Targeted and dedicated support

- **Technical Support (IT):**

- Level 1 – **Installation**: implementing and getting started with the BMS and related tools
- Level 2 – **Operational**: day-to-day use of the BMS PRO and related tools – hours in the bank with a service package

- **Professional Support (Breeders):**

- Customized breeding support primarily in developing countries
- Capacity development and training in using the tools

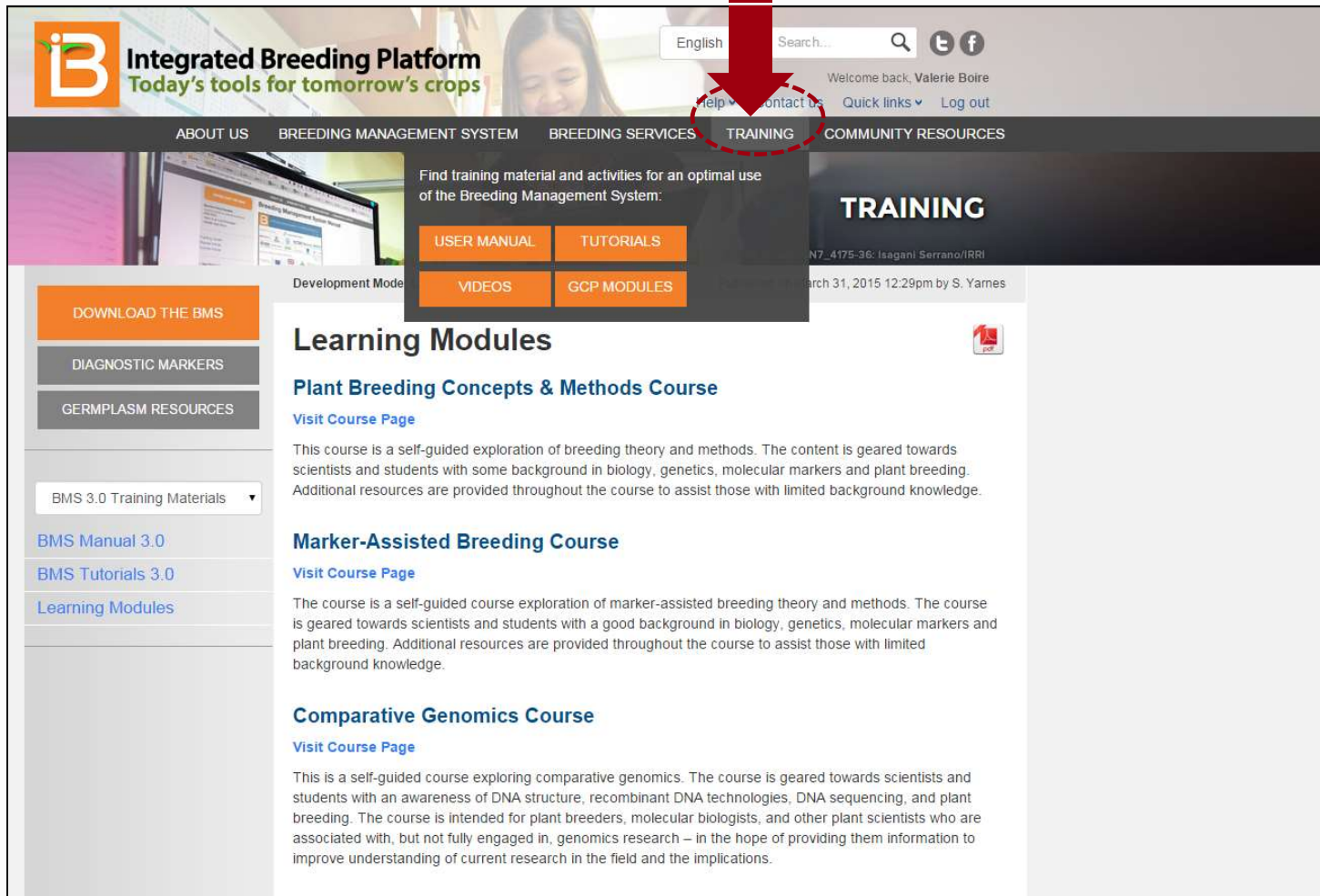
- **Online Documentation**

- Complete user manual and step-by-step tutorials by crop
- Instructional videos and e-learning modules



