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International Center for Tropical Agriculture
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Creating opportunities in LAC through partnerships with NARs and private sector: Cassava Seed System

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- Pest and diseases problems
- Mix of varieties
- Unsuitable materials
- Poorly performing
- Exhausted materials
- Low access to new materials
- Low propagation rate

No planting material of the clone of interest
(Quantity, Quality, Times, Space)

MGTCL Molecular Genetics and Tissue Culture Laboratory

CIAT'S CASSAVA SEED SYSTEM APPROACH

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1 **Implementation of relevant technologies for different scales**
- Industrial level
- Small farmer associations

2 **Simplified protocol to achieve low-cost design with adaptable equipment.**

3 **High throughput platform to integrate with multiple crops.**


In vitro methodologies


1 Conventional in vitro culture **2** Biorreactores **3** Synthetic seeds **4** Rural TC laboratory **5** Rural schools initiatives

TRAINING AND


Scaling up: Hardening & macro propagation


1 Hardening phase of in vitro culture **2** Tunnels system & sprouting rooting **3** Mature and immature cuttings **4** Pellets

CAPACITY BUILDING


To end-users


1 Farmers associations **2** Industrial company **3** NGO´s **4** NAR´s **5** School projects

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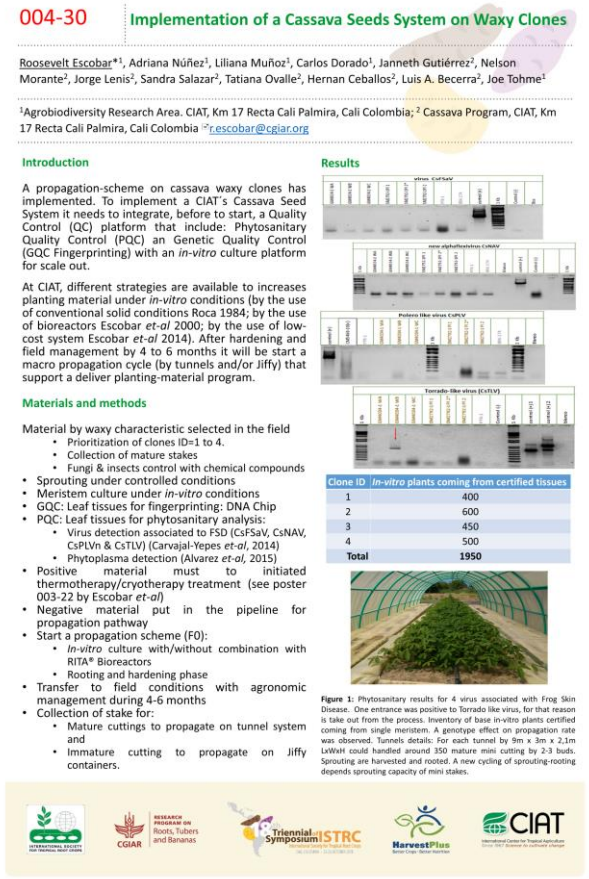
In Colombia, ¿with who are we talking?

Entity	Colombia	What they are need it?
NAR´s	Agrosavia	Plan Yuca País I and now is working in planing PYP-II, Many……..things **14K US**
Private	Almidones de Sucre	Planting material of Belloti, Agronomy, starch quality vs waxy on their formula, New options clones on the region
	Ingredion	Waxy 1.0, Waxy 2.0, which options could be for Tai8, implementation of tunnels system on II part, monitoring
	Fundación Santo Domingo	Yellow materials,promote use, training program
	Poltec	Test starch quality to define bussines route: which clones are intertes in market, produce it and scale it. Bussiness
	Bavaria	Just need to know how to do it. It offer us suport to do a food manual recipies with cassava (it could incude Gobernación Valle, too)
Universities	UniCauca	Give support on comunities in Cauca (renew planting & stablihsh seed plots) with black communities in Cauca (Garrapateros)
PMA	Guaviare-Orinoquia-Guajira	To discuss a Project for indigenous people + cassava
Colombian Agriculture ministry	RioSucio	Implement a banana/plantain/cassava intercropping system+education

And, in LAC ¿with who could be talk?

