



Integrated Breeding Platform

Today's tools for tomorrow's crops

# Breeding Management System

v3.0

Data Management Tutorial for Cassava

IBP Project Team

GENERATION CHALLENGE PROGRAMME

SEPTEMBER 2014



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# About this course

## Contributors

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## Funding & Acknowledgements

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Cassava Breeding Schema provided by CIAT. Data may have been adapted for training purposes. Any misrepresentation of the original data is the solely the responsibility of the IBP.

# Rationale

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## Importance of Data Management

The modern breeder has to gather, store and analyze huge quantities of data. Data generated during breeding processes has immediate value, as well as cumulative value over years and populations. Value-added data requires high standards of sample and pedigree information, and integration of field and laboratory data. Hence, maintaining the **quality** of data - more than quantity - is paramount.

The marriage of sound data management practices and the use of reliable software is crucial for ensuring that data are up-to-standard and Sh.A.R.P.:

- **Shareable:** more accessible to research partners; national and global linking of data.
- **Available:** enables reliable analysis and conclusions; leads to better science and more sophisticated research.
- **Re-usable:** more likely to be used again for the same purpose or an entirely different one.
- **Preservable:** crucial for historically significant data.

## Breeding Logistics and the BMS

The Breeding Management System (BMS) provides a suite of reliable software applications that work together seamlessly, transferring data from one tool to the next through successive steps in a breeding workflow. A breeder's routine processes and activities (seen in Figure 1) can be grouped into three categories:

- Program Planning
- Data Collection, Storage, Curation & Management
- Statistical Analysis and Decision Support

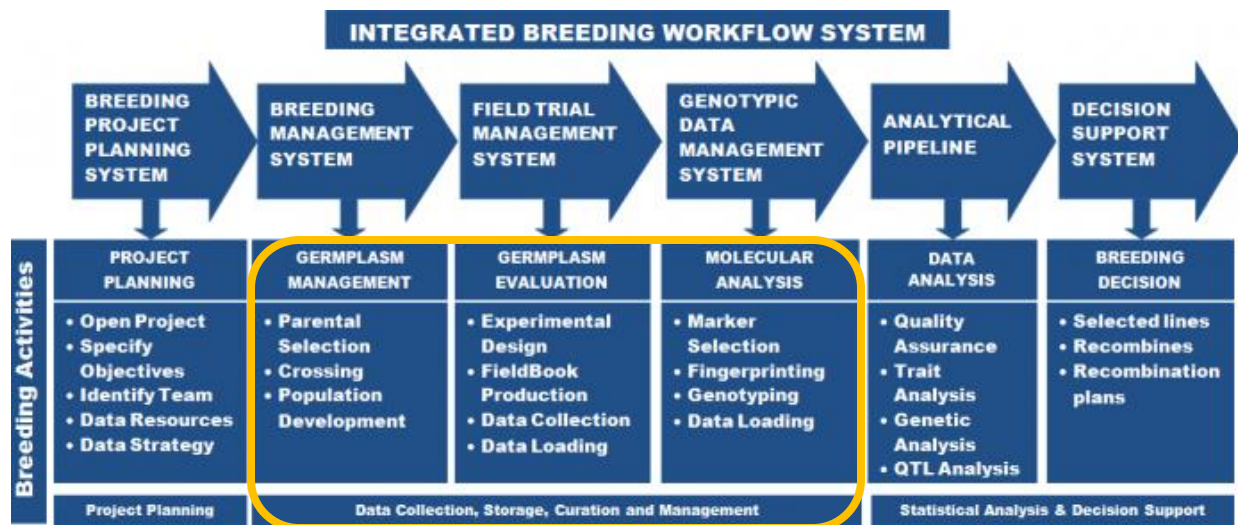


Figure 1. Breeding Activities

This course is focused on how BMS tools can support a breeder's **Data Collection, Storage, Curation & Management** activities, though it will also touch on some Program Planning and Statistical Analysis tasks:

- Manage records about program team members, locations, breeding methods
- Browse and import germplasm to prepare parental material
- Make crosses and develop populations
- Track pedigrees and seed inventory
- Select and annotate traits
- Generate experimental designs
- Produce nursery books, fieldbooks, fieldplans and labels
- Collect phenotyping data using a handheld device
- Validate and store phenotyping data
- Conduct statistical analysis on phenotyping data
- Manage information about molecular markers

