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EAST NUSA TENGGARA AGRONOMIC RESULT 2018-2019

Research Centre for Root and Tuber Crops Brawijaya University

CIAT Southeast Asia

Indonesian Legumes and Tuber Crop Research Institute

University of Nusa Nipa

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Background and Past Research





Background

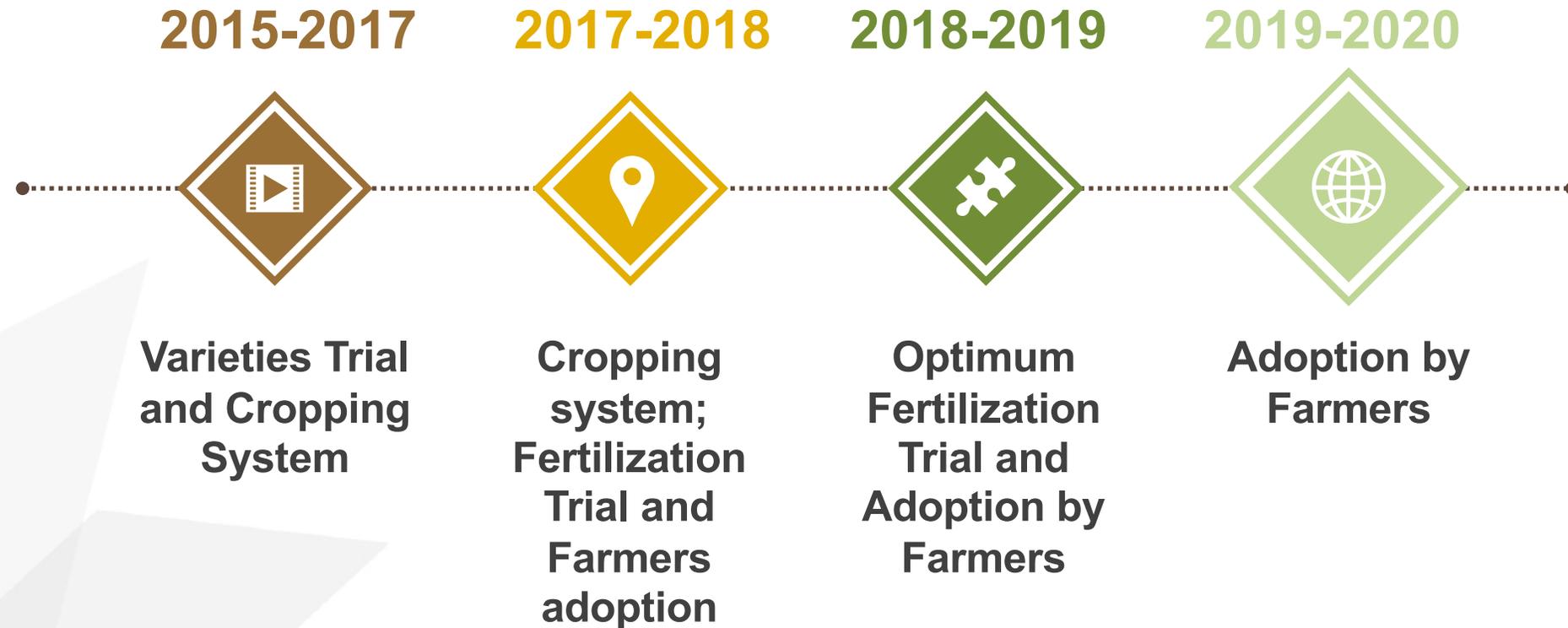


“Innovative agribusiness opportunities for profitable and sustainable cassava value chains in South East Asia”

- 1. Smallholder cassava farming usually harvest after 9-10 months however, most of the local varieties is being harvest more than 1 year (in some cases up until 2 years)**
- 2. Cassava mainly used as food source, and as animal feedstock**
- 3. Price at the local market (for food consumption) IDR 7,500-10,000 per kg (USD 0.75/kg)**
- 4. Most of the farmers keep the cassava as emergency food source and animal feedstock**
- 5. There are growing demand for cassava used as animal feedstock with price at IDR 1,500-2,000 per kg**

Past Research

Cassava value chain in smallholder cassava farmers in NTT





Cassava in East Nusa Tenggara

Activities from the project aims to improving cassava yield in East Nusa Tenggara. Recommendation from the previous experiment:

1. Plant density (intercrop with maize) 1 x 1 m
2. Introducing new varieties (Malang 4, Gajah and Faroka)
3. Fertilizer recommendation



Activities 2016-2018



2016-2017 Varieties Trial in Sikka



Cassava Varieties	Field Trial		Farmers Field	
	Mealy Bugs (%)	Yield (ton.ha ⁻¹)	Mealy Bugs (%)	Yield (ton.ha ⁻¹)
Sika Putih	20	25.7	-	-
Sika Kuning	25	26.6	-	-
Adira 1	41	31.2	100	29.4
Tambak Udang	65	32.5	100	28.2
Faroka	50	36.8	100	34.7
UB 1/2	52	34.8	100	34.2
UB 4472	39	33.6	100	35.7
Malang 4	35	45.7	-	-
Gajah	54	38.5	100	35.2



During the field day, farmers were invited to see the results of varieties trial, and were asked the preference of selected varieties. The Malang 4 and Gajah were the most preferable by the farmers

2017-2018 Varieties Trial in East Flores

Variety	Cassava Yield(ton/ha)				
	Rep. I	Rep. II	Rep. III	Total	Average
Malang 4	45.35	59.48	54.55	159.38	53.12
Faroka	42.28	55.42	41.61	139.31	46.43
TambakUdang	35.73	47.55	39.44	122.72	40.90
Gajah	44.02	46.20	56.00	146.22	48.74
Local White	21.69	32.58	31.70	85.97	28.65
Local Yellow	31.06	35.25	40.93	107.24	35.64



