Alliance

Australian Government
Australian Centre for International Agricultural Research

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Final Review

Objective 4.4

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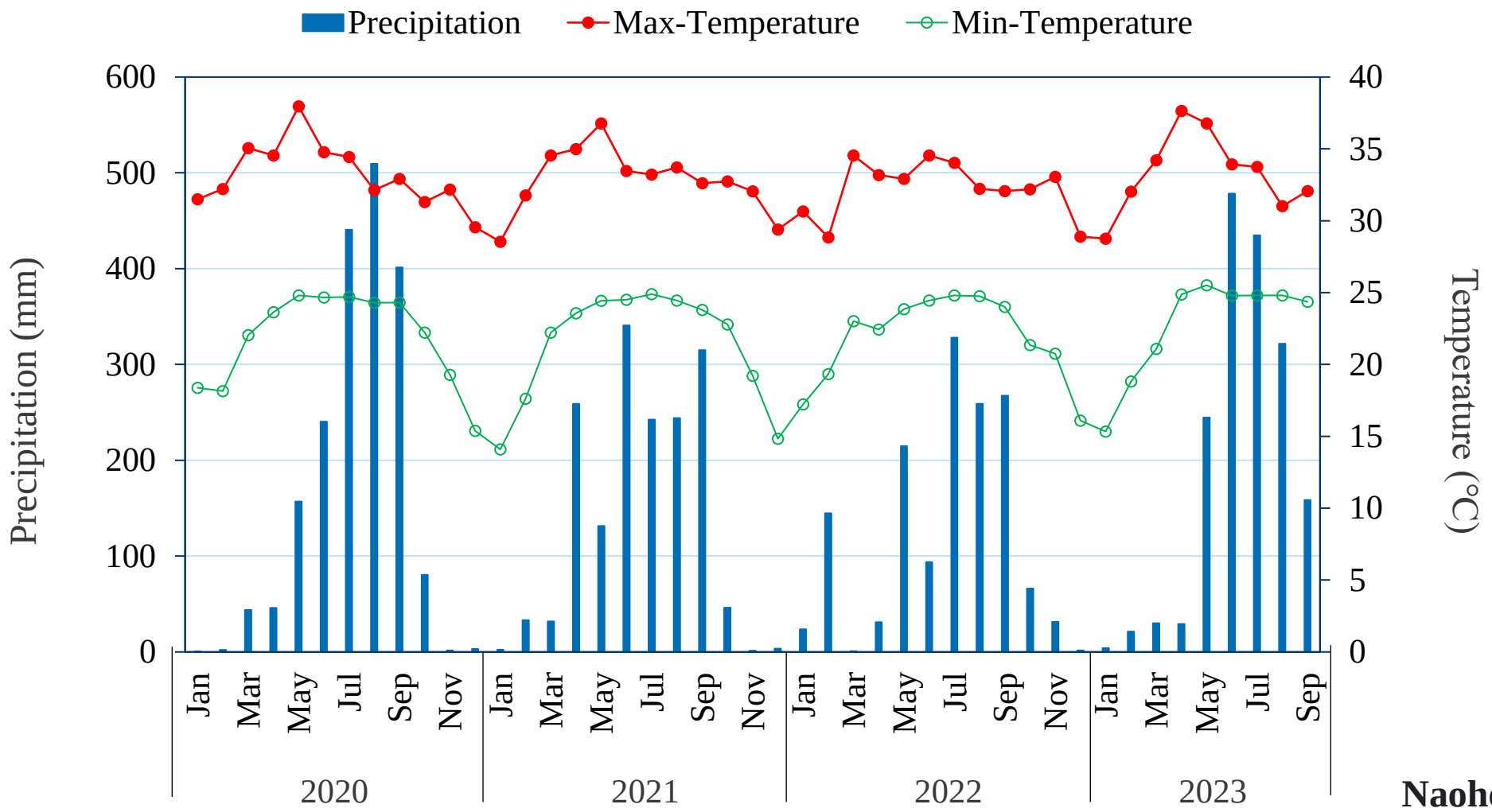
Activity 4.4
Optimize agronomic practices (variety, density, fertilizer) for the economic production of both cassava roots and clean planting material

- Rapid multiplication system producing plantlets that are feeding the multiplication field every two months
- There was no data available on the root yield of these plants grown from plant cuttings.
- Thus, the focus of the agronomic research was to find out optimum management package for multiplication purpose
- Ensure that supply of stems meets the demand in terms of timing– harvest early or extend the growing period.

