



# ***Modernization of KALRO Breeding Programs: 2 years of Collaborative Efforts***

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## **KALRO Mandate**

- ✓ *contribute to the growth of the agricultural sector through research coordination and regulation; technology and innovation development.*

## **EiB-NARES Mandate**

- ✓ *Support the modernization of NARES breeding programs through provision of tools, services and technical support.*

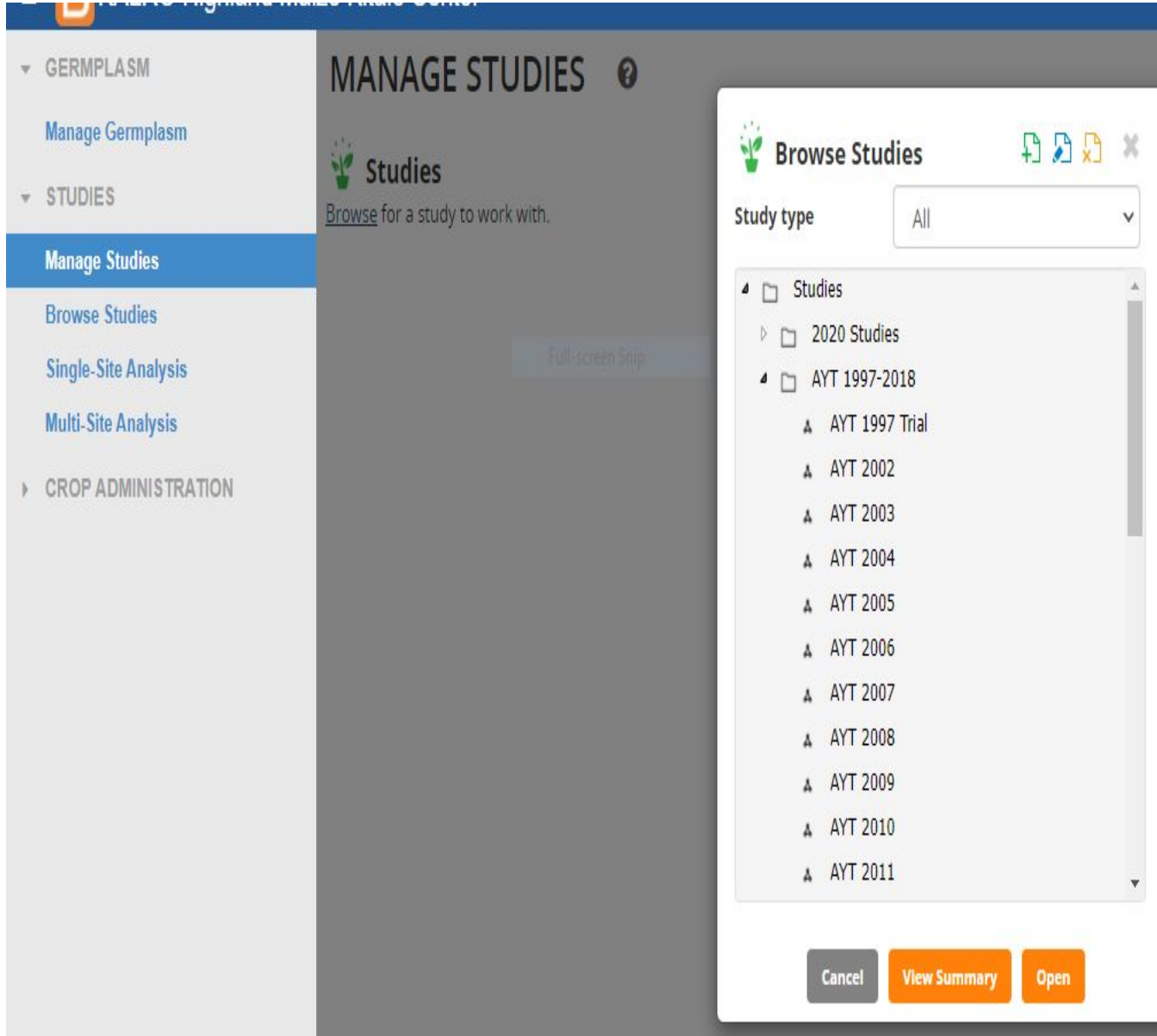
**Collaborative modernization efforts done by EiB with KALRO**