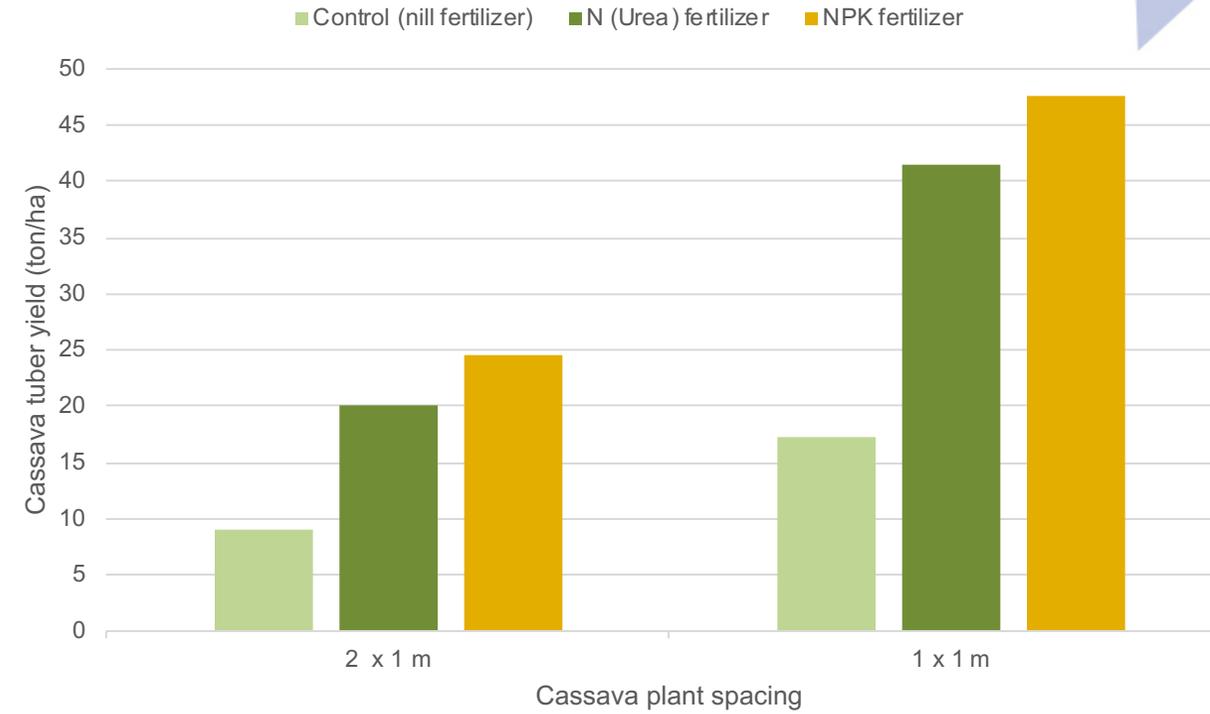
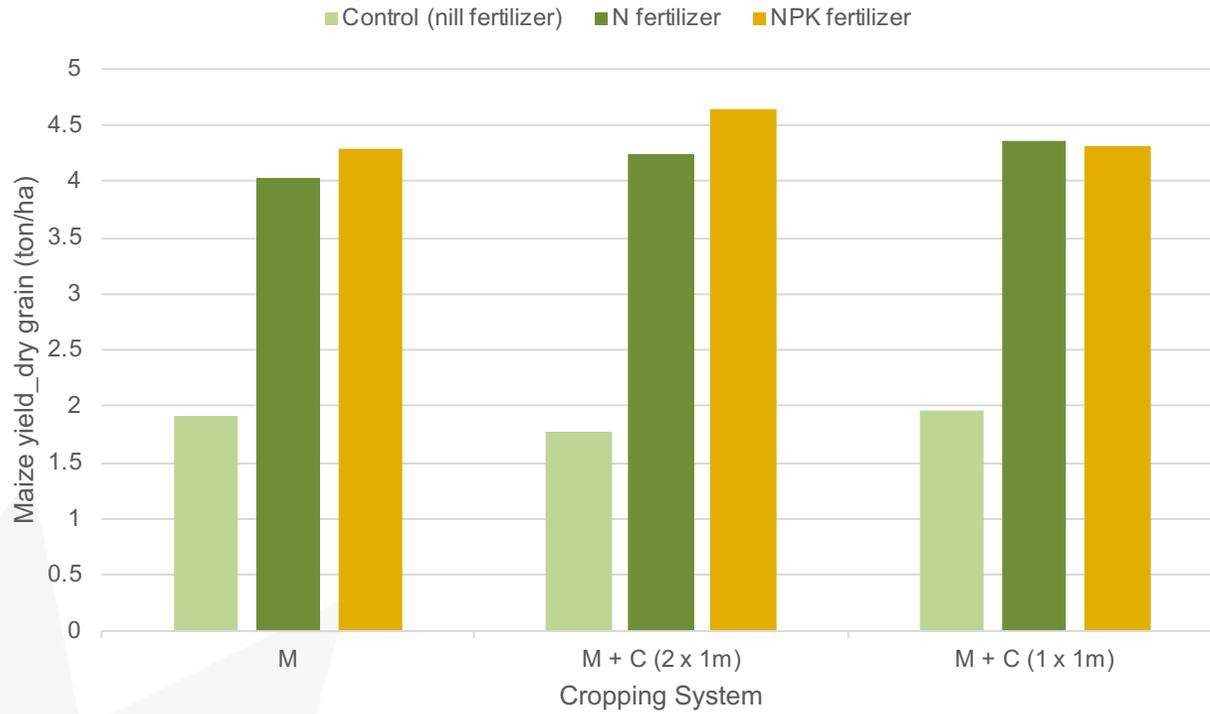
2017-2018 Fertilization Trial