Rapid multiplication system

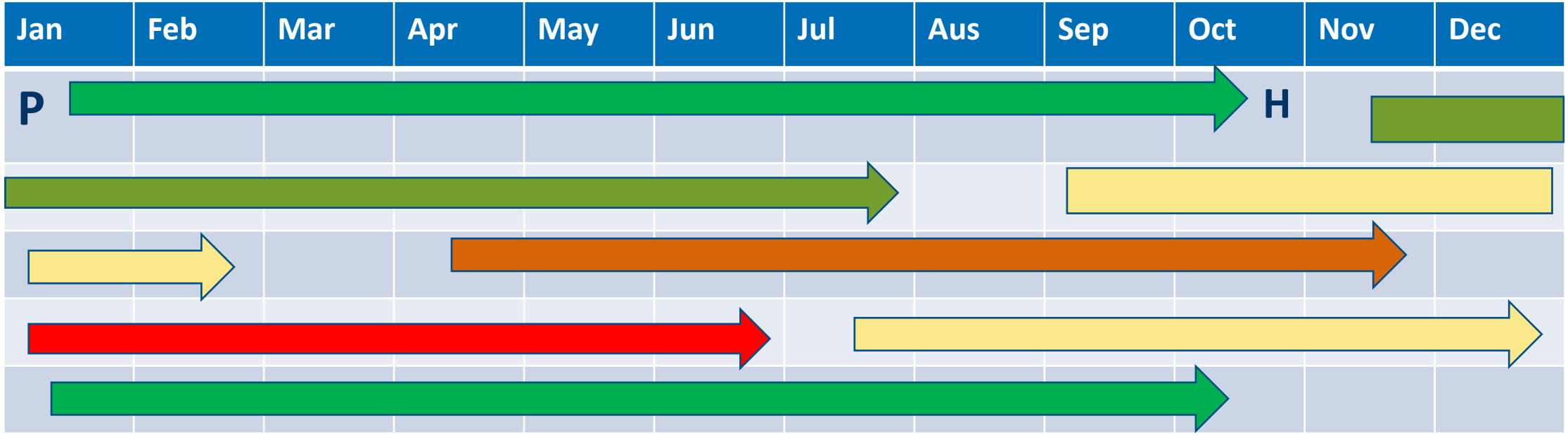
Temperature and rain pattern at Naphokh- experimental during 2020-2023



Naohok weather station

18.148572, 102.735597

Cropping calendar (an example) with different planting and harvest time



10-month crop

8-month crop

6-month crop

P= Planting ; H= Harvest

How does planting time and crop duration impact on yield?

- Planting at different time and harvest at full maturity - 10 months
- Planting at same time and harvest at different time
- Calculate the tradeoff in root yield when planting outside the optimum period.
- Additional irrigation requirement
- Understand the incentive for farmers, private sector, and public sector to modify production to produce stems

Different duration of crop under irrigated and rainfed conditions (season 2019-20, 2020-21 & 2021-22)

- Napohk, Vientiane
- Planted: Each season cassava planted at the same time during May to June
- **Harvest**
- **Early** : ~ 6 month after planting (MAP) of each season
- **Mid**: ~ 8 MAP of each season
- **Late**: ~ 10.5 MAP of each

