ESTABLISHING SUSTAINABLE SOLUTIONS TO CASSAVA DISEASES IN MAINLAND SOUTHEAST ASIA

AGRICULTURAL GENETICS INSTITUTE
END OF PROJECT

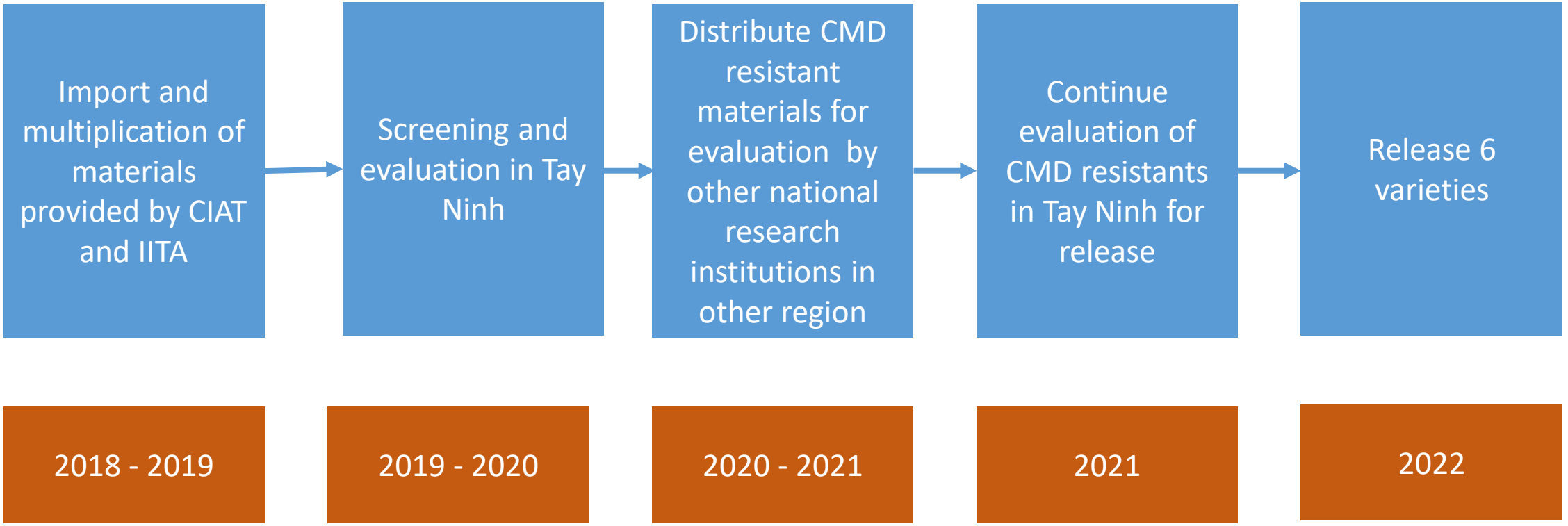
10/2023

Project Objective

- **Objective 1**: Assess the opportunities, challenges and risks for the development of sustainable regional solutions for cassava disease management in mainland SEA including coordinated policy development, sustainable business and public-private funding models;
- **Objective 2**: Enhance the capacity and collaboration between breeding programs in mainland Southeast Asia to develop new product profiles for commercially viable cassava varieties by identifying and incorporating known and novel sources of resistance to Cassava Mosaic Disease (CMD) and Cassava Witches Broom Disease (CWBD) into national breeding programs:
- **Objective 4**: Develop and evaluate technically feasible and economically sustainable cassava seed system models for the rapid dissemination of new varieties and clean planting material to smallholder farmers in different production systems and value chains.

