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Leveraging research partnerships in Cambodia to address emerging constraints and opportunities

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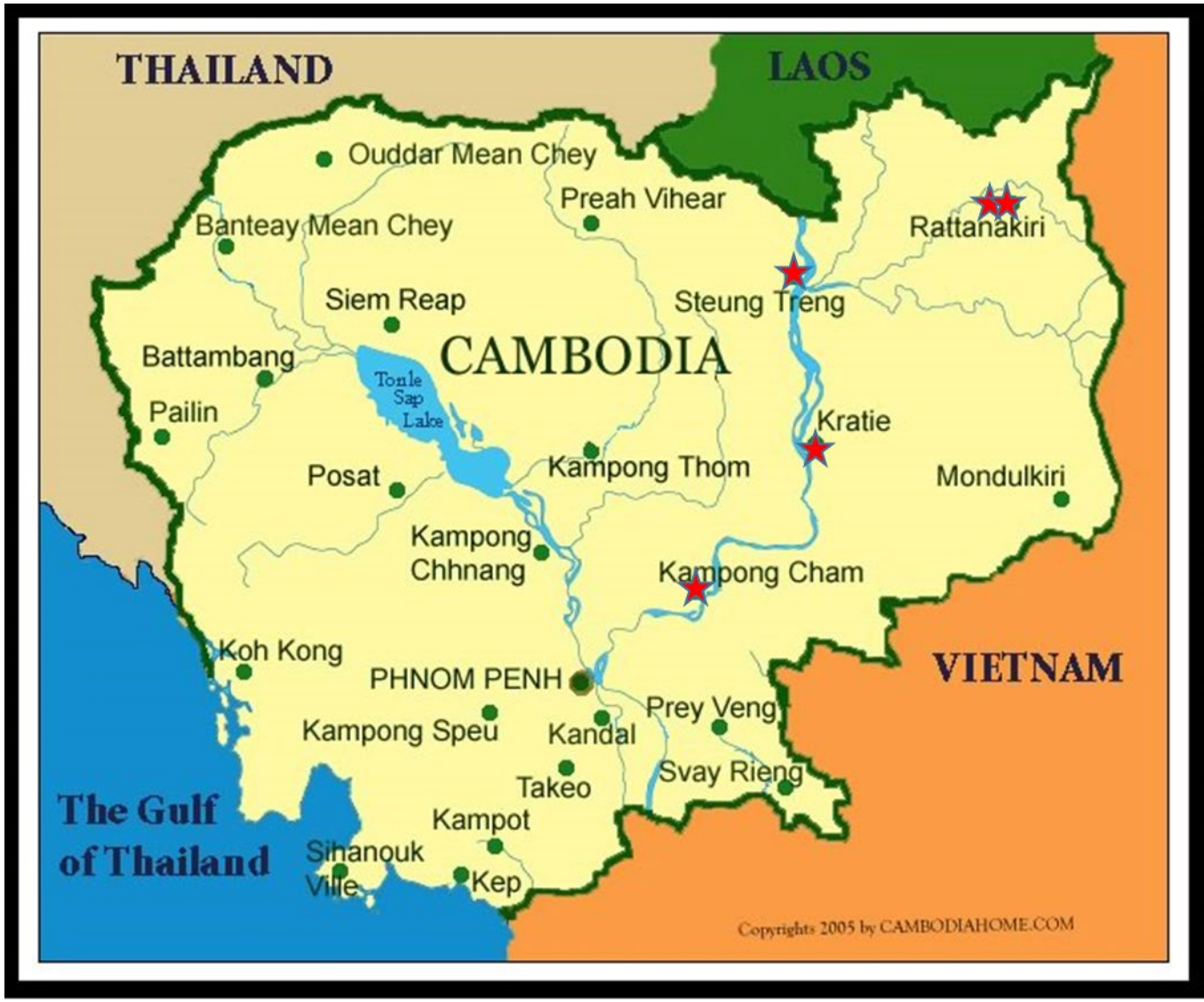
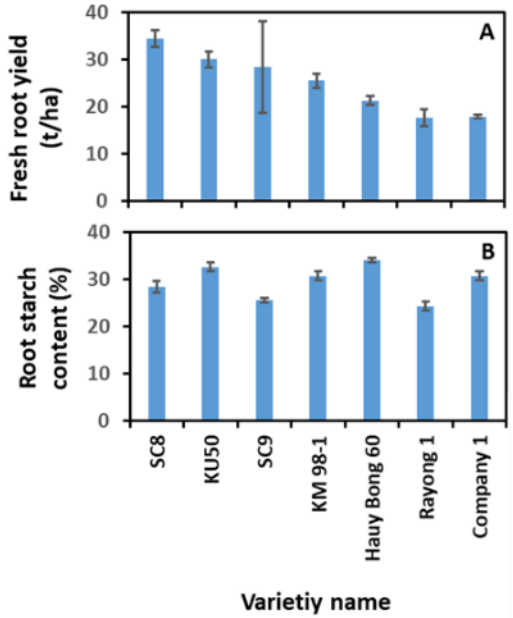
Background

1. Approached by Eucalyptus Plantation company to developing a CSR program with villagers on concession frontier – interest in some trials on their land