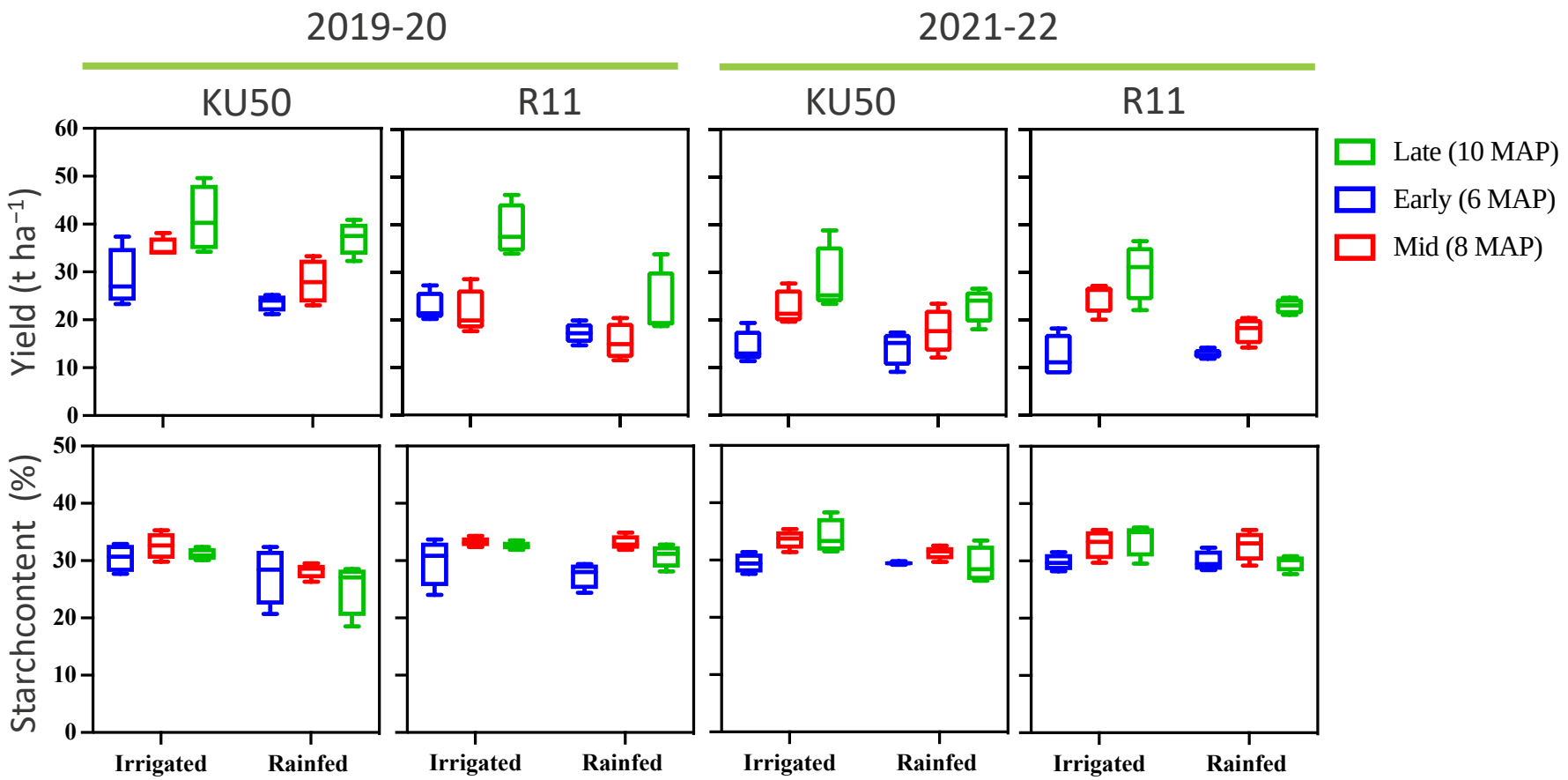
Site received a total of 1402 mm rain between January 2019 and February 2020

Harvest	Irrigation applied cumulative (mm)
Early	~ 123
Mid	~ 317
Late	~ 435

Longer duration crop yielded highest

Different duration of crop

- Highest yield obtained at late harvesting
- However, many farmer tend to harvest early be cuase they need the cash.



Different Time of planting (2020-2021)

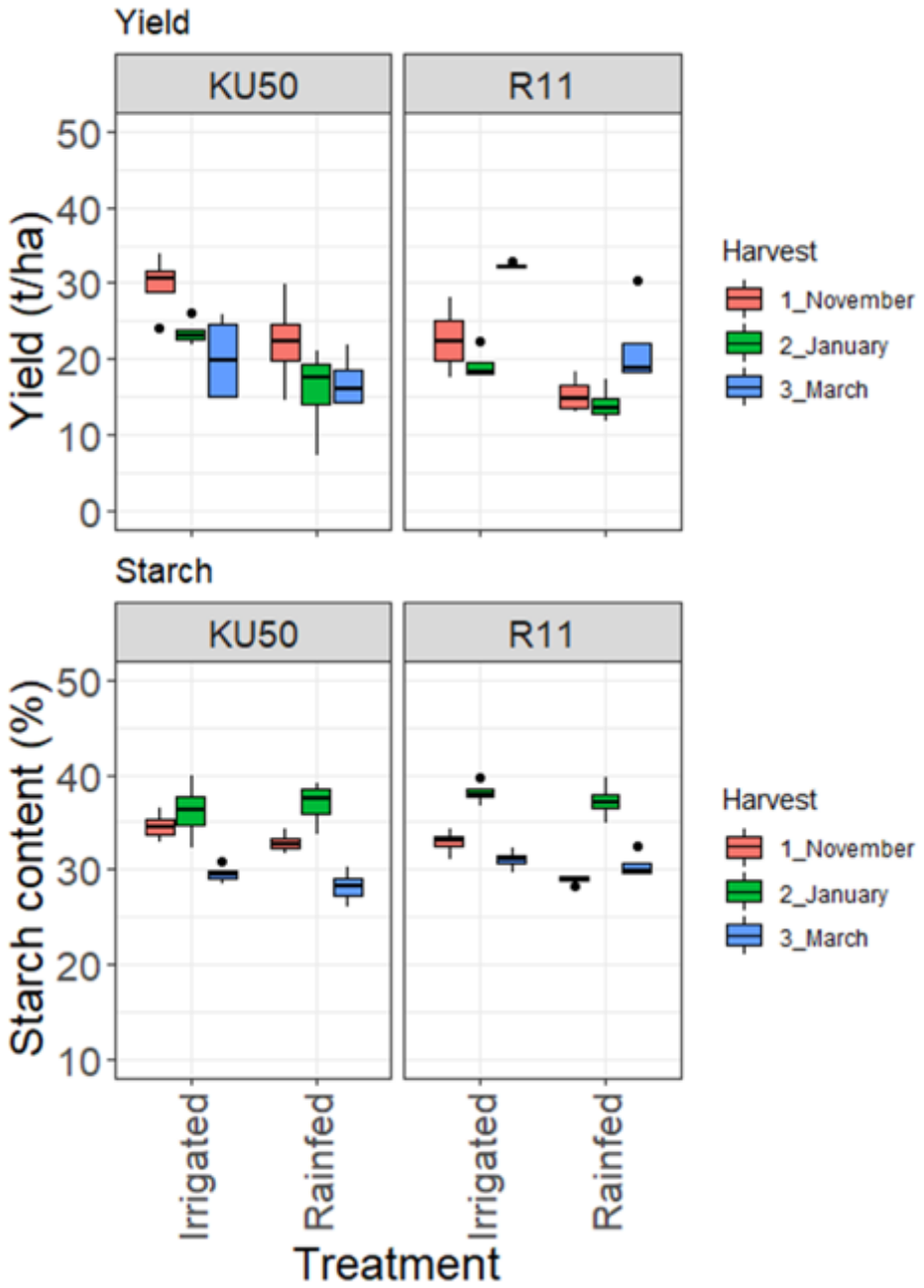
- Two varieties KU50 and Rayong11
- Rainfed and irrigated treatment
- Three planting dates and harvest after 10 months growth

