

The maize crop as a source of food and feed for livestock on smallholder dairy farms in the Kenyan highlands.



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Field observations

- Maize thinnings are available seasonally and
- Increase supply of good quality fodder without taking more land
- Often occur during cold periods when planted fodder is not growing.
- Allow Napier to grow for use later.
- Reduces need to purchase fodder off farm.

Hypothesis

Quantity of high quality maize thinnings can be increased by planting more densely without negatively affecting grain yield under farmers' management.



Methods

- Three individual experiments on three farms in Kiambu District of Central Highlands, Kenya.
- A 2 x 2 factorial:
Factor 1: Seed density Low (S1) and High (S2)
Factor 2: Manure/fertiliser rate Low (M1) and High (M2)
- Sixteen plots of 6 x 4 metres were laid out in a randomised block design on farmers land.
- Farmers defined low rates reflecting their current practices and made all decisions concerning subsequent maize management.
- Measurements taken include maize thinnings, total stover and grain yields. (kg DM ha⁻¹)

Results

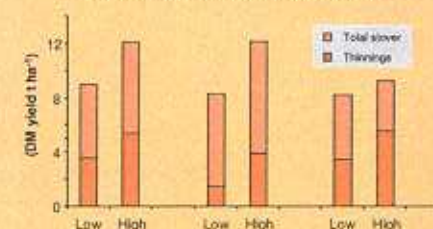
Farmer	Plant density '000 ha ⁻¹ (P)		Manure rate t DM ha ⁻¹ (M)		Fertiliser rate t ha ⁻¹ (F)		Percentage increase		
	S1	S2	S1M1	S2M1	S1M1	S2M1	P	M	F
1	53	75	4.0	2.9	0.33	0.24	43	100	22
2	37	63	4.3	3.6	0.33	0.33	69	100	18
3	70	75	5.4	2.9	0.45	0.24	7	200	0

- S1M1, reflects farmer rates for seed, manure and fertiliser.
- Farmers increased spacing when number of seeds per hole was increased. As a result, change in plant density for Farmer 3 was small.

		Total thinnings t DM ha ⁻¹			Total stover t DM ha ⁻¹			Grain yield t ha ⁻¹		
		F1	F2	F3	F1	F2	F3	F1	F2	F3
Seed rate	Low	3.6	1.5	3.5	5.4	6.8	4.7	8.5	5.4	6.2
	High	5.3	3.9	5.5	6.8	8.3	3.8	10.6	9.5	5.1
Manure/Fertiliser rate	Low	4.9	2.7	4.2	5.3	7.0	4.3	9.3	6.1	5.9
	High	4.0	2.6	4.8	6.9	8.2	4.2	10.9	8.8	5.3
Seed x Manure/Fertiliser interaction	Main	0.68	0.30	0.39	0.96	1.17	0.62	1.52	0.94	0.93
	Interaction	0.36	0.42	0.56	1.38	1.66	0.87	2.14	1.34	1.32
Sig.	Seed	*	***	*	ns	ns	ns	ns	***	ns
	Manure/Fertiliser	ns	ns	ns	ns	ns	ns	ns	**	ns
Interaction	Seed	*	***	*	ns	ns	ns	ns	***	ns
	Manure/Fertiliser	ns	ns	ns	ns	ns	ns	ns	**	ns

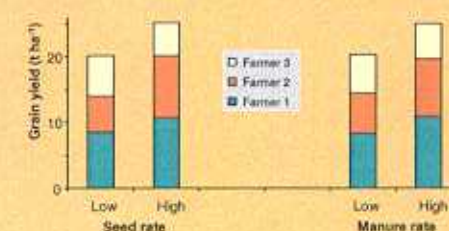
- Greatest increase observed was 166 % for 69 % increase in seed rate (F2)
- Manure application rate did not affect quantity of fodder produced, though it may be expected that continual dense cropping may reduce yields.

Effect of seed rate on fodder production



Quantity of thinnings increased by more than 48% even where seed density increased by only 7%.

Effect of seed and manure rate on grain production



Grain yields were only changed for F2, when increasing seed rate ($p < 0.001$) and manure/fertiliser rate ($p < 0.01$) both resulted in an increase in yield.



Conclusions

- Increasing plant density increased quantity of good quality fodder by 48 - 166 % depending on plant density.
- Even at the lowest thinning yield of 1.45 t ha⁻¹, a farmer with 0.17 ha maize could produce an additional 118-409 kg DM.
- Using an ME value of 8.3 MJ kg⁻¹ DM, this amount of extra thinnings could supply maintenance requirements for a typical cow in Kiambu District weighing 350 kg for 19 - 66 days.
- Grain yield was not affected negatively, although cob size decreased.

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