Region	Lowland	Upland	Total
Do you apply organic fertilizer to your cassava?	13.56%	28.85%	20.72%
Do you apply inorganic fertilizer to your cassava?	55.93%	43.40%	50.00%
Do you understand what the NPK values mean on the fertilizer you apply?	27.12%	26.92%	27.03%
Have you ever seen a fertilizer trial on cassava?	5.08%	9.62%	7.21%
Are you interested in visiting a fertilizer demonstration trial to see the result on production and returns?	88.14%	83.02%	85.71%
Are you interested in conducting a trial on your own land?	84.75%	81.13%	83.02%

Farmers were mostly applying fertilizer only for the main crops in the intercropping, but only few farmers applying fertilizer for the cassava

2017-2018 Fertilization Trial in Sikka





Activities 2018-2019



2018-2019 Activities

- **Farmers Adoption**
 - **Activities in Sikka and Hokeng**
 - **Involving 30 households (in Sikka) and 55 households (in Hokeng)**
 - **Mainly using Malang 4, Malang 6, Gajah varieties, but also local variety**
 - **Plot size varied between 0.25 ha – 0.6 ha**
 - **Fertilizer application : Urea 200 kg/ha and NPK 15/15/15 (300 kg/ha)**
- **Continue fertiliser trial (Optimum fertilizer-focus on Potassium)**
 - **Phosphorus applied as SP36 (36% P₂O₅) at 100 kg/ha**
 - **4 level of Nitrogen**
 - **4 level Potassium**



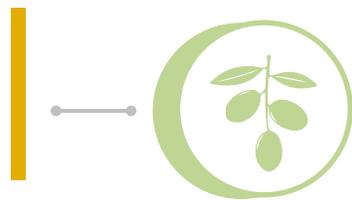
Optimum Fertilization Trial in Sikka 2018-2019

Objective

- Determine the optimum rate of Nitrogen and Potassium Fertilizer



Randomized Factorial Block Design with 3 Replication



- 4 Level of Nitrogen (Control-0 kg N/ha; 45 kg N/ha; 90 kg N/ha; 180 kg N/ha)
- 4 Level of Potassium (Control-0 kg K₂O/ha; 25 kg K₂O /ha; 50 kg K₂O /ha; 100 kg K₂O /ha)
- 1 level of Phosphorus - 100 kg/ha of SP-36 (36% P₂O₅)
- Intercropping cassava with maize (cassava at 1 x 1 m)

Optimum Fertilization Trial

in Sikka 2018-2019



Cassava at 15 dap
(days after planting)



Cassava at 45 dap
(third Urea
fertilization)



Cassava at 45 dap
(second Urea
fertilization)



Optimum Fertilization Trial

in Sikka 2018-2019



Maize Harvest

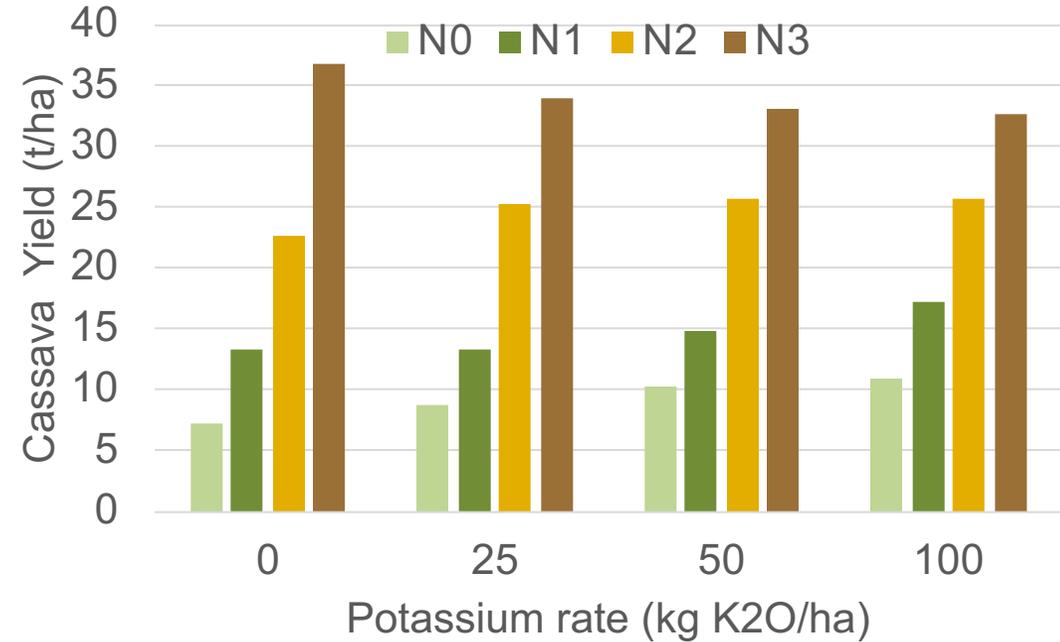
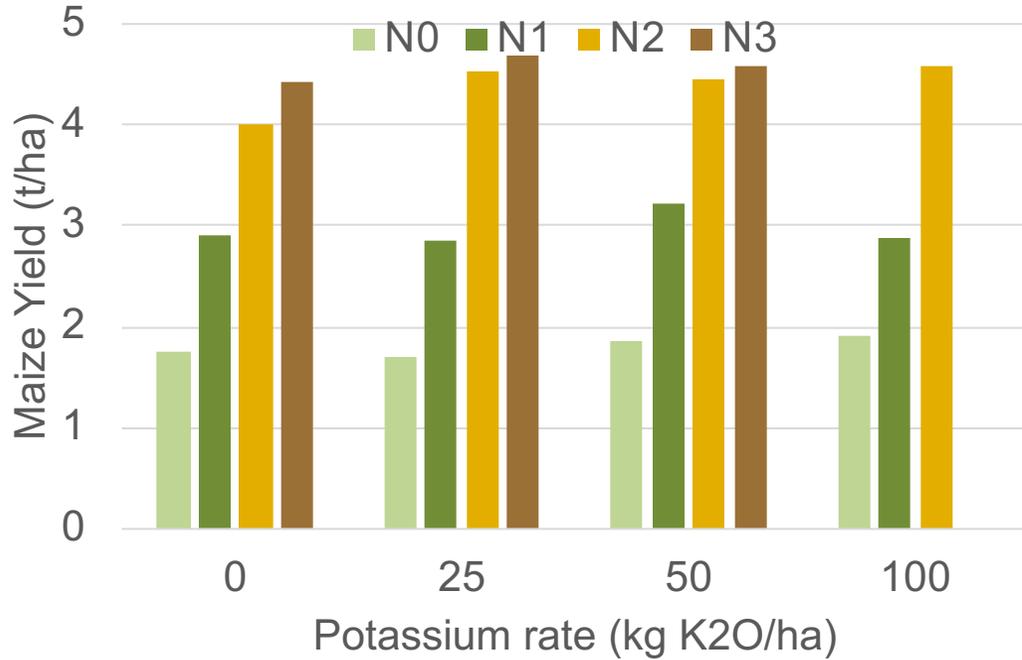


