Effectiveness of a candidate Potash fertilizer on maize and tomato performance in Tanga and Coast regions, Tanzania

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Problem statement

1. Declining soil fertility is among the major challenges limiting crop production in Tanzania
2. crop yields have not increased to appreciable levels despite GOT efforts
3. Soil analyses at the Central Soil Lab at Mlingano has revealed that potassium deficiency in our soils is wide spread than previously thought
4. Deficiency of potassium has caused a decline in crop yields in smallholder farmer's fields elsewhere
5. The situation in horticultural crops like tomato for Tanzania is not well understood

Objectives

We therefore established two field trials in Bagamoyo and Lushoto districts using maize and tomato as test crops;

- evaluate the effect of potash containing fertilizers on tomato growth
- assess influence of potash containing fertilizers on tomato K uptake,
- assess influence of applying potash containing fertilizers on tomato yields,
- compare the economic viability of applying two potash containing fertilizers sources on tomato

Materials and Methods

- Two experiments were laid out on fields which were deficient in nitrogen, phosphorus and potassium
- Experiments were carried out as Completely Randomized Blocks with 4 replications
- Each location and crop received recommended rates of NP with varying K-sources and rates

Soil conditions

SAMPLE IDENT.	pH 1:2.5		ORG C %	TOTAL N %	AVAILABLE -P BRA-I OLSEN		EXCHANGEABLE BASES				EC
							Ca	Mg	K	Na	mS/cm
	H_2O	KCl			mg/kg	mg/kg	me/100 g	me/100 g	me/100 g	me/100 g	
Mtunguja- Soni	5.9	5.3	1.37	0.13	1.46		11.00	3.96	0.02	0.03	0.09
Kigulunde-Soni	5.9	5.5	1.67	0.21	1.65		6.61	2.00	0.13	0.07	0.07
Mswaki-Kilindi	5.9	5.4	0.94	0.12	1.78		7.11	2.83	0.58	0.08	0.11
Mkindi-Kilindi	6.0	5.2	1.33	0.16	2.25		7.60	3.62	1.32	0.15	0.09
Kiwangwa-Pili	5.1	4.2	1.01	0.12	1.95		2.32	0.85	0.29	0.03	0.09
Kiwangwa(maize)-Salim	6.0	5.4	1.37	0.13	1.97		1.52	1.15	0.16	0.08	0.12
Kiwangwa(Tomato)-Salim	6.2	5.6	0.66	0.08	2.85		4.91	1.64	0.41	0.02	0.10

Lushoto-Soni area

Measurements

- Soil and water analyses were performed as described for their determination (Page, 1982).
- Irrigation water (tomatoes) was analyzed for nutrient content before and during the trial
- Soils were analyzed for texture, trace elements (Mn, Mo, Zn, B, Cu) in terms of 3 samples per trial field pre-cropping.
- Soil chemical properties (pH, P, K, Mg, Ca, S and EC) were analyzed before and after experimentation

Measurements cont….

- Plant tissues were analyzed for N, P, K, Mg, Ca, S, Zn, B and Cu for leaves, and harvested materials
- Sulphur was analyzed spectrophotometrically as described by the laboratory procedures at Mlingano (National Soil Service, 1990)
- Yields: Maize yield (kg/ha), and yield components (# of fertilized kernels, # of cobs per plant, # of plants ha^{-1}, average weight of cobs) will be determined and recorded
- Tomatoes will analyzed for quality and yields. Quality will be recorded in terms of number of tomatoes per picking, size (diameter of fruits) and average weight of 5 ripen fruits.

Treatments (tomatoes)

Lushoto AEZ E12	Treatment Codes	Actual	Soils
	1. Control1 (no fertilizers applied)	1. Control1 (no fertilizers applied)	Humic Acrisols
	2. Control 2 (local rates for N and P)	2. Control 2 (local rates for N (160kgN/ha) and P (82kgP/ha)	
	3. N + P + Poly K_2O (rate a)	3. 160 kgN/haN + 82KgP/ha + Poly K_2O (rate a)	
	4. N + P + Poly K_2O (rate b)	4.160 kgN/haN + 82 KgP/ha + Poly K_2O (rate b)	
	5. N + P + Poly K_2O (rate c)	5. 160 kgN/haN + 82 KgP/ha + Poly K_2O (rate c)	
	6. N + P + MOP K_2O (rate a)	6. 160 KgN/ha + 82 KgP/ha + 150kgMOP K_2O (rate a)	
	7. N + P + MOP K_2O (rate b)	7. 160 KgN/ha + 82 KgP/ha + 200kgMOP K_2O (rate b)	
	8. N + P + MOP K_2O (rate c)	8. 160 KgN/ha + 82 KgP/ha + 300kgMOP K_2O (rate c)	

