

The Seed System for CMD Resistant Cassava Breeding Program in Thailand



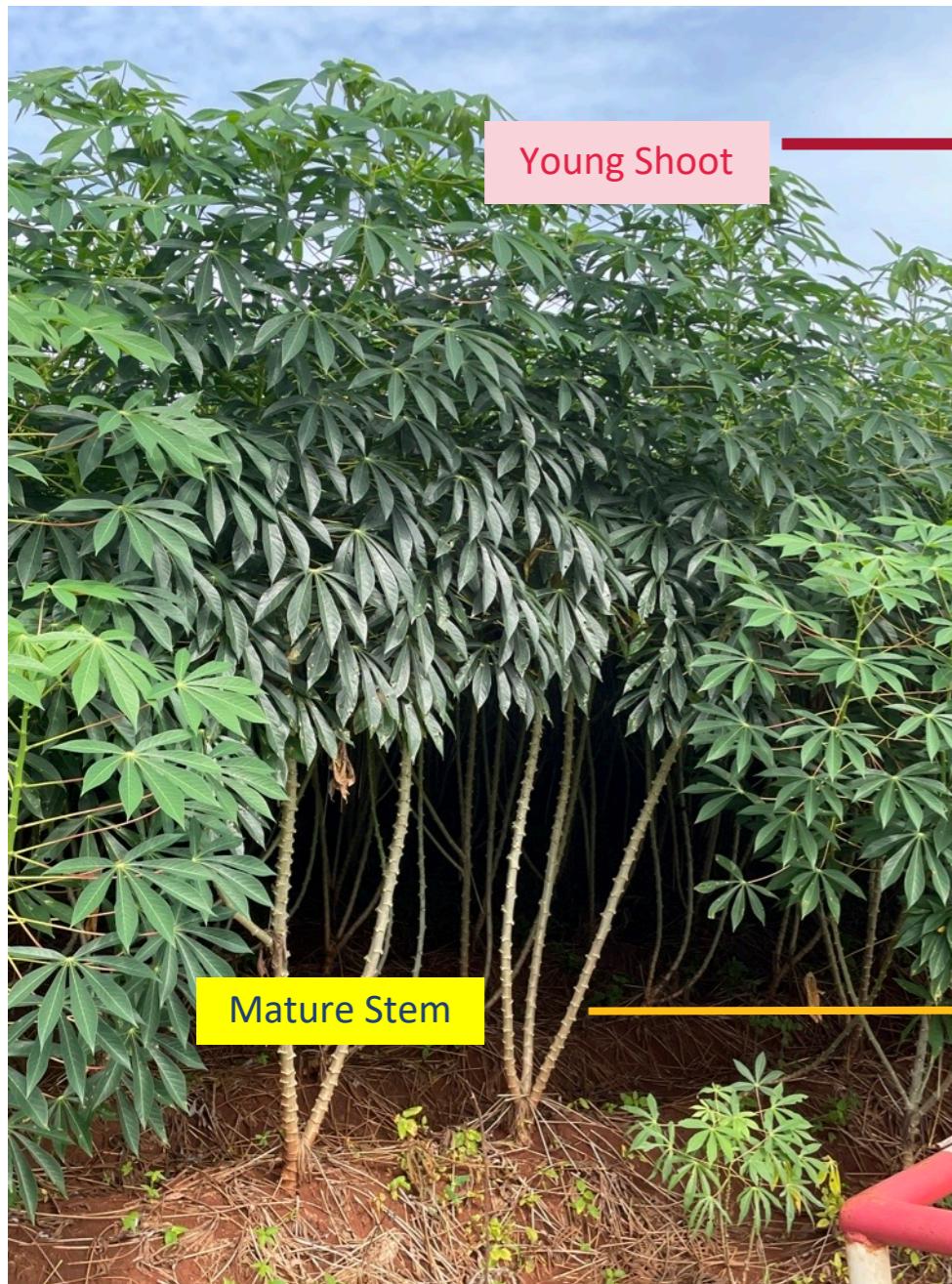
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Plant Tissue Culture and Propagation for Crop Improvement