EVALUATION OF 107 IMPORTED VARIETIES AND RELEASED 6 VARIETIES

TIMELINES



IMPORT AND MULTIPLICATION OF CIAT AND IITA CMD RESISTANT CLONES

5 CMD resistant clones from IITA arrived in December 2018. 25 in-vitro plantlets in total
102 clones from CIAT arrived in January and March 2019. 600 in-vitro plantlets in total
10,000 plantlets were multiplied and ready for evaluation September 2019

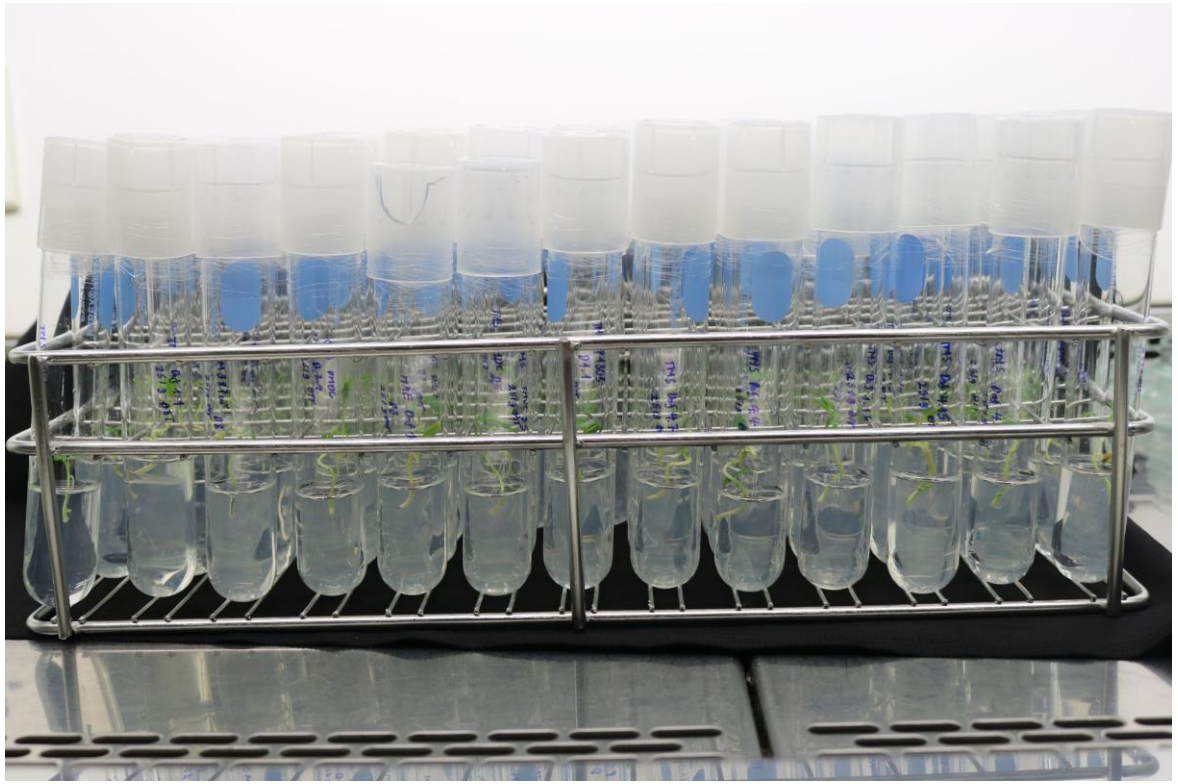


Figure 1. Multiplication of 107 clones using tissues culture

Screening and evaluation in Tayninh - 2019

Figure 2. Planting 107 clones for CMD evaluation

Grafting to confirm CMD resistance

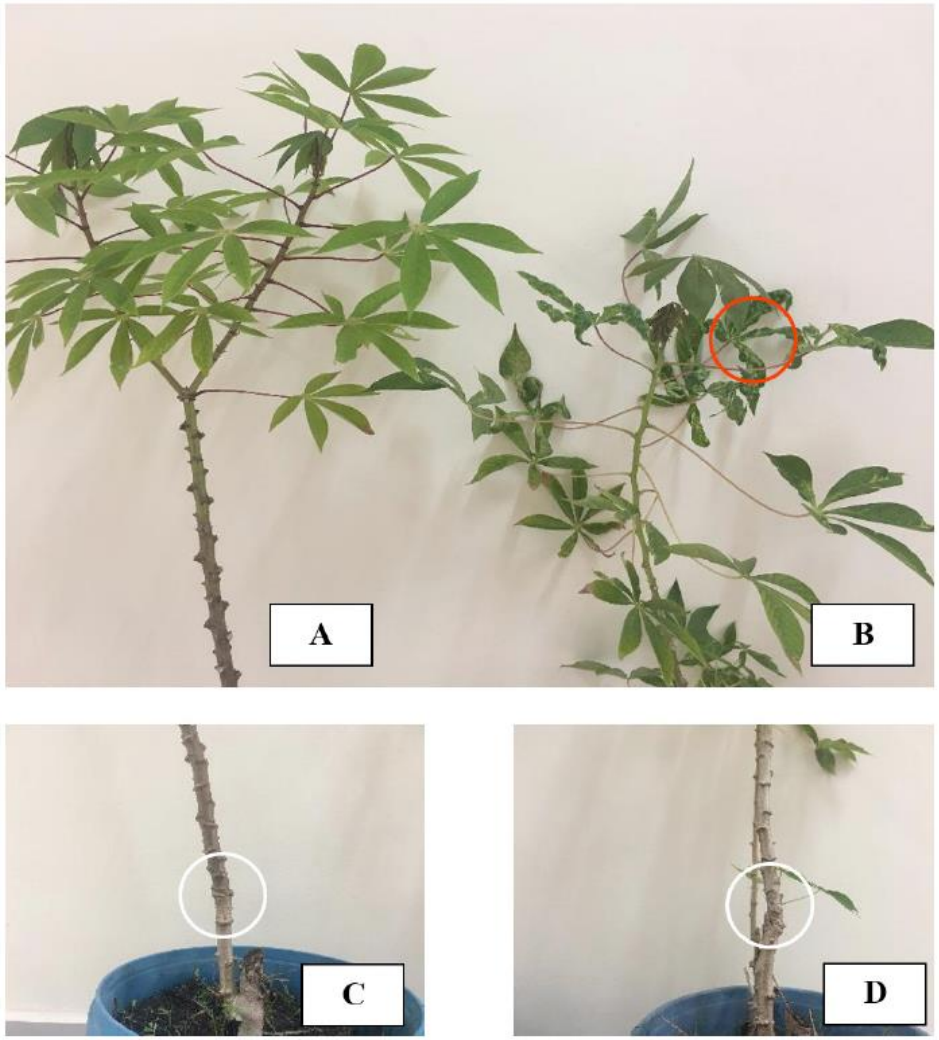


Figure 3. Results of grafting to quick assess resistance to CMD. A: C-33 grafts show no CMD symptoms; B: Clone 50C313 with CMD symptoms with mosaic leaf (red circle); C & D: Successful grafting (white circle).

42 CLONES ARE CONFIRMED RESISTANCE AFTER THE SCREENING

Figure 4. IBA980581 resistant variety harvested after 11 months in Tan Chau, Tay Ninh (September 2020)

