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International Center for Tropical Agriculture

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# Rapid multiplication system in the greater Mekong subregion

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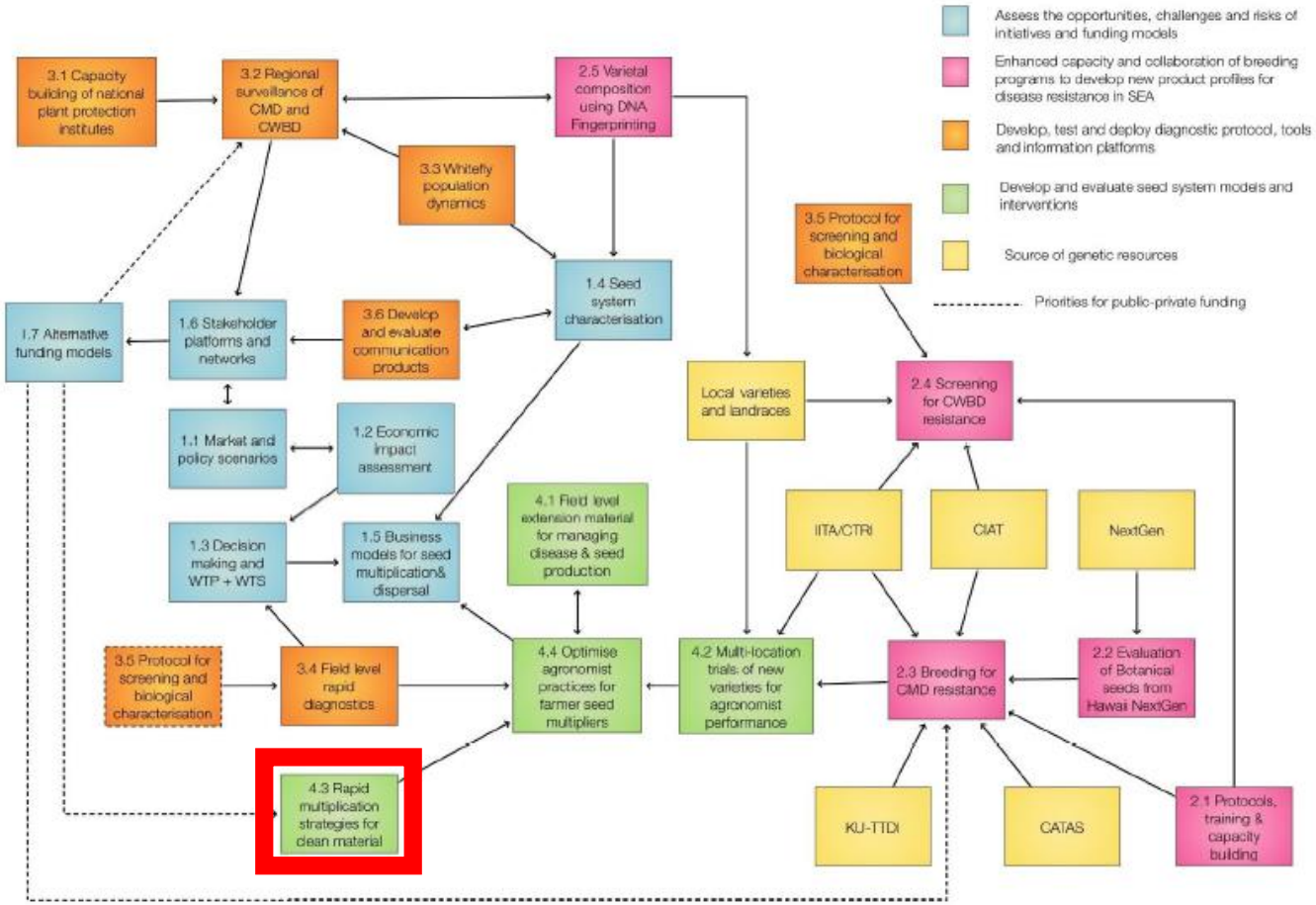
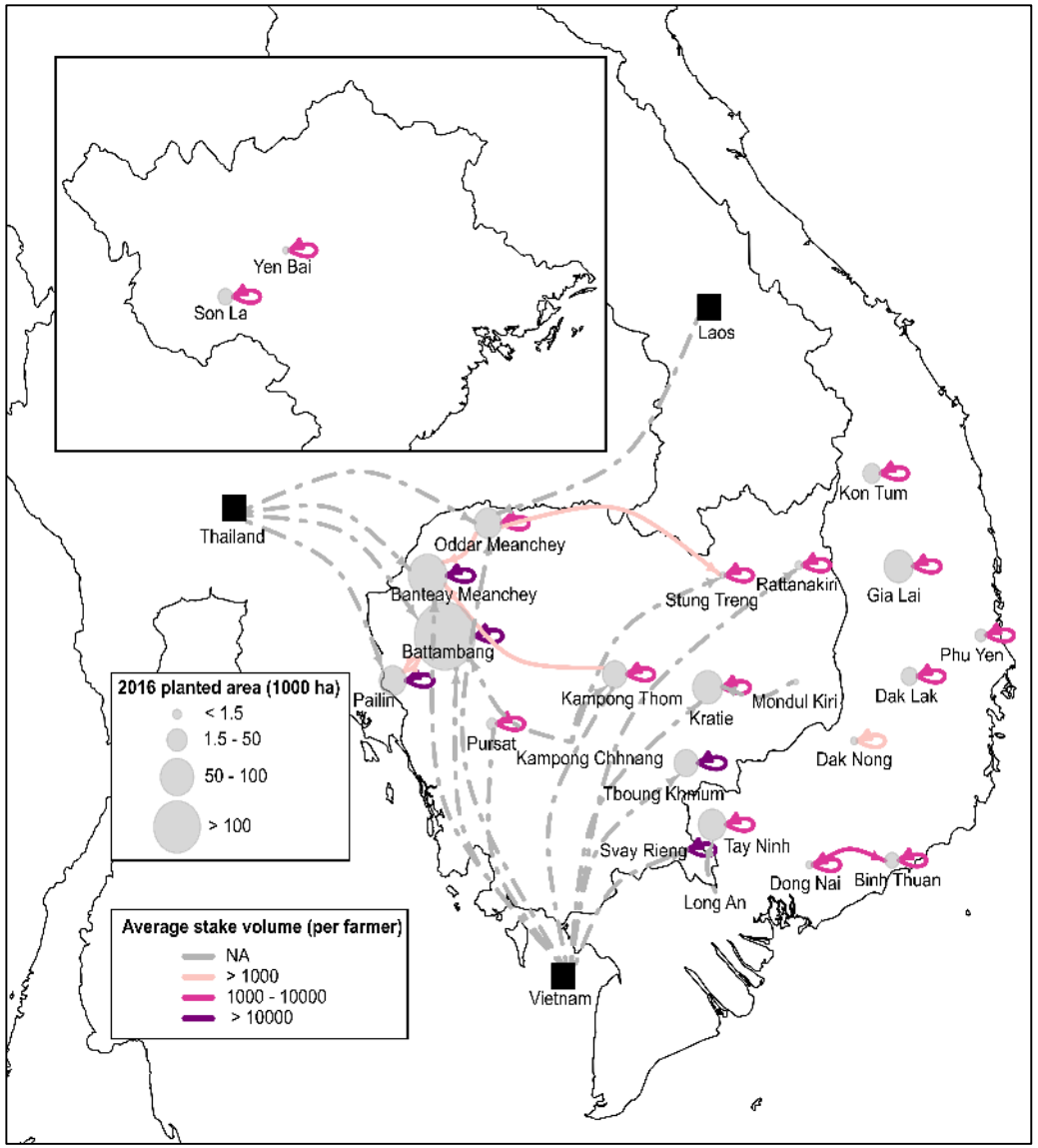