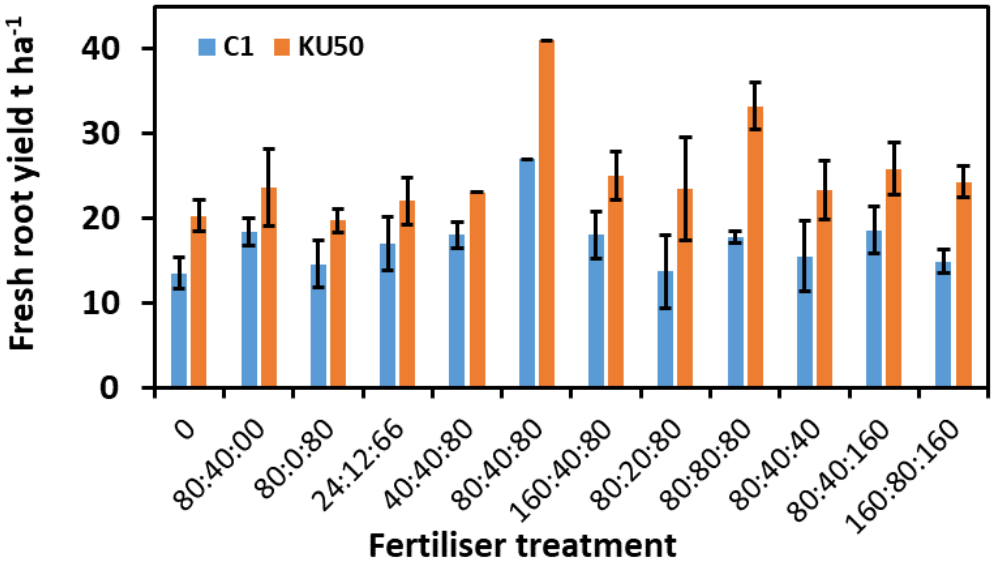
2. SLCMV was reported in Ratanakiri Province in eastern Cambodia (Wang et al., 2016)
3. Impact of CMD on CARDI managed activities in Kratie



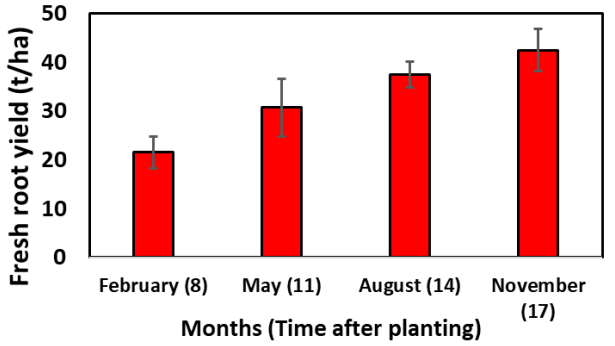
Experiments with factory owner (2016-17)

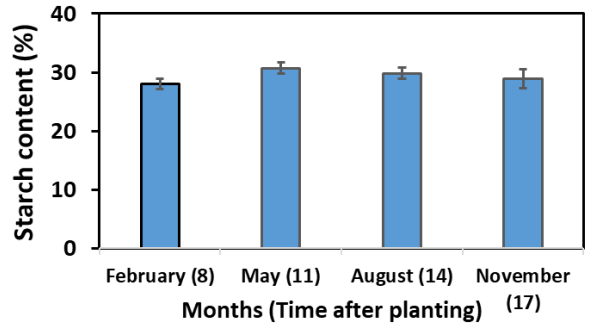


Evaluation of cassava varieties



Response of fertilizer combination of two varieties





Extending the harvest window

Root yield significantly increased by delayed harvest

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Some conclusions from this work

- Highest yield was achieve by **SC8** followed by KU50
- After this trial SC8 seemed like an interesting variety to explore in evaluations with farmers
- Farmers would be better off avoiding early harvest of roots, even if it meant taking out short-term loans for any immediate needs for cash. However, price uncertainty and debt likely to see this continue to occur
- Plantation company was using wrong NPK formula – similar farmers were using what was available.

CMD Monitoring within demonstration trial: A terrible opportunity (2017-18)

Variety: 7

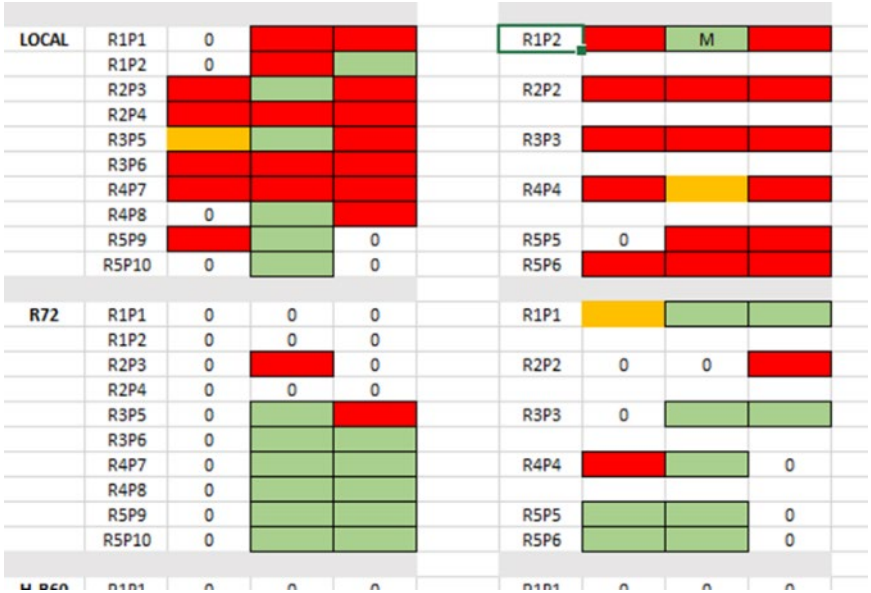
- HuayBong 60
- KU50
- Rayong72
- KM98-1
- **SC8**
- **SC9**
- Local(farmer's variety reserved from 2016)