Entity	Country	Topic
Embrapa	Brasil	• Pilot Project on Cryopreservation + gene bank • Bonsay collection
They asked through Colombian Cancilleria	Curazao	• Uso of cassava on animal feed • Propagation methods • Training
CIAT+ DICTA agreement	Honduras Jenny Weigel	• Training on propagation methods • Implementation of tunnels (visit with Sandra Salazar on march) • Guatemala, DICTA, PRIICA. Cassava, conservation, training, propagaction. A movilization of germplasm

I round with waxy clones: To get the system for CCS with those clones
Objective 1: Test the QC of stem vs sprouting vs storage, seed source & field practice



004-30 **Implementation of a Cassava Seeds System on Waxy Clones**

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Introduction

A propagation-scheme on cassava waxy clones has implemented. To implement a CIAT´s Cassava Seed System it needs to integrate, before to start, a Quality Control (QC) platform that include: Phytosanitary Quality Control (PQC) an Genetic Quality Control (GQC Fingerprinting) with an *in-vitro* culture platform for scale out.

At CIAT, different strategies are available to increases planting material under *in-vitro* conditions (by the use of conventional solid conditions Roca 1984; by the use of bioreactors Escobar *et-al* 2000; by the use of low-cost system Escobar *et-al* 2014). After hardening and field management by 4 to 6 months it will be start a macro propagation cycle (by tunnels and/or Jiffy) that support a deliver planting-material program.

Materials and methods

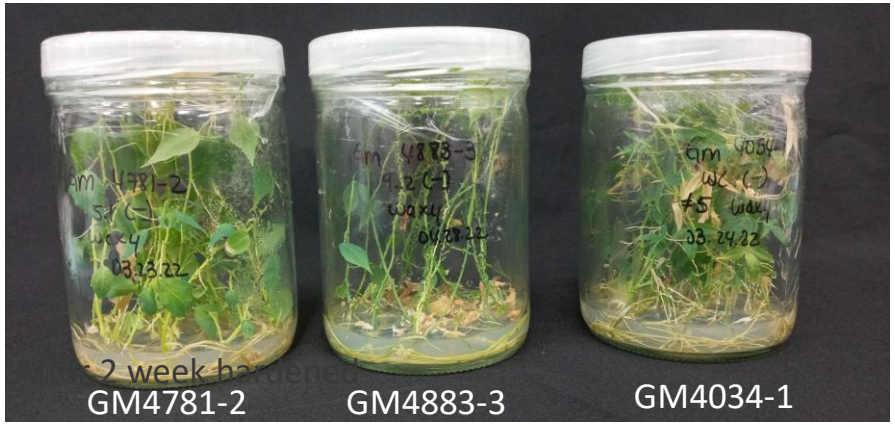
Material by waxy characteristic selected in the field
- Prioritization of clones ID=1 to 4.
- Collection of mature stakes
- Fungi & insects control with chemical compounds

- Sprouting under controlled conditions
- Meristem culture under *in-vitro* conditions
- GQC: Leaf tissues for fingerprinting: DNA Chip
- PQC: Leaf tissues for phytosanitary analysis:
  - Virus detection associated to FSD (CsFSaV, CsNAV, CsPLVn & CsTLV) (Carvajal-Yepes *et-al*, 2014)
  - Phytoplasma detection (Alvarez *et-al*, 2015)
- Positive material must to initiated thermotherapy/cryotherapy treatment (see poster 003-22 by Escobar *et-al*)
- Negative material put in the pipeline for propagation pathway
- Start a propagation scheme (F0):
  - *In-vitro* culture with/without combination with RITA® Bioreactors
  - Rooting and hardening phase
- Transfer to field conditions with agronomic management during 4-6 months
- Collection of stake for:
  - Mature cuttings to propagate on tunnel system and
  - Immature cutting to propagate on Jiffy containers.

