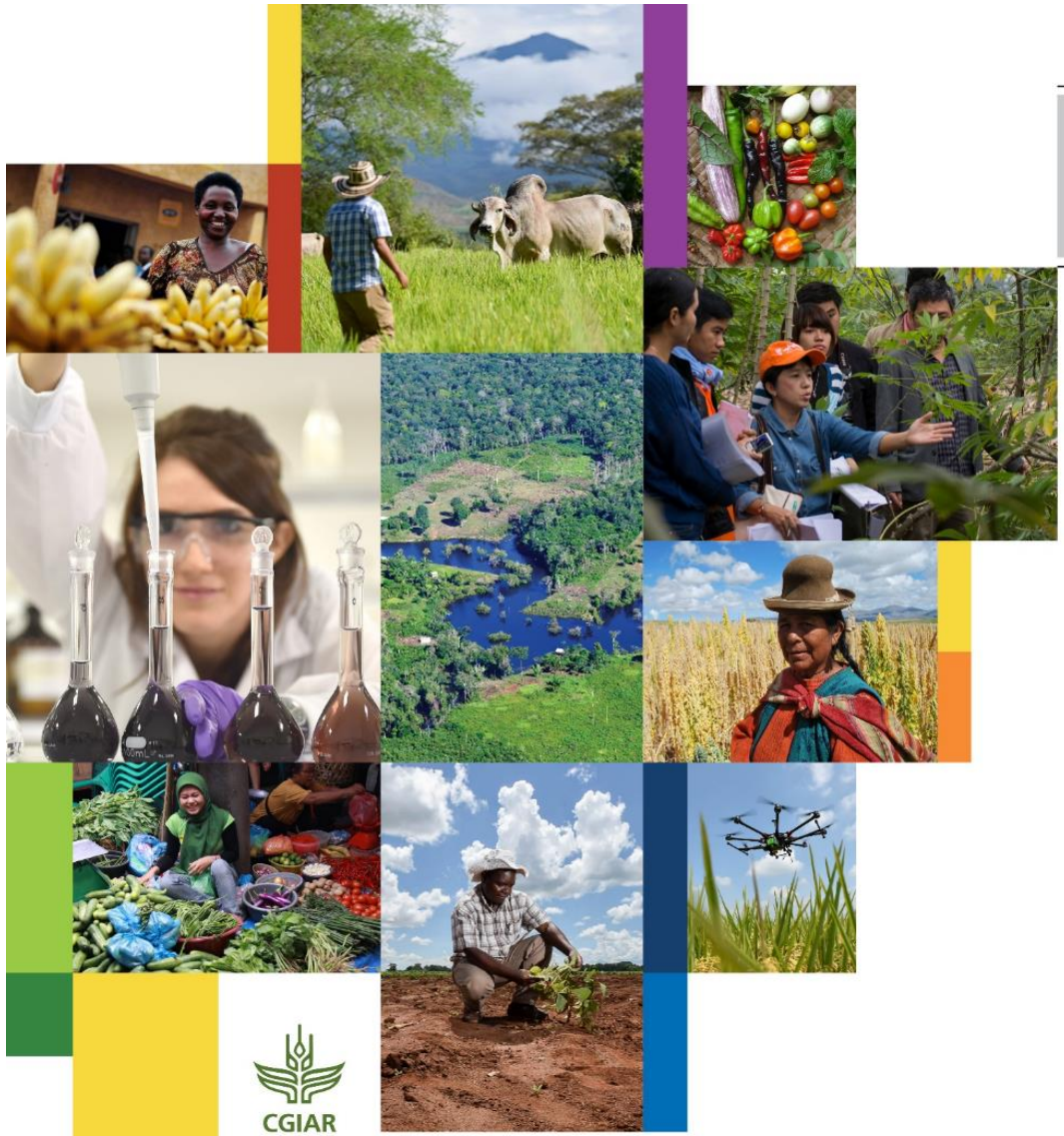

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Overview of Agronomy activities in ACIAR Cassava Value Chain and Livelihood Program

ACIAR Cassava Program Final Review July 2020

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Outline…..