DNA fingerprinting shows that SC8 & SC9 are the same variety

Asymptomatic plants also carry virus

	V	rayong_72		R	1			V	km98-1		R	2			V	huay_bong_60	R	3	
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
R1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	V	ku50		R	1			V	sc9		R	2			V	km98-1		R	3	
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
R1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	M	0	0	0	0	0	0	0	0
R3	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	M	0	0	0	1	0
R5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
	V	km98-1		R	1			V	rayong_72		R	2			V	sc8		R	3	

Sampling across the plots – 10 samples



PCR assessment shows many plants that did not display typical symptoms had the virus

e.g. Rayong 72 during the first visual assessment didn't show high incidence but did with PCR analysis

Approach CAVAC for funding for screening for CMD resistance (2018-19 and 2020)

- Systematic evaluation of resistance to CMD in current varieties
- Effect of fertilizer application (building on results with CWBD in Laos)
- Evaluate yield impacts on different varieties

Variety	Origin	Genetic background
KU50	Thailand	R 1 x R 90
Rayong 11	Thailand	R 5 x OMR 29-20-118
SC8	China	CMR38-120-10
HuayBong60	Thailand	R 5 x KU 50
KM98-1	Vietnam	R 1 x R 5
Rayong 5	Thailand	27-77-10x R3