Cassava harvest



Optimum Fertilization Trial

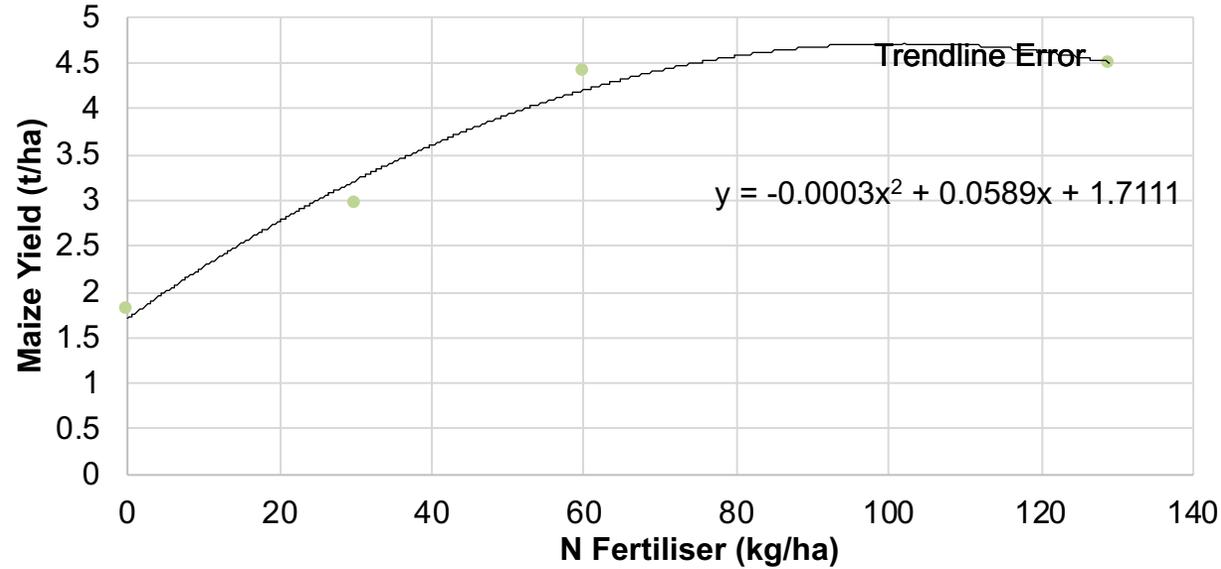
in Sikka 2018-2019



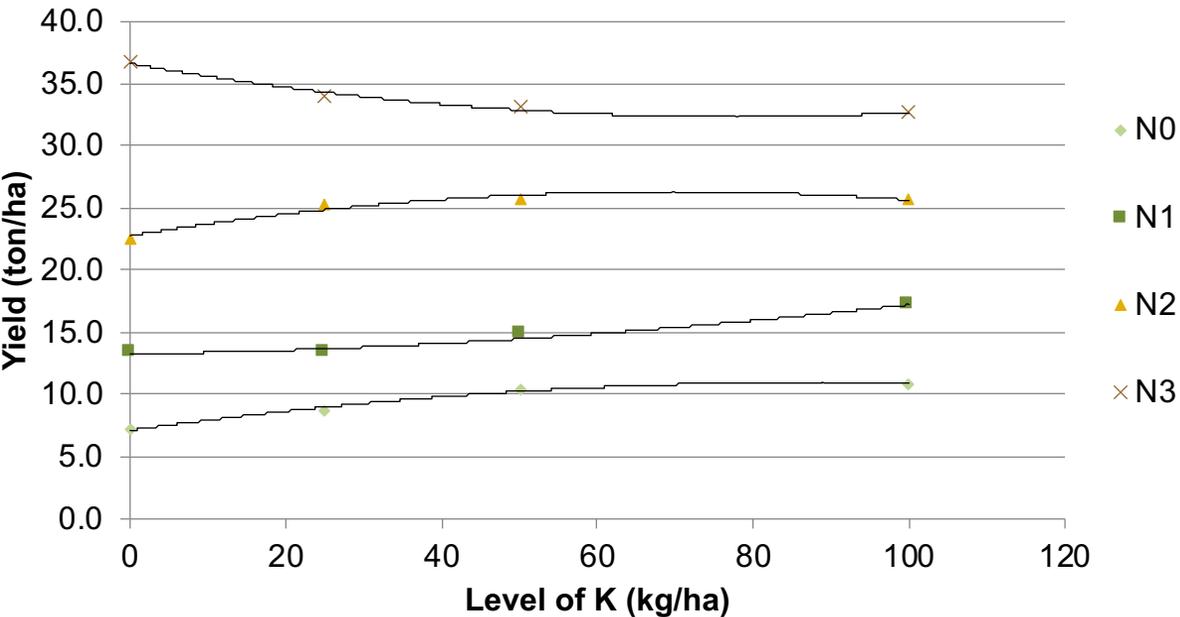
The result presented above show that the maize yield was only influenced by nitrogen application only. Cassava yield, on the other hand, was influenced by N and K application ($P < 0.05$). The cassava yield was also influenced by the interaction between N and K application although at a lower probability ($P < 0.1$).