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## ***Program Assessments, Barriers and Improvement Plans***

- Programs assessed Maize highland and Wheat Breeding programs*
  - KALRO Maize Highland Breeding - Dr Dickson Ligeyo*
  - KALRO Njoro Wheat Breeding – Dr Godwin Macharia*
  - Conservatism, manual and loss of data*
  - Program currently being assessed: Potato Breeding Program*
  - Improvement Plans Developed, Priorities identified*
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The screenshot shows the 'MANAGE STUDIES' interface. On the left, there is a navigation menu with 'GERMPLASM' and 'STUDIES' sections. Under 'STUDIES', 'Manage Studies' is selected. The main content area shows 'Studies' with a sub-header 'Browse for a study to work with.' A 'Browse Studies' modal window is open, displaying a tree view of study folders. The 'Study type' dropdown is set to 'All'. The tree view shows 'Studies' containing '2020 Studies' and 'AYT 1997-2018'. Under 'AYT 1997-2018', there is a '1997 Trial' folder and a list of years from 2002 to 2011. At the bottom of the modal, there are three buttons: 'Cancel', 'View Summary', and 'Open'.

## Digitization of Breeding Programs: BMS Adoption

- ☐ *Maize Highland Breeding Program*
  - ✓ *1997 – 2020 Trials Data (OPV, PYT & AYT)*
    - ❖ *24 years data*
  - ✓ *Genetic Gain Analysis carried out*
    - ❖ *Yield, disease tolerance, moisture*
  
- ☐ *Wheat Breeding Program*
  - ✓ *2014– 2020 Trials Data*
  - ✓ *2014 – 2020 Nursery data*
  
- ❖ **Current trials and nurseries generated on BMS for both programs**

## Training received and full adoption of BMS

Center	Crop	Station	Package Printer	Seed Counter	Label Printer	Handhelds
KALRO	Maize	Kitale	0	1	1	2
KALRO	Maize+Beans+Sorghum	Katumani	0	1	3	6
KALRO	Wheat+Soy	Njoro	1	1	2	4
KALRO	Rice	Mwea	0	0	1	2
KALRO	Potato	Tigoni	0	0	1	2
		<b>TOTAL</b>	<b>1</b>	<b>3</b>	<b>8</b>	<b>16</b>

### Breeding Management Software & Equipment Trainings

☐ Online trainings.

☐ Practical training (On-site training)

- ✓ KALRO Njoro 19-21<sup>st</sup> July 2021 (19 Scientists and Technicians)
- ✓ KALRO Kitale 3-5<sup>th</sup> August 2021 (9 Scientists and Technicians)
- ✓ KALRO Tigoni 16-18<sup>th</sup> August 2021 (9 Scientists and Technicians)

☐ KALRO breeding programs have fully adopted BMS and are partially automated.





# Adoption of Genotyping

- Focus on F1-Parent QA/QC and QTL profiling of Key Lines
  
- 376 wheat samples genotyped with 70 SNP markers for QTL profiling and purity assessment.
  
- 94 maize samples genotyped with 95 SNP markers for QTL profiling and purity assessment
  
- Ongoing genotyping projects:
  - ✓ QA/QC of all new breeding starts made by KALRO wheat and KALRO maize
  - ✓ Development of plans to purify lines that were identified as impure in first round of QTL profiling.
  - ✓ Development of plans to implement marker assisted back crossing of key traits on KALRO maize product profiles (e.g. MLN tolerance) into elite KALRO backgrounds.



# Internet Upgrade to support Digitization

## ☐ Kiboko (completed)

- ✓ *Increased bandwidth speed 5x+ while keeping costs similar or lower*
- ✓ *Provided both fiber links and microwave to the center*
- ✓ *Expanded the network*
  - ☐ *Many more wireless access points and wired access points*
- ✓ *Added backup redundancy for internet links*
- ✓ *Added controls for security and to avoid misuse*

