

FERTILIZATION OF CASSAVA (*Manihot esculenta* Crantz) IN SIANTAR AND SIMALUNGUN, NORTH SUMATRA

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INTRODUCTION

In North Sumatra, cassava is planted mainly for commercial crop. Although planted with a traditional technology, the yield of cassava in North Sumatra is higher compared to the mean national or other province yield. One of the reason farmers planted cassava in a very close distance (100 x 60 cm or 80 x 60 cm). Farmers are hardly fertilized their cassava, or if they do fertilized, they used improper fertilizer. Meanwhile, with its high total yield, cassava is known as the plants that take a lot of plant nutrient. Therefore, if there no correct fertilizer, planting cassava would speed up soil degradation.

The experiment discussed here was aimed to investigate the fertilizer requirement of cassava in Siantar and Simalungun, North Sumatra. The experiment was also intended to demonstrate to farmers the importance of fertilization for cassava.

METHODS

The experiment was conducted on farmer's field and managed by farmers. Project team helped with setting the experiment, and materials. There were five farmers conducted fertilizers experiment in monoculture system, and one farmer conducted experiment on cassava + maize intercropping system, i.e.:

- 1) Sinasak, Tapian Dolok (Muchlis' Field); monoculture, Malang 4 variety
- 2) Tanjung Tonga, Siantar (Turisno' Field); monoculture, Malang 4 variety
- 3) Tanjung Pinggir (Factory'Field), monoculture, Dacon variety
- 4) Tanjung Pinggir (Factory'Field), monoculture, Huabuong variety
- 5) Sipayung (Factory' field); monoculture, Faroka.
- 6) Tiga Dolok (bu Sirait field), Cassava + maize intercrop, Malang 4 variety

Farmers used to apply 300 kg Phonska (15 N; 15 P₂O₅: 15 K₂O). This was used as the control treatment. The improve suggestion were: (1) increasing nitrogen rate of Phonska application to 400 kg/ha; (2) increasing nitrogen rate only by adding 100 kg Urea (45 kg N); (3) increasing potassium rate only by 100 kg KCl (50 kg K₂O); (4) application of 10 t organic manure. The complete treatment is presented in Table1.

Table 1. Experimental treatment

Fertilizer applied	Equality to N, P and K
Farmer practices (300 kg Phonska)	45 kg N+45 kg P ₂ O ₅ +45 kg K ₂ O/ha.
400 kg Phonska	60 kgN + 60 kg P ₂ O ₅ + 60 kg K ₂ O/ha
300 kg Phonska + 100 kg Urea	90 kg N + 45 kg P ₂ O ₅ + 45 kg K ₂ O/ha
300 kg Phonska + 100 kg KCl/ha	45 kg N + 45 kg P ₂ O ₅ + 95 kg K ₂ O/ha
Organic manure 10 t/ha.	Organic manure 10 t/ha.

The treatments were arranged in a Randomized Block with 4 replications. Planting was done on 28-29 November 2017. Cassava was planted with distance of 1.0 m x 1.0 m on a plot size of 5.0 x 7.0 m. For intercropping system (Tiga Dolok), cassava was planted at plant distance of 1.25 x 1.0 m;

maize was planted at plant distance of 0.75 x 0.25 m (two rows of maize in between cassava row with spacing of 0.25 m within the row). The maize used was Syngenta NK212.

Fertilizer was applied 3 times, the first and the second were given at 1 weeks and 8 weeks (1/3 rate at each application), and the rest of the dosage was given at 12 weeks or after harvesting maize for cassava + maize intercropping. Maize was harvested on April 2018, and cassava was harvested on September 2018. Twenty (20) farmers attended the field days conducted during harvesting maize.

RESULTS

The results presented in Table 1 show that increasing potassium rate from farmer's practice significantly increased cassava yield, but not with increasing nitrogen. Increasing potassium rate from 45 kg K₂O/ha to 115 kg K₂O/ha increased yield obtained from 31.72; 36.37; 23.17; and 36.55 t/ha to 47.10; 44.20; 28.20 and 43.65 t/ha .fertilized with Increasing potassium from 45 kg K₂O/ha to 115 kg K₂O/ha significantly increased cassava yield. Except in Tj Pinggir planted with Huaibong variety, Increasing N rate did not significantly increased cassava yield. In Tj Pinggir planted with Huaibong variety increasing nitrogen rate from 45 kg N/ha to 90 kg N/ha increased cassava yield from 19.80 t/ha to 21.15 t/ha, but stil lower compared to 45 kg N if followed by 115 kg K₂O/ha, i.e. 26.32 t/ha. The ytiked fertilized with 10 t manure/ha did not significantly different from that of fertilized with 45 kgN+ 45 kg P₂O₅+ 45 kg K₂O/ha.

Table 2. Yield of cassava (t/ha) under fertilizer trials in North Sumatra

Treatments	Sinaksak Malang4	Tj Tonga Malang4	Tj Pinggir Dacon	Tj. Pinggir Huaibong	Sipayung Faroka
Farmer practices (300 kg phonska)	31.72b	36.67b	23.17b	19.80c	36.55b
400 kg Phonska	30.37b	37.80b	24.75ab	22.72b	38.35b
300 kg Phonska + 100 kg Urea	31.72b	36.90b	23.85b	21.15bc	37.35b
300 kg Phonska + 100 kg KCl/ha	47.10a	44.20a	28.20a	26.32a	43.65a
10 t Manure	30.3b	36.00b	24.75ab	23.62ab	36.67b
LSD 5%	4.08	2.67	3.84	2.78	1.95
CV %	8.53	4.53	10.00	7.95	3.29

The result presented in Table 3 showed that increasing nitrogen and potassium rate did not significantly increase maize yield in cassava maize intercropping system. Cassava yield, on the other hand, increased significantly by increasing nitrogen or potassium rate. Increasing nitrogen rate by adding 100 kg Urea/ha increased cassava yield from 22.57 t/ha to 34.30 t/ha. Increasing potassium rate by adding 100 kg KCl/ha increased the yield to 41.05 t/ha

Table 3. Yield of maize and cassava under intercropping with fertilizer Trials in Tiga Dolok North Sumatra 2017-2018.

Treatments	Maize Yield (t/ha)	Cassava yield (t/ha)	Revenue Maize Rp x 1000	Revenue Cassava Rp x 1000	Total Revenue Rp x 1000
Farmer practices (300 kg Phonska)	6.84	22.57 b	23,256	28,212	51,468
400 kg Phonska	6.93	37.35 a	23,562	46,687	70,249
300 kg Phonska + 100 kg Urea	7.20	34.30 a	24,480	42,875	67,355
300 kg Phonska + 100 kg KCl/ha	7.17	41.05 a	24,378	51.312	75.690
10 t Manure	6.66	32.30 ab	22,644	40,375	63,019
LSD 5%	NS	11.5	Price Rp 3400/kg	Price Rp 1250/kg	
CV %	5.49	21.98	-	-	

*) yield of maize monoculture : 6.73 t/ha = Rp. 22,882,000.-

DISCUSSION AND CONCLUSION

The experimental results presented in Table 2 and 3 indicated that in North Sumatra, especially Siantar and Simalungun district was more responsive to potassium fertilization. In both cropping system cassava had a significant response to the increase of potassium rate, but only in cassava + maize intercropping cassava had a positive response to nitrogen fertilizer.

During field day, all participated farmers interest to the intercropping systems. They now understand that planting cassava in between their maize did not influenced maize yield. They are willing to practice this system on their field, and try another crops as the cassava intercrops.