TMR 3


HB80

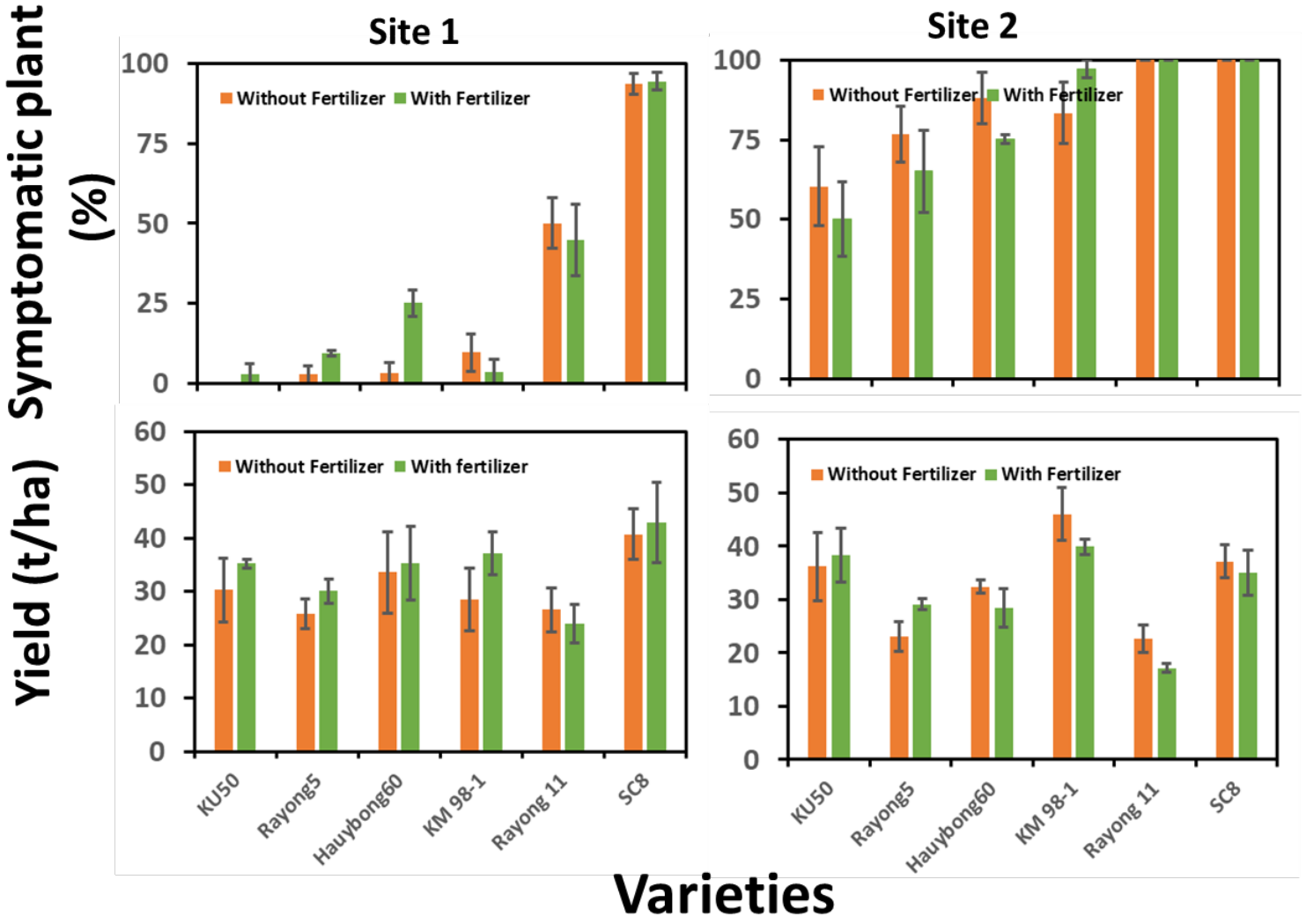
Healthy cassava crop 4 months growth

Healthy cassava crop 7 months growth

Disease Symptoms

Close to 100% infected field by 7 months

No effect of fertilizer on disease severity

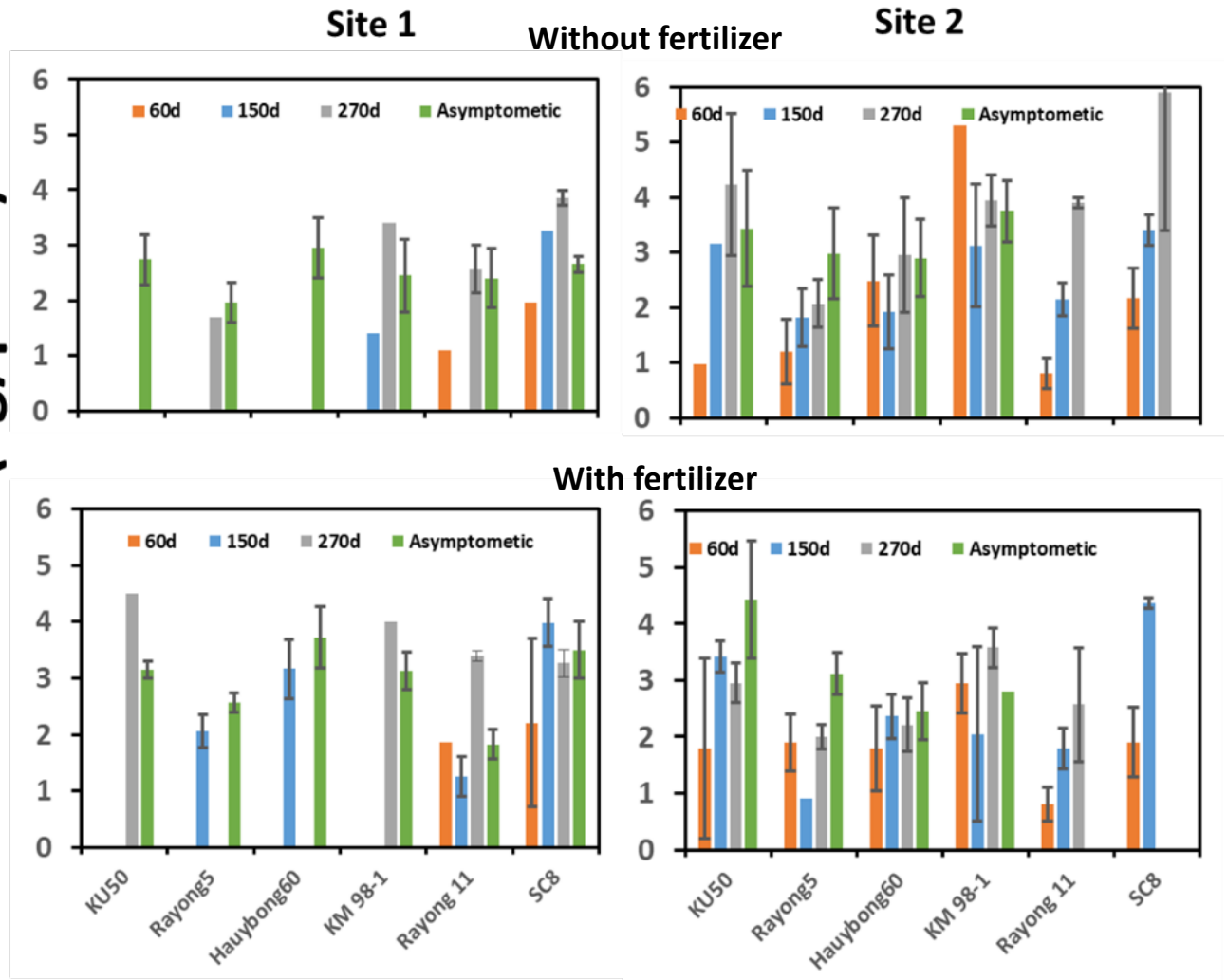


No effect of fertilizer on disease severity

Variety SC8 yielded highest in both treatment at site 1, however, in site 2 KM 98-1 produced highest.