- Background
- The project

<u>Objective & Results</u>

- Germplasm evaluation
- Fertiliser response
- Soil management
- Pest and Disease

Cassava in Southeast Asia

- More than 8 million farmers grow cassava in Asia covering approximately 4.2 million ha, and it is increasing……..
- A direct food crop to an industrial crop …….. export oriented

	Cambodia	China	India	Indonesia	Laos PDR	Philippines	Thailand	Vietnam
Production ('000 t)	10,207	4,794	4,554	20,775	3,096	2,815	31,161	11,045
Harvest area ('000 ha)	388	291	204	867	94	225	1,462	580
Yield (t ha^{-1})	25.9	16.2	21.9	23.5	32.2	12.3	21.0	18.7
Fertilizer:								
Inorganic	6–38%	Low–high	Med–high	50–95%	<1%	Very little	Up to 75%	74–85%
Organic	1.3%	N/A	N/A	22–32%	<1%	Some		1–6%

Malik *et al*. 2020

Fertilizer recommendation – Low awareness regarding N-P-K

Region	Sikka	North Sumatra	Laos	Cambodia	Son La	Dak Lak
Do you understand what the NPK values mean on the fertiliser you apply?	27.03%	36.23%	0.8%	1.29%	11.3%	11.5%

Smith, D.; Newby, J.; Malik, A.I.; Yadav, L.; Cramb, R. Fertiliser use patterns of smallholder farmers-implications for private sector involvement in technology dissemination, Cassava Program Discussion Paper Number 8, September 2018, School of Agriculture and Food Sciences, University of Queensland, 2018, ISSN 2209-2684. http://cassavavaluechains.net/wp-content/uploads/2018/09/Discussion-paper-number-8.pdf

Way forward…

- Business as usual……..
- Opportunity to increase production
  - High yielding varieties
  - Improve management
  - Strengthen linkages with stakeholders
- First task was to determine whether the agronomic changes created an significant incentive for adoption at the plot and household scale

Project Partners ASEM/2014/053 & AGB/2012/078

- Laos-NAFRI (National Agriculture and Forestry Research Institute)
- Cambodia-CARDI (Cambodian Agricultural Research and Development Institute)
- Vietnam-NOMAFSI; Agronomy and Plant Protection Department - Tay Nguyen University
- Indonesia-ILERTI; Department of Agriculture and Soils Science, University of Brawijaya, Malang

Leveraging additional partnerships

- RTB (CGIAR Research Program on Roots, Tubers, and Bananas)
- CAVAC (Cambodia Agricultural Value Chain)
- Crawford Fund workshop
- The University of Western Australia -joint workshop on Plant physiology and mineral nutrition in cassava and legume intercropping systems. Vietnam; (10 – 14 June 2019) and joint MSc student
- Field Crops Research Institute (FCRI), Vietnam
- National University of Laos- Joint student

RESEARCH PROGRAM ON Roots, Tubers and Bananas

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Project objectives

***AESM* Objective 2: Increase the adoption of improved cassava production, resource management, and post-harvest practices by strengthening linkages between farmers and research, extension, and industry actors.**

2.2 Establish on-farm demonstration trials of improved cassava cultivation practices and conduct participatory evaluation of new varieties, fertility management, pest and disease management, intercropping, and post-harvest practices with farmers and other industry stakeholders.

***AGB* Objective 2: Increase the adoption of improved and sustainable cassava technologies by strengthening linkages between primary value-chain actors (farmers, traders, processors) and with support actors (researchers, government agencies).**

2.2 Conduct participatory variety selection with farmers with varying levels of outside support from research institutions

2.5 Conduct participatory evaluation of soil management practices (including intercropping)

Approach taken…….