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Tay Ninh, Vietnam, October 6th, 2023

Current cassava seed multiplication model for CMD resistant hybrid



Shoot tissue

1. Modified Plant Tissue Culture System

Fully Funded by KURDI, Kasetsart University (2018)

Mother plants

2. X20 system

Developed by TTDI and KU (2019)
Fully Funded by TTDI (2019)

1. Plant Tissue Culture Program for CMD Resistant Cassava Breeding

Established-- Kasetsart University since 2012- present (2023)

--TTDI, since 2018-present (2023)

- ✓ **CMD genotypes imported from CIAT and IITA were *in vitro* propagated.**
- ✓ **Hybrid seedlings from crossing were mass propagated for primary yield trial.**
- ✓ **A disease free- back up set of all cassava assessments used in our current breeding program were conserved in tissue culture.**



Plant tissue culture lab, KU: in vitro establishment, shoot multiplication and germplasm collection



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Plant tissue culture lab, TTDI : in vitro rooting, acclimatization and nursery



Isolated field at TTDI, Nakhon Ratchasima, Thailand



Plant Protection Procedure for imported materials to Thailand

CMD monitory system for imported materials operated by **DOA**

2. Plant Tissue Culture : 7 months



1. Request of import permit and quarantine of imported materials : 1 year

Step 1. Virus detection must be proceeded at Plant Protection Research and Development Office, Department of Agriculture.

3. Greenhouse: 2 months



Step 2-3 CMD free- genotypes were **micropropagated** to increase the number of clones used in hybridization/ Field trial.

4. Field Evaluation : 9 months



Step 4. The clones were evaluated in **Field trial**.

Plant Quarantine and Inspection of incoming germplasm by DOA

Leaf samples of plantlets were detected for CMD virus [by PCR method](#) before releasing to KU plant tissue culture laboratory for micropropagation.



CMD inspection of TC seedlings **before/after** planting in the fields by DOA





CMD detection by PCR method



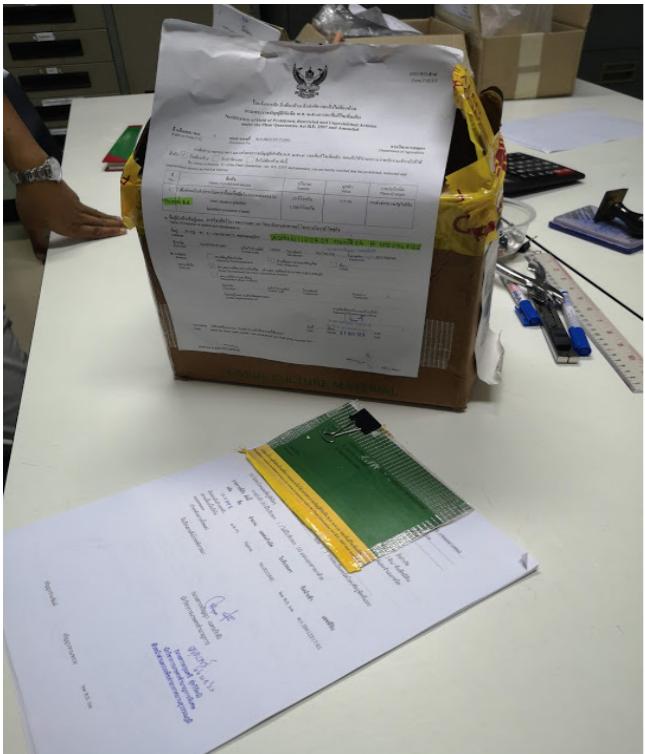
Importation of CMD resistant materials to Thailand