# Documentation and training

[www.IntegratedBreeding.net](http://www.IntegratedBreeding.net)



The screenshot displays the Integrated Breeding Platform (IBP) website. The header features the IBP logo with the tagline "Today's tools for tomorrow's crops". A navigation bar includes links for "ABOUT US", "BREEDING MANAGEMENT SYSTEM", "BREEDING SERVICES", "TRAINING", and "COMMUNITY RESOURCES". A red arrow points to the "TRAINING" link. Below the navigation bar, a "TRAINING" section is highlighted with a dark background. The main content area is titled "Learning Modules" and lists three courses: "Plant Breeding Concepts & Methods Course", "Marker-Assisted Breeding Course", and "Comparative Genomics Course". Each course has a "Visit Course Page" link. A sidebar on the left contains links for "DOWNLOAD THE BMS", "DIAGNOSTIC MARKERS", "GERMPLASM RESOURCES", and "BMS 3.0 Training Materials".

**Integrated Breeding Platform**  
Today's tools for tomorrow's crops

English Search... Welcome back, Valerie Boire  
Help Contact us Quick links Log out

ABOUT US BREEDING MANAGEMENT SYSTEM BREEDING SERVICES **TRAINING** COMMUNITY RESOURCES

Find training material and activities for an optimal use of the Breeding Management System:

USER MANUAL TUTORIALS  
VIDEOS GCP MODULES

**TRAINING**

Development Mode

**Learning Modules**

**Plant Breeding Concepts & Methods Course**  
[Visit Course Page](#)  
This course is a self-guided exploration of breeding theory and methods. The content is geared towards scientists and students with some background in biology, genetics, molecular markers and plant breeding. Additional resources are provided throughout the course to assist those with limited background knowledge.

**Marker-Assisted Breeding Course**  
[Visit Course Page](#)  
The course is a self-guided course exploration of marker-assisted breeding theory and methods. The course is geared towards scientists and students with a good background in biology, genetics, molecular markers and plant breeding. Additional resources are provided throughout the course to assist those with limited background knowledge.

**Comparative Genomics Course**  
[Visit Course Page](#)  
This is a self-guided course exploring comparative genomics. The course is geared towards scientists and students with an awareness of DNA structure, recombinant DNA technologies, DNA sequencing, and plant breeding. The course is intended for plant breeders, molecular biologists, and other plant scientists who are associated with, but not fully engaged in, genomics research – in the hope of providing them information to improve understanding of current research in the field and the implications.

**DOWNLOAD THE BMS**  
DIAGNOSTIC MARKERS  
GERMPLASM RESOURCES

BMS 3.0 Training Materials ▼  
[BMS Manual 3.0](#)  
[BMS Tutorials 3.0](#)  
[Learning Modules](#)

# Online helpdesk & support knowledge base

[www.IntegratedBreeding.net](http://www.IntegratedBreeding.net) – Under the ‘Help’ tab  
<https://ibplatform.atlassian.net/servicedesk/>

The screenshot shows the IBP Support Knowledge Base interface. At the top, there's a header with the IBP logo and the text "IBP Support Integrated Breeding Platform". Below this, a welcome message states: "Welcome to our Help Desk! To raise an issue directly with us, please select the appropriate issue type among the two (2) categories below (BMS Support, or Feedback & Other enquiries), to allow your request to be adequately channelled, and thus attended as promptly as possible." A search bar is present with the placeholder text "What do you need help with?". Below the search bar, there are two main categories: "BMS Support" and "Feedback & Other enquiries". Under "BMS Support", there are several links: "Download and Installation" (with a download icon), "Report a Bug" (with a warning icon), "Breeding Functionalities" (with a circular arrow icon), "Data Management" (with a database icon), "Manuals, Tutorials & Capacity Development" (with a book icon), "Technical Documentation" (with a code icon), and "Suggest Improvements" (with a lightbulb icon). Each link has a brief description of the support it provides.