- Varietal selections: Farmers' participatory
- Main focus on Fresh root yield and starch content to inform economic analysis, rather than collecting a lot of biophysical data
- Disease resistance became very important

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Approach taken…….

- Field management
- Fertilizer application: Farmers' comments and projected benefit (economic analysis)
- Move from replicated trials to larger field demonstrations over the life of the project

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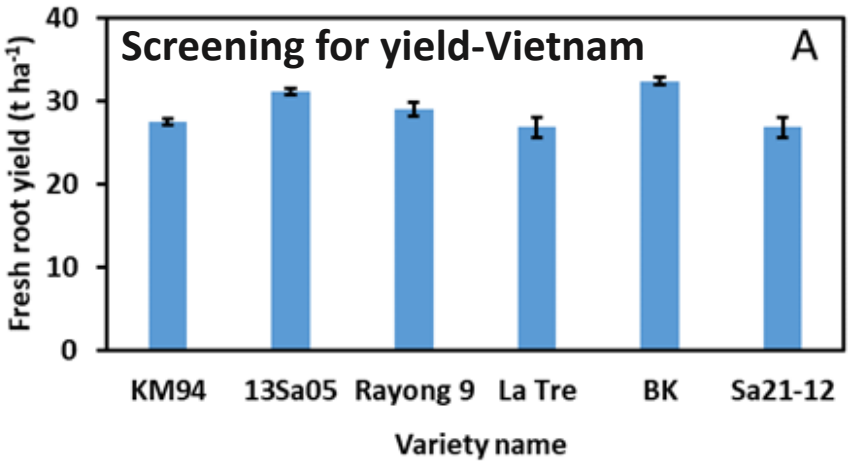
Poor management

Good management

Variety evaluations: Main activities and outputs

- **Germplasm evaluation: Which one is the best for different situations?**
  - Vietnam: a total of **13** varieties (Son La and Dak Lak)
  - Indonesia: a total of **15** varieties (i.e. sweet and bitter) East Nusa Tenggara and North Sumatra
  - Laos: a total of **7** varieties
  - Cambodia: a total of **7** varieties



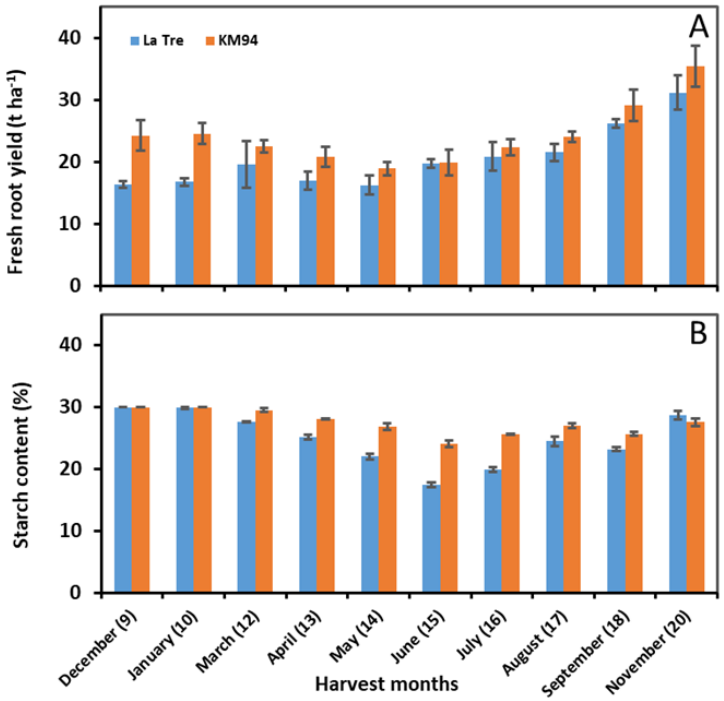
Main activities and outputs (farmers preference)