Planting date	Harvest date
21 Jan 2020	1 Nov 2020
23 Mar 2020	2 Jan 2021
28 May 2020	3 Mar 2021

Different Time of planting (2020-2021)

Harvest	Rainfall (mm)	Irrigation (mm)
1_Nov	1563	209
2_Jan	1563	232
3_Mar	1524	313

- In general November harvest (i.e., January Planting) yielded highest in both rainfed and irrigated crop
- Additional irrigation would be necessary to promote high yield.



Conclusions

- **Different duration of crop**
  - High yield related to longer duration of crop , but our target is sale root and stem as well.
  - Duration of crop should decide base on economic return by selling root and stem and labor viability.
- **Different time of transplanting**
  - Early harvested cassava (in Nov) showed higher yield than later time of harvesting (Jan and March).
  - It is benefit to support raw material to cassava processing industrial, especially starch factories.
  - Add irrigation is useful to cope with drought resulting better yield.

Yield comparison between tunnel plantlet and stake grown crop

- Different density and fertilizer rate

Density	Spcaing	Actual amount of fertilizer to be application per plant (g)				Concentration per ha		
No. of plant	m x m	Treatment	Urea	P2O5 (as TSP)	K2O (as KCl)	N	P2O5	K2O
10,000	1 x 1	T1	17.4	4.35	13.33	80	20	80
20,000	1 x 0.5	T2	8.7	2.37	6.66	80	20	80
13,000	1.5 x 0.5	T3	13.4	3.26	10	80	20	80
20,000	1 x 0.5	T4	17.4	4.35	13.33	160	40	160
13,000	1.5 x 0.5	T5	17.4	4.35	13.33	106.7	26.7	106.7
10,000	1 x 1	T6	0	0	0	0	0	0