Bagamoyo C1/C2	Treatment Codes	Actual	Soils
	1. Control1 (no fertilizers applied)	1. Control1 (no fertilizers applied)	Ferralic Cambisols
	2. Control 2 (local rates for N and P)	2. Control 2 (local rates for N (92kgN/ha) and P (46kgP/ha)	
	3. N + P + Poly K_2O (rate a)	3. 82 kgN/haN + 46 KgP/ha + Poly K_2O (rate a)	
	4. N + P + Poly K_2O (rate b)	4. 82 kgN/haN + 46 KgP/ha + Poly K_2O (rate b)	
	5. N + P + Poly K_2O (rate c)	5. 82 kgN/haN + 46 KgP/ha + Poly K_2O (rate c)	
	6. N + P + MOP K_2O (rate a)	6. 82 KgN/ha + 46 KgP/ha + 50MOP K_2O (rate a)	
	7. N + P + MOP K_2O (rate b)	7. 82 KgN/ha + 46 KgP/ha + 50MOP K_2O (rate b)	
	8. N + P + MOP K_2O (rate c)	8. 82 KgN/ha + 46 KgP/ha + 50MOP K_2O (rate c)	

Treatments (maize)

Lushoto AEZ E12	**Treatment Codes**	**Actual**	**Soils**
			Humic Acrisols
	1. Control1 (no fertilizers applied)	1. Control1 (no fertilizers applied)	
	2. Control 2 (local rates for N and P)	2. Control 2 (local rates for N (60kgN/ha) and P (17kgP/ha)	
	3. N + P + Poly K_2O (rate a)	3. 60 kgN/haN + 17 KgP/ha + Poly K_2O (rate a)	
	4. N + P + Poly K_2O (rate b)	4. 60 kgN/haN + 17 KgP/ha + Poly K_2O (rate b)	
	5. N + P + Poly K_2O (rate c)	5. 60 kgN/haN + 17 KgP/ha + Poly K_2O (rate c)	
	6. N + P + MOP K_2O (rate a)	6. 60 KgN/ha + 17 KgP/ha + MOP K_2O (rate a)	
	7. N + P + MOP K_2O (rate b)	7. 60 KgN/ha + 17 KgP/ha + MOP K_2O (rate b)	
	8. N + P + MOP K_2O (rate c)	8. 60 KgN/ha + 17 KgP/ha + MOP K_2O (rate c)	

Bagamoyo C1/C2	Treatment Codes	Actual	Soils
			Ferralic Cambisols
	1. Control1 (no fertilizers applied)	1. Control1 (no fertilizers applied)	
	2. Control 2 (local rates for N and P)	2. Control 2 (local rates for N (45kgN/ha) and P (10kgP/ha)	
	3. N + P + Poly K_2O (rate a)	3. 45 kgN/haN + 10 KgP/ha + Poly K_2O (rate a)	
	4. N + P + Poly K_2O (rate b)	4. 45 kgN/haN + 10 KgP/ha + Poly K_2O (rate b)	
	5. N + P + Poly K_2O (rate c)	5. 45 kgN/haN + 10 KgP/ha + Poly K_2O (rate c)	
	6. N + P + MOP K_2O (rate a)	6. 45 KgN/ha + 10 KgP/ha + MOP K_2O (rate a)	
	7. N + P + MOP K_2O (rate b)	7. 45 KgN/ha + 10 KgP/ha + MOP K_2O (rate b)	
	8. N + P + MOP K_2O (rate c)	8. 45 KgN/ha + 10 KgP/ha + MOP K_2O (rate c)	

What is POLY4?

- Polyhalite ("Poly4") is a naturally occurring evaporite mineral comprising hydrated sulphates of potassium, calcium and magnesium, with the chemical formula $K_2SO_4.MgSO_4.2CaSO_4.2H_2O$.

- Poly4 is used as a four-in-one macro-nutrient source of potassium, sulphur, magnesium and calcium.
- Potassium level is estimated at 14.06% K_2O

Results

- Measured parameters in maize and tomatoes have just been collected and will be analysed for statistical comparisons in the coming weeks

Photographic displays

Mswaki village - Kilindi 2 weeks maize

Kiwangwa village, Bagamoyo-maize 2 weeks

Shashui village Lushoto-tomatoes- 4 days old

Mswaki village, Kilindi, 6 weeks - maize


TREATMENT 1
CONTROL

Kiwangwa village, Bagamoyo-tomatoes 8 weeks old


TREATMENT 5
45 Kg N ha-1 + 10 Kg P ha-1
+ 40 Kg K ha-1 Poly 4


TREATMENT 3
45 Kg N ha-1 + 10 Kg P ha-1
+ 10 Kg K ha-1 Poly 4

THANK YOU FOR LISTENING