# Context & background

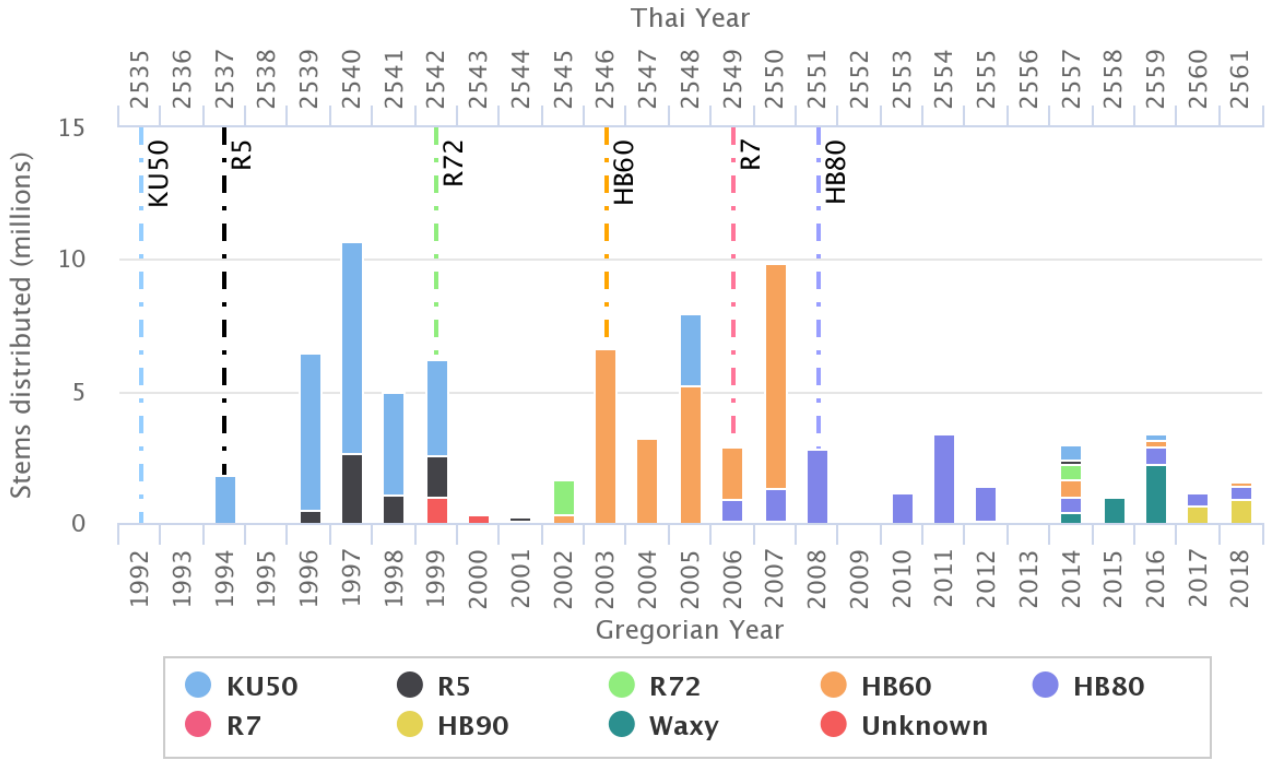
- 100+ years of ‘disease-free’ multiplication, evolution of complex regional farmer network
- ‘Formal’ system: government, research & extension players
- Different models of production, dissemination
- Levels of subsidy – no strictly business models