1. C-33 and TME-3 exported from CIAT in 2013



Importation CMD resistant materials to Thailand

2. CMD-resistant cassava cultivars exported from IITA in 2018

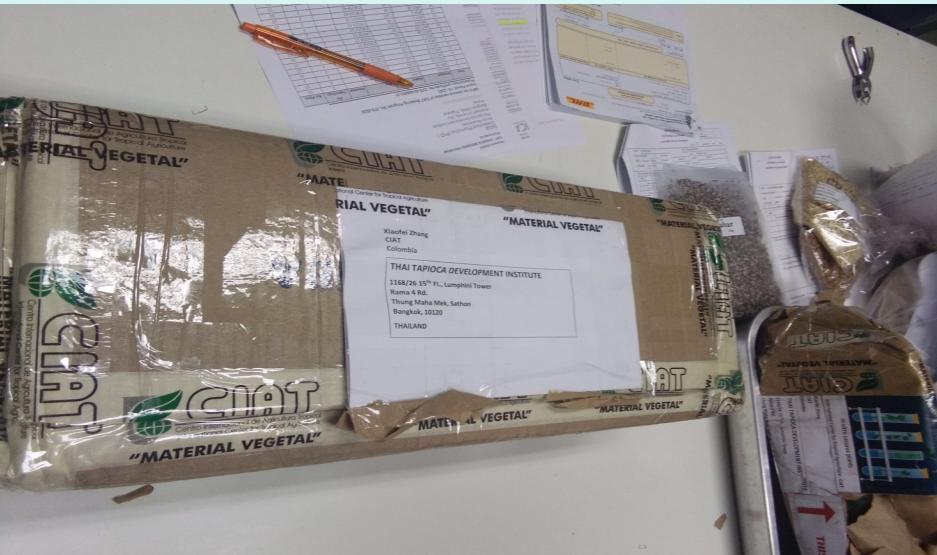


TME B419