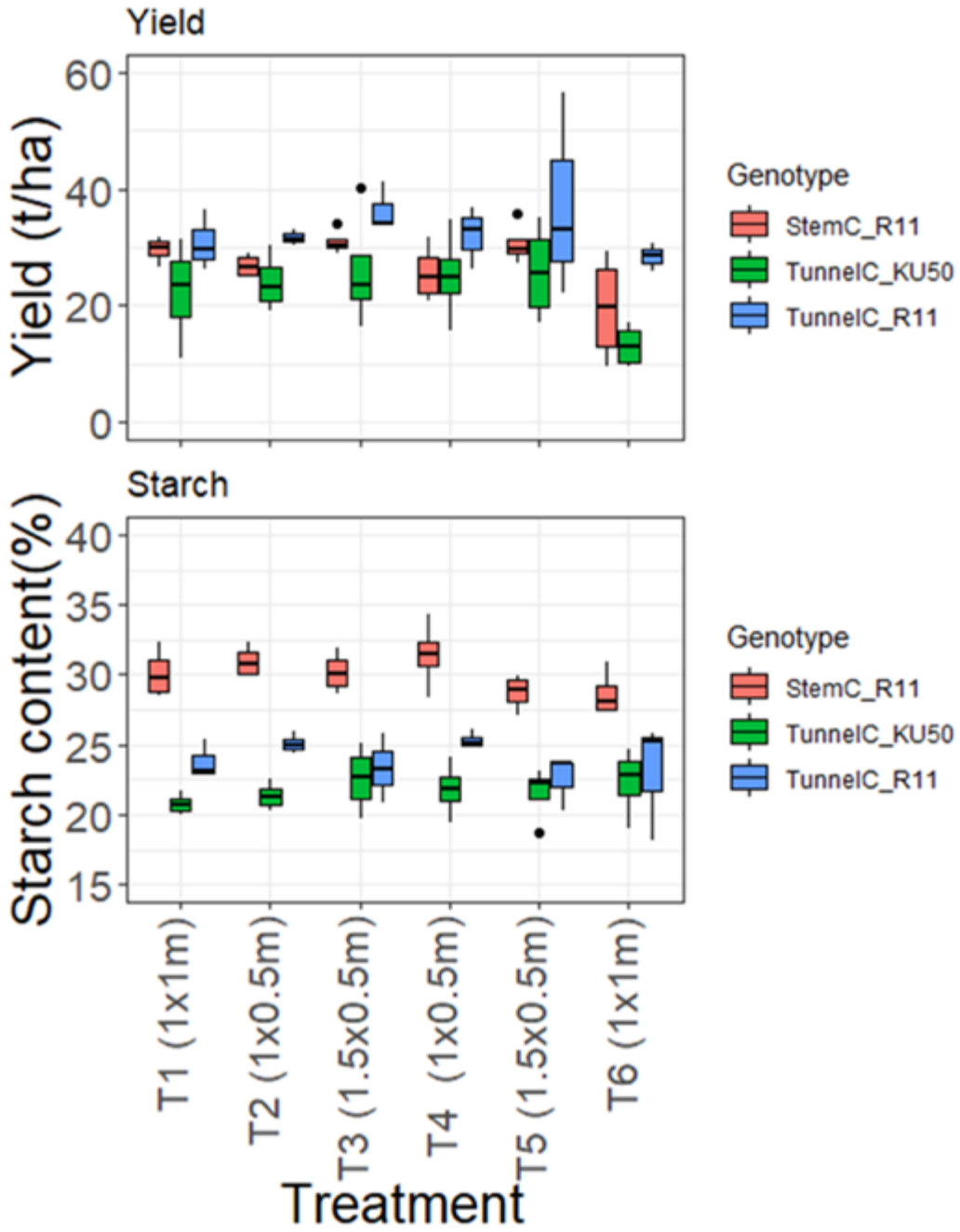
Season 2020-21 at Naphokh

Optimum management package for multiplication purpose

- Rayong11 from mature stems (StemC_R11)
- Rayong11 from tunnel grown seedlings (TunnelC_R11
- KU50 from tunnel grown seedlings (TunnelC_KU50)

Yield was not significantly different when compared with stem cutting and tunnel grown plantlets

Starch content demonstrated difference (~15%) lower; however, harvest of Tunnel cuttings were done after a rain event (2 days difference between harvest)