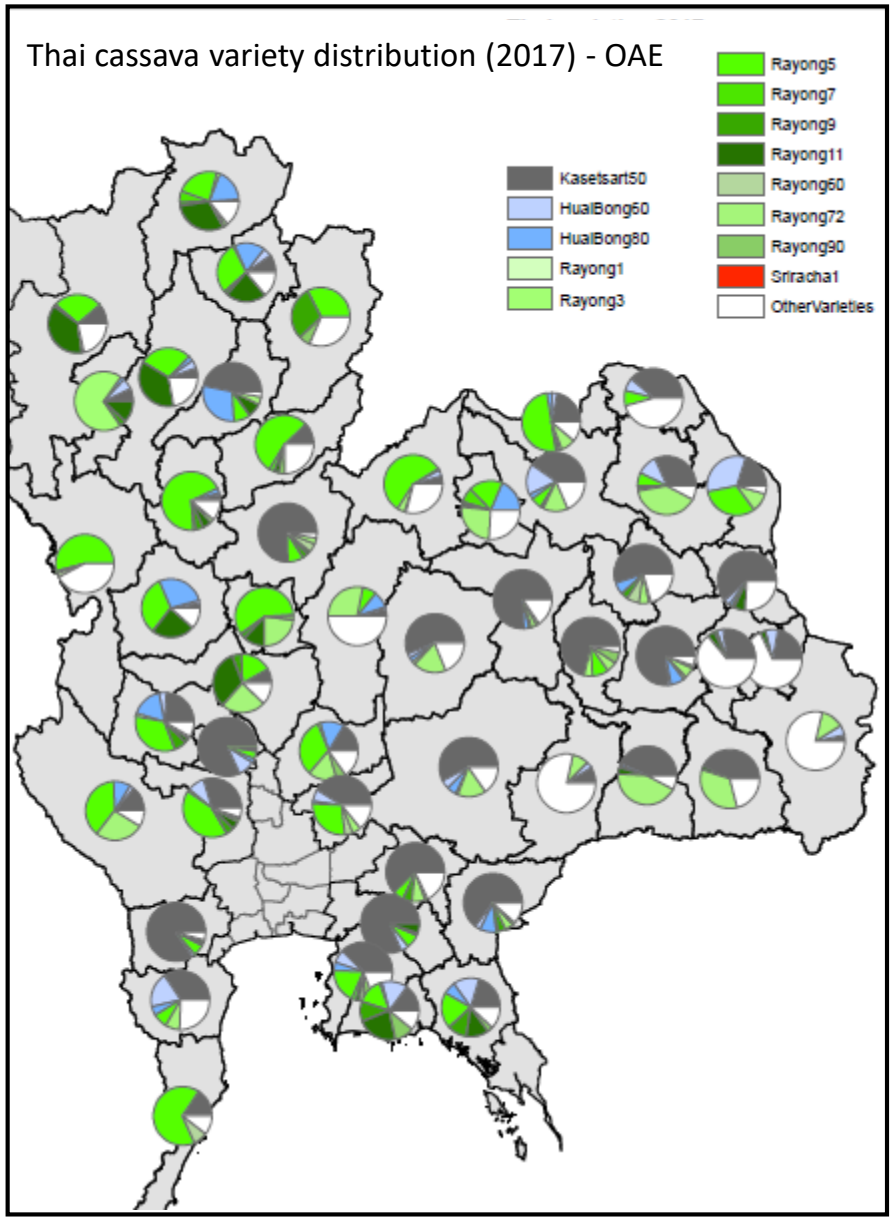



Delaquis et al., 2018

# Context & background

- Old goal of multiplication:
  - New varieties -> farmers -> ↑ production
- New goals for multiplication:
  - Varietal identity control
  - Phytosanitary control
  - Product quality control / market differentiation



# Rationale

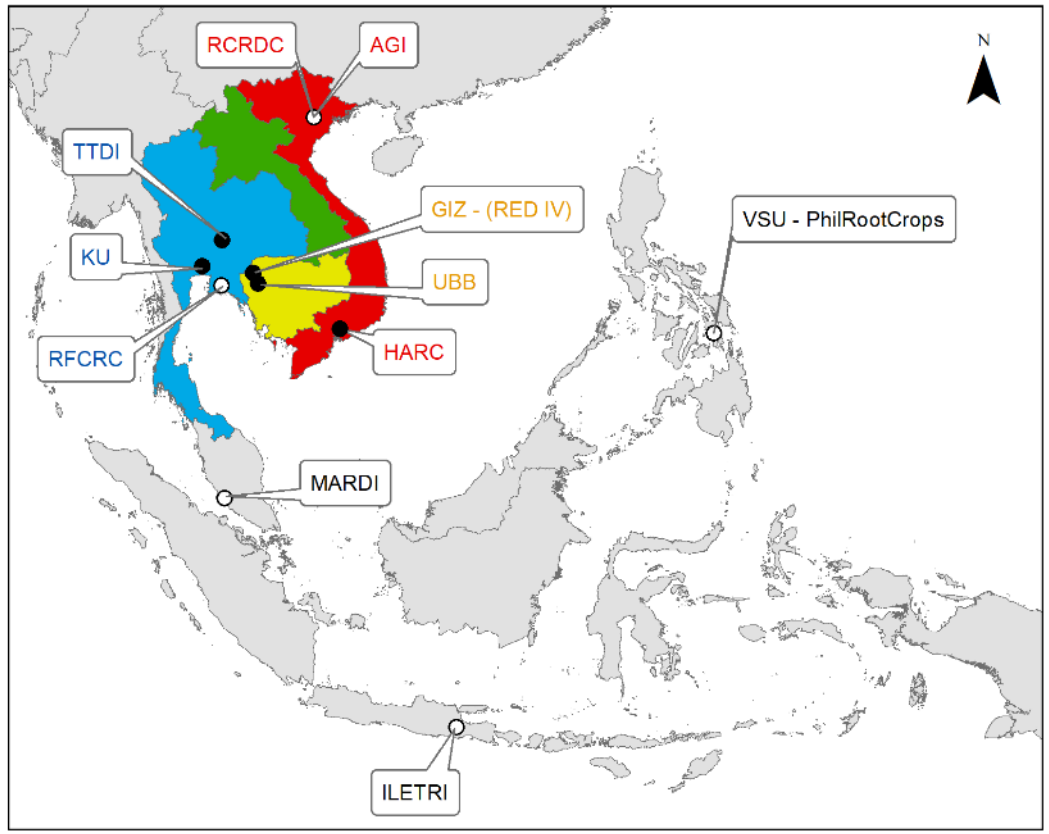
- Preliminary results (CAVAC): clean planting material can defend yield penalty from CMD infection (at least in year 1)