IITA-TMS-IBA980581
IITA-TMS-IBA980505
IITA-TMS-IBA972205
IITA-TMS-IBA920057



Importation of CMD resistant materials to Thailand

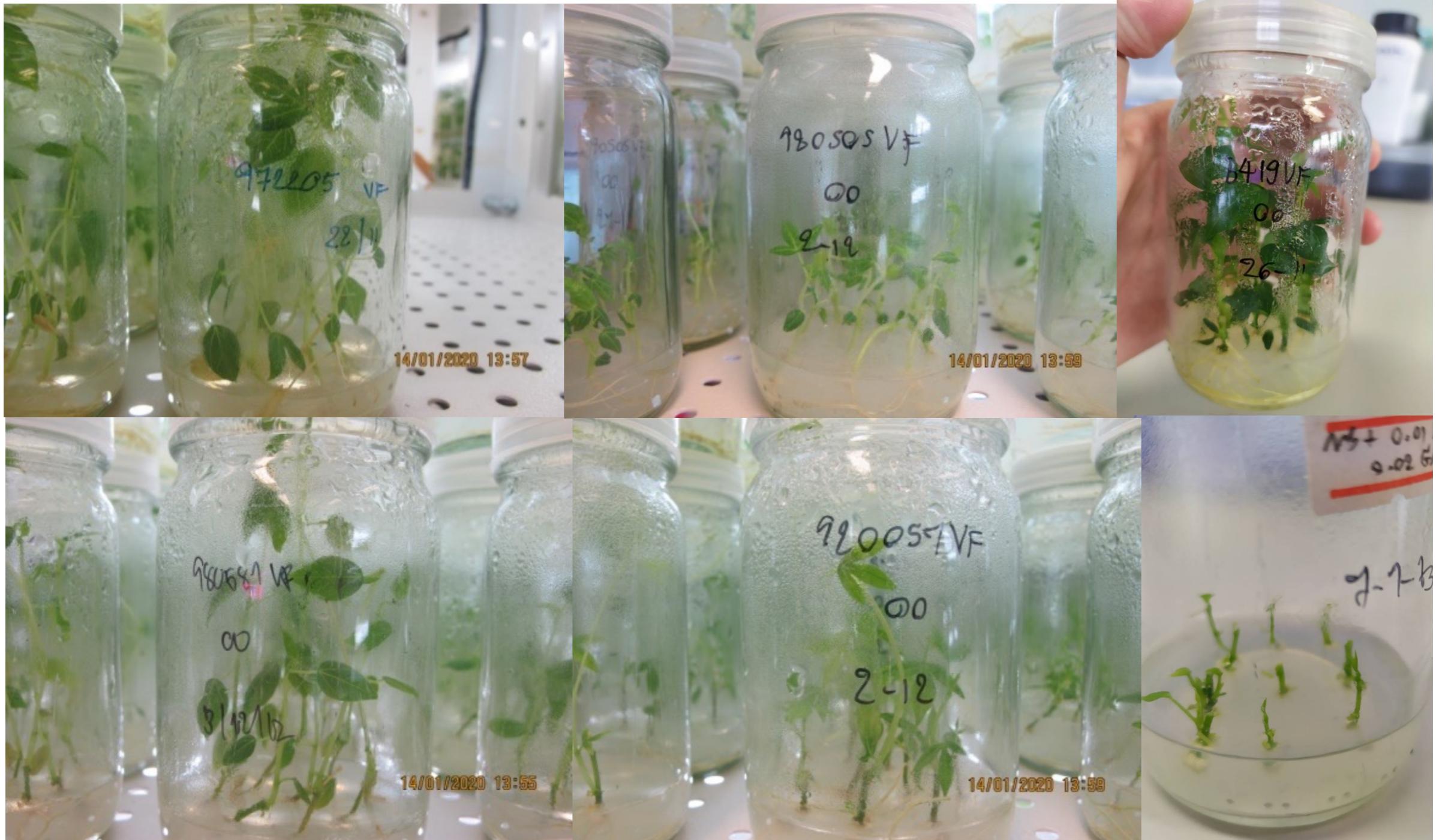
3. 32 hybrid clones exported from CIAT in 2021