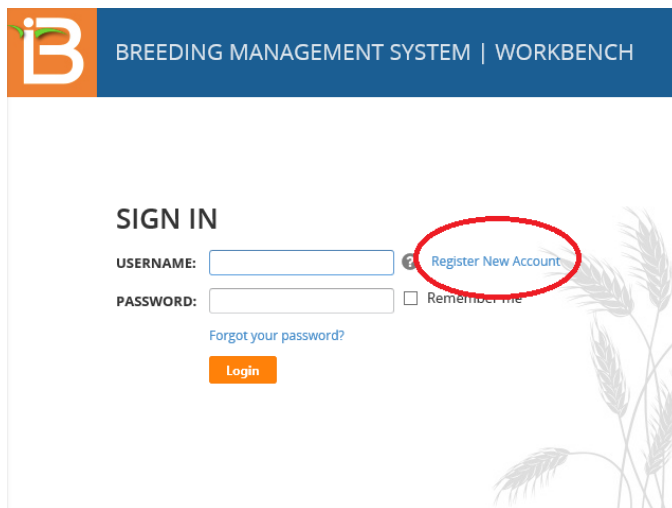
## Before you begin...

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### BMS Basics

#### Registration

After successfully downloading the BMS from the IBP Portal and installing it on your computer, it is necessary to register for a BMS user account so you can start using the System. **Note: The IBP Portal and the BMS do not share login information.**



**iB** BREEDING MANAGEMENT SYSTEM | WORKBENCH

**SIGN IN**

USERNAME:  [Register New Account](#)

PASSWORD:   Remember me

[Forgot your password?](#)

#### Home page

After a successful login, the user is brought to the BMS Home page. The Home page acts as the user's workbench, offering access to multiple breeding programs and allows users to add and remove programs as required. **Note: Initially, the Home page will NOT show any programs.**

# HOME

**PROGRAMS** Click on a program and preview it. [+ ADD A PRO](#)

| PROGRAM NAME | CROP        | LAUNCH |
|--------------|-------------|--------|
| Cassava      | Cassava     | ▶      |
| Pearl Millet | Pearlmillet | ▶      |
| Rice         | Rice        | ▶      |
| Groundnut    | Groundnut   | ▶      |
| Sorghum      | Sorghum     | ▶      |
| Maize        | Maize       | ▶      |

**Lists** | **Nurseries & Trials**

[LAUNCH](#)

- Program Lists
  - 2011 Trial Lists
  - 2012 Trial Lists
    - LLTYT2012P1
    - LLTYT2012P2
    - LLTYT2012TC
  - H2H Check List
  - H2H Test Entries
  - MT2010F1
  - MT2010F2
  - MT2010FP
  - MT2010MP
  - MT2011F3R

## PROGRAM SUMMARY ALL [6]

| NAME     | TITLE             | OBJECTIVE                             |
|----------|-------------------|---------------------------------------|
| MT2010F1 | MT 2010 Nurseries | 2010 Population development nurseries |
| MT2010F2 | MT 2010 Nurseries | 2010 Population development nurseries |
| MT2011F3 | MT 2011 Nurseries | 2011 population developemnt           |
| MT2011T1 | MT 2011 Trials    | Germplasm evaluation                  |

Germplasm lists, nurseries, trials and recent activities are shown for the highlighted program.

**Note: Initially, the Home page will NOT show any lists, nurseries, trials and recent activities.**

# HOME

**PROGRAMS** Click on a program and preview it. [+ ADD A PRO](#)

| PROGRAM NAME | CROP        | LAUNCH |
|--------------|-------------|--------|
| Cassava      | Cassava     | ▶      |
| Pearl Millet | Pearlmillet | ▶      |
| Rice         | Rice        | ▶      |
| Groundnut    | Groundnut   | ▶      |
| Sorghum      | Sorghum     | ▶      |
| Maize        | Maize       | ▶      |