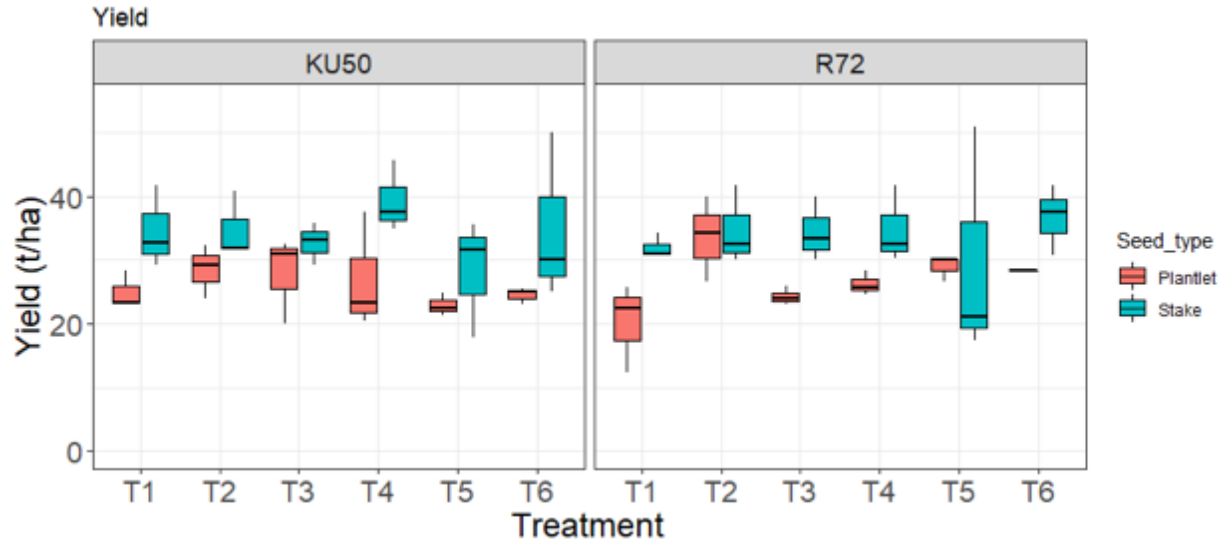


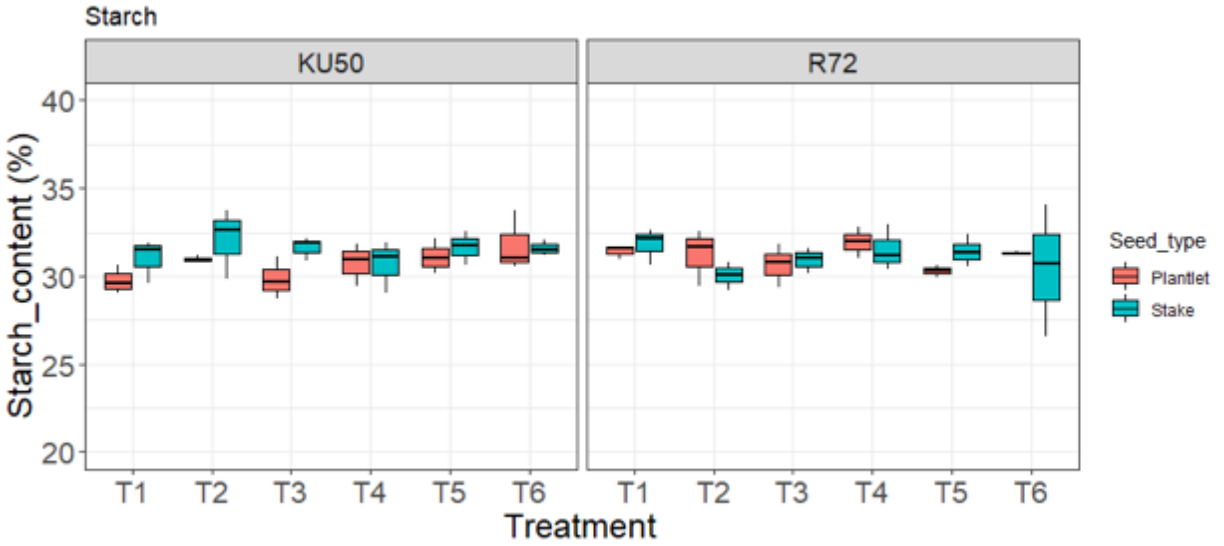
At Khounsub company land at Bachiang district, Champasak province (2020-21)

Optimum management package for multiplication purpose

- **T1 = Control (No fertiliser)**
- **T2 = Organic fertilizer(Chicken Manure: 1.5 t/ha)**
- **T3 = Organic fertilizer(Chicken Manure: 1.5 t/ha) + 300 Kg/ha of N:P2O5:K2O (15-5-22)**
- **T4 = 300 Kg/ha of N:P2O5:K2O (15-5-22)**
- **T5 = 40-10-40 (N:P2O5:K2O)**
- **T6 = 80-20-80 (N:P2O5:K2O)**

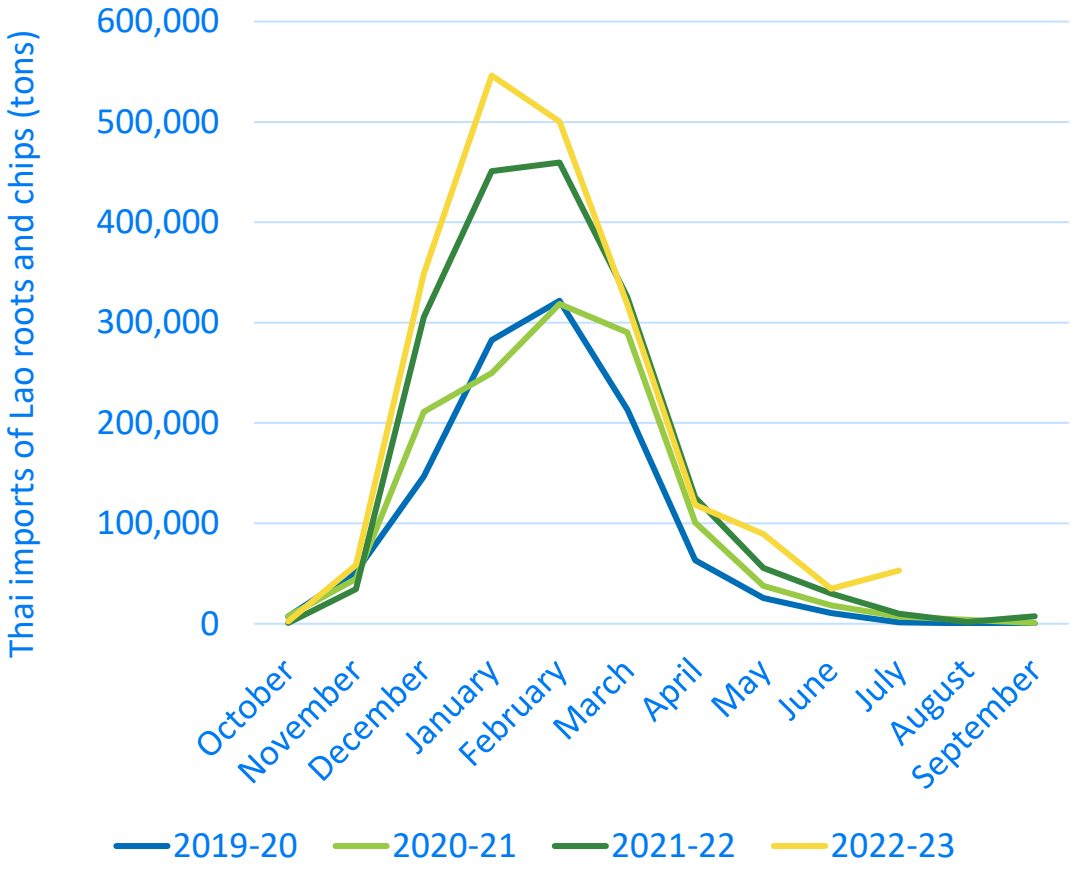
- **Stem grown crop yielded higher compared to tunnel grown plantlets**

