The adaptability of high yielding cassava varieties in two contrast climatic conditions

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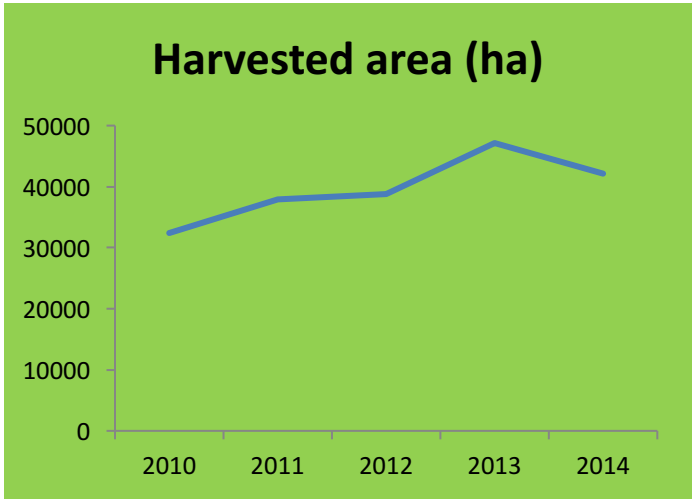
International Conference on Root and Tuber Crops
University of Brawijaya, 10 – 11 October 2017

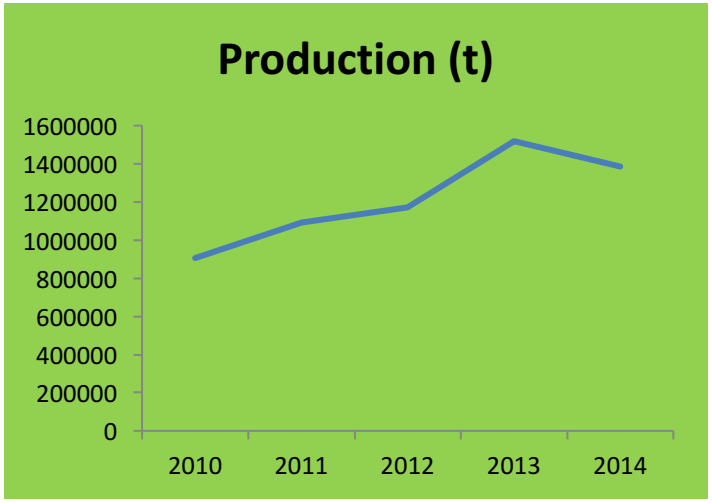
Introduction

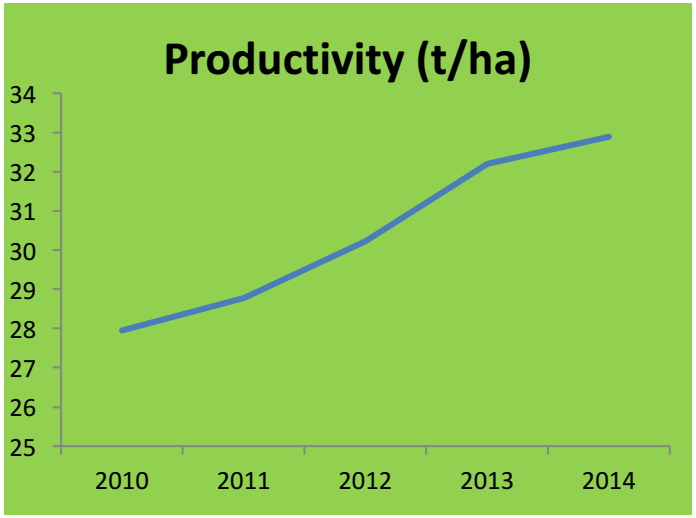
North Sumatera

- has a climate type A (very wet).
- Simalungun district has wet months of more than 9 months even throughout the year.
- Simalungun district has the highest cassava harvested area in North Sumatera followed by Serdang Bedagai.
- In North Sumatera, cassava can be planted through the year.