Results

Clone ID	*In-vitro* plants coming from certified tissues
1	400
2	600
3	450
4	500
Total	**1950**

Figure 1: Phytosanitary results for 4 virus associated with Frog Skin Disease. One entrance was positive to Torrado like virus, for that reason is take out from the process. Inventory of base in-vitro plants certified coming from single meristem. A genotype effect on propagation rate was observed. Tunnels details: For each tunnel by 9m x 3m x 2.1m LxWxH could handled around 350 mature mini cutting by 2-3 buds. Sprouting are harvested and rooted. A new cycling of sprouting-rooting depends sprouting capacity of mini stakes.



Preliminary yield test/plant

- GM4781-2

Multiply by minisets one round in tunnels
8 moths we need wait to harvest
Average per plat= 3,75 kg

- GM4034-1

Coming from in-vitro plants
IV, pass to substrate/hardened on 1kg bags.
We needs harvest and extract starch and/or flour
Average per plant= 7,26 kg

Average by Ingredion at nort coast 1.5 kg/plant

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GM4034-1 from in vitro + bioinsumos (cocktail of bacterias* + Trichoderma)

After 2 week of hardened

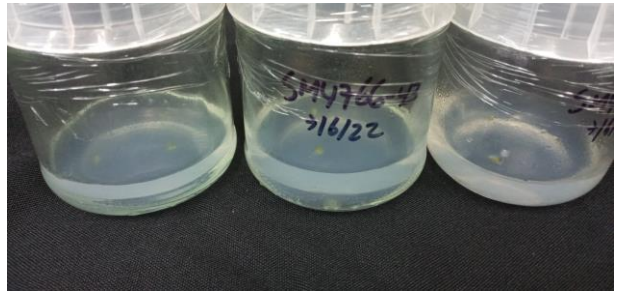
**Azospirillum. Azotobacter, Bacillus, P. fluorescens*

II round with Waxy 2.0 clones:
Objective 1: Determine propagation rate on tunnels
Objective 2: Start a cleaning process and TC introduction for CSS

- Cuttings from observation field
- Just one site, 1 plant
- Site: Repelon
- 3 clones

- 2 stem/clone/1 plant/40 cm
- Treat and cut as mini set
- Grown on tunnels
- Control conditions form sprouting

- ID per mini set
- Take tissue for virus and phytoplasm detection (PST)
- Take tips for TC
- Waiting for phytosanitary test



- Based on PST
- Negative tissue use for scaling up
- Positive tissues start a cleaning process

