Crops to End Hunger Project Update

CIP

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International Potato Center (CIP)

Webinar: CtEH Project Update: RTB Breeding - Phenotyping & Germplasm Exchange Hub Upgrade
November 14, 2023

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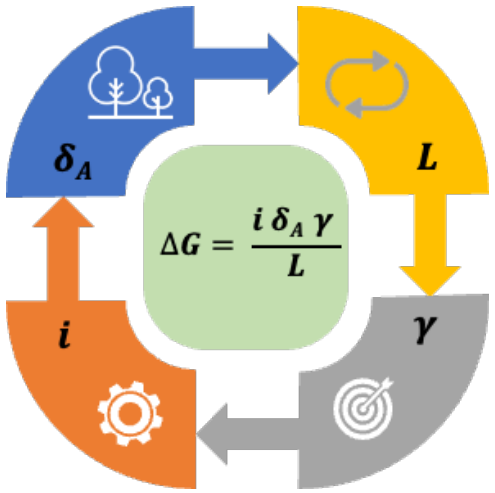
CtEH projects at CIP

Project name	Facilities to improve
CtEH-14: Investing in (sweet)potato breeding networks to mitigate climate change	CIP HQ stations in Lima and Huancayo
CtEH-15: Upgrading CIP-NARS East Africa potato breeding hub infrastructure	KALRO - Tigoni (Potato Research Center - Kenya), University of Nairobi (UoN) – Kabete Campus, KEPHIS - Kenya
CtEH-16: Regional Germplasm Hub for Vegetatively Propagated Crops @ KEPHIS Muguga – in collaboration with IITA	KEPHIS - Kenya
CtEH-26: A Global Breeding Analytics Unit to accelerate the delivery of superior genetic gains on farmer's fields – in collaboration with all CGIAR centers	-

Project goals



Cycle length	• True seed processing laboratory • Better facilities for tuber seed multiplication and storage
Selection accuracy	• Digital tools for data collection • Digital scales • Improved processing laboratory for quality traits
Selection intensity	• High throughput platform for selecting traits: smart grader for yield assessment • New greenhouse facilities for crossing blocks

Capacity sharing

Gender equality

Climate change mitigation

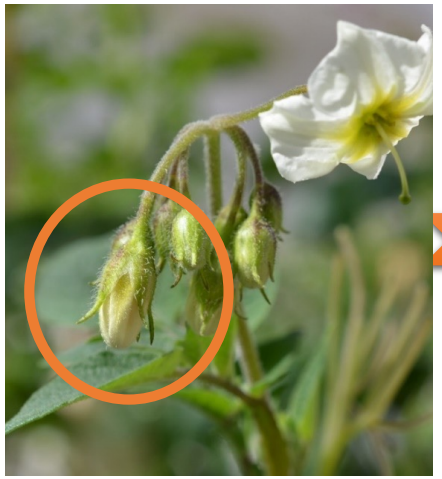
Objective: Improved selection accuracy, shorter breeding cycle and selection intensity

- Increased capacity for generating new crosses, and extract true seed
- Increased capacity for multiplication and storage of tuber seed
- More precise and faster phenotyping of priority TPP traits: tuber yield, dry matter, quality and nutritional traits

  - Evaluation of larger population sizes enables higher selection intensity (BPAT)
  - Evaluation of key traits possible in earlier stages: Cycle time down by 4 years
  - Heritability of dry matter content increased by 10%

First Challenge: crossing in potato

x



Emasculation

Pollination

Fruits with seed

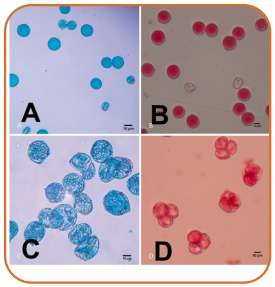
Managing a crossing block

Planting progenitors: first males, 30 days later the females

Preparing the greenhouse for the crosses: setting up the bamboo stakes for support, pots with soil

Setting up the plants on top of soil in the pot

Managing the plants: cutting stolons, tie for support



Collect the pollen and examine viability

Crossing

Processing the botanical seed

Detection of seed transmitted viruses: PVT and PSTVd

Flowering period
2-3 months

2 months

Shorter breeding cycle through improved crossing facilities

More space with better facilities -> more successful crosses

Activity (Peru): *Build a new greenhouse for potato crossing at the CIP breeding station in Huancayo*

Activity (Kenya): *New greenhouse at KALRO-Tigoni for potato crossing block*

Shorter breeding cycle through improved true seed processing facilities

Adequate laboratory
-> 20% less time spent
in seed processing

Activity (Peru): *Renovate the true seed processing laboratory at the CIP breeding station in Huancayo*.