| | | |
|-------------------|--------------------|--------------------|
| 1.AR9-12 | 12.AR23-1 | 24.CR25-4 |
| 2.AR9-14 | 13.AR35-1 | 25.CR27-20 |
| 3.AR11-12 | 14.AR37-38 | 26.CR52A-2 |
| 4.AR12-11 | 15.AR37-103 | 27.CR52A-4 |
| 5.AR12-57 | 16.AR40-3 | 28.CR60B-10 |
| 6.AR14-2 | 17.AR40-5 | 29.CR61A-1 |
| 7.AR14-3 | 18.AR40-19 | 30.CR100-2 |
| 8.AR17-3 | 19.AR42-3 | 31.CR100-5 |
| 9.AR17-18 | 20.AR42-4 | 32.CR100-9 |
| 10.AR17-23 | 21.CR13-8 | |
| 11.AR18-1 | 22.CR24-3 | |
| | 23.CR24-16 | |



1. Shoot proliferation and rooting of CMD resistant germplasm



**TMEB419, IITA-TMS-IBA980581, IITA-TMS-IBA98055,
IITA-TMS-IBA972205, IITA-TMS-IBA920057**

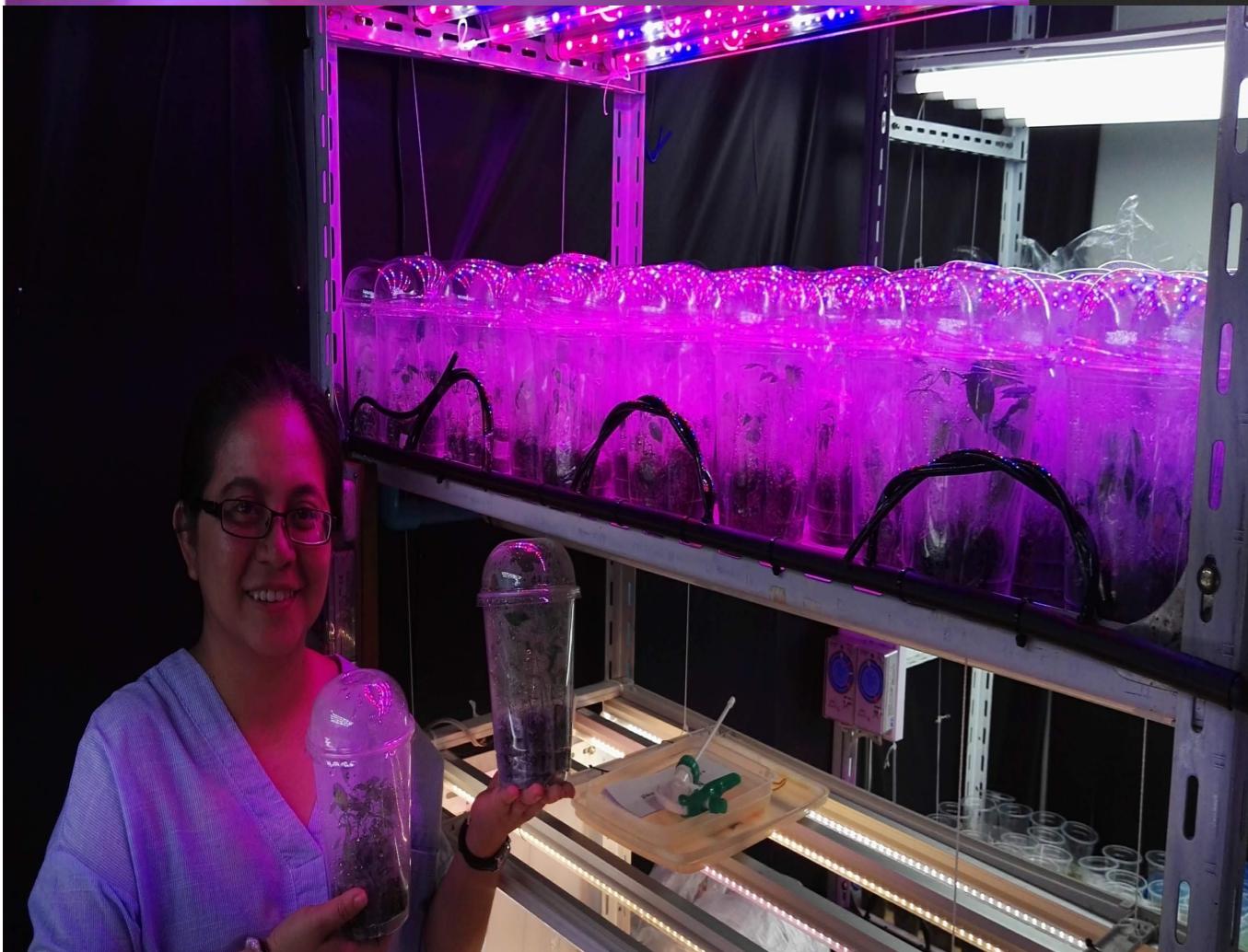
TC plantlets were acclimatized in **EVAP (Evaporative cooling system)**
Kasetsart University, Bangkok in 2013



2. Acclimatization of C-33 and TME -3 plantlets



Rooting and acclimatization of CMD tissue culture in 2018



Tissue culture derived seedlings after hardening in artificial lighting room for 45 days



Tissue culture derived seedlings after hardening in artificial lighting room for 45 days