The screenshot shows the IBP Support Knowledge Base interface. At the top, there's a header with the IBP logo and the text "IBP Support Knowledge Base". Below this, there's a search bar with the placeholder text "Browse our knowledge base to find answers to known issues:". Below the search bar, there are three main sections: "Frequently asked questions", "Online resources", and "Need more help?". Each section contains a list of links. The "Frequently asked questions" section includes links for "About the Breeding Management System (BMS)", "About the Integrated Breeding Platform (IBP)", "IBP Website questions", "Training opportunities", and "Intellectual Property". The "Online resources" section includes links for "GitHub documentation for developers and IT managers", "BMS manual", "BMS tutorials", "Video instructions", "e-learning modules", and "Crop information & genomics". The "Need more help?" section includes links for "Send a request through our Help Desk", "Contact VSN Support for DESKTOP licensing and/or installation issues", "Contact the IBP Hub in your region", "Communities of practice", "Support, maintenance and consultancy services", and "Professional courses". Below these sections, there's a "Browse by topic" section with a grid of links organized by letter (A, B, C, D-F, G-H). The "Recently updated articles" section at the bottom right lists several articles with their titles, dates, and authors.

# IBP: more than just the BMS –

e.g. Markers; 3<sup>rd</sup> party services; etc.

[www.IntegratedBreeding.net](http://www.IntegratedBreeding.net)

The screenshot displays the Integrated Breeding Platform (IBP) website. The header features the IBP logo, the tagline "Today's tools for tomorrow's crops", a language selector (English), a search bar, and social media icons. The main navigation bar includes links for ABOUT US, BREEDING MANAGEMENT SYSTEM, BREEDING SERVICES, TRAINING, and COMMUNITY RESOURCES. A large banner for the BREEDING MANAGEMENT SYSTEM (BMS) is visible, with a photo credit to IIRI. A dropdown menu for BREEDING SERVICES is open, showing two columns: PARTNER SERVICES (Order genotyping services from LGC, More genotyping services, Phenotyping services, Location & climate maps, BMS complementary software, More third-party software, Hardware options) and IBP PRODUCTS (Crop information & genomics, Trait-linked markers, KASPar SNP markers, Germplasm). The left sidebar contains links for DOWNLOAD THE, TRAIT-LINKED MAP, GERMPLASM, Genotyping, Phenotyping and protocols, Location and climate maps, BMS Complementary Software, and a section for selection decision and add a file with QTL additive effects and OptiMAS.

**Integrated Breeding Platform**  
Today's tools for tomorrow's crops

English Search... [Icons: Twitter, Facebook]

Help Contact us Log in Create an account

ABOUT US BREEDING MANAGEMENT SYSTEM BREEDING SERVICES TRAINING COMMUNITY RESOURCES

**BREEDING MANAGEMENT SYSTEM (BMS)**  
Photo Credit: IIRI

Tap into our vast network of partners and service providers to access quality services, concessionary prices, complementary software tools and more. Our product catalogue offers public access to diagnostic markers and genetic resources... [read more](#)

**PARTNER SERVICES**

- Order genotyping services from LGC
- More genotyping services
- Phenotyping services
- Location & climate maps
- BMS complementary software
- More third-party software
- Hardware options

**IBP PRODUCTS**

- Crop information & genomics
- Trait-linked markers
- KASPar SNP markers
- Germplasm

**DOWNLOAD THE**

**TRAIT-LINKED MAP**

**GERMPLASM**

**Genotyping**

**Phenotyping and protocols**

**Location and climate maps**

**BMS Complementary Software**

selection decision and add a file with QTL additive effects and OptiMAS will use this information to compute predicted genotypic values. You can also combine any of the information available (QTL, predicted values, molecular scores, quantitative traits) into a selection index to rank individuals and identify the best crosses to make.