Condition cassava plant in North Sumatera



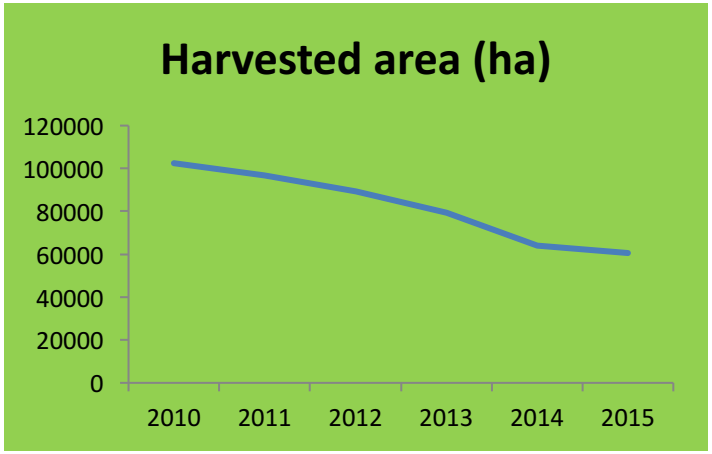


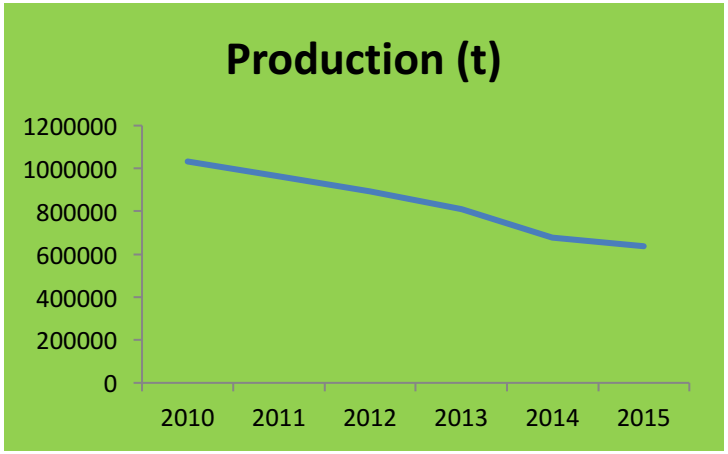


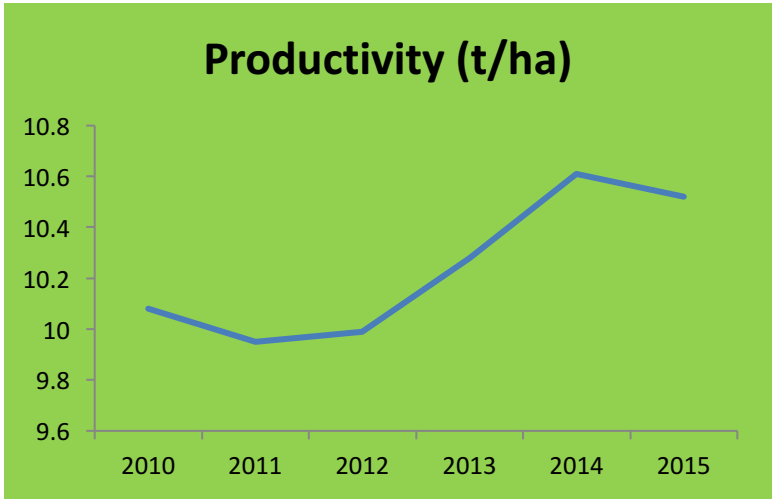
East Nusa Tenggara

- The area of East Nusa Tenggara has a hilly area with a dry climate
- The dry season is longer, ie ± 8 months (April to November), while the rainy season is only 4 months (December to March).
- Production of cassava in 2015 decreased 5.94 percent compared to 2014 last year. This is due to the decline in harvested area and productivity.
- In East Nusa Tenggara, cassava can be planted at beginning of rainy season.