Optimum Fertilization Trial in Sikka 2018-2019



—●— Response of maize planted in intercropped with cassava to nitrogen application.



—●— Respons of cassava intercropped with maize to K application at N0= 0 kg N/ha; N1: 45 kg N/ha; N2: 90 kg 20 N/ha and N3: 180 kg N/ha



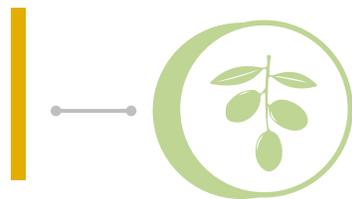
Reducing HCN from Malang 4

Objective

- Reducing the HCN content from Malang 4 variety using simple methods



Cassava tuber submerged in NaCl and NaHCO₃ solution



- 4 Level of NaCl solution (0%; 4%; 8% and 16%)
- 3 Level of NaHCO₃ solution(0%; 5% and 10%)
- After submerged in solution for 3 days, the measurements include HCN content, starch, protein, fiber, fat and preference based on taste test



Reducing HCN from Malang 4

Treatments		Properties					Preference
NaCl (%)	NaHCO3 (%)	HCN (mg/kg)	Starch (%)	Protein (%)	Fiber (%)	Fat (%)	
0	0	114.23	26.31	1.63	1.06	0.39	1.26
	5	89.92	26.16	1.62	1.01	0.47	1.93
	10	66.62	26.73	1.56	1.06	0.46	-
4	0	80.36	25.73	1.62	0.95	0.46	1.66
	5	58.92	25.92	1.51	1.04	0.44	2.93
	10	53.5	24.93	1.52	0.92	0.46	-
8	0	75.16	25.79	1.59	1.02	0.46	2.46
	5	52.52	25.7	1.55	1.02	0.45	-
	10	46.37	26.44	1.54	1.03	0.41	3.2
16	0	64.69	25.92	1.56	0.99	0.41	2.66
	5	50.39	25.65	1.54	1.01	0.42	-
	10	44.57	25.42	1.63	1.01	0.43	2.6
Tambak Udang (sweet variety)		26.72	12.35	1.65	0.86	0.42	3.46
Significant at P< 5%		P < 0.05	NS	NS	NS	NS	

Combination of NaCl 8% and NaHCO3 5% is able to decrease HCN content to 52.52 mg/kg (safe level of HSN is 50 mg/kg).