**Lists** | **Nurseries & Trials**

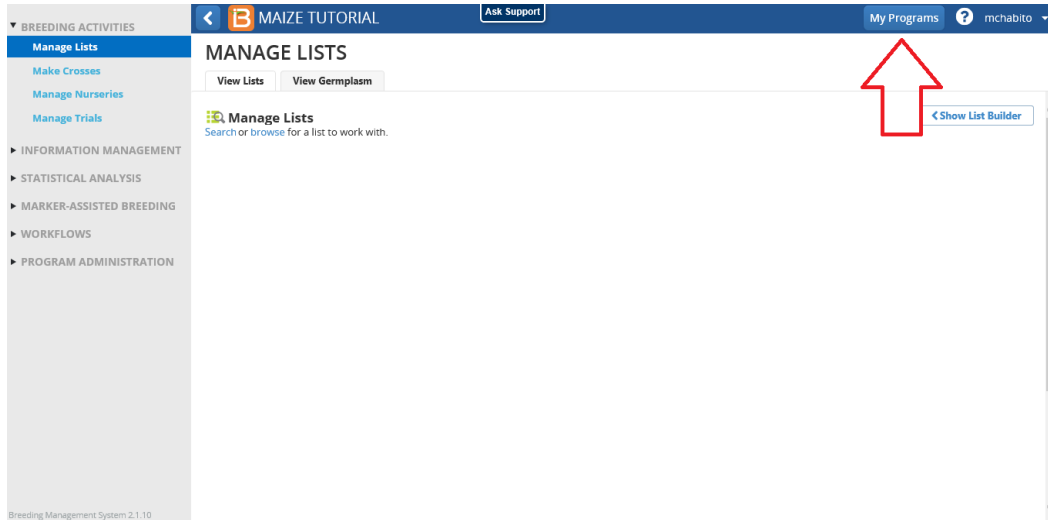
[LAUNCH](#)

- Program Lists
  - 2011 Trial Lists
  - 2012 Trial Lists
    - LLTYT2012P1
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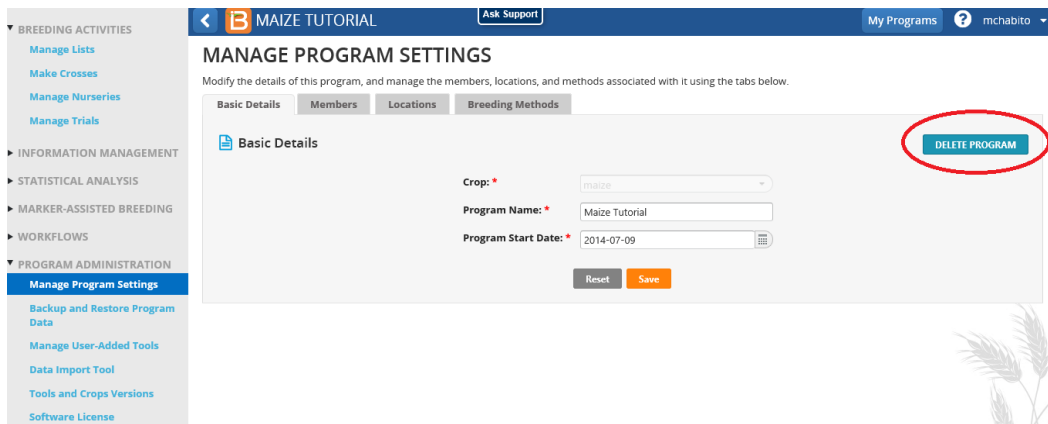
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| MT2011F3 | MT 2011 Nurseries | 2011 population developemnt           |
| MT2011T1 | MT 2011 Trials    | Germplasm evaluation                  |

You may easily navigate back to the Home page by clicking **My Programs**

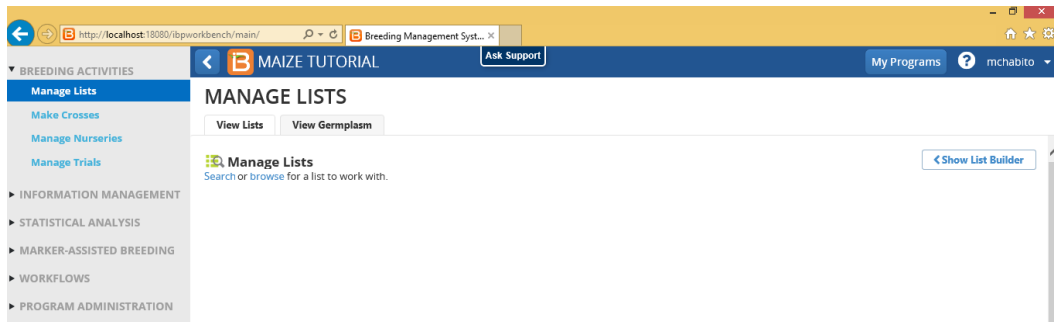


To delete a program, launch the program, click **Manage Program Settings** (under Program Administration menu), and finally click the **Delete Program** button.