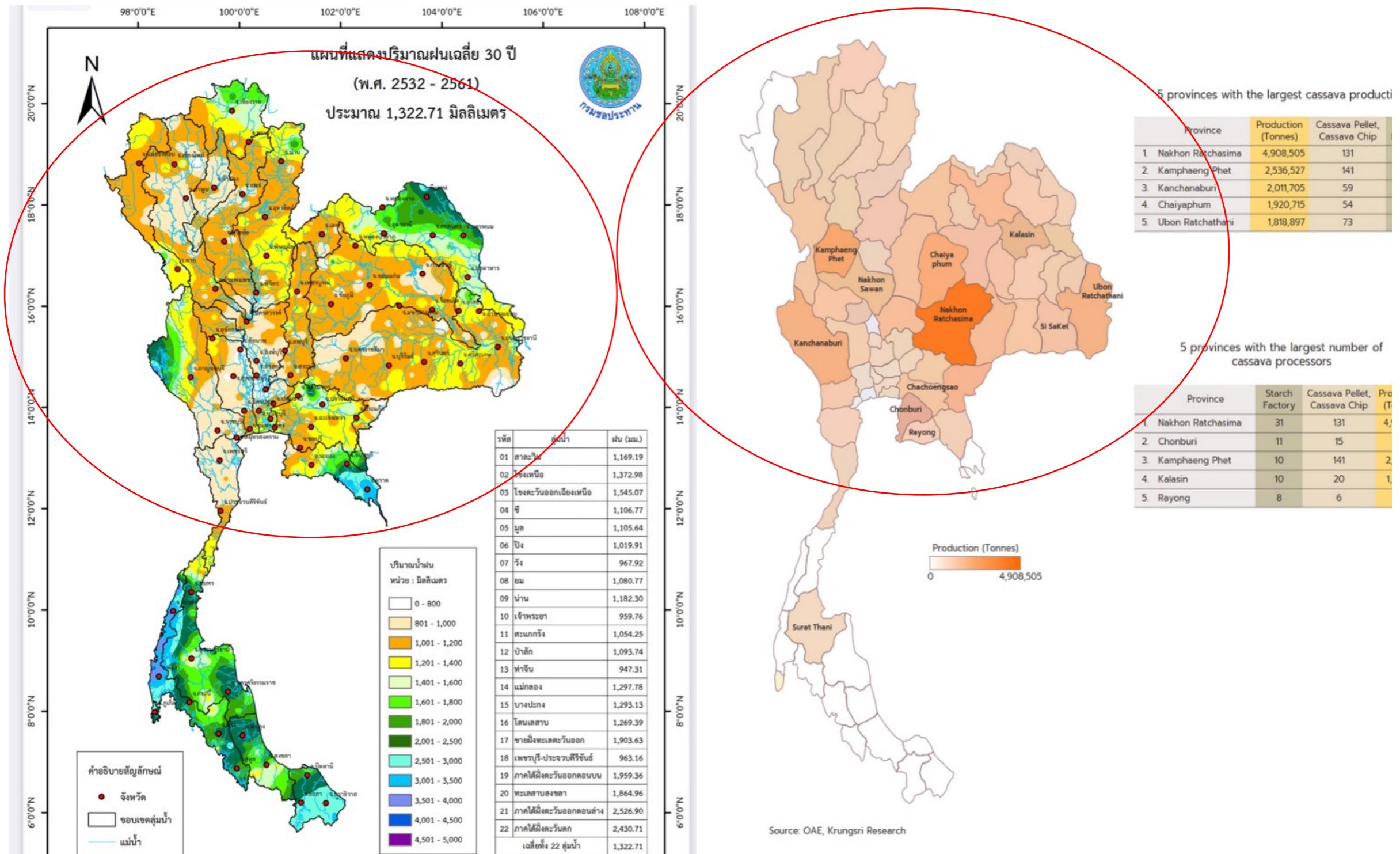
3. Hardening of tissue culture seedlings in greenhouse for one month.





Young seedling were hardened in full sunlight for one week before transplanting in the field.

In Thailand, cassava production was mostly done in low rainfed area



4. Field transplantation of tissue culture derived cassava seedlings : beginning of rainy season



Healthy tissue culture derived cassava seedlings formed well-developed root system.



Young seedling were irrigated for one-two months depending on the rainfed level.



TME B419 after planting for 2 months

TME-3

Growing season 2019/2020

C-33



CMD resistant clones imported in 2018: growing season 2019/2020



CMD Hybrid clones imported in 2021: growing season 2022/2023



2. X20 system



Cassava stacks used for cutting

1 stem

20 of two
node
cutting

20 plants

30 days



Large scale-waxy propagule production by using x20 system at TTDI in 2021



**790,500 cassava cuttings were produced and delivered to starch factories
(March 2021- June 2021)**



Mar 2023, 7,000 cassava stems were delivered to TTDI for 20X seed multiplication (TMEB419, IITA-TMS-IBA980581 and IITA-TMS-IBA920057)