Vietnam: BK, 13Sa05, HLS11, HlS12 and HLS14
Indonesia: Malang4 and Faroka high yielding
Laos: Rayong11 (High yield and somewhat tolerant to CWBD)
Cambodia: KU50 and KM98-1(High yield and with stand CMD better)

Main activities and outputs……

Extending the cassava harvest window:

Vietnam and Cambodia: To ensure availability of cassava roots during off season

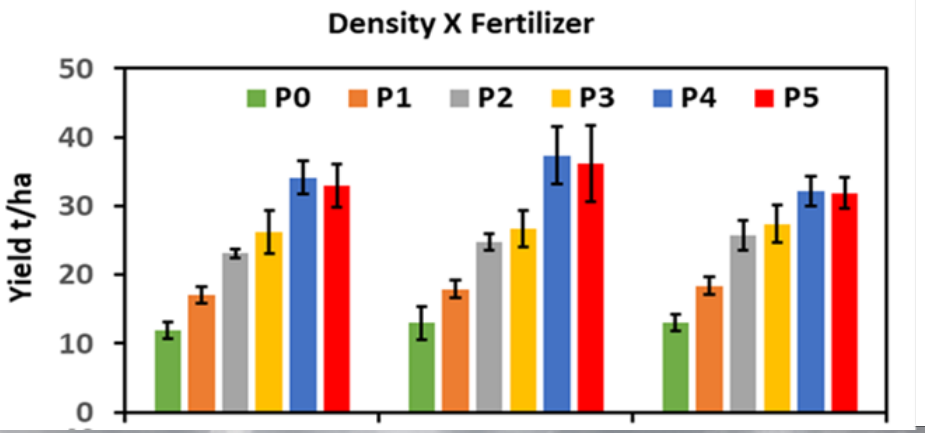


- Fresh root yield of cassava increased with the duration of the crop.
- During rainy season, the starch content was lowest for both varieties
- Risk of disease – especially root rot

Fertility management: Main activities and outputs

Fertiliser – What and how much: new mix or market available mix?

- Vietnam: Nine different fertiliser combinations
- Indonesia: Sixteen different fertiliser combination
- Laos: Eight different fertiliser combinations
- Cambodia: Eight different fertiliser combinations



- **Vietnam:** Market available fertiliser combinations (i.e. NPK 12:5:10 or 5-10-3 or 15:5:20) were also experimented. Single nutrient applications (i.e. 40N-10P-40K or 60N-15P-60K) came out to be profitable.
- **Indonesia:** Medium rage fertiliser application (i.e. 45N: $45P_2O_5$ $115K_2O$ kg ha^{-1}) turned out to produce higher yield in all districts with different varieties in North Sumatra. In East Nusa Tenggara, root yield was influenced by both N and K application. As cassava roots are being removed from the field as harvest product, a balance of N and K fertiliser application is highly recommended.
- **Laos:** Market available fertiliser mix N:P_2O_5:K_2O (14-5-35 and 15-7-18) has been tested in Laos.
- **Cambodia**: Single mix fertiliser $NP_2O_5K_2O$ (20:05:20) and market available mix 14-5-35 can be recommended

Cropping system: Main activities and outputs

Soil management – Minimise nutrient loss

Vietnam: Intercropping with Legumes, also with grass strips and cassava residues from previous year
Indonesia: Intercropping with maize for diversifying cropping system, different high value crop was also experimented
Laos: Intercropping and grass strips
Cambodia: Intercropping