Rayong11 yielded lowest in both treatment and both site.

Early infection can lead to crop failure



Infected at 60 DAP produced on an average 1.5 to 2.2 kg/plant

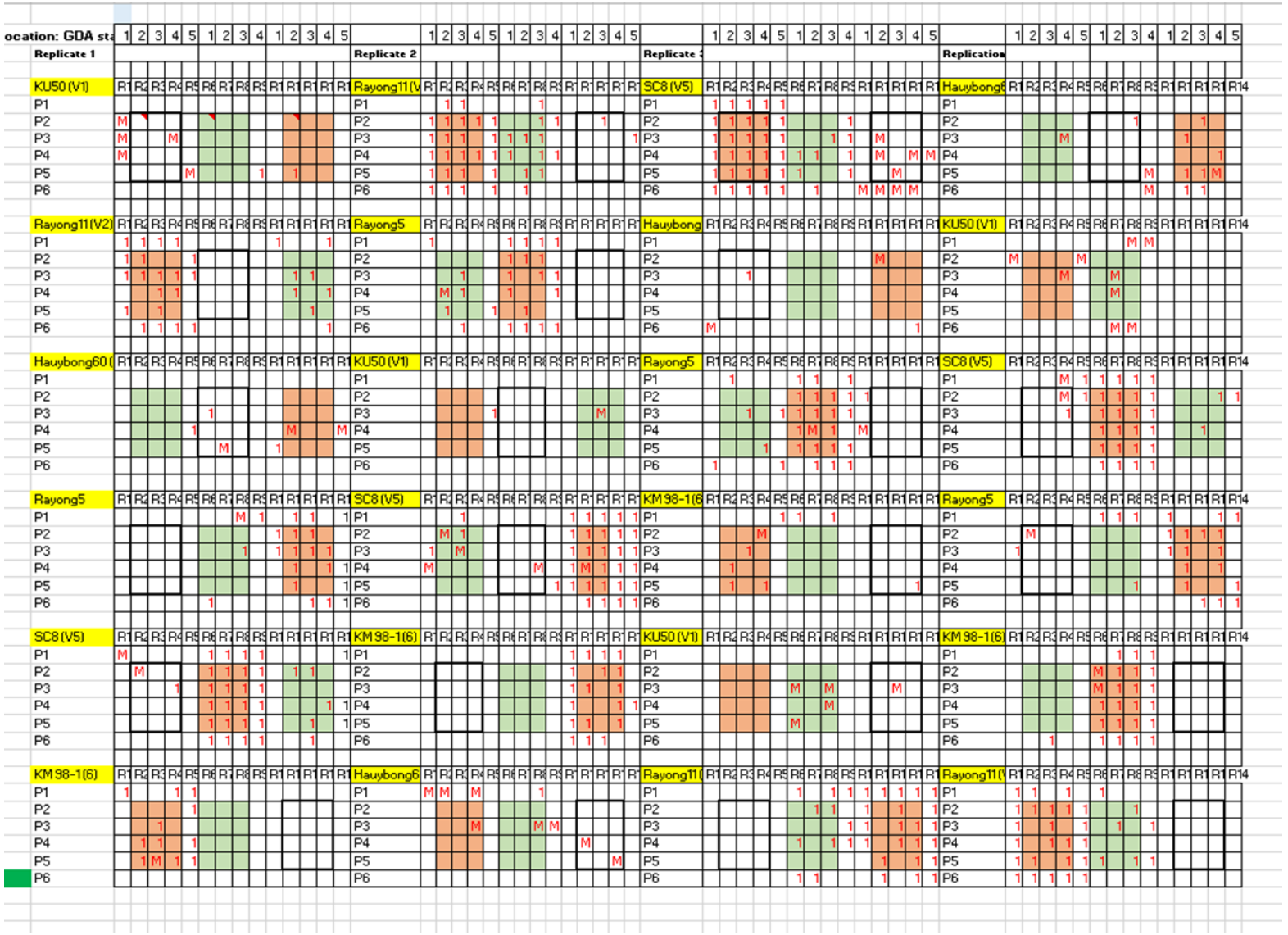
Infected at 270 DAP and/or asymptomatic plants produced 2.5 to 3.8 kg/plant

Some variation in disease susceptibility was observed

Early infection can lead to crop failure

Clean plating material can produce profitable yield during first year of infection