**OptiMAS**

computation of genotypic probabilities - Estimation of genetic

Genotyping errors coming from the genotypespedigree file (.dat) file and recorded in the "events\_summarylog" file (if present) can be filled with missing data ("") after that the consistency of marker genotyping information has been checked along generations of selection. A new map file (.map) has been created to run OptiMAS marker by marker, cycle by cycle, in order to check genotyping errors along the pedigree. A new genotypespedigree file is created with genotyping errors filled with missing data.

Data file to import:

Special map file (.map):  Browse...

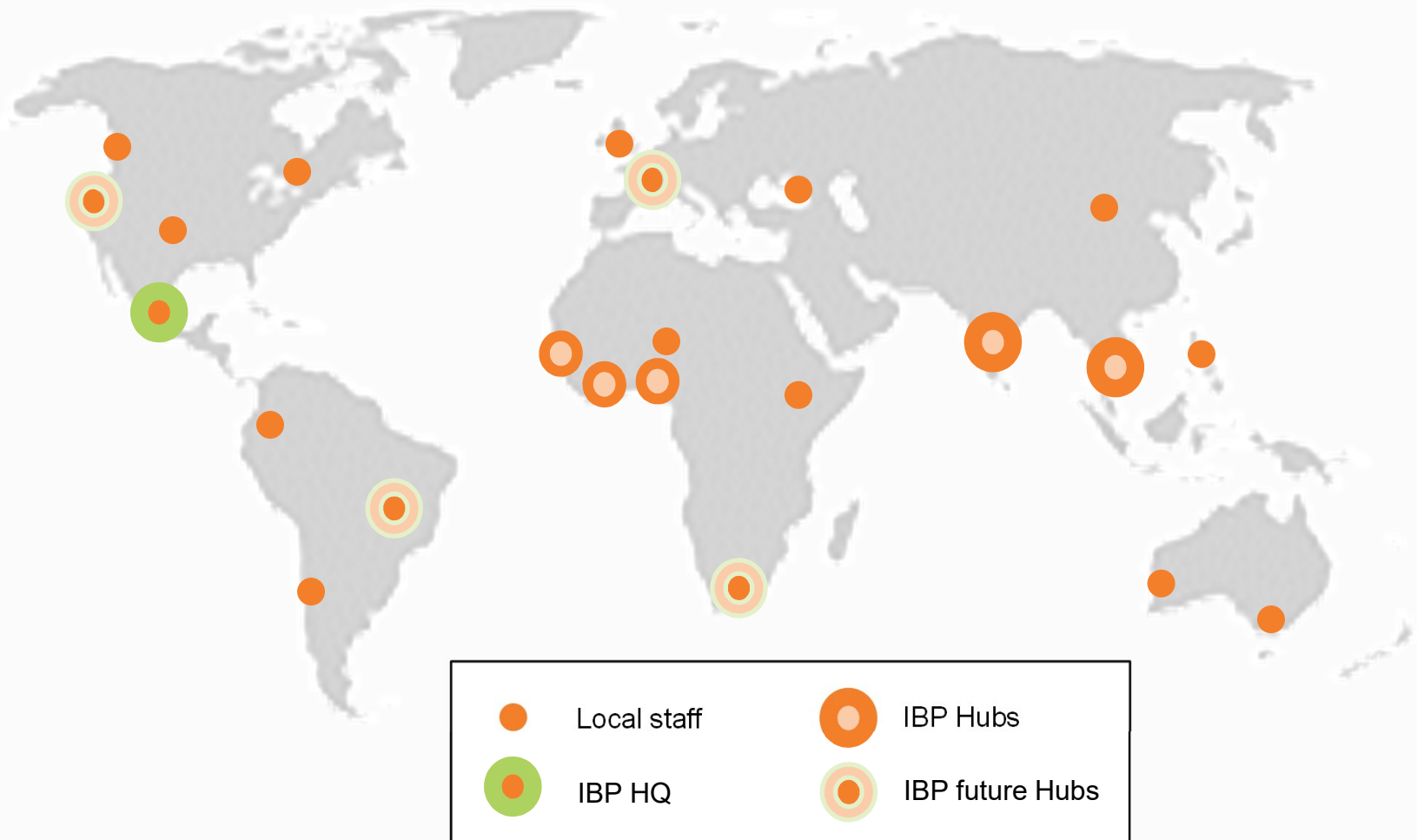
Genotypespedigree file:  Browse...