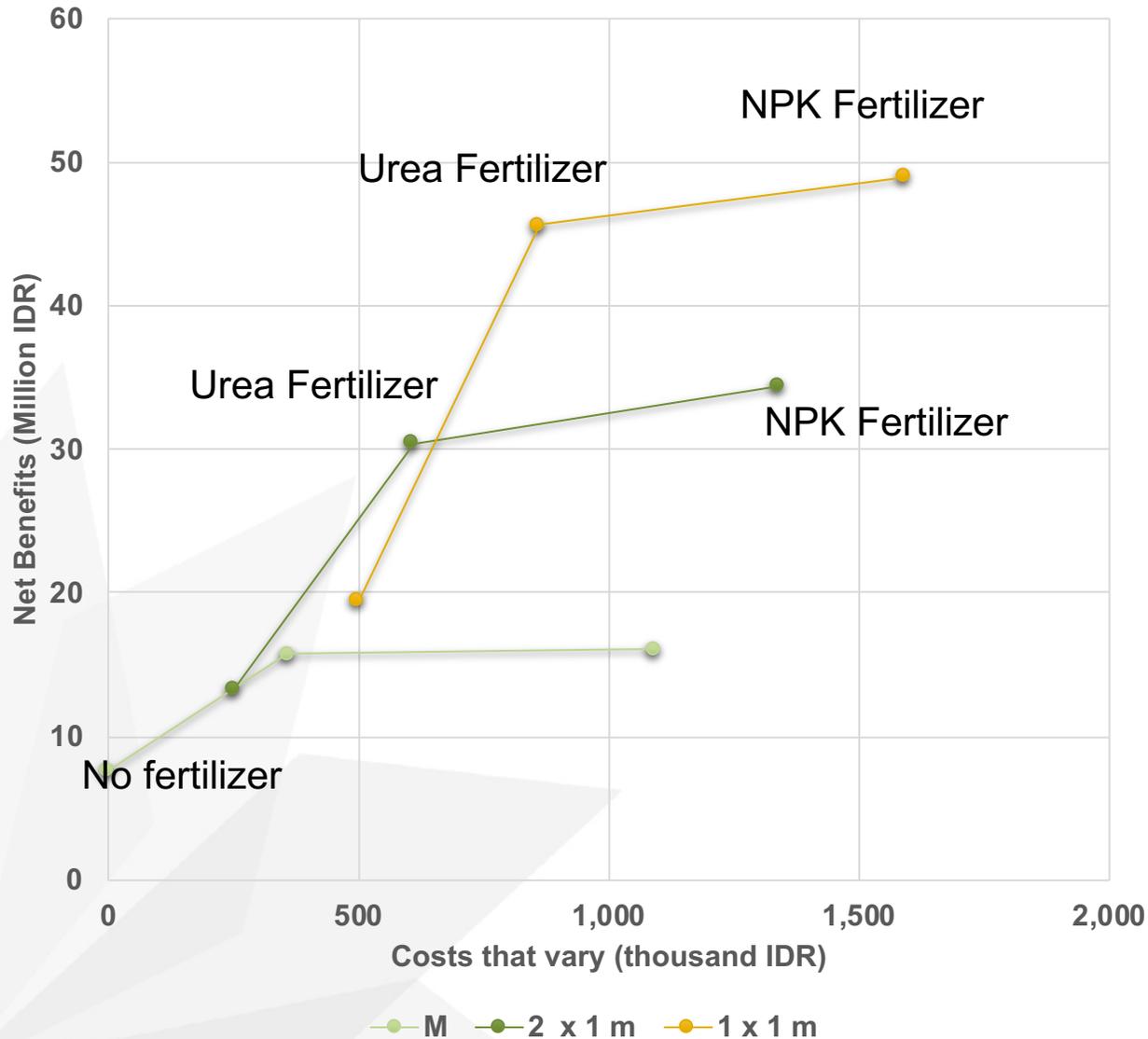
Economic Analysis 2017 - 2019



2017-2018 Fertilization Trial in Sikka

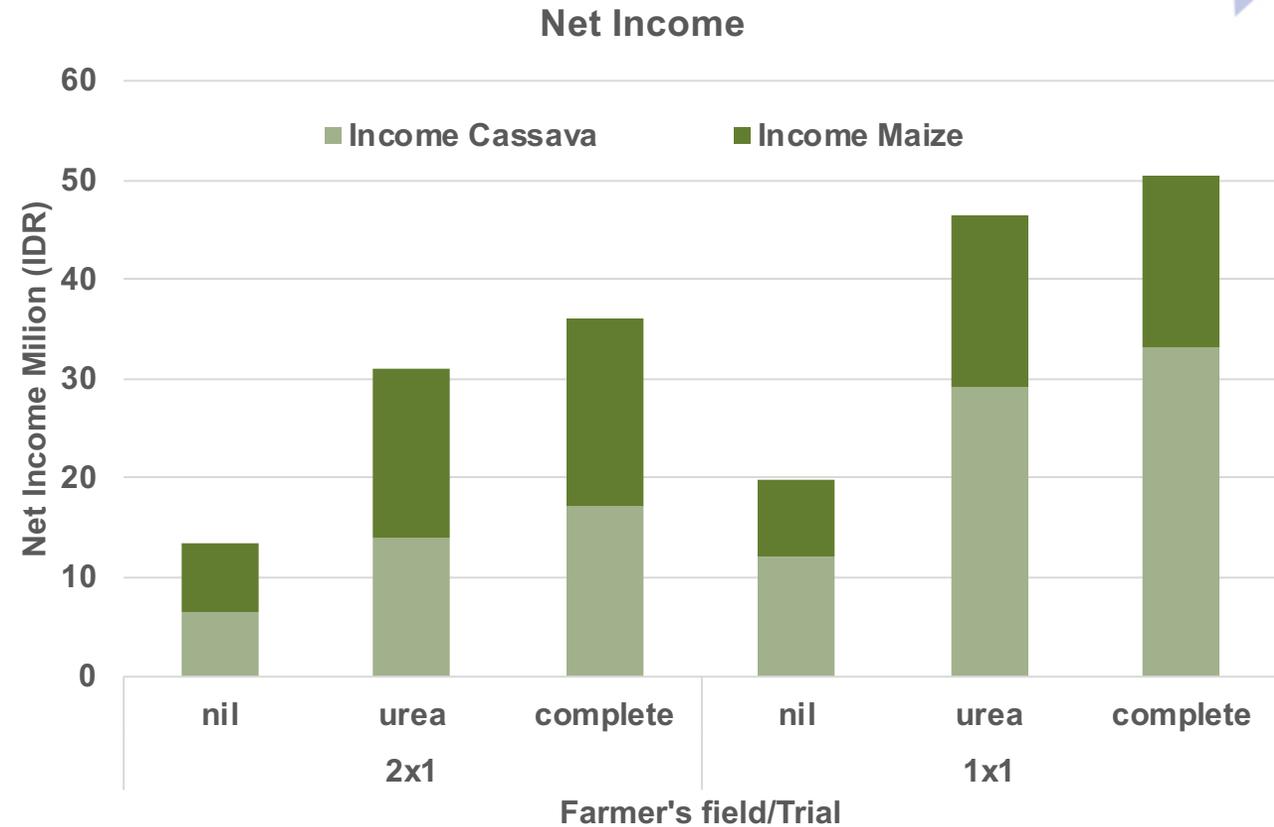
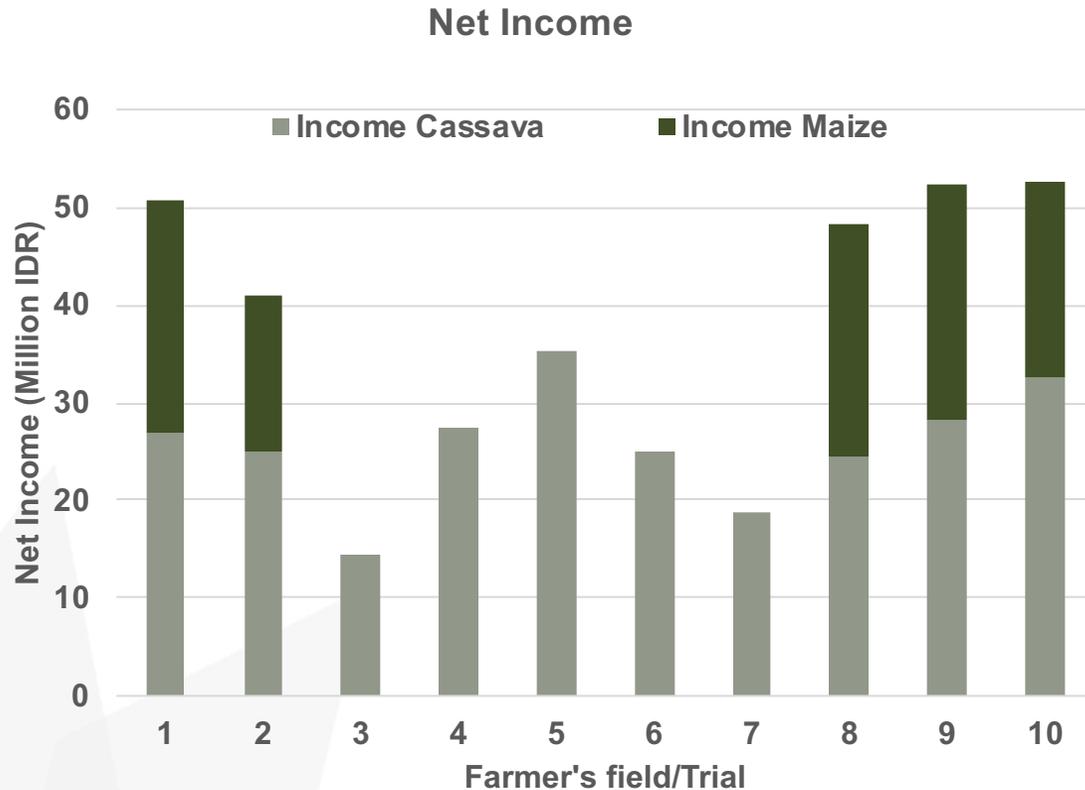