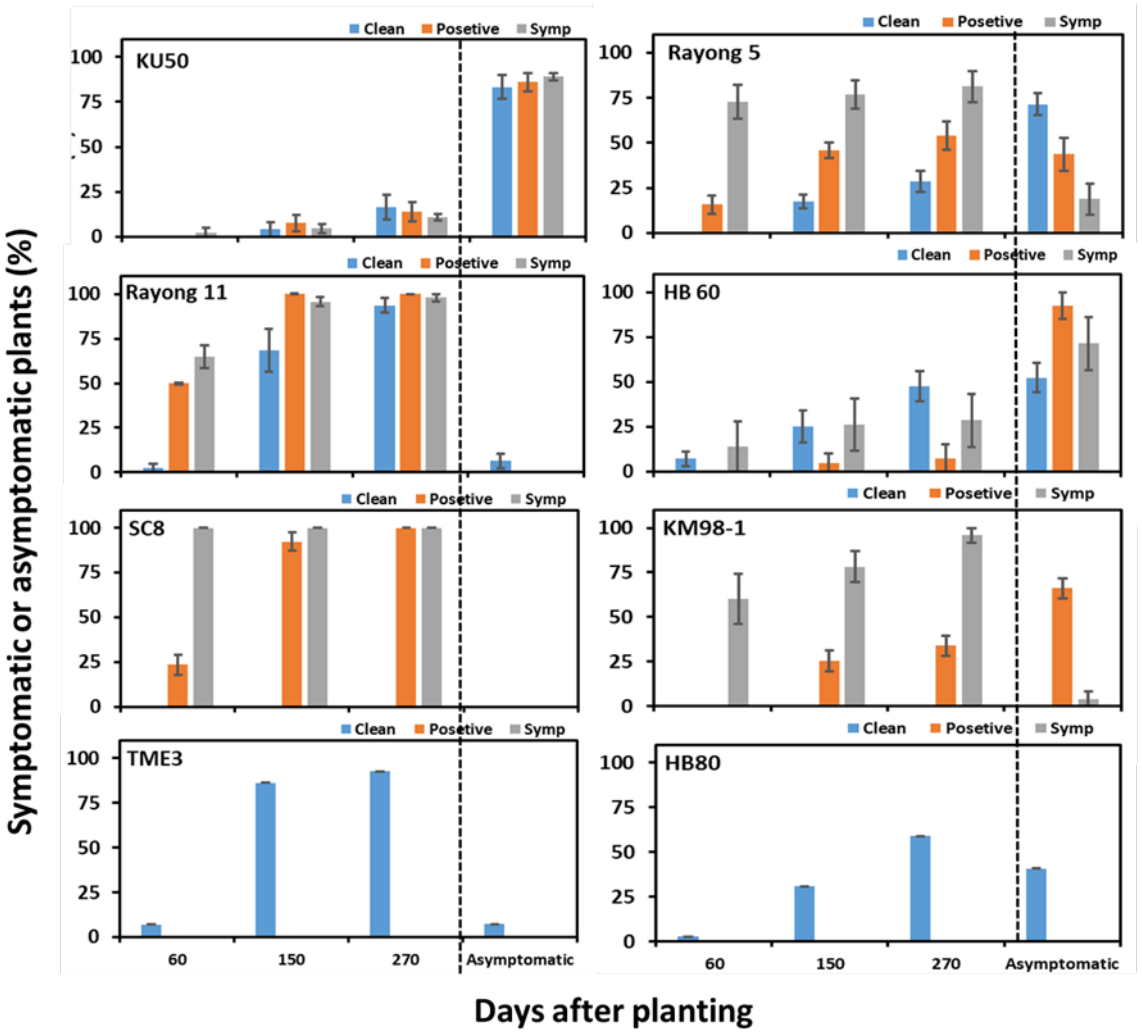
Is there yield penalty for planting diseased stakes?

