Sub-theme:

Include sub-theme Here

Title:

Virus Elimination in Cassava Clones and Maintenance of Clean Stock

Presented by:

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Introduction

Introduction cont’

Cassava Mosaic Disease (CMD)

- DNA viruses
  - East African CMV (EACMV)
  - African CMV (ACMV)

Transmitted by whitefly

Cassava Brown Streak Disease (CBSD)

- RNA viruses
  - CBSV
  - Ugandan CBSV

Transmitted by whitefly

Problem Statement

Viruses are transmitted from season to season in this clonally propagated crop, with increasing viral load in early generations after infection, causing total yield loss in susceptible cassava varieties.

Justification

Clean ‘seed’ or ‘planting material’ is required for:

1. Support a clean (virus free) seed system to increase yields in farmers’ fields
2. Provide breeders with clean ‘seed’ for multi-locational trials
3. Landrace conservation in genebanks

Objectives

Overall objective:

Enable the safe exchange of cassava germplasm within and outside ESC Africa

Specific objectives:

1. Optimise protocols for use at the KEPHIS Plant Biosafety and Quarantine Station, Muguga
2. Optimise virus indexing protocols
3. Eliminate viruses from landraces from Kenya, Tanzania, Rwanda and Burundi for conservation purposes
4. Eliminate viruses from breeders' germplasm to facilitate multi-locational trials
5. Eliminate viruses from released varieties to support a clean seed system

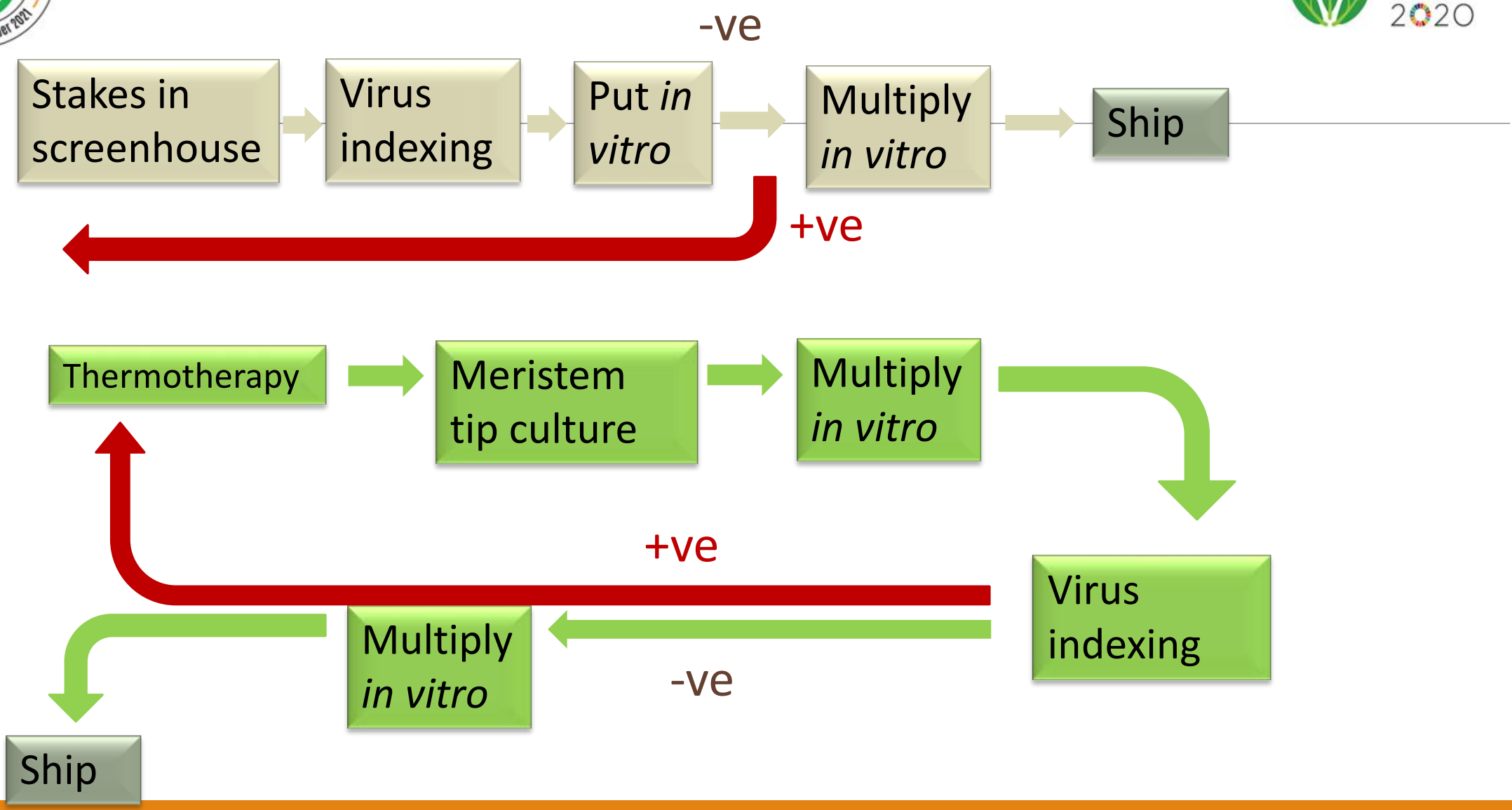
Methodology

Virus elimination:

- Thermotherapy
- Meristem tip culture
- *In vitro* multiplication

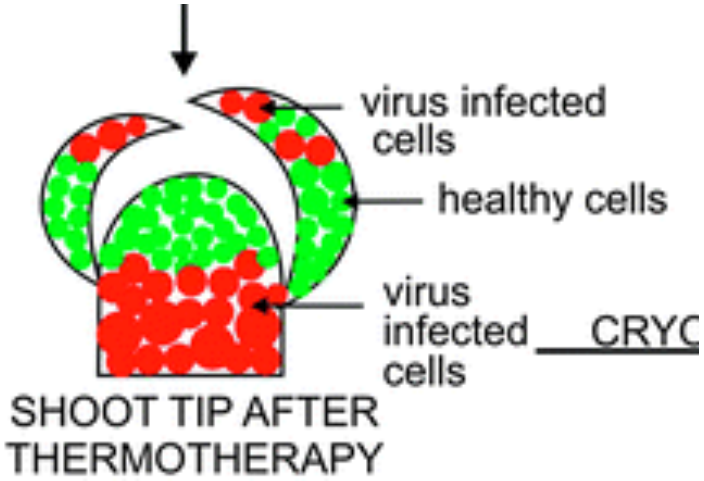
Disease indexing:

- End-point PCR for CMDVs
- Real-time RT-PCR for CBSVs


-ve
Stakes in screenhouse
Virus indexing
Put *in vitro*
Multiply *in vitro*
Ship
+ve
Thermotherapy
Meristem tip culture
Multiply *in vitro*
+ve
Virus indexing
Multiply *in vitro*
-ve
Ship

Methodology cont’

- 28°C for 6h under dark
- 38°C for 18h under light
- 70% humidity
- 3 -5 weeks until sprouted
- Virus retracts from meristem



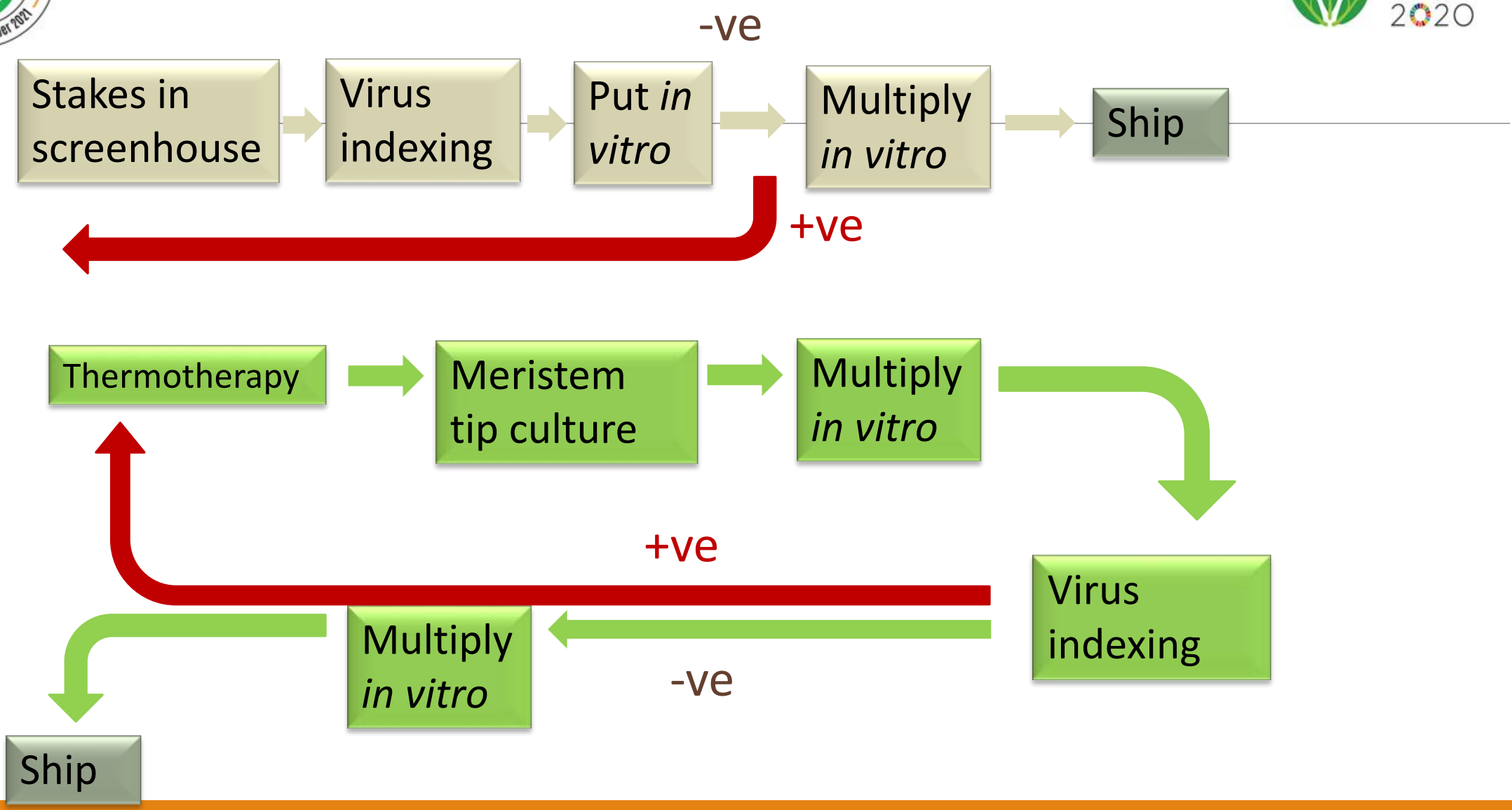
Methodology cont’