Marginal Rate of Return (MMR)



	NET BENEFITS (000 IDR)				MRR SPACING	
	Mono	2x1	1x1		2x1	1x1
0	7,640	13,254	19,406	0	2246%	2461%
N	15,760	30,413	45,658	N	5861%	6098%
NPK	16,110	34,410	48,940	NPK	7320%	5812%
	MRR FERTILISER					
N	2256%	4766%	7292%			
NPK	48%	548%	450%			

2017-2018 Farmers Adoption vs Fertilization Trial



Estimated with price of cassava IDR 700/kg, and price of maize IDR 4,000/kg
Farmers were applied Urea (IDR 1,800/kg) at 200 kg/ha and NPK (IDR 2300/kg) at 300 kg/ha

Economic Analysis at Farmers Discussion Group at East Flores 2019 (Hokeng Village)

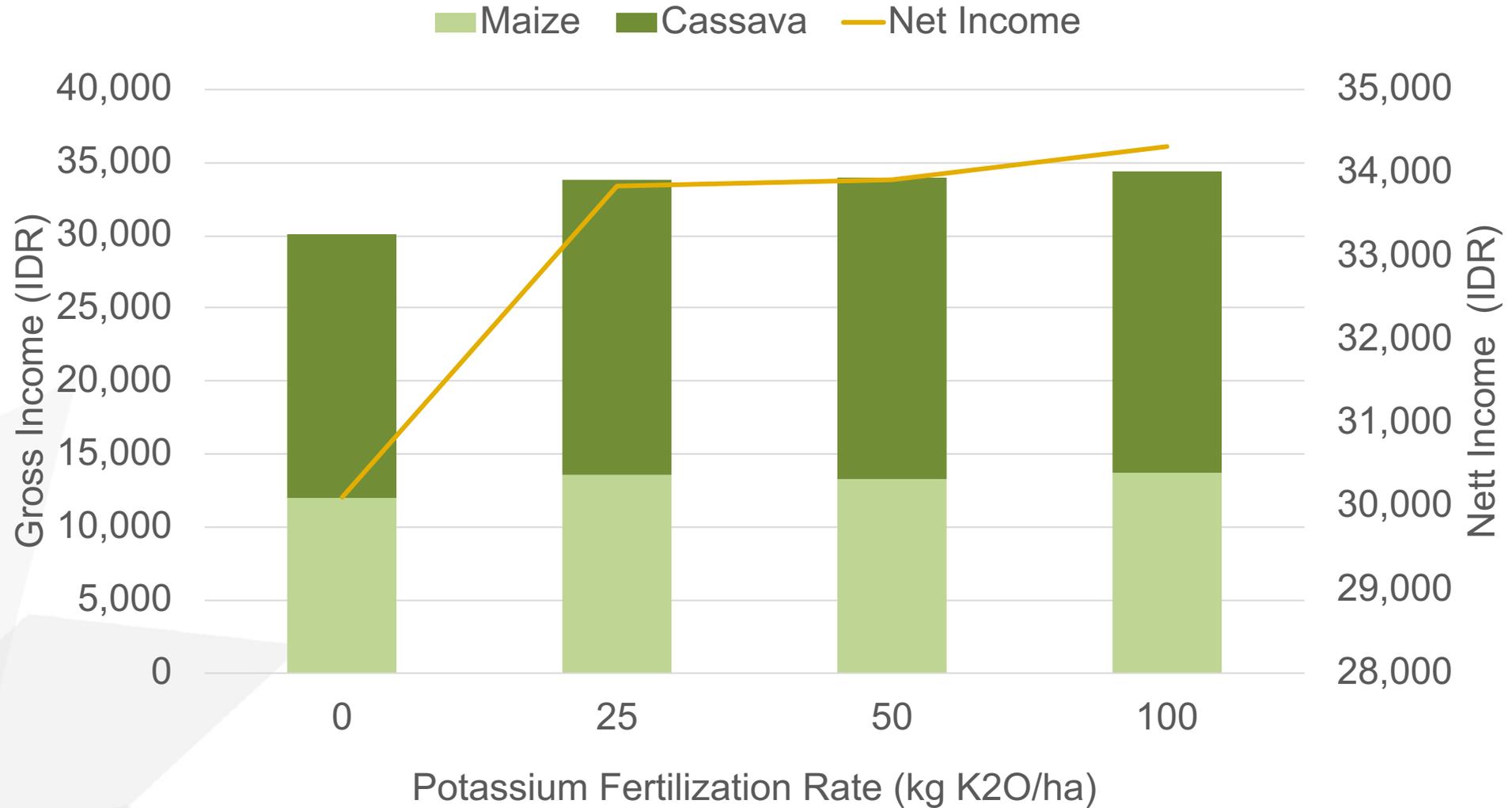
	Cassava Monoculture	Cassava Mono (USD)	Cassava- Maize	Cassava- Maize (USD)
Material costs (A)	1,110,000	\$78	1,630,000	\$115
Labour costs (B)	2,360,000	\$166	2,560,000	\$180
Total costs (A+B = C)	3,470,000	\$244	4,190,000	\$295
Focus group yields (0.8 maize + 25t cassava)				
Revenue (D)	17,500,000	\$1,232	21,500,000	\$1,514
Net returns (D-C)	14,030,000	\$988	17,310,000	\$1,219
Net returns to household resource (D-A = E)	16,390,000	\$1,154	19,870,000	\$1,399
Labour days (F)	59	59	64	64
Net returns per labour day (E/F)	277,797	\$20	310,469	\$22
Experimental yields (4t maize + 35t cassava)				
Revenue			40,500,000	\$2,852
Net returns			36,310,000	\$2,557
Net returns to household resource			38,870,000	\$2,737
Labour days			64	64
Net returns per labour day			607,344	\$43