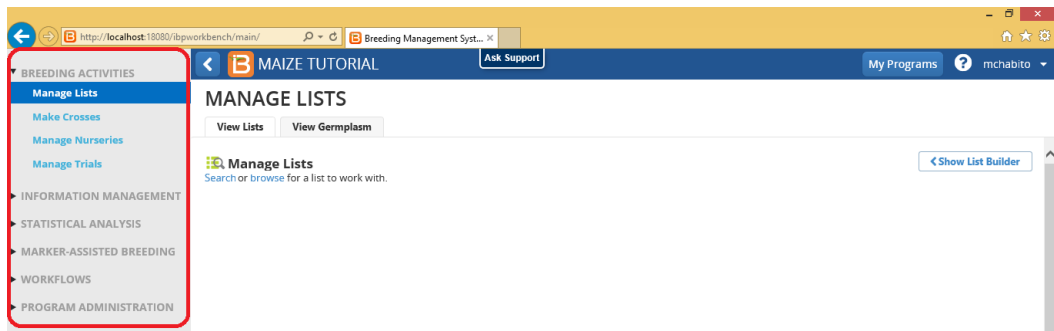
## List Manager

The **List Manager** is at the center of all activities in the Breeding Management System, hence it is the first page that you arrive at after launching your program.



## Main Menu

The main navigation menu panel on the left provides direct access to all the tools.



The links for launching the BMS tools are grouped into six sub-menus:

*\* will be used in this course*

| Menu                     |   | Tool  |
|--------------------------|---|---|
| Breeding Activities      | * | Manage Lists<br>Make Crosses<br>Manage Nurseries<br>Manage Trials   |
| Information Management   | * | Import Germplasm<br>Browse Studies<br>Head to Head Query<br>Adapted Germplasm Query<br>Manage Ontologies          |
| Statistical Analysis     | * | Single-Site Analysis<br>Multi-Site Analysis<br>Multi-Year Multi-Site Analysis<br>Breeding View Standalone for QTL |
| Marker-Assisted Breeding |   | Molecular Breeding Decision Tool: OptiMAS<br>Molecular Breeding Planner   |
| Workflows                |   | Conventional Breeding (CB)  |



|                        |   |   |
|------------------------|---|---|
|                        |   | Marker Assisted Selection (MAS)<br>Marker Assisted Backcrossing (MABC)<br>Marker Assisted Recurrent Selection (MARS)                                      |
| Program Administration | * | Manage Program Settings<br>Backup and Restore Program Data<br>Manage User-Added Tools<br>Data Import Tool<br>Tools and Crops Versions<br>Software License |

## Tutorial Tips

This tutorial consists of a number of documents which can be found in directory:

C:\Breeding Management System\Documents\BMS Workbench Nursery & Trial Managers\Tutorials\cassava\ together with a number of sample data files in the directory C:\Breeding Management System\Examples\cassava\.

The tutorial documents give step by step instructions for accomplishing specific tasks with the BMS and are designed to be followed sequentially. However there are a number of program backup files (with extension .sql) in the documents directory, and the tutorial sequence can be started with any chapter if the backup file from the previous chapter is restored before starting with the desired steps. To restore a backup file, use the “Restore from Backup” feature on the Program Administration menu of the BMS Workbench as detailed in *Chapter 1: Getting Started with the Breeding Management System*. For example to start with the tutorial **Cassava\_Tutorial\_004-Characterize Clones** first restore the backup file **Cassava\_Tutorial\_03.sql**.

As you work through this tutorial, please take note of useful snippets of information and test your knowledge with quizzes and exercises, indicated by the following icons:



Important information



Exercise



Quiz question