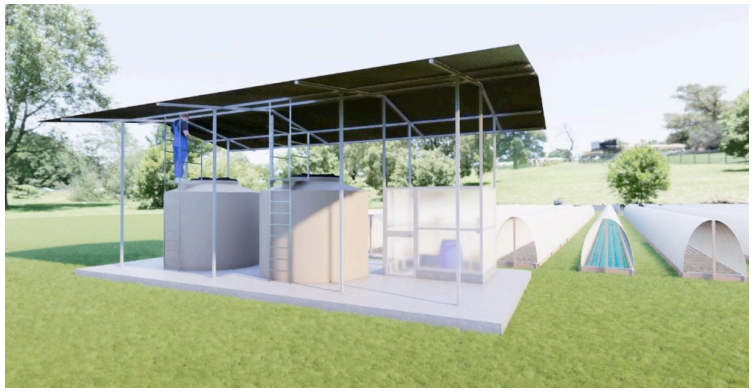
Second challenge: tuber seed production and storage

- Multiplication rate in potato is 1:10 (one plant produces at maximum 10 tubers/plant)
- The best quality and disease-free seed is produced in seed beds in the highlands (less insect pressure -> less viruses)
- Current seed production capacity is insufficient and labor intensive (no automatic irrigation)
- Current method of soil sterilization is suboptimal
- Current volume of seed storage is too low

Shorter breeding cycle through increased capacity for tuber seed multiplication

Install automated irrigation -> decrease FTE in manual irrigation
Add more beds -> Increase seed production capacity by 40%

Activity (Peru): *Extension of tuber seed multiplication beds at the CIP breeding station in Huancayo.*



Shorter breeding cycle through increased capacity for tuber seed multiplication

Bottle neck: current soil sterilization method has low capacity

Note! A total renovation of electric circuits at the station need improving so that this machine can run with electricity and that we can switch to solar energy

Activity (Peru) Installing a new soil sterilizer.

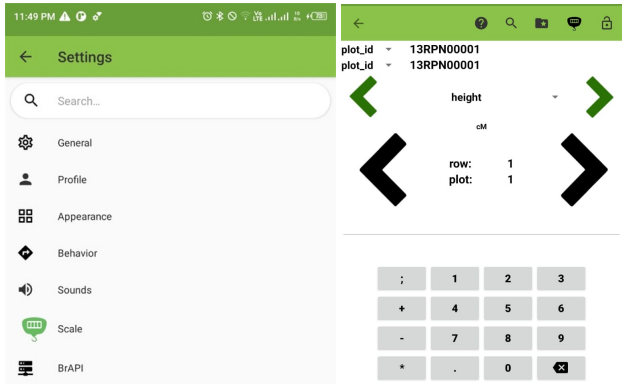
Shorter breeding cycle through increased capacity for tuber seed multiplication

Increment seed storage capacity by 25%

Activity (Peru): *Improve diffuse light storage facilities for potato tuber seed at the CIP breeding station in Huancayo*

Activity (Kenya): *Renovate diffuse light storage for breeder's seed at UoN, Diffuse light storage for breeder's tuber seeds at KALRO-Tigoni*

Improved selection accuracy through more precise and faster phenotyping



Activity (Peru & Bangladesh): *Purchase of digital tools for phenotypic data recording in the field .*

Activity (Kenya): *Purchase digital tools for phenotypic data recording in the field for NARS in Kenya, Ethiopia, Rwanda, and Uganda.*

Objective: Strengthen NARS-CIP breeding programs data collection systems and capacity for digital data collection

- to reduce errors and improve the quality of phenotypic data: Create an integrated data collection network with a centralized database that all partners can use.
  - At least 40 staff members of the breeding networks, of which at least 50% are female, trained in the use of BreedBase and the newly acquired digital tools in compliance with the established standard operating procedures (SOPs) for breeding data management, by Q4 2024.
  - By Q2 2024, two female CIP staff members trained on sensory analysis for the evaluation of organoleptic traits, and on the use of new equipment in the QN Lab. Acquired knowledge shared with at least 2 other CIP staff members.

CtEH-16: Regional Germplasm Hub for Vegetatively Propagated Crops @ KEPHIS Muguga – in collaboration with IITA

Training of KEPHIS and CIP staff on virus diagnostics and phytosanitation in Lima, Peru October 25-November 6, 2023

- Justification: Rapid introduction of breeding materials to *in vitro*, cleaning from viruses, and further maintenance and rapid multiplication for secure distribution among countries or to be used as nuclear material in a seed production system is required for RTB crops.

Course contents:
Micropropagation and in vitro conservation – 6 hours
Elimination of pathogens: thermotherapy, meristem culture, bacteria elimination – 8 hours
Plant tissue culture – 4 hours
Virus diagnosis based on symptoms, serology, PCR, LAMP, and high throughput sequencing -36 hours

Thanks for your attention!

The International Potato Center (known by its Spanish acronym CIP) is a research-for-development organization with a focus on potato, sweetpotato, and Andean roots and tubers. CIP is dedicated to delivering sustainable science-based solutions to the pressing world issues of hunger, poverty, gender equity, climate change and the preservation of our Earth's fragile biodiversity and natural resources.

www.cipotato.org

CIP is a member of CGIAR

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