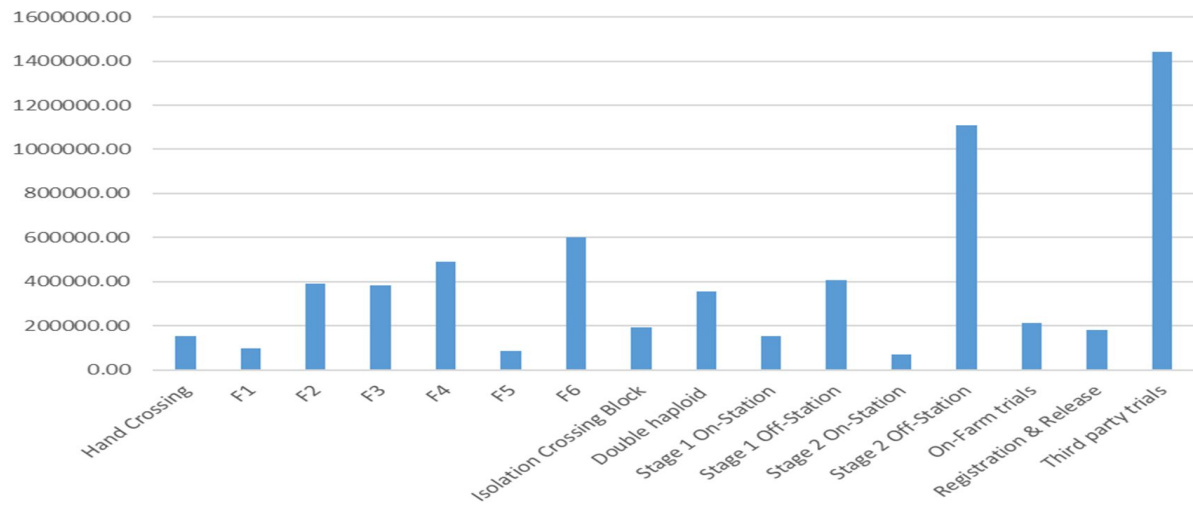
## ☐ Njoro (completed)

- ✓ *Bandwidth increased*
- ✓ *Significant increase in network coverage to additional buildings and facilities*
  - ☐ *Many more wireless and wired access points*
- ✓ *Added additional controls for security and to avoid misuse*



# Costing of Breeding Program

Total cost exclusive of permanent labour cost



☐ KALRO maize program has been costed on the University of Queensland costing tool.

☐ An overview of actual breeding costs that can support budget and proposal development.

☐ Support is being deployed to other KALRO breeding programs to cost out their programs and train staff on the use of the Costing Tool.

Activity	Total cost US\$	Cost US\$ /row	Row size (1 row)
Hand Crossing Nursery	2869.75	23.91	18m x 0.75m x 0.3m
Selfing Nursery	4083.85	20.11	18m x 0.75m x 0.3m
Isolation Crossing Block	3217.28	13.41	18m x 0.75m x 0.3m
On-station trials	1699.74	8.61	5m x 0.75m x 0.25m
Off-station trials	2762.40	14.26	5m x 0.75m x 0.25m
On-farm trials	2003.08	8.35	5m x 0.75m x 0.25m
Third party trials	7776.11	6.30	5m x 0.75m x 0.25m





## ☐ **CtEH Investments**

- ✓ *Kiboko Irrigation upgrade – 8 ha for breeder seed maintenance*
- ✓ *Upgrade of foliar disease phenotyping platform at KALRO Kakamega*

## ☐ **Station Upgrades**

- ✓ *KALRO stations amongst the 15 core breeding hubs selected for upgrade in Africa*
  - ❖ *Kiboko: Drought phenotyping hub; maize and dryland cereals breeding hub*
  - ❖ *Njoro: Global wheat rust screening hub; KALRO data management hub*
  - ❖ *Kakamega: Key testing site for multiple crops (maize, cassava, sweet potato, millets, beans);  
Disease hotspot*



## ***What Next? KALRO's priorities for modernization***

- *KALRO request for direct funding to support research activities.*
    - *Operational funding to sustain breeding pipelines*
    - *Mainstream QA/QC analysis within KALRO breeding program*
    - *15 programs in KALRO require QA/QC analysis with funding from both government and donors.*
    - *Grain legumes (Beans, Mung beans, Pigeon peas, RTB crops)*
  - *QTL profiling of KALRO germplasm (lines + varieties) and incorporating data management softwares across all crops & livestock*
  - *Staff continuity especially on EiB-NARES projects – young interns that can be funded and trained.*
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- A solid green horizontal bar at the bottom of the slide.



# Acknowledgement

## Alliance



Excellence in  
Breeding  
Platform



- KALRO Management
- Other International organizations