Figure 5. IBA972205 resistant variety harvested after 11 months in Tan Chau, Tay Ninh (September 2020)

YIELD TRIALS OF 42 CMD RESISTANT CLONES

Name CODE	Plant Type TN	Main stem height TN	First branching height TN	Germination rate (%) TN	Yield TN	Starch TN	Observations
AR35-1	3	293	213	0.98	28.85	27.62	
AR42-4	3	330	263	1.00	21.58	27.52	
AR9-48	**4**	**294**	**258**	**0.92**	**24.48**	**26.30**	
CR13-8	3	315	167	0.93	27.45	29.73	
CR24-16	**4**	**287**	**287**	**1.00**	**29.03**	**30.38**	
CR25-4	4	303	273	0.98	23.58	30.07	
CR27-20	**3**	**217**	**137**	**0.95**	**23.95**	**30.66**	
IBA972205	1	300	134	0.87	18.40	25.50	
IBA980581	4	318	181	0.97	31.10	27.95	
TMEB419	**4**	**285**	**272**	**0.90**	**42.55**	**29.37**	
KM140	4	191	191	1.00	17.28	27.28	Lodging in Tay Ninh
KM94	4	247	247	1.00	7.61	29.25	Stunting
KM419	4	159	151	1.00	4.03	28.70	
KM505	4	233	227	0.77	8.85	29.40	Stunting, lodging, small roots

ADVANCED YIELD TRIALS OF 12 CLONES SELECTED BASED ON RESULTS FROM YIELD TRIAL OF 42 CLONES

- 2nd yield trial of 12 clones selected from the yield trial in 2020 established in April 2021 in Tay Ninh.