Condition cassava plant in East Nusa Tenggara







Material and Methods

NORTH SUMATERA

- In North Sumatera, twelve cassava genotypes that planted were UB ½, UB 1472, Adira 1, Malang 4, Cecek Ijo, Faroka, Gajah, Ketan, Kaspro, Malaysia, Adira 4, dan Cikaret
- Randomized Completely Block Design with four replications was adopted for undertaking this experiment.
- Stem cuttings with 25 cm length were planted in the spacing of 100 cm x 100 cm in the plot size of 5 m x 5 m. So population of each plot was 25 plants.
- Planting was carried out at December 2015 and harvesting was undertaken at 25-28 October 2016, at the period of around 10 months after planting.
- Organic MABAR was applied as basal fertilizerentirely at rate of 50 kg in each replication, so required 200 kg for four replications.
- At two weeks after planting, first fertilizer application was applied with compound fertilizer Phonska NPKS = 15:15:15:10, at amount of 2.1 kg/plot or 25 kg Phonska/replication or 100 kg Phonska for whole plots in four replications.
- At 1.5 months after planting the second fertilizer was applied in a form of Urea 12.5 kg/replication or 50 kg for whole plots in four replications.
- At three months after planting the third fertilizer application was practiced in a form of compound Mutiara fertilizer with NPK = 16:16:16 at amount of 12.5 kg Mutiara/replication or 50 kg for whole plots in four replications.

EAST NUSA TENGGARA

- Planting date in Sikka was 16 January 2016.
- The varieties that planted in Sikka were Sikka Putih (local variety, sweet) Sikka Kuning (local variety, sweet), Mentega (introduction variety, sweet), Tambah Udang (introduction, sweet), Faroka (introduction variety, bitter), UB ½ (introduction variety, bitter), UB 14772 (introduction variety, bitter), Gajah (introduction variety, bitter).
- Fertilizers given was 300 kg Urea (46% N); 150 kg SP_{36} (36% P_2O_5); 100 kg KCL (50% K_2O).
- Fertilizers was given three times, at planting 1/3 rate of Urea + 100% SP36 + 100% KCl, at 30 days after planting with 1/3 rate of Urea, and at 90 days after planting with 1/3 rate of Urea.
- Weed control was also done three times that were at pre-emergence (before land preparation) with herbiside, at 30 days after planting (before second fertilization) manually, and at 90 days after planting (before the third fertilization) manually.
- Harvesting was done in November 2016. Parameters observed were branch number, plant height, tuber number, and tuber yiled (kg/plant).

Result

NORTH SUMATERA

Table 1. Cassava above ground parameter observed of twelve cassava genotypes, Pematang Siantar, North Sumatra 2015/2016.

Genotypes	Plant height	Forking/ branching height	Stem diameter	Weight of stem (kg/plant)		
	.....cm.....			Basal	Middle	Upper with leaves
UB1/2	254	135	3.25	4.0	2.9	2.5
UB1472	200	140	3.05	3.6	2.8	2.5
Adira 1	208	140	2.45	3.7	2.9	2.5
Malang 4	310	254	2.75	4.3	2.7	2.3
Cecek Ijo	233	74	2.61	3.5	2.4	2.0
Faroka	291	118	3.16	4.2	2.8	2.3
Gajah	290	95	2.50	4.1	2.7	2.3
Ketan	225	84	3.13	3.1	2.2	1.9
Kaspro	189	128	2.85	3.2	2.2	1.8
Malaysia	174	86	2.10	3.7	2.6	1.9
Adira 4	259	106	2.58	3.8	3.0	2.6
Cikaret	253	103	2.33	3.1	2.9	2.2
LSD 5%	52.25	51.26	0.53	0.2	0.2	0.6
CV (%)	15.11	29.26	13.45	3.91	4.90	5.63

Note: LSD = Least Significant Difference, CV = Coefficient of Variation.

- In North Sumatera, among the introduced varieties, Malang 4 indicated the highest yield, almost reached 50 t/ha, than followed by Faroka (41 t/ha), UB ½ (38 t/ha), and UB 1472 (35 t/ha).
- It was surprise that Gajah variety produced only 31 t/ha. In its origin location (East Kalimantan) this variety can produce more than 10 kg/plant (if the plant soacing is 1 x 1 m is equal to 100 t/ha).
- In East Nusa Tenggara with the very dry condition Gajah variety could produce more than 5 kg/plant .