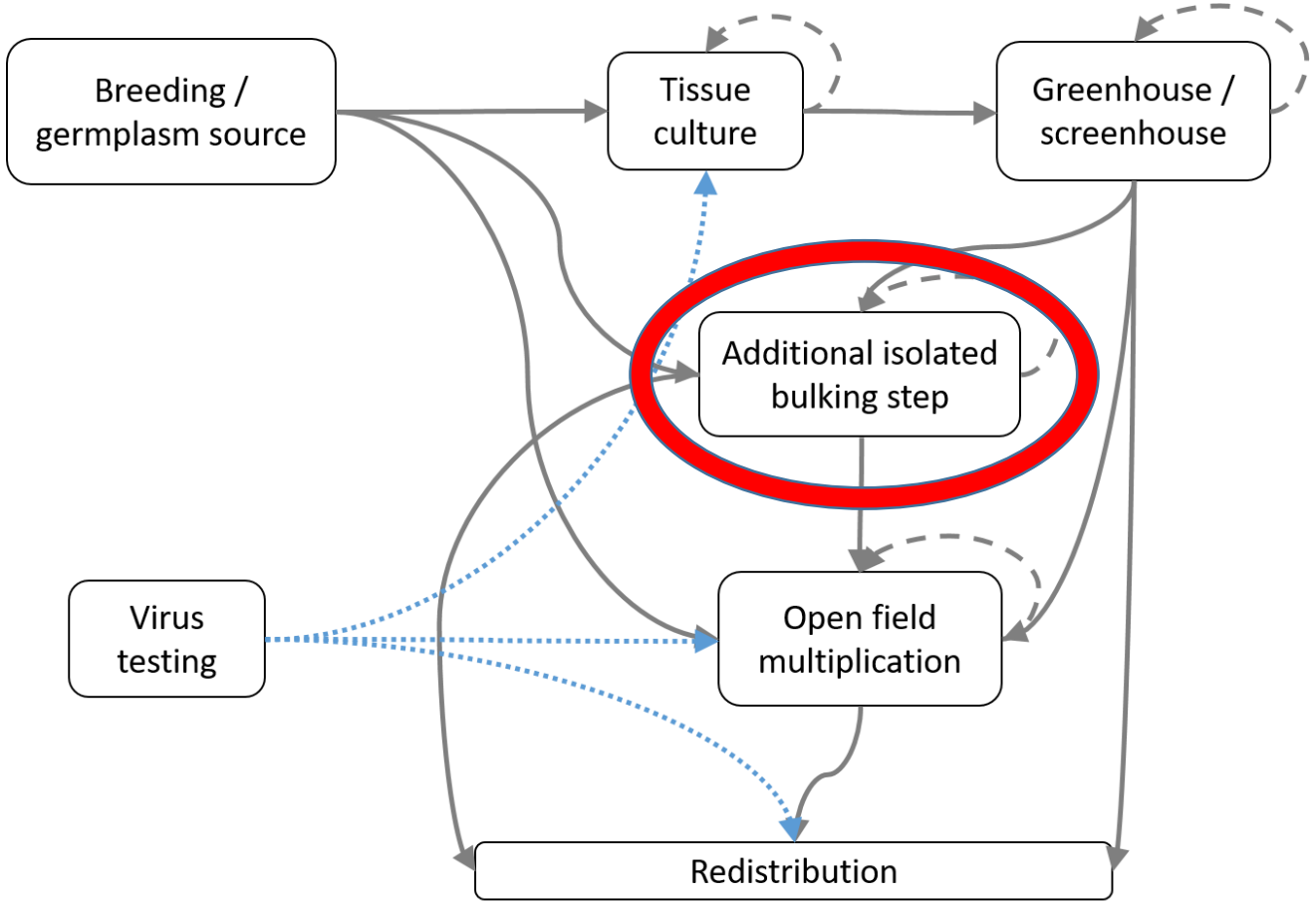
- Laws limiting transport of untested materials, but no sources of clean material available in most countries/settings