Cassava field day, TTDI : Aug 30th, 2023

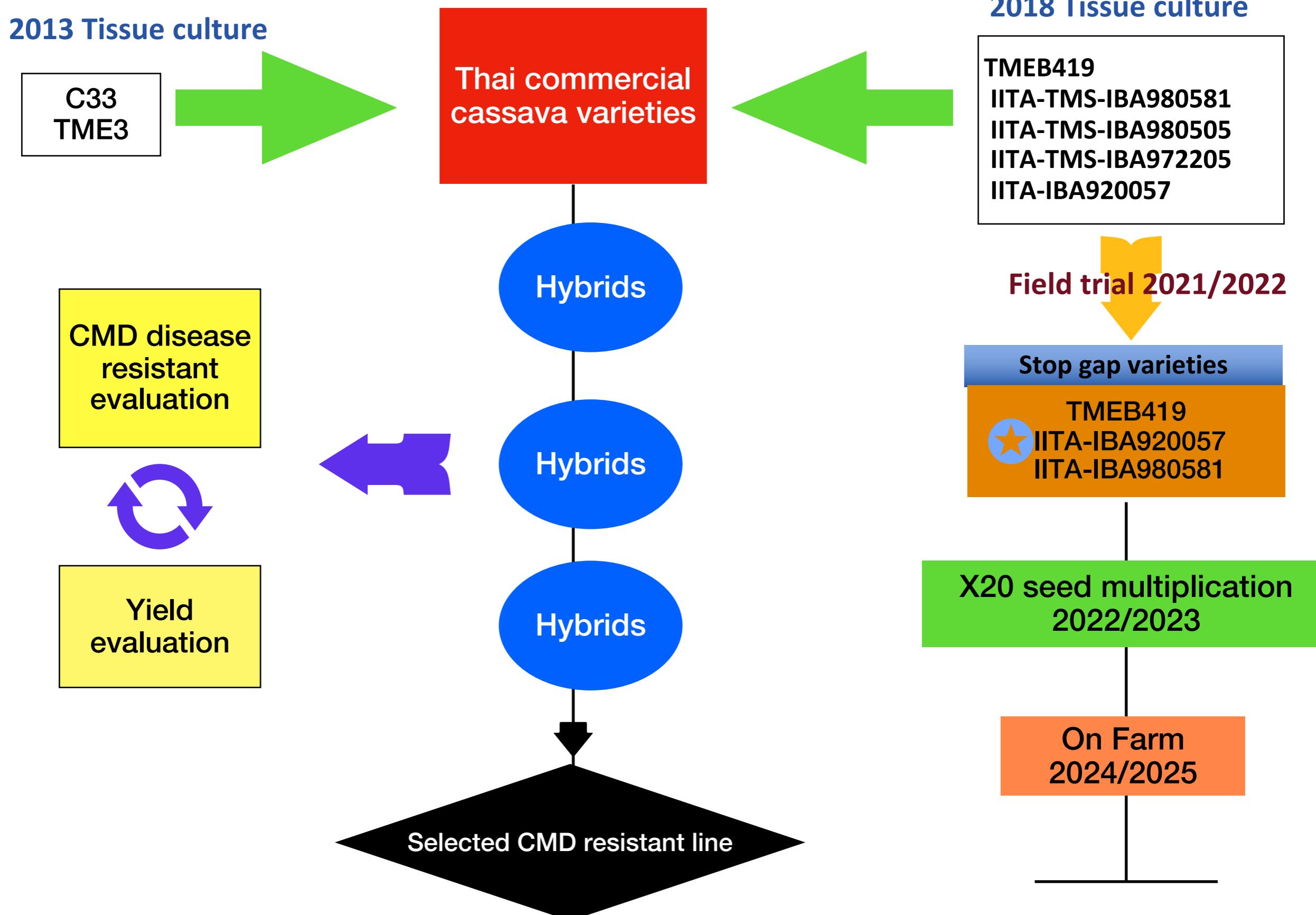




90,000 CMD resistant cassava plants(3 mth old)



Seed system of CMD resistant cassava in Thailand



Thank you