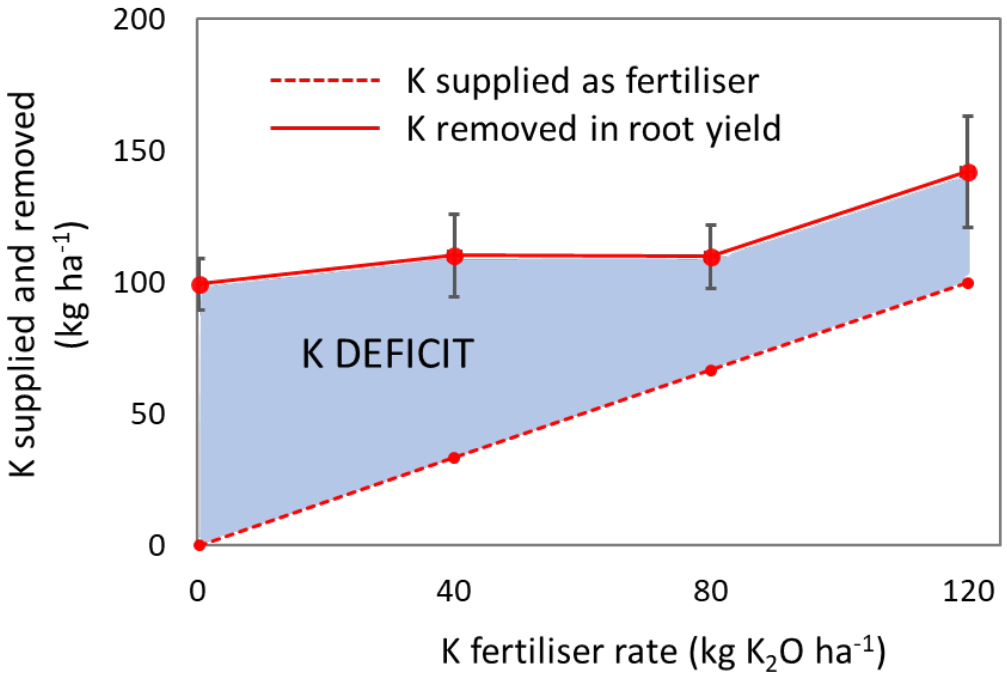
Intercropping with maize

Intercropping with peanuts

A lot of challenges

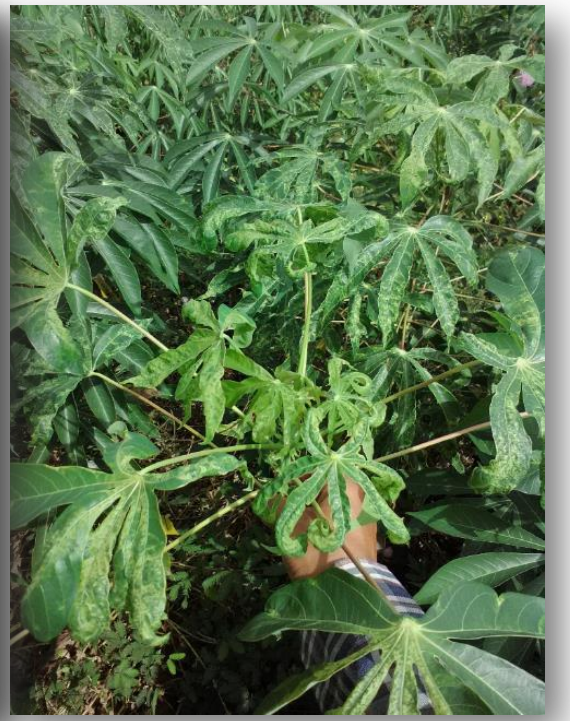
- **Vietnam:** Farmers were very enthusiastic about the potential to get extra income from the same field while cassava was growing. Concern of scarcity of farm labour has been raised by farmers
- **Indonesia:** Intercropping with maize be come popular; changed configuration in NTT
- **Laos:** There was failure of crop due to waterlogging and limited farmer interest . Labour concerns
- **Cambodia:** Cassava roots were harvested earlier due to higher price, data could not be recorded; and lack of interest among the farmers as scarcity of farm labour

Nutrient removed by harvest root



Amounts of K supplied as fertiliser and removed in tuber yield at the second harvest for treatments (0,40,80,120 kg ha^{-1} K_2O).