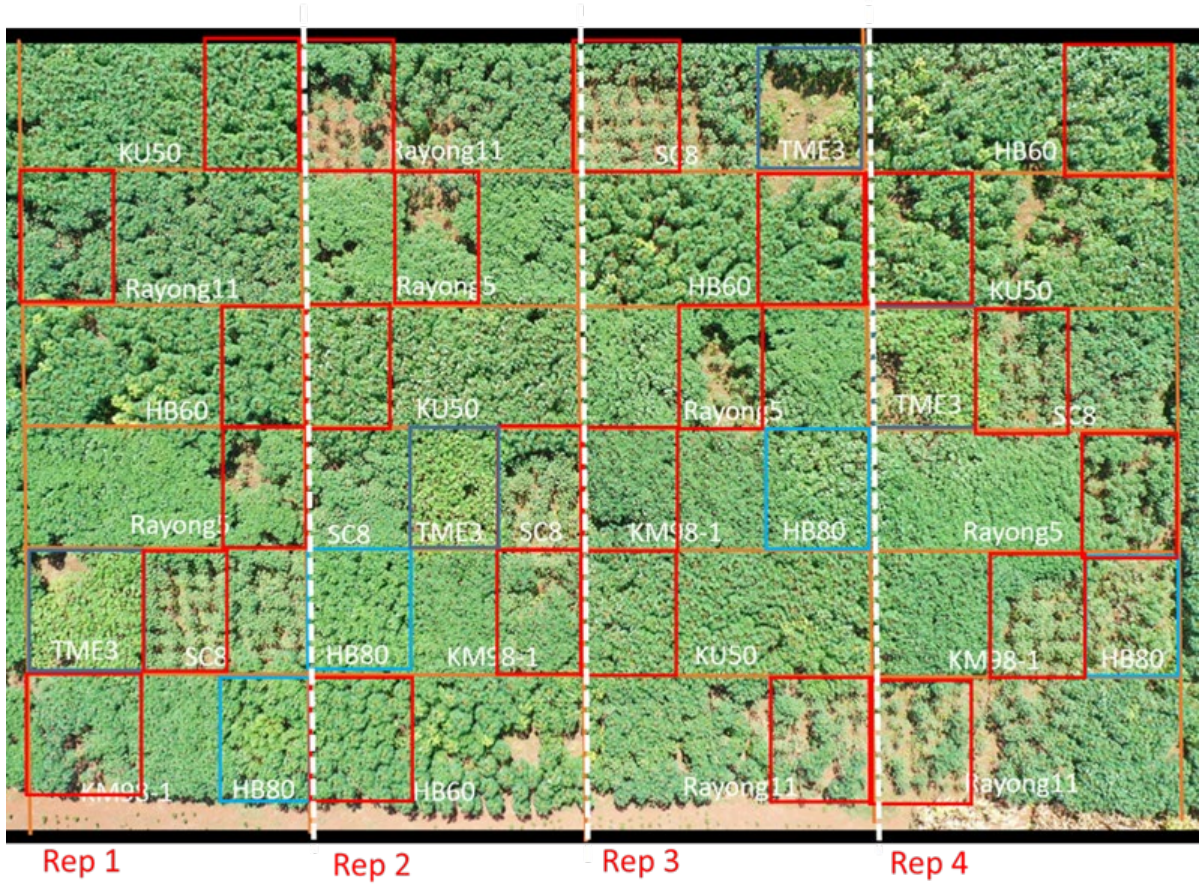


(1)positive selected (i.e. visually healthy looking plants) planting material from 2018–19 multiplication block,

(2)symptomatic planting material from 2018–19 experiment; and

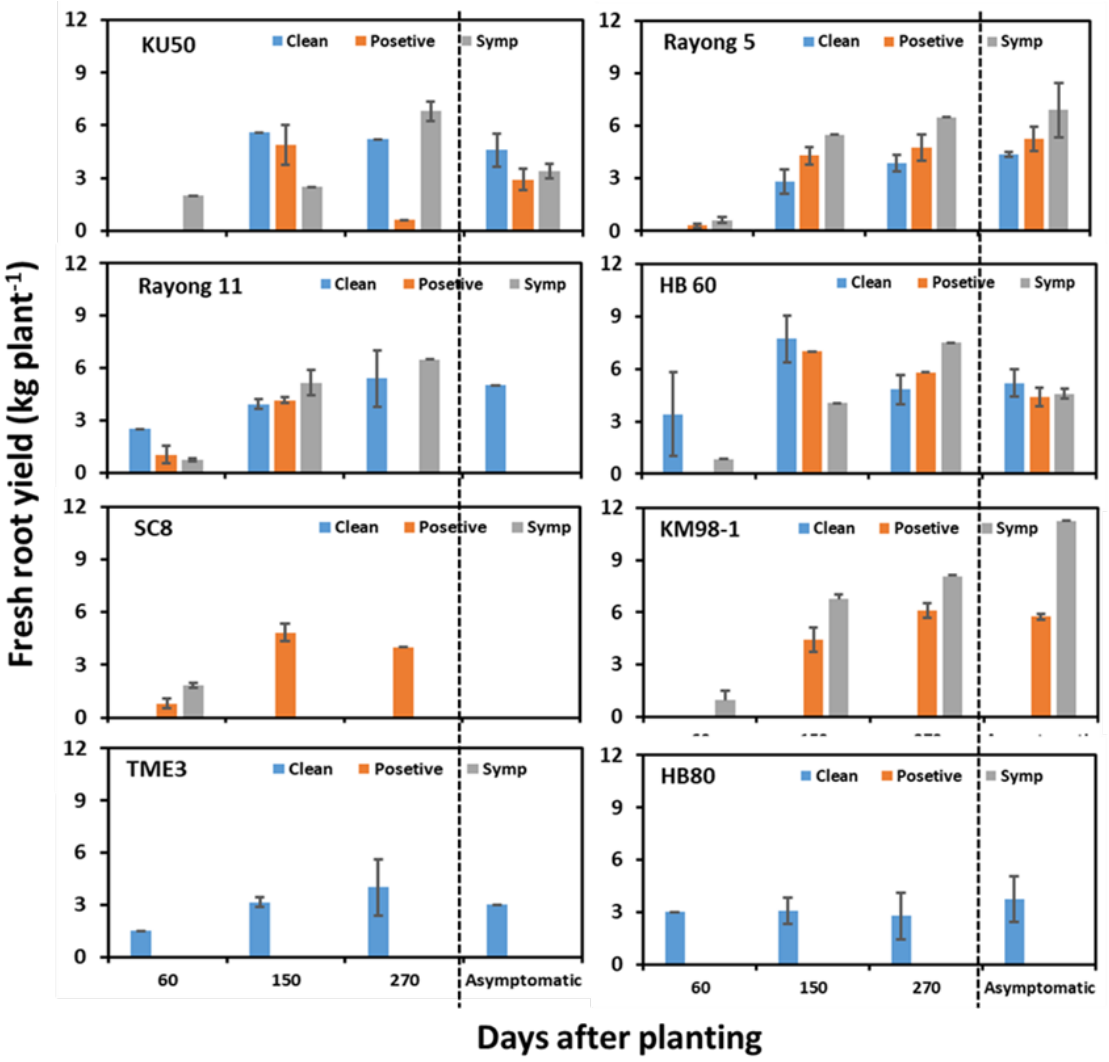
(3)clean planting material from the Thai Tapioca Development Institute (TTDI).