- Need for increased capacity to rapidly multiply resistant materials in the pipeline

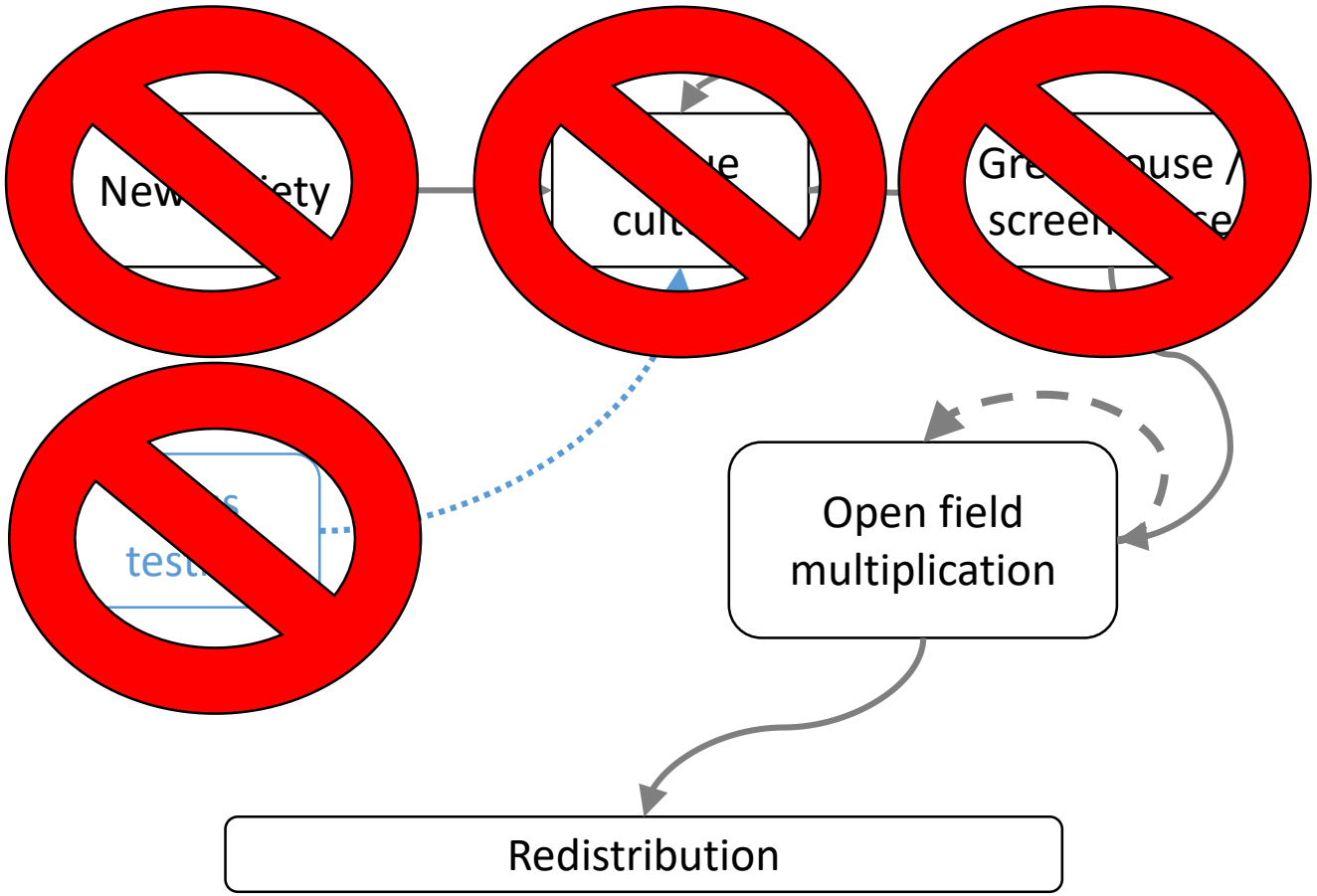
# Seed multiplication models

- Stem multiplication pathways
- Need for increasing multiplication rates, lowering cost per unit