Output directory:  Browse...

Results (new ".dat" file):  Browse...

Run Close Help

# Local support teams: providing assistance where you need it



# Value proposition



## all in one place

1 software suite, 1 license, 1 provider to assist you  
load and carry your data seamlessly between tools

## safe, standardized and centralized

no more loose pages or scattered excel sheets  
use a common language and conventions

## more results in less time

collect & analyze in days rather than months  
extract more data from each breeding cycle

## institutional memory

keep records for an infinite number of generations  
mitigate the brain drain effect

## team collaboration

connect and share across decentralized locations  
open or close access to members

## knowledge builds value

beyond collecting data pieces:  
observe trends, gain foresight and innovate

all in one place  
safe, standardized and centralized  
beyond collecting data pieces:  
observe trends, gain foresight and innovate



Credit (photo in tablet): N.Palmer/CIAT

# Clear benefits

## A comprehensive suite

- Flexible standalone or LAN solution for a decentralized organizations (cloud solution also coming soon)
- Manages breeding information as well as workflow
- Support multiple crops within one system
- Statistical tools for data analysis and quantitative genetics
- Applications for a gradual transition into integrating genotypic data
- Data visualization tools, and advanced analytics and decision support tools for better breeding outcomes
- Easily integrates with external technologies

## Meeting educational and research objectives

- Online educational resources to help integrate breeding theory with cutting-edge breeding technologies
- Customizable educational materials to integrate into a plant breeding curriculum
- IBP staff to assist with structuring workshops and curricula

## Improved data management

- More security and preservation / legacy
- Standardized documentation and quality control
- Easier and faster retrieval and sharing
- All in one place, from the field to the lab, thanks to electronic data capture capabilities

## Dedicated support

- Adapted, from small workgroups to big scale breeding programs
- Affordable professional support and training for change management and to ensure success in implementing new technology
- Collaboration with international institutions, professionals and academics in extended communities and networks
- Dedicated relationship: we know your business and understand your local needs

## Tangible impact

- Crop research data management
- Breeding programme efficiency
- Crop improvement practices and outputs
- Ultimately, on regional economies and food security

# Tangible impact at all levels

## ■ **Breeders:**

- Increase data quality, documentation and exchange
- Savings in time and cost to run breeding activities and to bring new crop varieties
- Increased genetic gain at each crop cycle
- Enhanced certainty in crop breeding outcomes
- Students: learning now how to use breeding software now is added value for prospective employers

## ■ **Institutions:**

- Improved institutional data management
- Better product at a lower price (efficiency and effectiveness)
- Improve the value proposition to attract funding (public) / further Corporate Social Responsibility (CSR) objectives (private)

## ■ **Society:**

- Improved crops (quality and yield) in farmers' fields
- More income for smallholder farmers, contributing to a larger-scale impact on regional economy
- More and better food to feed the world



# Next steps:

- Register on our website: [www.integratedbreeding.net](http://www.integratedbreeding.net)
  - Download the BMS (free trial of PRO functionality)
  - Access tutorials, videos, publications and more
  - View other presentations, fact sheets and case studies
  - Join a Peer Community
  - Get special rates on breeding services through our network of providers
- Request a personalized demo of the BMS:  
[deployment@integratedbreeding.net](mailto:deployment@integratedbreeding.net)



Our team will be happy to answer your questions!



**Integrated Breeding Platform**  
Today's tools for tomorrow's crops

[www.integratedbreeding.net](http://www.integratedbreeding.net)

@IBPlatform • /IntegratedBreedingPlatform