2018-2019 Fertilization Trial in Sikka



Economic Analysis





Discussion and Implication





Variety Selection

Farmers were prefer to planting Malang 6, Malang 4 and Gajah varieties



Cropping System

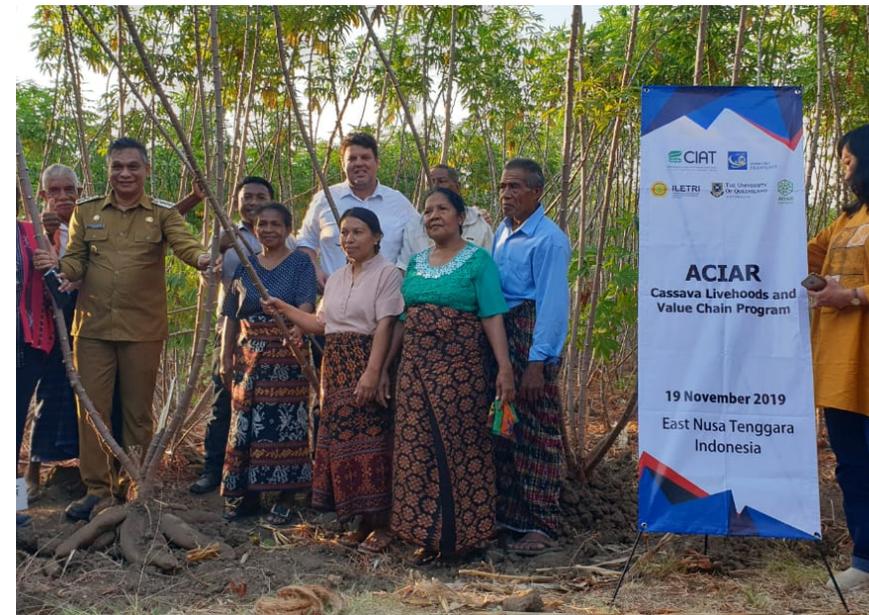
Intercropping is the main cropping system due to the needs for maize/rice for food source

Discussion and Implication



Market

Farmers willing to plant more cassava as long as there are a MOU-agreement with trader/industry



Fertilizer requirement

Fertilizer in NTT is controlled by the government through a Fertilization Plan (RDKK), hence farmers need to design the fertilizer requirements for the following planting season with Field Extension Officer



Stakeholder engagement



Local Government of Sikka and East Flores are preparing MOU for farmers, cassava industries, and agriculture field extension officer for expanding cassava farming

Discussion and Implication



Optimum Fertilization

Optimum fertilization for cassava combining Urea (90 kg N/ha); SP36 (100 kg/ha); KCl (25 kg K₂O/ha).

Government Support



Local government of Sikka provide mechanization for opening new field for cassava

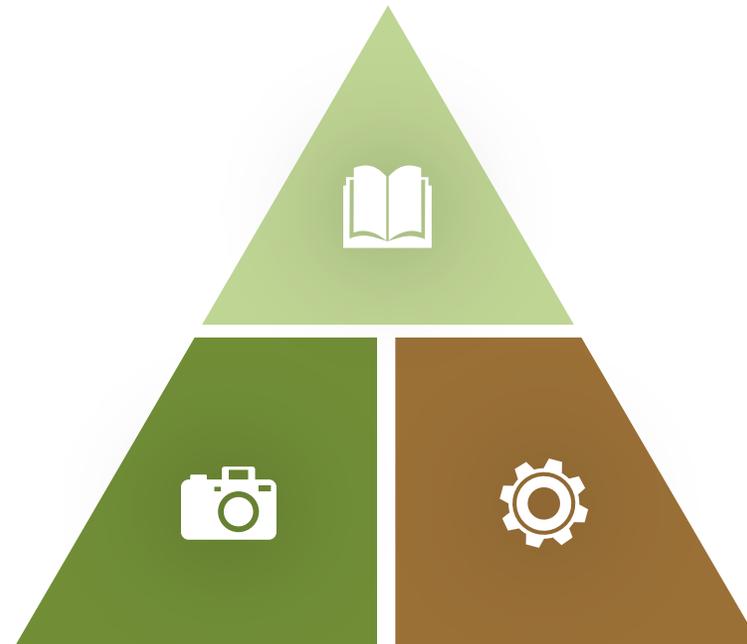
Implication

Fertilizer application

The needs for collaboration between farmers-trader/industry-field extension officer to plan the fertilizer requirement for the following planting season (moreover if cassava monoculture). Combination of Urea, SP36 and KCl is the most appropriate fertilizer application for farmers in East Nusa Tenggara.

Mealy bug attack

Planting season in NTT mainly during the rainy season, thus in August (dry season) mealy bug attack is quite severe. Needs to consider treatment for mealy bug attack



Market certainty

There is a needs to formulate a formal agreement between farmers and trader/industry that address:

1. Price of cassava
2. Area of cassava planting
3. Timing of harvesting

T h a n k Y o u