7/7/2022

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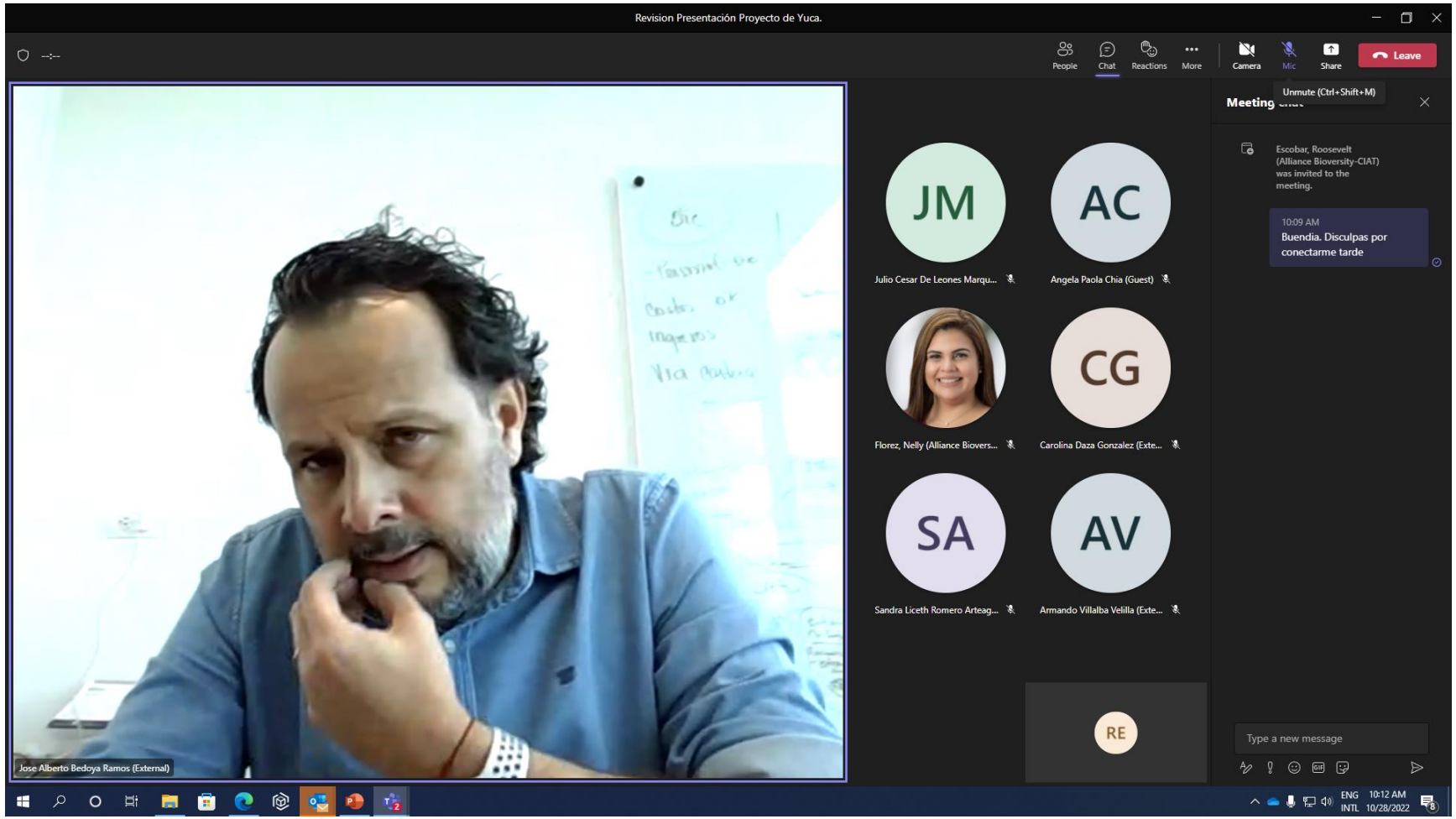
Cassava team is working to relase **a new biofortified** clone

- **Good** Quality Cooking
- **High** β-carotene content: 12%
- **Better** yield than Venezolana
- **Better** plant type

GM3426-5

Poltec and Fundación Santo Domingo



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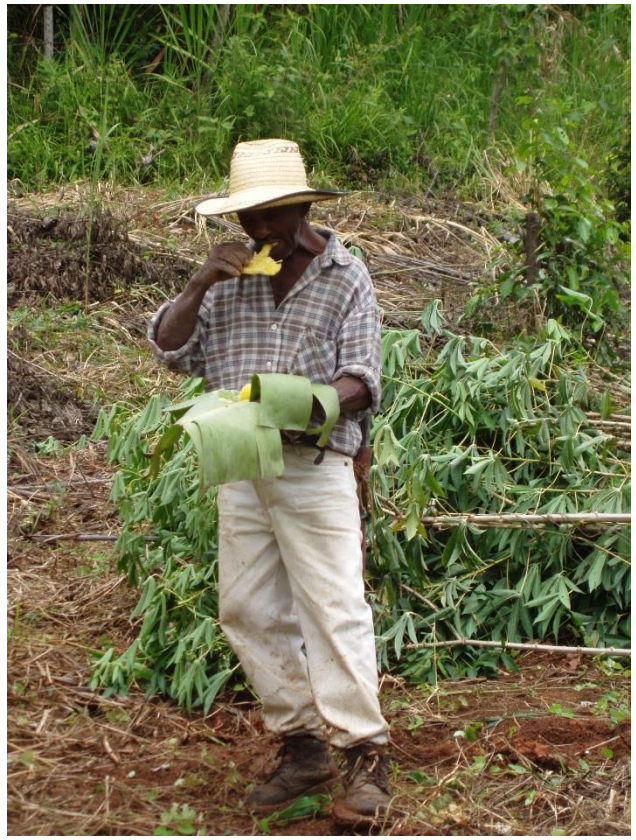
Biotech at farm level