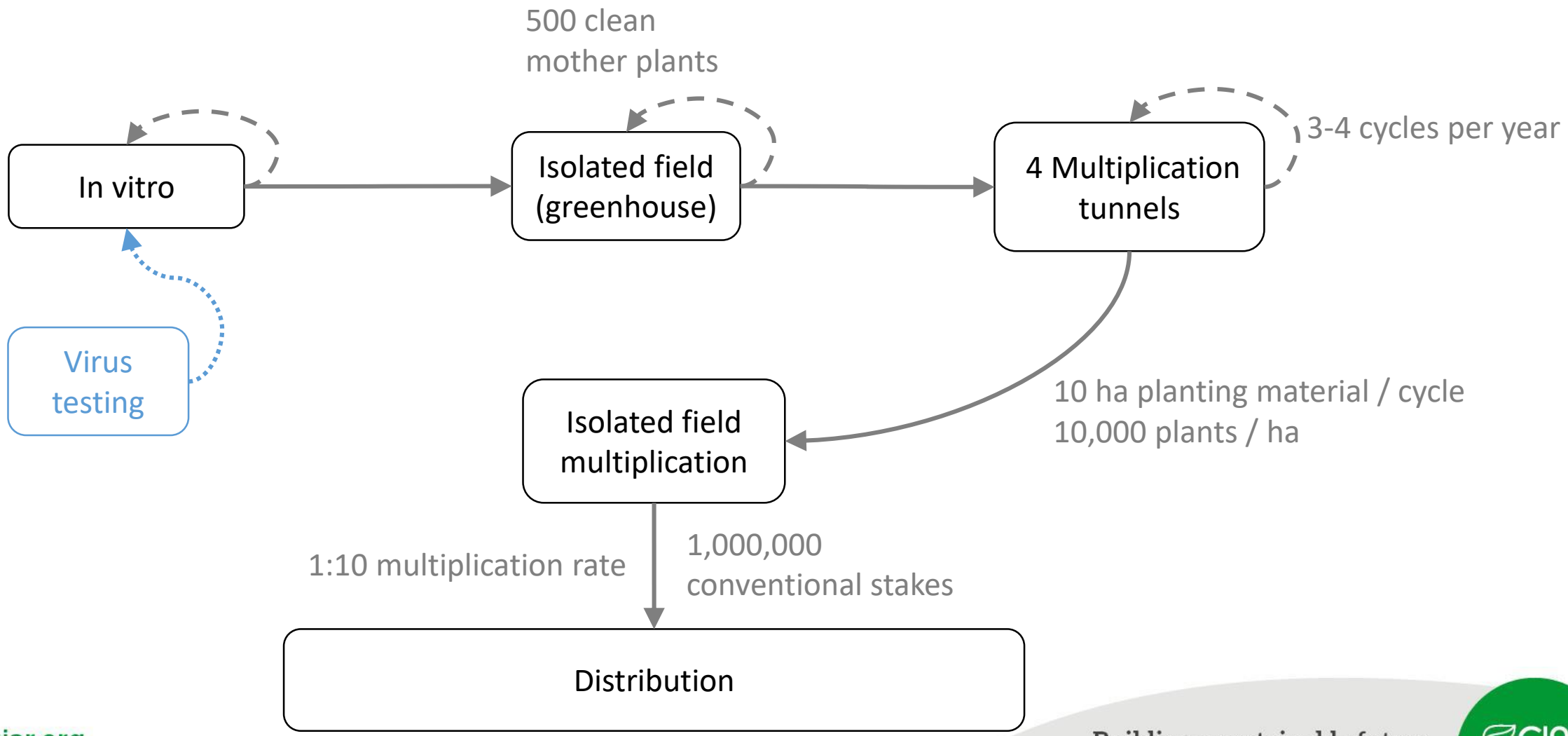



# ‘Conventional’ cassava multiplication pathway




- Relies on repeated open field multiplication cycles
- Low 1:10 multiplication rate / year; very slow to multiply new material
- No phytosanitary control in major multiplication stages
- In reality…