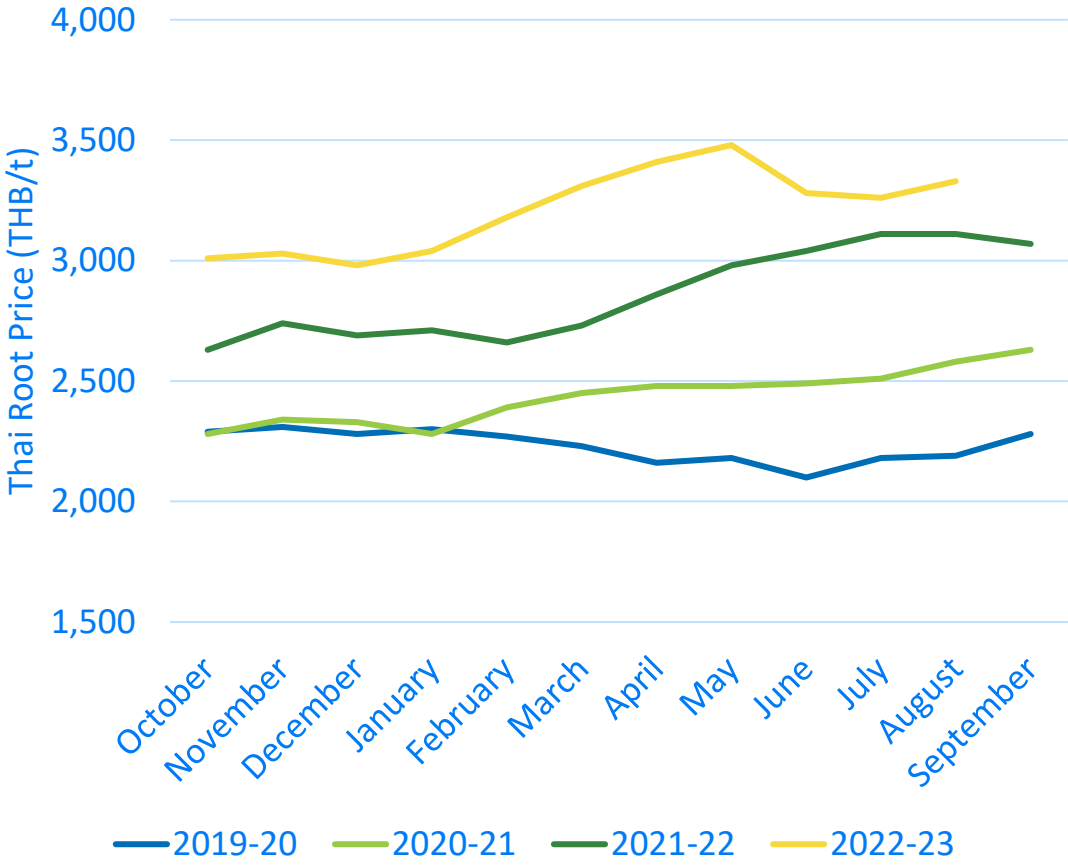




Issue with weeding due to COVID lockdowns

Is there a premium for off-season harvesting?