Escobar et al 2006



CM 2772-3

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Emprendimiento con yuca amarilla en Nicaragua

"Cony Barahona pinta su futuro de amarillo"

- Clon CM6119-5 Germoplasma de CIAT
- Se envió para pruebas de adaptación PRIICA (2004)
- Recién fue liberada en Nicaragua Inta Amarilla (2015)
- Raíz amarilla, 2,3 veces más productiva, 35% > MS, alta calidad culinaria, poca fibra, fácil pelado, menor tiempo de cocción, tolerancia a plagas y enfermedades
- Con este emprendimiento esta enviando a sus 2 hijos a estudiar a la Universidad
- Un quintal (45 Kg) en fresco vale 140 córdobas y transformado en chips lograr 1200 córdobas (40 US)

Corporación CLAYUCA

PRIICA

CIAT 50 1967-2017

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“Sazón Atlántico” is a program that would activate the economy through gastronomy festivals (festival del frito) on department. It Worked during Covid pandemic

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Training & Workshops to update and move new topics

Propagation methods
Tunnels system

Products

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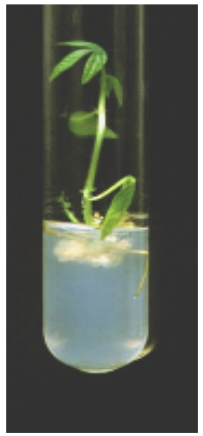
What will be on Next phase & New ?



In vitro material

[Hardening] x CC
+ Bioinsumes Bacteria +Trichoderma

Field conditions + Insect proof mesh
Mother plants

Scaling up

QC Future seeds → QC Future stems

1.5 Ha shade house ULMA

1600 m^2 - - - - - - - - → Clones for fresh consumption

60K US

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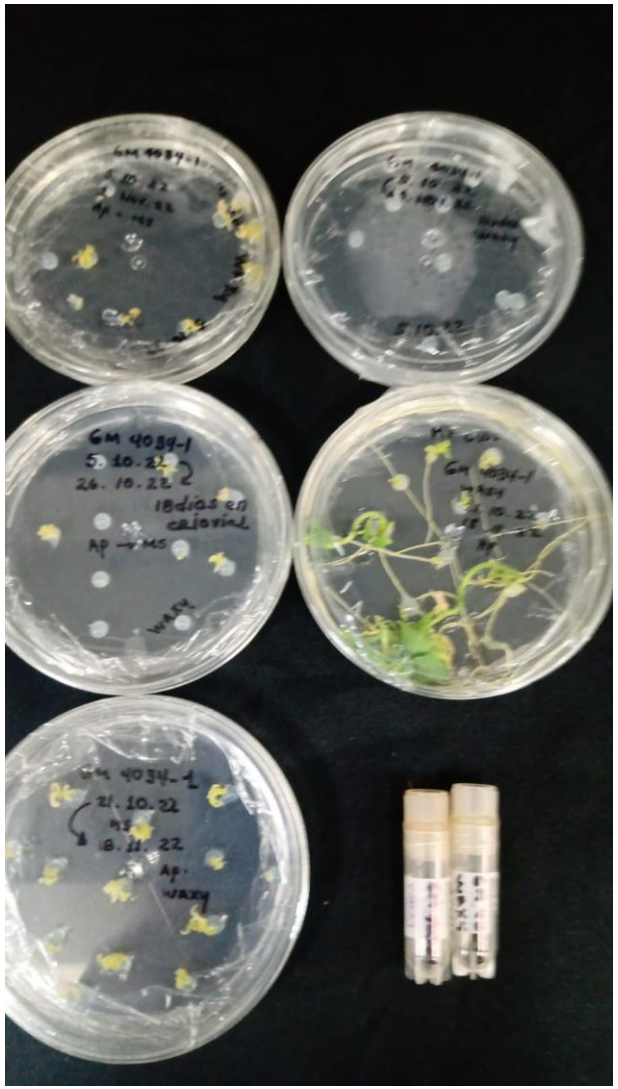
Seed priming technique
&
Synthetic seeds



ACCR24-16
Trichoderma after 6 days inoculation

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Gracias

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