Figure 6. Roots of HN1 (TMEB419), HN80 (CR27-20), HN36 (CR24-16) HN97 (AR9-48) – at 7 month age, (starch from 21 - 24%) (November 2021)

4 varieties are released in December 2021 and January 2022.

PARTICIPATORY EVALUATION WITH CASSAVA STAKEHOLDERS

Figure 7. The representative of the delegation of the Plant Protection Department coordinated with the Plant Production Department , National Center for Agricultural Extension, Agricultural Genetics Institute, Plant Protection Institute; Department of Agriculture and Rural Development, Sub-Department of Plant Production and Plant Protection, Agricultural Extension Center of Tay Ninh Province to evaluate new clones (11/2021)

Crossing nursery

- Established crossing nursery in Mai Son, Son La in 2019-2022
- Flower inducing using red-lights introduced by CIAT
  - Progenitors: AR42-4, AR9-48, CR27-20, CR52A-4, TMEB419, CR24-16, IBA972205, IBA980581, Rayong 11, KM94, KM419
  - Understanding of effect redlight in Northern Vietnam condition for cassava flowering

TEST FLOWER INDUCING TECHNOLOGY IN NORTHERN VIETNAM BY COMPARING WITH NORMAL CROSSING NURSERIES

Establish crossing nursery with CMD resistance clones and elite clones in Sonla province