Understanding the stem x root trade off (tons of roots forgone)

10,000 stems per ha @ 80 % sale

		Price of fresh roots (LAK/kg)				
		500	**750**	**1000**	**1250**	**1500**
Price of stems (LAK/bundle)	**10,000**	8.0	5.3	4.0	3.2	2.7
	20,000	16.0	10.7	8.0	6.4	5.3
	25,000	20.0	13.3	10.0	8.0	6.7
	50,000	40.0	26.7	20.0	16.0	13.3
	75,000	60.0	40.0	30.0	24.0	20.0
	100,000	80.0	53.3	40.0	32.0	26.7

20,000 stems per ha @ 80 % sale

		Price of fresh roots (LAK/kg)				
		500	**750**	**1000**	**1250**	**1500**
Price of stems (LAK/bundle)	**10,000**	16.0	10.7	8.0	6.4	5.3
	20,000	32.0	21.3	16.0	12.8	10.7
	25,000	40.0	26.7	20.0	16.0	13.3
	50,000	80.0	53.3	40.0	32.0	26.7
	75,000	120.0	80.0	60.0	48.0	40.0
	100,000	160.0	106.7	80.0	64.0	53.3

Conclusions

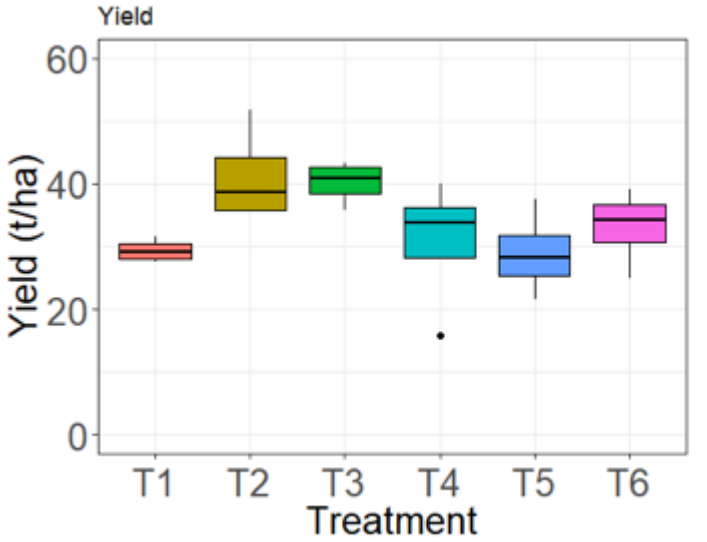
- Planting high density with adequate fertilizer application (20,000 stands/ha+ 80-20-80 kg NPK/ha) is optimum for both multiplication- selling stems and roots.
- At early growth stage, cutting plantlet has slower establishment than stem,
- Therefore, weeding control is necessary for cassava within three MAP, especially cutting plantlet from tunnel.
- Land preparation to avoid waterlogging (making ridging)
- Further, research on different option of weed control in cassava production system is needed .

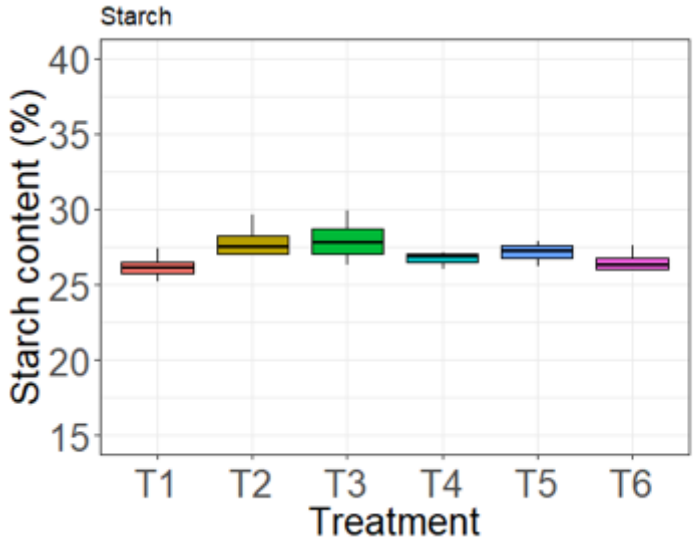
Effect of organic fertilizer application

- Propose is to determine whether varying rates of inorganic fertiliser can match the cost of applying organic fertiliser and produce similar root yield
- if organic fertiliser alone or mixed with inorganic fertiliser can ameliorate soil nutrient status

Treatments:
T1: 0-0-0
T2: 80-20-80
T3: 40-10-40
T4: 40-10-40 + 1.5 t ha^{-1} organic fertilizer
T5: 1.5 t ha^{-1} organic fertilizer
T6: 3 t ha^{-1} organic fertilizer

There significant among the different fertilizer treatments. However, organic fertilizer application could not increase yield due to organic fertilizer has low potasium content and is expensive for the low response.





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