Table 2. Yield and yield component of twelve cassava genotypes, Pematang Siantar, North Sumatra 2015/2016.

Varieties	Number of root	Root diameter	Root length	Root yield (t/ha)
		..... cm		t/ha
UB1/2	9	6.5	30.9	38.720
UB1472	8	5.9	29.9	35.750
Adira 1	10	6.4	28.1	36.300
Malang 4	13	8.0	28.9	49.830
Cecek Ijo	9	5.0	27.6	19.140
Faroka	13	6.0	41.5	41.690
Gajah	10	5.9	31.0	31.460
Ketan	9	5.8	31.1	20.570
Kaspro	10	6.0	31.3	27.830
Malaysia	12	6.3	30.9	41.030
Adira 4	12	6.1	31.1	27.390
Cikaret	10	6.3	30.6	25.960
LSD 5%	1.3	0.7	1.86	9.862
CV (%)	8.75	7.75	4.16	22.87

Note: LSD = Least Significant Difference, CV = Coefficient of Variation.

- Table 2 show that Ketan an introduced variety from Malang for human consumption was the lowest one, only yielded 20.57 t/ha. The reason of poor yield in Ketan was due to mainly many root rot suffering. In Malang, Ketan is mostly planted by farmers in upland at higher altitude with very good drainage.
- While in site of trial at Siantar with higher rainfall as well as humidity, Ketan to be susceptible to root rot and ultimately yield is reduced due to many rotten roots were separately removed. The serious of root rot incident may cause by the lower soil pH ranging from 4.3 to 4.5, although during the harvest period by pH measurement kit indicated pH around 5 however data from laboratory seems more accurate.

EAST NUSA TENGGARA

Table 1. Yield and yield component of nine cassava genotypes in Sikka, NTT, Indonesia.

Cassava varieties	Branch No	Plant height (cm)	Tuber No	Tuber yield (kg/plant)
Sika Putih	2.04 ± 1.03	157.86 ± 11.53	4.86 ± 1.14	2.80 ± 0.52
Sika Kuning	2.20 ± 0.77	169.70 ± 7.72	4.75 ± 1.03	2.74 ± 0.66
Mentega	2.00 ± 1.20	164.75 ± 14.02	9.85 ± 2.67	5.06 ± 0.46
Tambak Udang	2.00 ± 0.77	152.76 ± 6.83	11.00 ± 2.19	5.57 ± 0.57
Faroka	2.28 ± 0.48	143.42 ± 2.63	9.75 ± 1.28	5.12 ± 0.84
UB ½	2.77 ± 0.92	143.31 ± 14.66	7.72 ± 1.80	4.22 ± 0.45
UB 1472	1.95 ± 0.88	157.55 ± 22.26	7.15 ± 1.08	4.31 ± 0.49
Gajah	2.00 ± 0.95	180.28 ± 5.03	10.08 ± 2.82	6.85 ± 1.20

- In East Nusa Tenggara, due a very dry season, the cassava cannot grow well (less than 30% for each plot). However, the measurement from individual crops (average of 6 to 9 plants/plots).

- The growth and yield of the tested varieties obtained were the least number of branches is found in UB 1472 variety (1.95 branches per plant) and hightest at UB ½ (2.77 branches per plant).
- The highest tuber yield was found in the Gajah variety (6.85 kg / plant).
- Sikka Kuning and Sikka Putih as local varieties had lowest tuber yield.
- Based on the observation of the first year (2016), the productivity of all varieties of cassava introduced can exceed local varieties.
- It showed that introduction of these varieties have the opportunity to be developed further in Sikka district and around.

75 days

10 months

CONCLUSIONS

- The growth and yield of some introduced higher yielding cassava varieties was strongly influenced by environmental conditions.
- Malang 4, Faroka, UB ½ and UB 1472 well adapted in dry climate condition such as East Nusa Tenggara as well as wet climatic condition, such as North Sumatra. Gajah variety, on the other hand, could not adapt to the wet climatic condition. The same phenomenon was found with Ketan variety.

THANK YOU