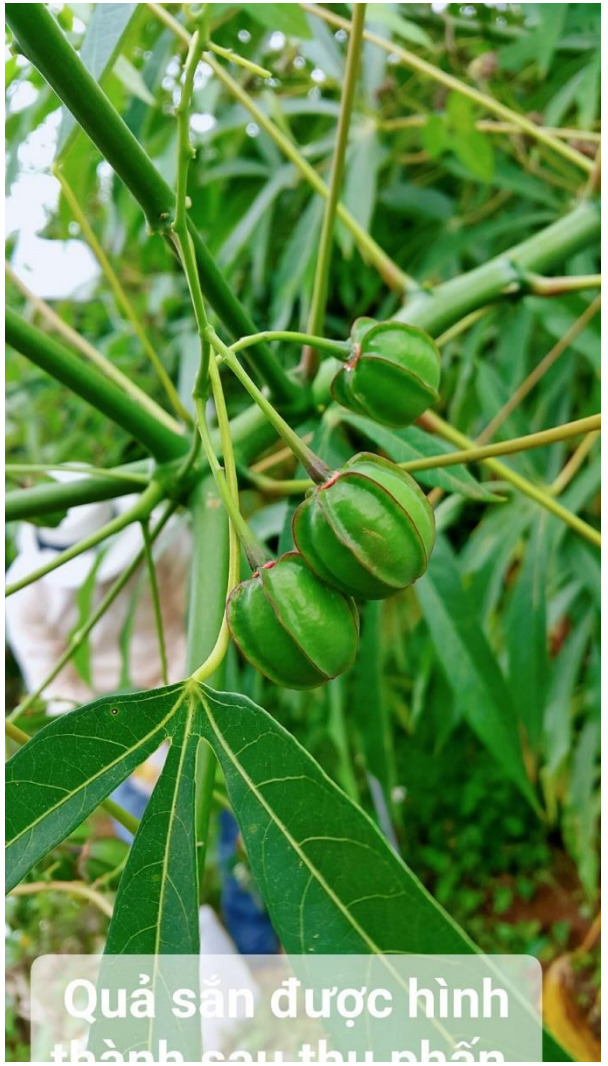


Figure 8. Flowering and crossing in Sonla province

SEEDS

Figure 9. Drying seed

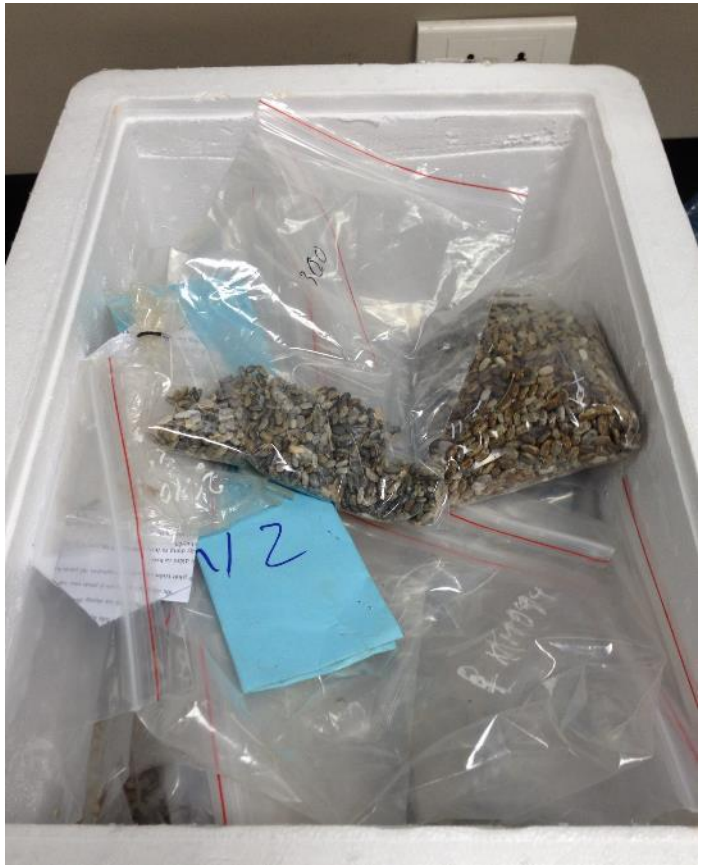


Figure 10. Package of drying seed

FULL-SIB

No.	Mother	Father	Number of seed
1	IBA920057	KM94	8
2	IBA920057	KM419	78
3	AR42-4	KM94	51
4	AR42-4	KM419	5
5	KM94	CR24-16	3
6	KM419	AR42-4	15
7	IBA972205	C-33	2
8	KM94	CCR100-13	2
9	CR100-13	KM94	3
10	KM94	AR42-4	55
11	HL-S12	C-33	9
12	Rayong11	C-33	5
13	IBA972205	KM419	17
14	KM419	CR24-16	5
15	Rayong11	AR42-4	11
16	Rayong11	IBA972205	36
17	Rayong11	CR100-13	11
18	KM94	Rayong11	123
19	Rayong11	KM419	13
20	KM94	C-33	22
21	KM94	KM94	49
	Total		**523**

HALF-SIB

No.	Mother	Number of seed
1	KM94	1572
2	CR27-20	384
3	KM419	1022
4	IBA972205	749
5	IBA980581	614
6	CR100-13	76
7	C-33	145
8	IBA920057	860
	Total	**5423**

Total of seed in 2022 is nearly 6000 seeds.

CORE COLLECTION

- Core collection is a collection of 509 clones from CIAT
- 4 batches included 509 clones were transferred to AGI from end 2020 to 2022.
- Only 300 clones survived due to the transported and long custom clearance (plants stay in low light, contaminated)
- 84 clones was evaluated at 6 months, 55 clones at 3 months.
- In first 84 clones, they are BRA12 and COL2353 that resistance to CMD.
- In second 55 clones, there are 51 clones which don't show CMD symptoms after 1 month.
- The result will be reported to CIAT when they are harvested.
- At the end of this year, next 100 clones will be planted to test.

THANK YOU FOR LISTENING