Meristem tip culture

Methodology cont’

Regeneration of the meristem and multiplication *in vitro*

Can take more than six months depending on genotype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Multiply *in vitro*
Ship
+ve
Thermotherapy
Meristem tip culture
Multiply *in vitro*
+ve
Virus indexing
Multiply *in vitro*
-ve
Ship

Methodology cont'

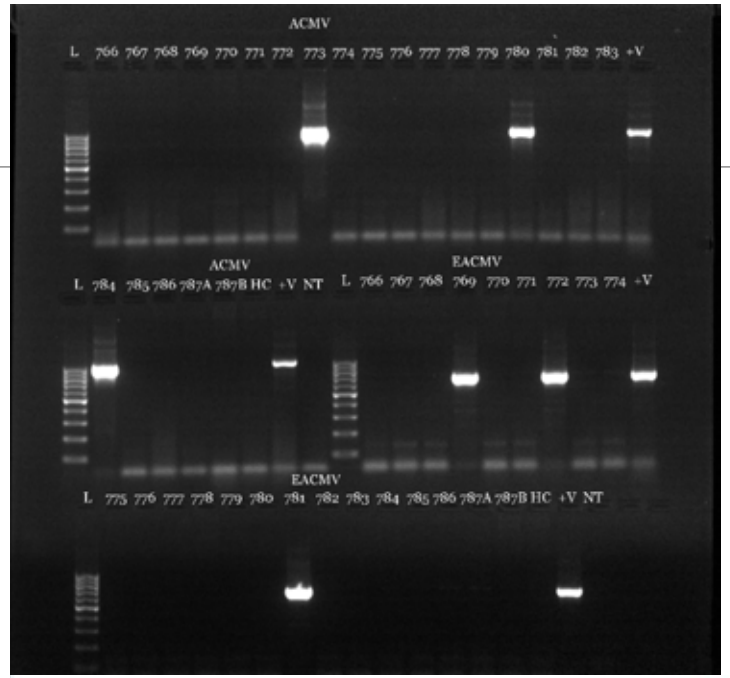
CMD

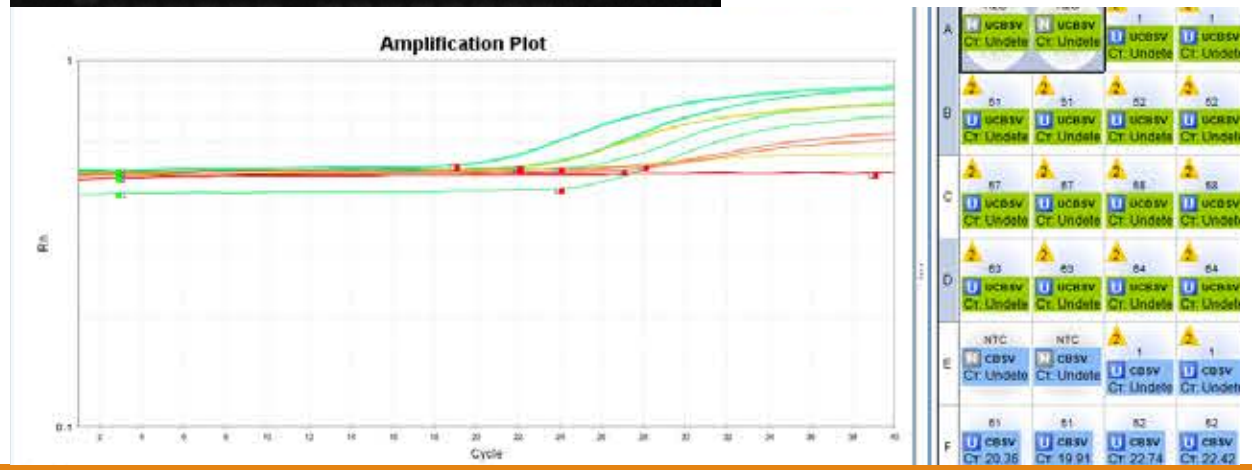
- End point PCR for:
  - EACMV
  - ACMV

CBSD:

- Real-time RT-PCR for:
  - Cassava brown streak virus (CBSV)
  - Ugandan cassava brown streak virus (UCBSV)

Sequencing: CMD and CBSD viruses through GHU, Ibadan

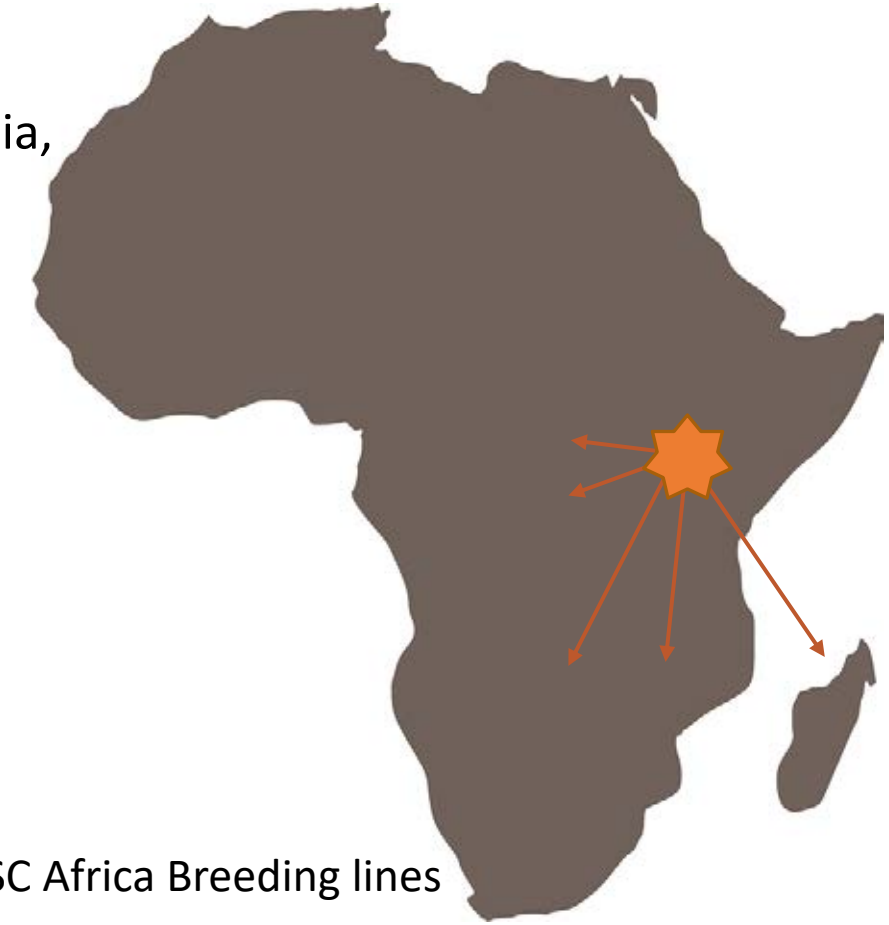




Results

- Viruses eliminated from:
- 183 landraces for conservation purposes from Tanzania, Uganda, Kenya, Rwanda and Burundi.
- 75 breeding lines

- Many repatriated to their country of origin
- Breeding lines distributed
- Small number of each clean clone maintained



2019: Distribution of ESC Africa Breeding lines

Conclusion

- A reliable methodology has been developed for virus elimination in cassava at PQS, Muguga
- KEPHIS, in collaboration with OneCGIAR has a central role to play in the regional / global distribution of clonally propagated crops; cassava, sweet potato, bananas, yams etc.

Recommendations

- Improvements in efficiencies in technologies and protocols for virus elimination and indexing in cassava are still sought
- KEPHIS build on the capacity that has been developed, and the collaboration with OneCGIAR, to provide a centralized facility in the region that can operate at scale and provide a reliable service to multiple institutes would be more cost effective and could serve as a center of excellence and training.

Acknowledgements

Theme: *"Enhancing Phytosanitary Systems for Healthy Plants, Safe & Sustainable Trade"*
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