# Tunnel based rapid stem multiplication (4 tunnels + 10 ha field)



**MGTCL** Molecular Genetics and Tissue Culture Laboratory

# CIAT'S CASSAVA SEED SYSTEM APPROACH

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

# 10 Ha field plan for stem multiplication (4 tunnels)

In vitro

- Start with 1000 tested in vitro plants

Isolated field (greenhouse)

- 500 mother plants maintained in clean greenhouse

4 Multiplication tunnels

- Rapid multiplication tunnels increasing multiplication rate with cycle time 3 months

Isolated field multiplication

- Production in each year of 10 ha planting material

Distribution

# Tunnel system: speeding up scaling


Lateral table 1
0.7 x 9 m
36 tray/50 holes
3600 plantlets

Central bed
1x 8 m
1000 mini-cuttings

Lateral table 2
0.7 x 9 m
36 tray/50 holes
3600 plantlets

Inexpensive, major increase in multiplication rate
Uses immature sprout cuttings instead of conventional stakes, speeding up multiplication
Each tunnel can produce material for 0.75-1 Ha / year

# How does the system work?

# *Using immature tissues (cuttings and branches*)*

**Harvest after 4- 6 months**

**Material on field conditions with agronomic & practical management**

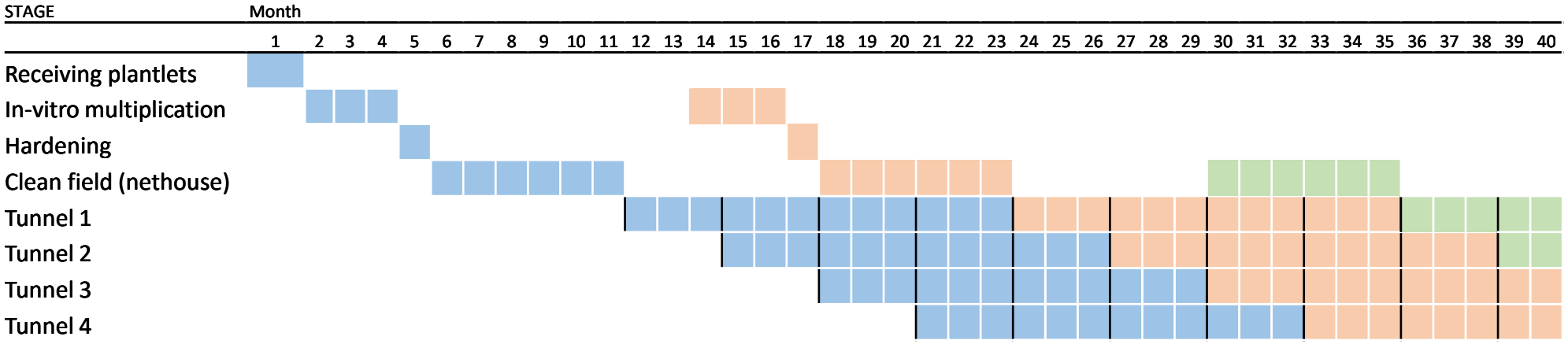




In most of Asian clones is not occurs many branches. It works for Latin American clones

# Timeline for tunnel multiplication – 4 tunnel system for 10 ha

## Tunnel multiplication




| | Year 1 |
|---|---|
| Tunnels cumulative output (plants) | 100,000 |
| Isolated field material (plants) | |
| Secondary field multiplication (farmer) | |

# Summary

- Tunnel system advantages:
  - Greatly shortens time to increase available planting material
  - Increases annual multiplication rate through use of miniset and immature cuttings
  - Could implement a QC program
  - Tunnel system can support releases of new planting material

- Required infrastructure:
  - Centralized greenhouse for mother plants
  - Set of 4 multiplication tunnels
    - Electric/solar power, water supply
    - 8 staff & manager
  - 10 ha fields for first round multiplication (pre-basic seeds)

# Considerations for discussion groups

- Clones (by level of resistance & agronomic performance) to put into the system
- Location of centralized greenhouse facilities (mother plants)
- Number & location of field systems, considering strategy for dissemination
- Evaluation of existing facilities, in vitro varieties (where, #, QC)
- Future: dissemination strategies, dealer concept and tracking/monitoring
- Training & capacity building

# Thank you!

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HAVE CELEBRATED 50 YEARS
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