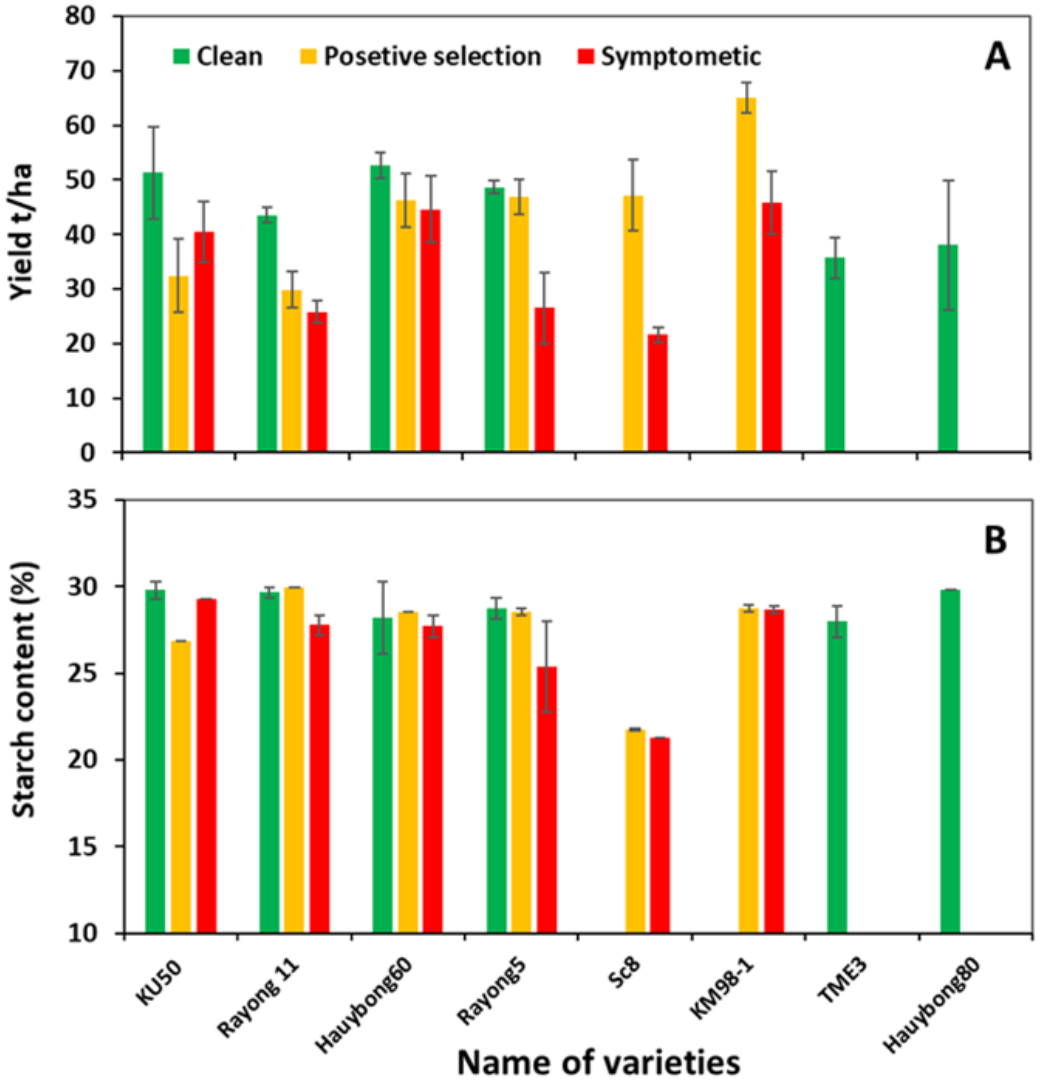


The number of infected plants increased with time. Many plants from symptomatic planting material did not develop symptoms

Areal view of the experiment site



Plants from clean and positive selection planting material produced 2- to 3-fold higher yields than diseased planting material



Plot yield was 1.2- to 2.2-fold higher in plants from clean and/or positive selection planting material than those from symptomatic planting material

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Field day with government, industry development organisation and farmers

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Results informing multiplication of clean stems – KU50 became short term priority

Treatment	Fresh root yield (t ha^{-1})	Starch Content (%)
No fertilizer	**30.8** ± 2.0	**18.9** ± 1.2
14:7:35=300 kg ha^{-1}	**33.9** ± 2.1	**19.2** ± 0.6
20:05:20	**33.7** ± 2.8	**20.2** ± 0.8
40:20:40	**32.8** ± 2.5	**20.5** ± 0.3

- No response to fertiliser due to relatively new land.
- Only 17 Plants from 480 showing symptoms at harvest
- Waiting for PCR results when samples can be shipped
- Highlights the importance of in field diagnostics

The ACIAR Cassava Value Chain and Livelihood Program enabled the leveraging of additional resources to answer the emerging question around disease and build a solid foundation the new project.

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Thank you!

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