Biotic Stresses



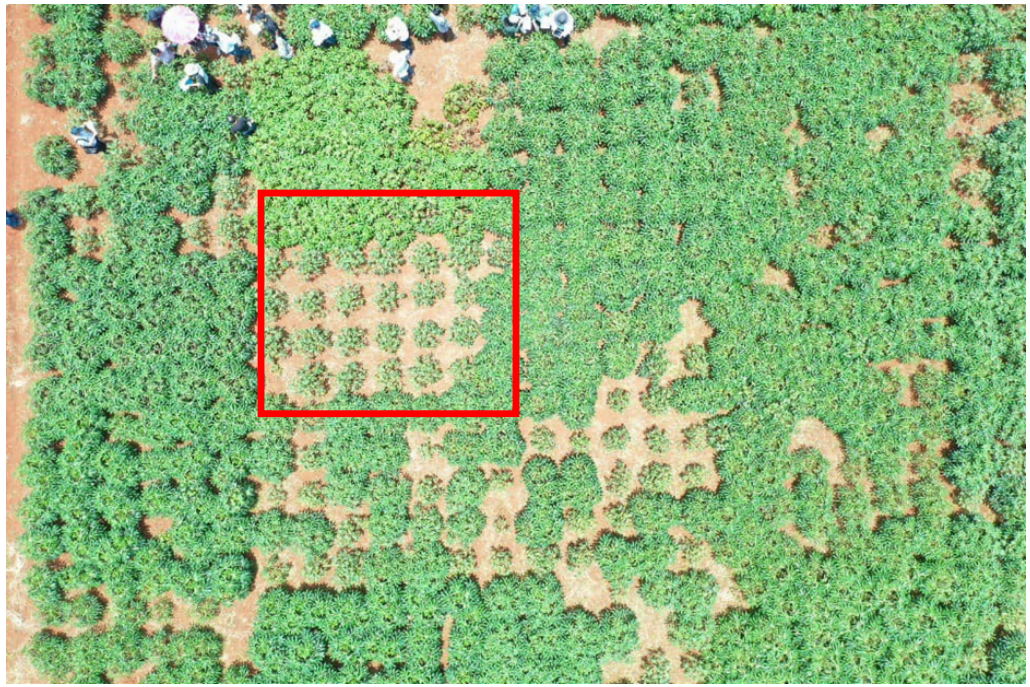
Pest and disease a new challenge for cassava industry in Asia

Main activities and outputs……

Screening for CMD resistance

In Cambodia

Variety	Origin	Genetic background
KU50	Thailand	R 1 x R 90
Rayong11	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
Rayong5	Thailand	27-77-10x R3



In Vietnam HLS11, HlS12 and HLS14 screened for CMD

- Screening of elite lines on going in Vietnam
- CMD resistance varieties from Africa are already in Vietnam and Thailand

Future direction for agronomy to combat biotic stresses

- Clean management practice (i.e. clean stakes, timely weeding and fertilization)
- Early detection and timely data sharing
- Rapid multiplication and deployment of disease free planting material
- Change cultural practice (i.e. crop rotation, intercropping)
- Biological control (i.e. parasitoid wasps for controlling cassava mealy bug)
- Genetic resistance (screening for resistance)

Overall conclusion

- The level of improvements in agronomic performance varied considerable between countries, sites, farmers and years
- Some technologies provided attractive benefits at the plot level and incentives for adoption
  - Look at towards scaling with stakeholders
- Some technologies failed the basic agronomic and economic evaluation
  - Technology redesign or other incentives required
- Some relatively straightforward changes may be scaled with limited ongoing support - new varieties for example
- In many situations there is an ongoing need for some form of facilitated extension as unlikely that current stakeholders will scale to a large number of farmers, especially for more complicated technologies

ACIAR Cassava Value Chain and Livelihood Program

Join the conversation at : https://www.facebook.com/groups/1462662477369426/

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Thank you!

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